Damming the Yarlung Tsangpo: Its Implications

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Yarlung Tsangpo- Dam Construction

The Yarlung Tsangpo is a major international river shared between Tibet/China, India and Bangladesh. It stretches over a total length of 2880km flowing from west to east on the Tibetan Plateau from its sources near the sacred Mt. Kailash then turning north to take a sharp U-turn (known as the Great Bend) to flow south into India. The Yarlung Tsangpo enters India via the Siang District of Arunachal Pradesh, as the Siang River. It is joined by the Dihang and Lohit rivers when enters Assam and is called the Brahmaputra. Upon flowing into Bangladesh, the river joins the Ganga and then merges with the Meghna from where it is known as the Jamuna and finally dividing into hundreds of channels to form a vast delta flowing into the Bay of Bengal.[1]

Until recently, the Yarlung Tsangpo was considered undammed and the last free-flowing river of Tibet however, eleven hydropower stations were planned for the Yarlung Tsangpo[2] namely: Jiacha, Zhongda, Lengda, Jiexu and Langzhen[3] Dagu, BaYu, Zangmu, Motuo, Daguaiwan, and Daduqia (see table: 1). The Dagu- 640 MW, BaYu- 780 MW, Jiexu- 510-560 MW, Zangmu- 510 MW, Jiacha- 320-360 MW, and Lengda-capacity are currently unconfirmed are located in Lhoka (Shannan) Prefecture of the Tibetan Autonomous Region (TAR). The Zhongda- 480 MW, Langzhen- 340 MW, Motuo- 38000 MW, Daguaiwan-4900 MW, and Daduqia- 43800 MW are located in Kongpo, TAR. The Zangmu dam was the first dam started to construct on the Yarlung Tsangpo in 2010 and expected to be generating electricity this year.

The Metog (Chinese: Motuo) dam project at the Great bend is planned tod be the world's largest hydropower station and could generate about two times the capacity of the Three Gorges Dam[4]. When the Yarlung Tsangpo enters one of the world's deepest and largest gorges, starting from a 4,900 meter cleft between two of the highest mountains in Eastern Himalaya: 7756 meters high Namchak Barwa and 7294 meters tall Gyala Pelri, the river drops nearly 2500 metres in altitude, forms several waterfalls and gives up huge potential for

hydropower generation[5]. According to the HydroChina Corporation, the China's biggest dam builder, the Metog dam will generate 38,000 MW of power with an estimated cost of $30 billion[6].

This project may be feasible from an economic and engineering perspective, but major environmental and seismic issues will be inevitable if the Chinese government decides to build a dam of such scale. The project is likely to be built after related infrastructure of nearby dams to supply power for its construction and ultra-high voltage power transmission lines are completed.

Brahmaputra Water Diversion

Many discussions have taken place in regards to the idea of the Brahmaputra diversion where the water will be pumped northward across hundreds of kilometers along with the Yellow River and finally falls into the city of Tianjin on China's East Coast. In early August 2011, Green Earth Volunteers, a Chinese NGO organised a seminar on the Shoutian Canal (Great Western Route scheme) with experts in geology, meteorology and wetlands[7]. Zhou Wei, the assistant editor in chinadialogue's Beijing office was present at the seminar and witnessed the plan of the Shoutian Canal. Zhou saw the promotional material of the Shuotian Canal Preparatory Committee where they showed the canal crossing five different rivers, requiring 10 separate reservoirs, crossing more than 14 provinces and municipalities in the west and north of China such as Qinghai, Gansu, Inner Mongolia, Xinjiang and Beijing[8].

Guo Kai, the chief designer and project's initiator also presented in the seminar. He was a retired technical cadre and comes from a hydraulic engineer family. He was the vice-director and secretary-general of the Shuotian Canal Preparatory Committee and chairman of the Beijing Shuotian Consulting Development Company. According to Guo, the Yarlung Tsangpo diversion would solve the water shortage in north, desertification, electricity, and relieve pollution**.** He explained during the seminar that he originally planned to bring water from the Yellow river to Beijing but the Yellow river had dried up. Then he saw the Brahmaputra which has "plenty of water and it won't make any difference to India,"[9] he said. Chinese army

generals supported his idea when he proposed the plan[10] and Guo was also shown support from senior levels of government[11] during the seminar.

Gu Kai's idea also inspired Li Ling who wrote a book *Tibet's Water will Save China*, published in 2005. Li proposed that China can go beyond simply damming Tibetan tributaries of the Yangtze, not only channeling them north to the Yellow River, but also damming the Yarlung Tsangpo to direct the flow of water northward. The idea of water diversion is also visible from the late Masaki Nakajima, founder and special advisor of the Mitsubishi Research Institute of Japan. He proposed a $500 billion project to the Global Environment Fund in 1977, however there is no evidence of the Chinese government's interest in it at the time[12].

Another scholar called Wang Guangqian, at the Chinese Academy of Sciences and director of Tsinghua University's State Key Laboratory of Hydroscience and Engineering attempted to push forward the proposal but the Minister of Water Resources rejected his efforts[13]. According to Wang, the diversion is necessary because water usage has dramatically increased on the lower reaches of the Yangtze and Yellow River, causing desertification and groundwater extraction in Northwest China. Thus, it is important to exploit the water resources of the Tibetan Plateau to "ease water shortages in the north of China, but also transform desert landscapes, increase farmland, provide power and create jobs"[14].

On the other hand many Chinese have objected to the project. Qian Zhengying, the former minister of water resources and supporter of the Three Gorges Dam Project told the State Council in July 2000 that there would be "no feasibility, technical or economical, for the Great Western Route scheme"[15]. Chen Chuanyon, research fellow at the Chinese Academy of Sciences' Institute of Geographic Sciences and Natural Resources Research mentioned that the Yarlung Tsangpo valley is an ecological marvel, attained after millions of years of evolution and if human activities caused damage to the ecosystem, the loss would be incalculable[16].

The Yarlung Tsangpo water diversion project is not feasible and practical due to many reasons. It is not practical in terms of climatic conditions; the Tibetan plateau would be in below freezing point during winter and early spring when water demand is highest in North China[17].

Moreover, the Yarlung Tsangpo diversion would not able to supply the quantity of water claimed in the proposal and the canal would change the entire format of distribution of water across China[18]. Finally, the Yarlung Tsangpo water diversion project could instigate geological disasters and potentially cause earthquakes.

Effects of Earthquakes on Dams

Dams change the flow of water downstream affecting farmers and fishermen[19], causing environmental problems, displacement of peoples and geological risks. The increasing number of dams in Tibet severely raises pressure on the rivers running from the region. This will not only affect Tibet but also the neighboring countries and China. The greatest risk dam construction poses on the Tibetan Plateau is how frequent earthquakes could trigger the falling of dams.

The Tibetan Plateau is a region ridden with seismic activity, thus creating high risks. The Himalayas and the Tibetan Plateau are formed by the collision of tectonic plates. The higher levels of seismic activity pose grave threat to dams. Thus, there could be catastrophic repercussions for the plateau if an earthquake were to take place. Dams could be destroyed; causing not only impacts on various levels domestically, but also for those downstream in neighboring countries[20]. Some Chinese researchers believe dams are both the trigger and the victim of these quakes[21]. Cascade Dams are likely to cause chain reactions and expand the impact of any earthquake.

(Table: 2) Percentage of total dams (based on the 137 dams in the ziyuan_b map) in each seismic hazard zone for selected rivers in western China

River	**Dams in the high to very high seismic hazard zones (%)**	**Dams in the Moderate seismic hazard zones (%)**	**Dams in the low seismic hazard zones (%)**
Dadu	10.9	6.6	0
Mekong	3.7	9.5	0
Min	0	2.2	0
ParlongTsangpo	5.8	0.7	0

Salween	3.7	16.1	0
YarlungTsangpo	2.9	0	0
Yalong	9.5	2.2	0
Yangtze	11.7	2.9	0
Yellow	0	10.2	1.4
Total Percent	**48.2**	**50.4**	**1.4**

(Source: Jackson, 2012: 18) *The data is based on the map published by HydroChina. The status of the 137 dams has changed since 2004.

In 2012, Probe International published a study on *Earthquake Hazards and Large Dams in Western China*. According to this study, China has large dams under construction or proposed large dams for the Yarlung Tsangpo, Parlong Tsangpo, Salween, Mekong, Yangtze, Yalong, Dadu, Min, and Yellow river. 48.2 percent of these dams are located in zones of high to very high seismic hazard, 50.4 percent are located in zones of moderate seismic hazard and only 1.4 percent are located in zones of low seismic hazard[22] (see table: 2).

Thus, the greatest risk to a large dam at the Great Bend of Brahmaputra in Metog County is seismic activity. The Metog County in the Nyingtri Prefecture of the TAR had a moderate earthquake in 2008 before the disastrous Sichuan Earthquake that killed over 90,000 people in 2008. Earthquakes collapse dams, which can be exemplified by the 2010 earthquake of 7.1 magnitude in Yushu County, Qinghai province destroyed the town of Yushu Tibetan Autonomous Prefecture and damaged three dam complexes, the Xihang, Dangdai, and Changu dams, all located on theYangtze tributary. This is a nerve-wracking example for people living downstream in India and Bangladesh, given the proximity of the Great Bend to India[23].

China-India on Brahmaputra

The major rivers originating from Tibet into India are the Brahmaputra in the northeast and the Indus and Sutlej in the northern part of the country but China and India do not have any water sharing treaties. Several memorandums of understanding (MoU) have been signed between the two nations, in which China shall provide the "hydrological information on the Yarlung Tsangpo/Brahmaputra River in flood season to India"[24]. India and China signed the first MoU in

2002. The lastest MoU was signed on 30th June, 2014 during the visit of Vice President Hamid Ansari of India to China and hydrological information sharing has been enhanced to start from May 15th instead to June 1st to October 15th. India will pay over Rs 82 lakh annually for hydrological data sharing to China[25].

Eight meetings of Expert-Level Mechanism (ELM) to discuss interaction and cooperation on provision of flood season hydrological data, emergency management and other issues regarding trans-border rivers between India and China have been held since 2006. However, this did not produce effective measures as every year the middle and lower reaches of the Brahmaputra caused devastating floods killing thousands of people. Such devastation is happening because there are no multilateral agreements between China and India for joint management of the river in addition China refuses to share data on its upstream projects, despite agreements and memorandums of understanding.

The Indian government has been continuously pressuring China for "transparency, greater hydrological data sharing, and a commitment not to redirect the natural flow of any river or diminish cross-border water flow"[26]. Denial of China's hydrological data sharing during a critical season can be seen as China using water as a 'political tool'- according to Brahma Chellaney, Professor at the Centre for Policy Research in New Delhi.

On the other hand, Li Zhiwen, a deputy researcher at the Chinese Academy of Social Sciences' Institute for Asia- Pacific Studies said that China was firmly opposed to any attempt by India to strengthen its de-facto control of the region (Arunachal Pradesh) by developing the Brahmaputra[27]. Li further states that real progress in talks on trans-border river issues is unlikely as India and China have not yet dealt with border issues. Thus, China would see any Indian development downstream of the Brahmaputra as threatening its claims over Arunachal Pradesh, which it refers to as South Tibet[28].

Thus, India and China are more actively concerned about their unresolved border issues and political stability in the region than finding solutions for the devastation[29]. Similarly, there is competition to build as many dams on the Brahmaputra. India's Central Electricity Authority

announced 146 projects on the Brahmaputra basin in 2007 and today there are about 200[30]. In addition China has built one dam on the Yarlung Tsangpo and proposed 10 more. Thus, there is an urgent need for an ideal, sustainable form of development regarding the watershed, which must move beyond "nationalistic approaches of economic growth to focus on people's livelihood and human development"[31].

Conclusion

China has accelerated hydropower projects in Tibet through China's 12th Five-Year Plan (2011-2015) to build 120 GW and then 160 GW in Energy Development Plan in 2013. (Rephrase first sentence of paragraph) Thus, China dammed all the rivers flowing in Tibet and currently under construction are projects on the Mekong, the Salween and the Brahmaputra. China has built the Zangmu dam and proposed to build three more on the Brahmaputra as well.

The demand of energy and carbon reduction emission might push China further to build the world's largest hydropower station on the Brahmaputra in Metog. Moreover, many scholars have discussed about the diversion of Brahmaputra to the northeast of China. Though the Chinese government and many scholars don't see the feasibility of such a project, it would create a devastatingly great impact downstream on countries like India and Bangladesh if such a project were to be completed.

Dam constructions on the Brahmaputra changes the water flow downstream affecting the farmers and fishermen of India and Bangladesh. Upstream on the Brahmaputra, it has witnessed mudslides and desertification. The biggest risks of damming the Brahmaputra or any river on the Tibetan plateau would be how it could trigger earthquakes and in turn how frequent earthquakes and active seismic activities on the Tibetan plateau could bring damage upon dams. Thus, India and China should come together to save their countries from such disasters by signing the water treaty. The Indus Waters Treaty between India and Pakistan on the water sharing is a great example of how India and China could manage the disasters of Brahmaputra and safeguard each other's interests irrespective of their political disagreements.

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