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Editorial

China is weaponising rivers

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The future will be fought on water and not on any other issues. The word has witnessed many disputes on water in the recent past but fortunately they have not crossed the critical threshold of becoming a world war. There are many bilateral or multi- lateral agreements which have the potential for water exploitation (Ashok swain, 2001). This has been seen that world has witnessed more human causalities in the past than the natural disasters and this is indicative of water as an emerging threat to the world peace (Angelakis, A.N. et al 2021). Emergence of water as a threat requires strong legal landscape across the countries (Peter Gleick, 2023). The Helsinki rules on the uses of water in not legally binding therefore, it doesn't serve the purpose for which it was structured (International law association, 1966). The Chinese have weaponised water and building many dams on the Yarlung Tsangpo River, possibly the China plans to make 360 dams on slope with a gradient of 60^{o} on the Himalayas which is very young and Fissile Mountain. Chinese government has taken a decision to lift a decade-long embargo on hydropower 'projects in the lower reaches of the Yarlung Tsangpo (Brahmaputra) river in Tibet. And soon after The Chinese government decided to build 40 dams in the Tibetan portion of Brahmaputra basin of which 20 dams are expected to generate 60,000 MW of power on the Yarlung Tsangpo itself. This unilateral decision may threaten the entire North-Eastern part of India if not stopped now. In a research article published recently the authors argue that status quo renders China multiple geopolitical, geo-economic and geostrategic advantages (Verma, 2023).

The Himalayas are extremely sensitive seismic zone and very fragile in nature therefore, a minor earthquake or any other disturbances can make a huge damage to the ecosystem like what is being seen in Chorabari, Rishiganga and Sikkim glacial lake outburst flood in the recent past. The Yarlung Tsangpo River (YTR), located in the Himalayan orogenic belt, is renowned for its deep gorges and complex tectonic features, as well as its reputation as a landslide-prone region (Zhao et al., 2024) is well known hence, if one dam breaks down on account of earth quake or any other external factors there could be a domino effect on others and that may be uncontrollable and devasting to the areas down below. The earth quakes are also very frequent and their occurrences at different years can be seen in the maps below therefore, Chinese mega dams sitting in the lap of such a high seismic zone is a matter of great concern for all of us.

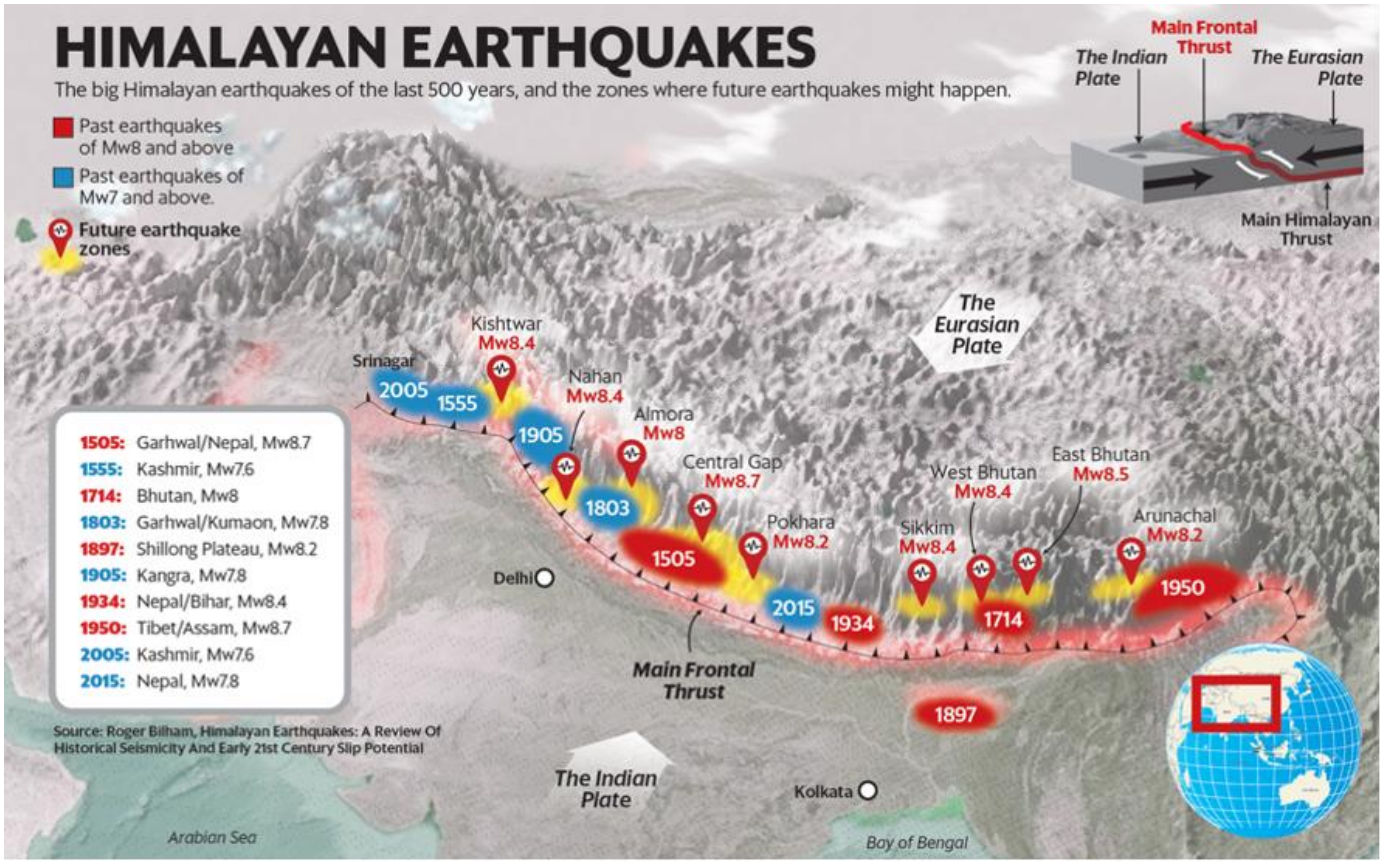

Figure 1: Number of major himalayan earthquakes

All these dams have water reservoirs containing a huge volume of water and weight since their heights are great. This has been properly researched and published in peer reviewed journals that reservoirs can trigger earthquakes. Water bodies increase ground stress which in turn decreases the effective strength of the rock under a reservoir. Several geologic, geohydrologic, tectonic and seismic factors that influence the phenomenon of reservoir-triggered seismicity (RTS) are reported. Filling of reservoirs has induced earthquakes in over hundred sites in the World including some fifteen cases in India (Rastogi, 2021). Earthquakes are caused by the filling of reservoir at sites where natural stresses in the underlying rock mass have developed to a state close to rupture. Perhaps, reservoirs might advance the earthquake which would otherwise have occurred sometime later (Jain & Singh, 2003). The interplay between the rate of diffusion of water into permeable rock, the permeability of the rock, and the tectonic faults are not predictable. The build-up to a quake will occur deep below the earth's surface (often kilometres below) It could take years to become lethal enough to trigger a quake. The stresses and pore pressure induced by impoundment of reservoirs there may trigger or induce earthquakes by being the proverbial last straw (Chander, 1999). However, it is also not predictable whether a new reservoir will immediately induce seismicity or experience it. The state of stress and the rock strength deep below where earthquakes occur cannot be measured. All that the world knows that there are examples of devastating 'induced earthquakes' as they occurred at Koyna, India, in 1967, and Xinfengjiang, China, in1962. In a study on the reservoir-triggered seismicity (RTS) in the Zipingpu Reservoir way back in 2008 the researchers evaluated that that the impoundment could have changed the Coulomb stress by −0.01 to 0.05 MPa at locations and depth consistent with reported hypocentre positions. This level of stress change has been shown to be significant in triggering earthquakes on in a scale of 7.9 Richter scale around critically stressed faults (Shemin Ge et al., 2009).

Geologically this area in Tibet China is highly unstable, subduction zone of Indian Plate, due to instability area is prone to faulting and earthquakes. China efforts to construct dams in this region may pose danger to life downbow in the Brahmaputra river in India. Highly faulted area. Due to movement Indian plate earthquakes can occur at any time.

Quaternary deposits of loose soil and glacial deposits, area look like loose sands. Neogene sandstone exposure at places. Volcanic rocks are standing as hillocks. Tethyan Himalayan sequence rocks around Mansarovar lake and Lhanag Tso Lake area. Mélange type rocks are present around south of these lakes. Paleocene granite and Miocene leucogranite hills stand amidst Quaternary deposits, low lying areas look like sand dune. Some trees are located here and there at few places, otherwise area appears barren with very thin population in these inhospitable climatic conditions. Yalk is life line of people. Structurally number of faults and thrust zone which make area unsafe for big dams. In between hills strike slip dual has been reported.

The concern in India and Bangladesh is about how much of the water of the Brahmaputra and the Yamuna would get blocked by the massive dam that China will build in this Yarlung Tsangpo canyon. Some experts are of the opinion that this may not be so worrisome a factor because the longer stretch of the Yarlung is located in the rain-shadow zone to the north of the Himalayan range and receives much less rainfall compared to the south part of the river. This means that the average annual precipitation from snowmelt and meagre rainfall that the river receives in Tibet is about 300mm. But after the U bend, as the river moves towards the foothills and into India, the average annual precipitation, mainly rainfall, is 3,000 mm or more. The river flow increases by about 10 times between where it comes out of the canyon and when it reaches Guwahati halfway down the Brahmaputra valley in Assam. There are also at least 7 very healthy tributaries of the Brahmaputra that contribute to its massive flow.

In all, China intends to build 40 dams on the river and its tributaries and panned to generate 60000 MW. Of the 40 dams, 20 dams are smaller dams which are situated on the tributaries of Yarlung Tsangpo. They are expected to generate 5000 MW. Of the remaining twenty dams eleven dams on the Yarlung Tsangpo will be located between its source and the Great Bend where the Yarlung Tsangpo turns northwards, executes a huge 'U' turn and falls from 3,500 metres on the Tibetan plateau to 700 metres in the undulating hills of Arunachal Pradesh in India and this is an extremely dangerous proposition. These eleven projects are supposed to generate 20000 MW of electricity.

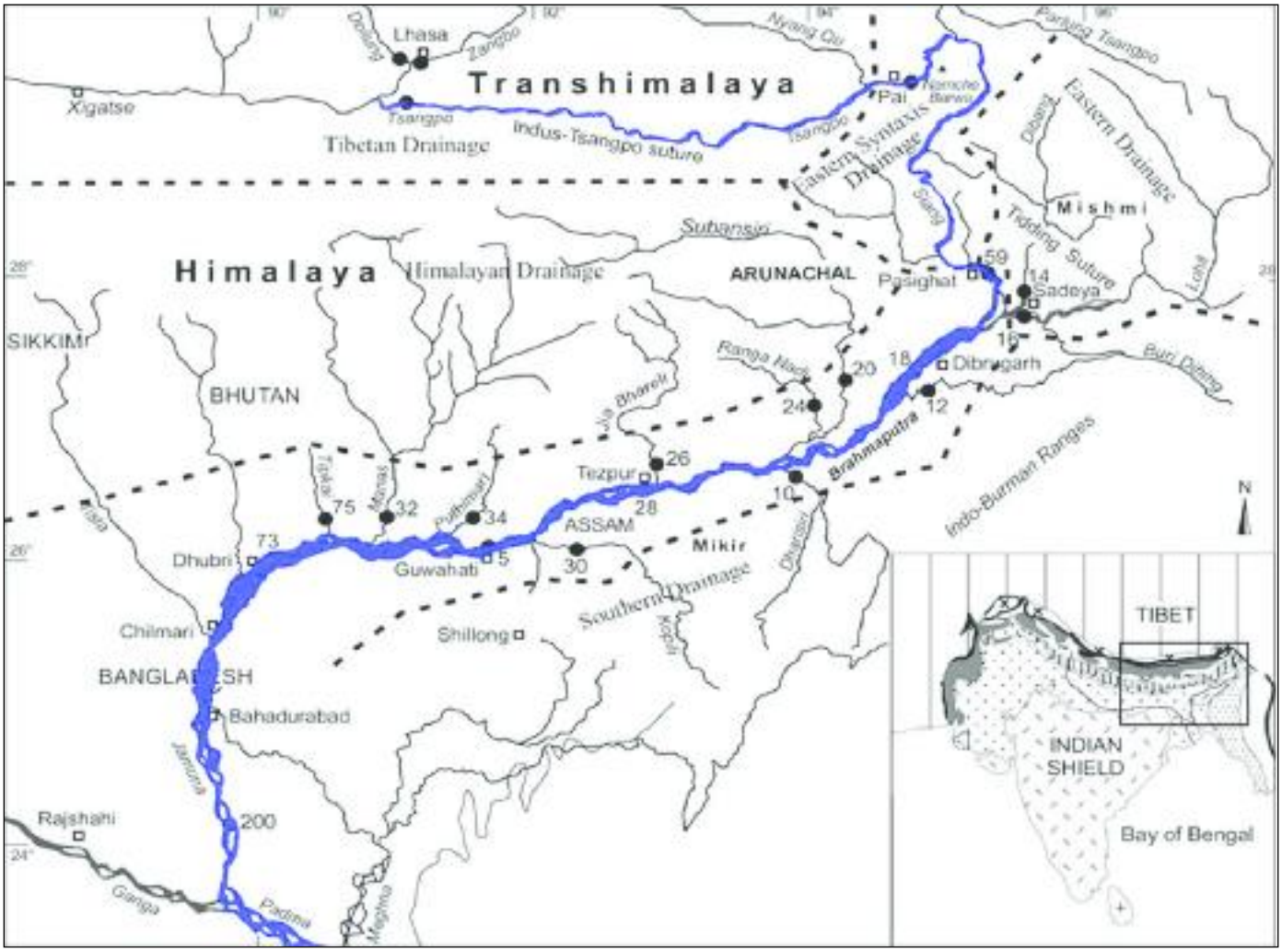

Figure 2: The great bend of the yarlung tsangpo river

The nine projects which are also called as mega projects or monsters are located on the great bends itself and are expected to generate rest of 20000 MW. Now, India has also been trying to match China by constructing dams on Brahmaputra which may prove counterproductive. India, for its part, plans to generate 22,000 MW from two large dams on the Yarlung Tsangpo in Arunachal Pradesh and 10,000 MW from dams on its tributaries. In all, therefore, the two countries plan to generate 97,000 MW of power from this tiny region of their respective countries. The company which is asked to build this dam has already built a vast tunnel separating the two arms of the big bend (also called as U bend) and diverts 50 billion cubic meters of water a year to the south-eastern slope where it will fall over nine cascading hydropower dams to generate 40,000 MW of peak power. The Chinese government has reiterated many times in the past the proposed dams will not deprive India's and Bangladesh right over legitimate share of water as lower riparian states despite this claim of china being contested by many water experts. The experts are of the opinion that 11 dams already built has enough potential to deny much needed water to India and Bangladesh during lean phase or repeated drought.

For India, the Brahmaputra accounts for nearly 30% of freshwater resources and 40% of total hydro power potential of the country. It is a matter of concern that after the construction of the dam, China can divert the water of Brahmaputra. Not only this, but it can release a lot of water through this dam at any time, which can cause flood-like situations in Arunachal Pradesh and Assam. And it certainly does not help that China's intent to divert a portion of Brahmaputra's water to arid parts of North China has remained a well-known point of contention between the two nations in the past. There are many reports which have also indicated that a "twin disaster" may be looming for India if the new dam is actually built. As the super dam engulfs the flow of the Brahmaputra river, some assert that India could stand to face acute shortages due to

weakened flow in the winter season. Conversely, if China releases excess water from the structure during its monsoons, future flash foods could lead to disaster in the north-eastern and state of Bihar in India.

The problem is further compounded as it is evident that the Brahmaputra is actually expanding. For perspective, the area covered by the Brahmaputra has almost doubled since the first surveys in the 1910s, gobbling up a devastating 8% of the state's total area. The Brahmaputra flows over 70% of Kaziranga National Park, making the area extremely susceptible to flooding. Currently, it is the widest river in India, having increased by up to 15 kilometres at some places due to the continual erosion of its river banks. According to the Rastriya Barh Ayog (RBA), as much as 39% of Assam is currently prone to floods and to put this into right perspective, this amounts to almost 10% of the total flood-prone area in the country, amounting to about 31 Lakh Hectares. And most of them are fertile lands. According to the ASDMA, major floods have occurred in Assam in 1972, 1974, 1978, 1983, 1986, 1988, 1996, 1998, 2000, 2004, and 2012. Since then, there have been annual flash floods and long-term inundations in 2018, 2020, 2021, 2022, and 2024. Historical data shows a troubling trend of rising flood impacts. From the 1950s to the early 2000s, the average annual flooded area and affected cropland increased. The number of affected people surged from 860,000 to over 4.5 million in the early 2000s. The economic damages increased more than 120-fold, annually. According to the Assam State Disaster Management Authority (ASDMA), 838 people died in floods from 2013 to 2022. The toll peaked in 2022 at 181 flood-related deaths - the highest in a decade. The government of Assam also claims an average loss due to floods comes to the unfortunate tune of around ₹200Cr a year on average.

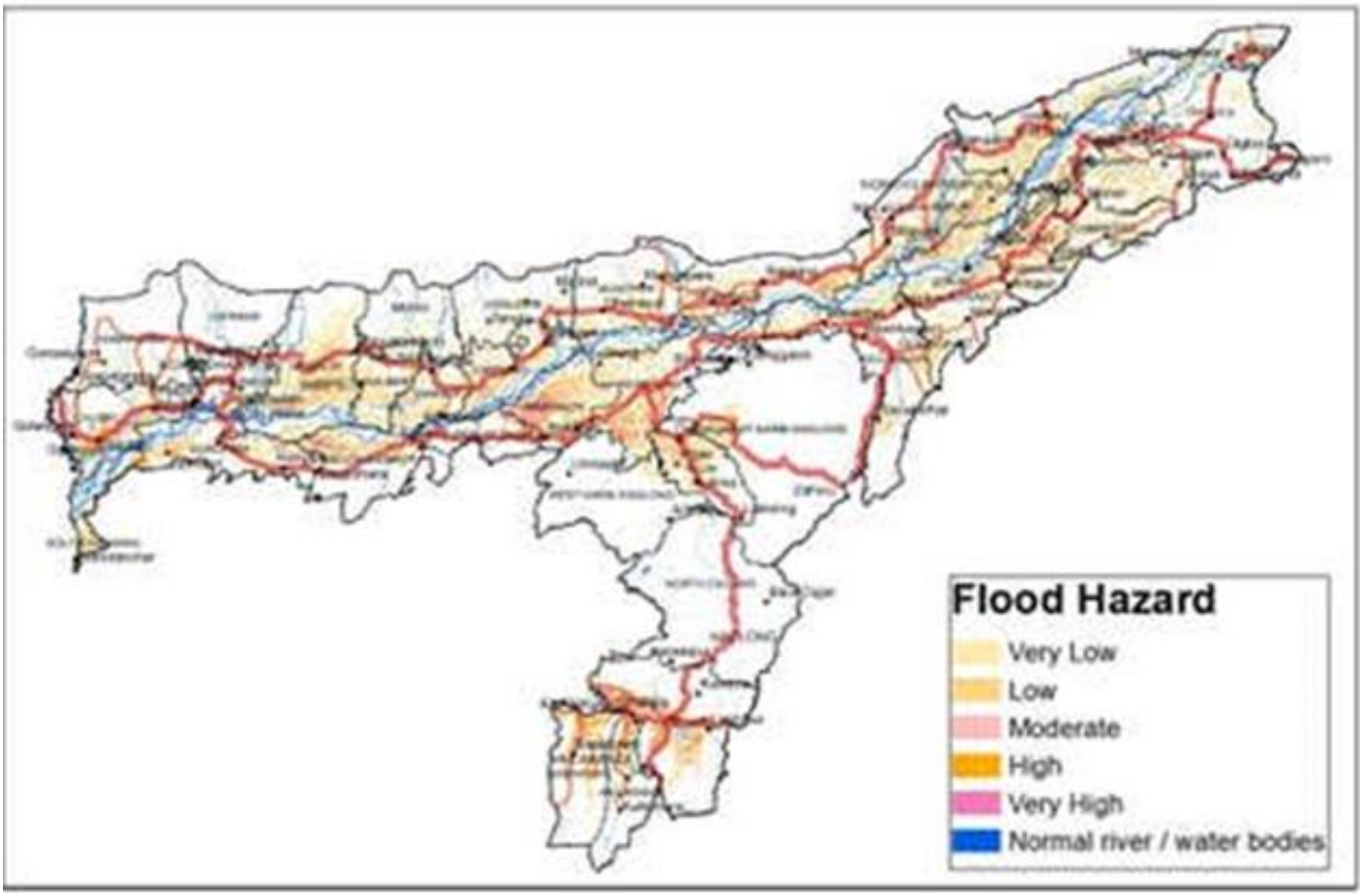

Figure 3: Map of assam flood prone areas

CONCERNS ARE FAR MORE DANGEROUS

The Medog region sees heavy monsoon, landslides and avalanches are common occurrences, and many instances of flash floods have been recorded here. Add to that the suspect tectonicity of the Eastern Himalayas, meaning that the chance of an earthquake is not rare in this region. So, imagine what could happen if a mega dam built

here bursts because of an earthquake; the devastation that it would cause in Arunachal Pradesh, Assam, and even in Bangladesh with a wall of water, like a Tsunami, with terrible force sweeping everything in its path. In 1975 the Banqiao Dam, in China, collapsed killing an estimated 230,000 people. The dam had burst after incessant rains, sending a wall of water nearly 20-foot-high and over 11-km-wide surging downstream, bursting 62 other dams downriver drowning 26,000 people within a few hours. There is certainly no comparison between the near primitive engineering of the Banqiao and what China is capable of now, but that will not stop people down-river of a mega dam from worrying. Engineering can never guarantee a feel-safe promise against nature, and a mega dam on the Yarlung Tsangpo will always carry with it the danger of a mega disaster in the event of an earthquake or landslide. The Himalayas have experience powerful earthquakes in recent past. The earthquakes where so strong that they measured 7.8 to 8.9 on the Richter scale in a time span of 53 years between 1897 and 1950. The proposed dam is so seismically sensitive the last earthquakes that took place in the region of South and West of the great bend in the Yarlung Tsangpo. This earthquake was equivalent to an explosion of 7.6 million tonnes of dynamite or medium size hydrogen bomb. This caused tremendous loss of the human life in upper Assam region. The 1950 earthquakes was the severest recorded in the earthquake history. It took place at rima in tibet and measured 8.7 in the richter scale. This caused a huge loss to the lives and properties in the Indian sub-continent. Both India and China are huge countries and they are facing water shortages but constructing dams on Yarlung Tsangpo is not a solution. Dam construction may destabilize the geology of Himalayas. Water security should be seen as an issue of national and international security (Biba, 2014). India must use diplomacy as a tool to pressurize China to respect the principle of commons (Jayram, 2015; Lovely, 2016) as the International law is weak and India should use hydro politics through Cooperative mechanism (Mahapatra and Rath, 2016). Forest ecosystems in the tributaries catchment area over 2500 meter altitude are very fragile and most of the trees are dying. The biodiversity is in the decline therefore, this need and urgent attention..

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