Chinese geologists warn an active fault line threatens world's biggest hydropower project along Yarlung Tsangpo River across Tibet

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New analysis brings call for slope reinforcement for massive mega-dam project in Tibet to mitigate risks of landslides and collapses

Geologists in China have determined that an active fault line directly beneath the world's largest hydropower project poses a threat to the multiple mega-dam under early construction along Tibet's Yarlung Tsangpo River (becoming the (Brahmaputra River in India before merging with the Ganges River). The scientists say a fracture in the Earth's crust in the eastern Himalayan region would significantly affect the integrity of the massive hydropower project's infrastructure.

In a paper published last month in the Chinese-language journal *Sedimentary Geology and Tethyan Geology*, supervised by the state-owned China Geological Survey, the team urged engineers to strengthen slope stability and implement retaining protections to mitigate the risk of landslides and collapses. The study was conducted by geologists from the Chengdu University of Technology, the Civil-Military Integration Centre of the China Geological Survey, and the Middle Yarlung Zangbo River Natural Resources Observation and Research Station.

"The Paizhen Fault, which has been highly active since the Pleistocene [also known as the Ice Age], will have a major impact on the structural stability and construction of nearby structures, including dams, roads, bridges and tunnels, as well as the reservoir area," the researchers wrote.

The active fault has fractured the surrounding rocks and altered their mechanical properties, they wrote, adding: "This makes the foundation bearing capacity and structural stability of nearby engineering projects more susceptible to damage.

"The Paizhen area is located within the reservoir area of the Yarlung Tsangpo downstream hydropower station."

The terrain has a "loose structure and weak cohesion", they said, warning that "after long-term immersion and under the influence of fault activity and earthquakes, instability of the slopes on both sides of the reservoir area can be extremely easily triggered".

Construction started last year on the mega-dam project on the Tibetan Plateau, which is said to be the largest of its kind in the world, with an estimated annual capacity of 300 billion kilowatt-hours of electricity – three times that of the Three Gorges Dam.

The Yarlung Tsangpo becomes the Brahmaputra River as it leaves China's Tibet autonomous region and flows south into India's Arunachal Pradesh and Assam states, and finally into Bangladesh as the Jamuna River.

China's construction has also raised concerns about water supply and environmental impact downstream in India and Bangladesh.

In the recent study, the team said Pai village area is located in the Himalayan seismic belt, which has the strongest and most frequent earthquakes in China and neighbouring regions. A strong seismic activity zone has formed along the Yarlung Tsangpo. “Since the Pai village area is located within the construction zone of the Yarlung Tsangpo downstream hydropower project, its records of Quaternary tectonic activity provide an important basis for exploring the structural stability of nearby projects.”

The Quaternary period is divided into two epochs: the Pleistocene (2.58 million to 11,700 years ago) and the current Holocene.

The Paizhen Fault is part of a network of tectonic breaks in the eastern Himalayan region, an area defined by collisions between the Indian and Eurasian tectonic plates. The team says the fault has been active since the Early Pleistocene and continues to show strong activity in the Holocene. Dating of ancient lake sediments indicates the fault was active as recently as 9,500 years ago.

The researchers also point to the magnitude 6.9 earthquake in Milin, Tibet in 2017, which occurred at the northern end of the fault line, as evidence of its modern seismic potential. “Under regional seismic action, landslides and collapses can easily be induced, threatening the safety of engineering facilities and personnel,” they report.

“During construction, structural stability safeguards must be strengthened. Implementing strategies such as slope reinforcement and retaining barriers is essential to mitigate the risks of landslides and collapse to construction and operation.”