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# The Koshi Deluge of 2008 and the aftermath

Aparajita Chattopadhyay

Koshi flood in Nepal and Bihar district of India is a historical phenomenon. The rage of Koshi has made it a different type of a river that faces upstream erosion, downstream siltation, braiding of channels, political obstacles of two countries and population pressure. In August 2008, the Koshi, a tributary of the mighty Ganges, flooded an area roughly the size of Belgium. The floods changed the course of the river, shifting it 120 km towards a dry river channel it last flowed through a century ago. Millions of people were affected by the devastating flood in both the countries. Though the reason for this recent flood is the breaching of the embankment, it calls for sincere research that may help treating a river more holistically. The embankment of Koshi that are built since the Mughal period has worsened the flood situation by making the river channel higher than its surrounding river basin. The anthropogenic causes are very much responsible to aggravate the flood situation of this river basin with time. This paper is an attempt to pinpoint the devastation of the 2008 flood, its aftermath along with the history of taming the river for so called 'development'.

*Key words: Koshi, Flood, Treaty, History.*

## Introduction

Millions of people were affected by Koshi flood in the bordering region of Nepal and Bihar state of India in August 2008. For some decades Koshi, also known as the 'sorrow of Bihar', was under control. However, in August 2008, it broke all its barriers. Morang, Sunsari districts of Nepal and Araruya, Supaul, Begusarai, Khagaria, Madhepura, Saharsa, Purnia, Bhagalpur, districts of Bihar were badly hit by this devastating flood (Fig 1). Breaching of the eastern embankment and heavy flow were the main causes of this catastrophe (Fig 2). Poor villagers of both the countries were shattered by this devastation. The biggest question is --was it not possible by the authorities and government to avert this situation, which is threatening to swallow many districts of Bihar and Nepal? In this paper, the causes and the extent of the disaster are first looked into followed by the history of taming Koshi and the possible solutions of avoiding floods are discussed.

## Causes and Extent of Koshi Flood in 2008

It is impossible to estimate the damage caused by Koshi flood in 2008, lives that had been lost during the flood hit days as millions were stranded in marooned areas where no relief effort was reached. About 6000 hectares of crop land in Nepal and 35000 hectares in India were affected with a huge

loss of agricultural products. More than 70,000 people in Nepal and 1 million in Bihar were affected by flood (The International Centre for Integrated Mountain Development, 2008).

The disastrous floods had brought in its wake untold tragedy and hardships on people. About 275 camps were erected by government and non-government agencies and by survivors themselves (Win, 2008). Some survivors made temporary shelters to share space in dimly lit squalid camps with thousands of others, where they were at risk from water borne diseases as well as contagious measles. These were no proper lighting in the camps and drinking water sources were far away. The same was true for people who had refused to leave their submerged homes for fear of looting. Many wanted to save with whatever they had left, despite the risk of their lives. 'Save the children' foundation reported to Reuters (2008) that a number of children who had taken shelter on highway had been killed by passing vehicles. Many aid agencies were worried about women and children who became vulnerable to abuse and trafficking in the aftermath of the disaster. There were also looting of warehouses and trucks in some areas of Bihar (Reuters, 2008). Moreover, heavy rain, damaged roads hampered flood relief measures in several areas. UNICEF officials reported to Reuters that it would be months before the displaced families

could return to their homes and expressed concerns over the hygienic condition of the government run relief camps (Reuturs, 2008).

The flood occurred due to structural failure of the embankment and not because of heavy discharge of water. Discharge of Koshi River at Chatra in the month of August is about 4400 m<sup>3</sup>/sec. On August 2008, the discharge was 4200 m<sup>3</sup>/sec which was well below the average monthly discharge. A high-level Government of Nepal team that inspected areas devastated by the flood in Koshi River, had held India responsible for the havoc. Media reports stated the devastation took place as the both the countries did not carry out repair and maintenance work on the Koshi barrage and the embankment along the river due to lack of efforts by Indian officials to save the breach in time, besides labour problem, logistics problem and law and order complication in Nepal, although Koshi took fifteen days to make the breach.

After flood, both the countries have agreed to conduct round the clock patrolling of the embankment during the flood season for any embankment repair work as needed. India has agreed to provide assistance to Nepal for strengthening the existing and reconstruction of new embankment along Koshi and its tributaries. In 2009, The Minister of Water Resources, India had announced that the only solution of controlling flood in that area is construction of a high dam, though environmentalists believe that construction of such dam would be suicidal. It will rather create more social problems.

It is the worst flood in the area in the past half century, prompting Manmohan Singh, the Prime Minister of India to declare a “national calamity” on August 28 and the government earmarked \$ 230 million in aid for the region. The Indian army and non-government organizations operated the biggest flood rescue operation in India in more than 50 years. Villagers ate raw rice and flour mixed with polluted water in Bihar, amid hunger and diseases like diarrhea, fever.

As stated by the D Gyawali, an eminent expert of water conservation of Nepal, (Sept 1, 2008, The Kathmandu Post):

*“It is important to step back a bit to realize that this catastrophe happened because of the unholy confluence of three things: wrong technological choice for this kind of a hydro-ecological regime, wrong institutional arrangements resulting from the Koshi Treaty that are not right for managing this kind of a trans-boundary river system, and wrong conduct in*

*public service over the last half-century, which includes aspects of corruption”.*

The causes of this disaster are briefed below:

**Wrong technological choice:** Koshi is a river that carries massive sediment load from the Himalayan belt. It is a natural geological process. Some one hundred million cubic meters of gravel, sand and mud flow out of Chatra every year. All the collected sediments from east, west and north passes through the Chatra gorge. At the foothill zone or Tarai region, sediments settle down raising the river bed and forcing the river to overflow its bank before finding a new course. The river swings like a pendulum from Supaul in the west to Katihar in the east in a natural process. But over centuries, man has jacketed the river by construction of embankments thus forcing the river to deposit its sediments in the river bed, leading to increase the height of the river and flood catastrophe in the rainy season. So, the Himalayan geo-tectonics, heavy monsoon regime and embankments are the causes of Koshi flood.

Koshi project is a bad idea that ignored the problem of sedimentation of the river. Man cannot tame nature. Koshi is such a vibrant river that it is extremely difficult for man to make it stable. Increasing the height of the embankment to further jacket Koshi is a dreadful design. The proposed high dam on the Koshi is also an adoption of a wrong technology as stated by Dipak Gyawali (2008).

“It is wrong because it would take two or more decades to construct, thus failing to address problems of current and immediate future concerns, is extremely expensive, does not address the primary problem of sedimentation (the reservoir will fill up too soon with Himalayan muck), has no convincing answer regarding the cost of attending to high seismicity in the region as well as diversion of peak instantaneous flood during construction (it is a major engineering challenge with no easy solution), and will create more social problems when indigenous population in Nepal have to be evicted from their ancestral homes.”

**Wrong institutional arrangements:** The Koshi treaty has been criticized for many reasons: Instead of a proper bi-national management arrangement, Nepal can only be a by-stander even for matters within its own territory. When Koshi treaty was signed in 1950s, India took upon itself all responsibility for design, construction, operation and maintenance of the Koshi project. After this flood havoc, Nepal government accused India for not being serious over rehabilitation of the

displaced people (Kathmandu Post, 2008). Both the governments failed to start repair work to stop further degradation of the embankment but continued to exchange words over who is responsible for the disaster mainly for the wrong institutional arrangements in Koshi treaty.

*Wrong conduct in public service:* Koshi project has become a synonym of corruption. Whatever money is spend for repair and maintenance of Koshi, about 60 percent of that is pocketed by the contractor, engineer and politician nexus (Ojha and Bista, 2008). The actual expenditure never exceeds 30 percent of the budgeted cost. Many of the desiltation and repair and maintenance works shown to have been completed are never done at all and yet payments are made (Gyawali, 2001). A serious public review and debate must ensue over the Koshi project and the treaty that brought about this catastrophe. Besides corruption, local agitations, political blamegaming of the local governance are regular features that also hamper the smooth conduct of the Koshi project work. Inadequate compensation and rehabilitation agitated local Nepali flood victims to obstruct the repair work at the embankment site after this catastrophe. The agitation led to delay in the construction of wall (The Times of India, 2008). Again, the repair work on the breached embankment was not done on a dependable manner. As stated by D Gyawali, “it is not possible to tame the river merely by piling sand” (Himalayan Times, 2008). Moreover, the construction of pilot channels was going on without concrete plan. The pilot channels failed to redirect Koshi River due to siltation.

### Histroy of Koshi flood control

The Koshi River or Kosi River, is a transboundary river between Nepal and India and is one of the largest tributaries of the Ganga. The river, along with its tributaries, drains a total area of 69,300 kmsq (26,800 sq mi) up to its confluence with the Ganga in India (29,400 km<sup>2</sup>/11,400 sq mi in China, 30,700 kmsq/11,900 sq mi in Nepal and 9,200 kmsq/3,600 sq mi in India), a part of Tibet (China) including the Mount Everest region as well as the eastern one third of Nepal (The International Centre for Integrated Mountain Development, 2008). The river basin is surrounded by the ridges separating it from the Brahmaputra in the north, the Gandaki in the west, the Mahananda in the east, and by the Ganga in the south. The river is joined by major tributaries, approximately 48 km (30 mi) north of the Indo–Nepal border, breaking

into more than twelve distinct channels with shifting courses due to flooding (fig: 3). All the rivers originating from the Himalayan zone carry heavy sediment load during monsoon and Koshi is not an exception. The sediments get multiplied due to younger geological formations, glacial silt in snow melt season, landslides and uncontrolled human activity. Statistics also show that though the land use of Koshi hill region in Nepal is remaining constant, over the last 12 years the occurrence of landslide has gone up 1 percent (Virgo and Subba 1994).

Koshi is a flood prone area since its historical past. The average water flow goes up to 18 times more than its average (1560 m<sup>3</sup>/Sec). The highest recorded flood in Koshi occurred in 1954 when the water flow increased 24 times. The upper catchment area of this river generates huge silt for natural and manmade causes and the silt yield is one of the highest in the world (19 m<sup>3</sup>/ha/year) (Vargehese, 1993). The river carries its huge silt through its gorges in the upper catchment. But due to flattening of its slope in the foothill zone sedimentary loads are deposited mainly beyond Chatra gorge and innumerable alluvial fans are formed along the international border of Nepal and Bihar. The river has several interconnected channels that shift laterally over the fans from time to time (fig 3). Thus Koshi swing like a pendulum through its ‘diara land’ which is a densely populated area for abundance of alluvial soils (Lahiri-Dutt, 2008).

The upper catchment area of Koshi experience frequent glacial lake outburst flood (GLOF). In the Himalayan region, glaciers are melting and retreating resulting in formation of lakes that are dammed by ice and moraines. Out of 960 glacial lakes, 24 are potentially dangerous for its possible bursting of moraine dams. Such GOLF bring huge amount of moraine and silt downstream and deposit the load in the form of alluvial fans mainly at the mouth of deep gorges downhill (Vargehese, 1993).

Since the Mughal period attempts were made to control Koshi by construction of low embankments. These embankments were gradually gained heights during the British period for construction of transportation links and in course of time villages got trapped within a series of embankments (Lahiri-Dutt, 2008). Post Independence India followed the same pattern. After the flood of 1953, Koshi project was conceptualized mainly to protect the people of Nepal and Bihar from recurrent floods. This project was built on three interlinked stages-

first construction of a barrage to check its shifting nature and providing irrigation and power to Nepal and India; second to construct embankments below and above the barrage for checking flood and thirdly, to construct a multipurpose dam in Nepal for a series of benefits in both the countries. Koshi barrage was built in between 1959 and 1963 under a bilateral agreement of Nepal and India largely for the purpose of irrigation through canals, for hydroelectricity generations and east-west connection through a highway. Koshi embankment system was built mainly to check its westward shift. The third phase of Koshi project, that is, construction of multipurpose dam is a debatable issue. It is still at the stage of investigation and research.

### Possible solutions

The problems of Koshi River are several. It is a braided channel and in nature it shifts channel through historic past. The heavy sediment load compounds the problem and makes the river bed unstable. For sedimentation, the entire river bed between embankments has gone up, so the embankment height is being raised in the past decades. As a consequence, the river bed has become higher than the surrounding plains and the river always create a high pressure on the embankments. The Chinese have adopted a dual method of taming the flow of Huang-ho and regular de-siltation of these rivers. They have erected dams along Huang-ho River to tame its flow, remove regularly the fertile silt from the river bed and distribute this fertile silt to neighboring areas to increase fertility of those lands. They have also altered the flow of Huang-ho River to new lakes. By adopting these three methods the Chinese have made "The Ungovernable" Huang-ho to be governed by people. For Koshi also, desiltation and bringing the river below to the surrounding plain is a sustainable solution. Afforestation of the Siwalik is a must to reduce sediment load. Construction of a solid embankment with heavy gabions is another way out, but difficult to implement (Tiwari, 2008). The embankments of Koshi are built for a good reason since the Mughal period. However the embankments has worsened the flood situation where regular inundation is an integral part of its hydro-ecology (Lahiri-Dutt, 2008). To quote Lahiri-Dutt (2008):

*"(R)ural life has moved from the utilization of flood waters to seeing floods as the problem that needs to be solved by river control. The higher riverbed*

*prevents the flood waters from returning to the channel. Older villagers complained that the floods have become unprecedented and catastrophic, and longer in duration. From rich riparian region, North Bihar in the last sixty years has turned into one of the poorest parts of India".*

Furthermore, the embankments are not maintained properly with regular repair work which is essential in the tectonically active Himalayan zone. The Koshi flood caused due to breaching of the embankment was about 50 years old. Experts say the safeguards have not developed at the required pace, and this is causing concern. (Khadka BBC, 2008). It is an immediate requirement for Nepal and India to think for a better solution suited to this fertile but unstable floodplain. Houses could be built of stilts and villages could be built on with raised plinth levels that keep life and property safe but allow the flood to easily pass by leaving fertile silt behind. Building houses on stilts is a cheaper, more 'doable' and thus a better solution (Gyawali, 2008).

The Koshi is one of the world's highest silt-yielding rivers. While the challenge silt-yielding rivers pose to dams is yet to be properly dealt with, huge new river-taming infrastructures are in the pipeline. In the context of weak maintenance of existing river infrastructure in Koshi river area, the river linking project of India is needed to be critically looked into. Researchers have also warned more floods and changing stream pattern due to glacial melt in the Himalayan region (Deccan Herald, 2008). So glacial melt water added with monsoon downpour will lead to havoc in the coming years if serious steps are not taken now. Instead of blame gaming each other by both countries, time has come to act fast and cooperate with each other for a long term solution. There are deep seeded issues that are needed to be addressed – common people of that region do not want statistics of number of deaths or displaces, they expect at least an early warning of such hazards from which they can save their lives and belongings.

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Fig 1. Districts of Bihar, India, Source: <http://gov.bih.nic.in/Profile/Districts.htm>, Government of Bihar

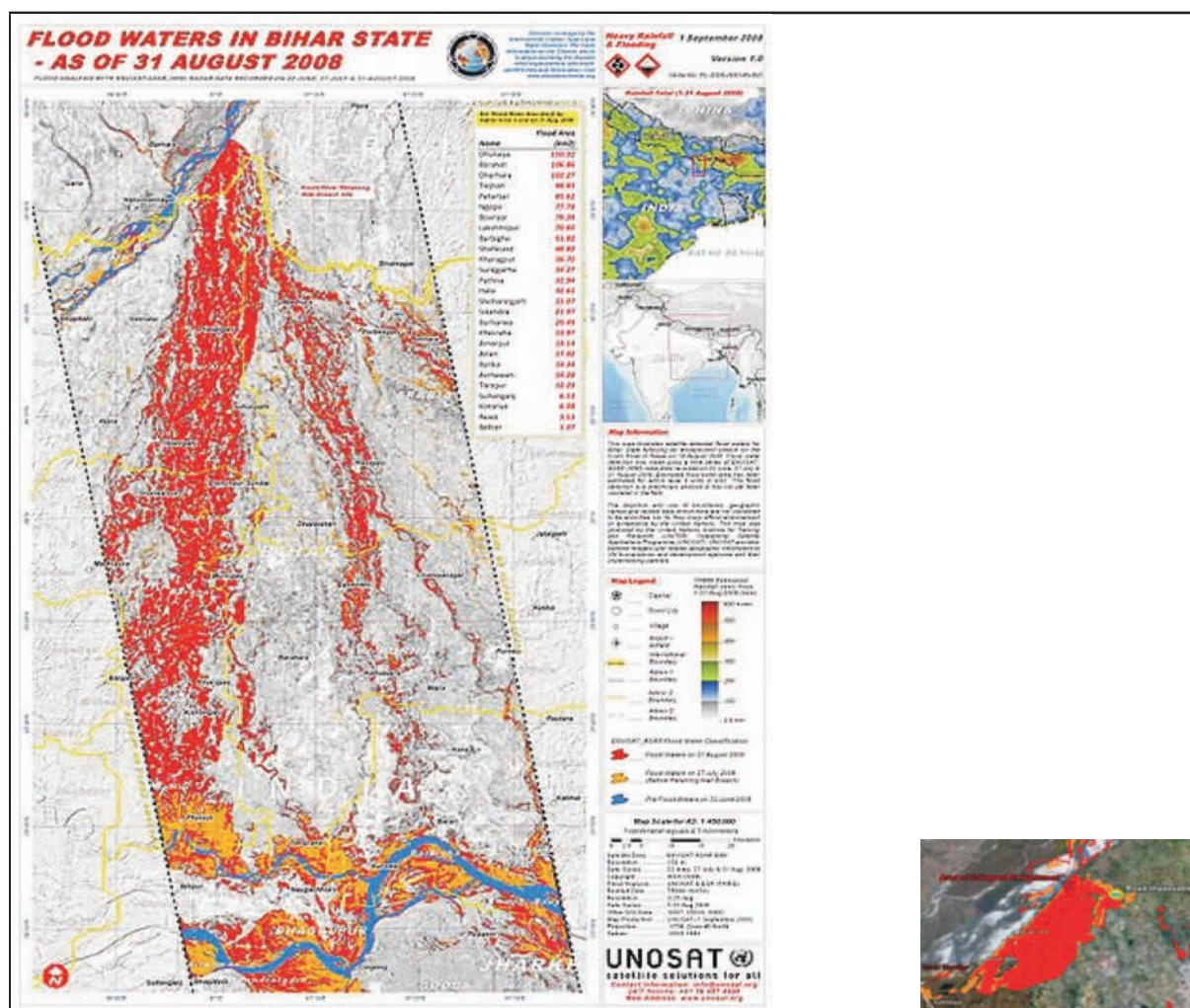


Fig 2. Shift of Course of River Koshi after 2008 Flood and the extent of flood

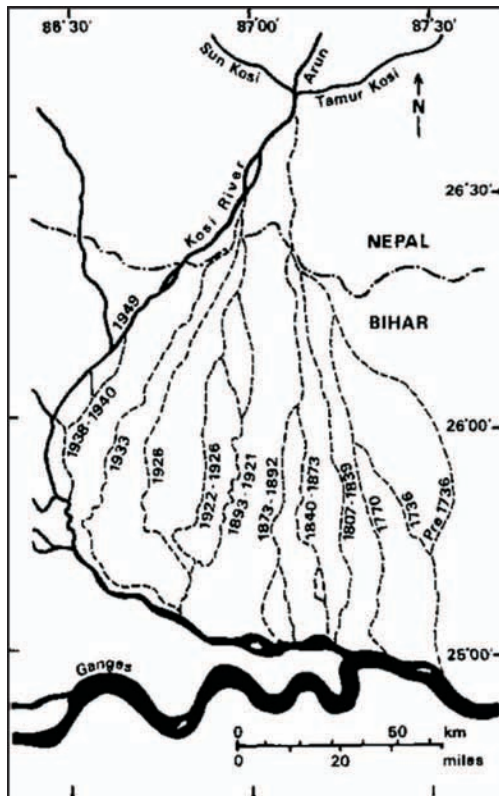


Fig 3. Shifting Course of Koshi

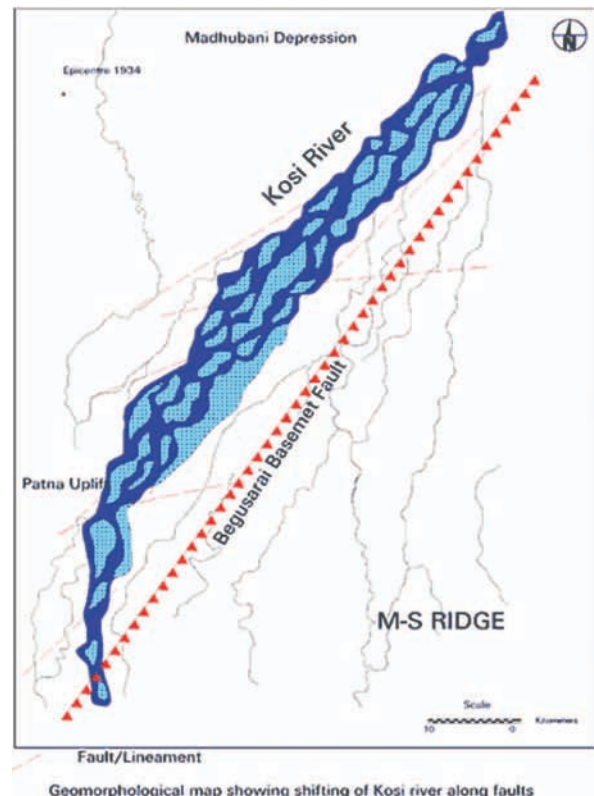


Fig 4. Braided pattern of Koshi along a Fault Line in Bihar, India

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