

# The River Koshi: Its Now And Then

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## Abstract

The River Koshi is infamous for its changing dimension and direction for ever. It is very much devastating in nature and to control it; the Koshi Barrage was built near the international border of India and Nepal. It is tried to confine its channels in a certain area but when catchment area receives heavy rainfall; it overflows and many a times, it broke out the embankment made alongside and become furious that causes the huge loss of lives and property. The Koshi embankment has seen a number of breaches at various times and at various locations due to unprecedented high discharge of water from upper catchment area in Nepal. The lower catchment of the River Koshi and its tributaries are badly affected by sever floods almost every year. The recent Kosi megaflood, caused by a breach in the Kosi embankment in Kushaha, Nepal on August 18, 2008 and a sudden change in the course of the Kosi River, was one of the most significant and damaging flood events ever to hit Bihar and ultimately, once again It resulted in changing and widening of the dimension of this river basin. It shifted 108 km eastward. The Kosi disaster also ranks as one of the greatest disasters in India. This preliminary note briefly discusses some of the available details of the megaflood, the past great floods on the river, the special hydro-geomorphic characteristics of the basin, and the probable reasons for the failure of structural measures designed to mitigate the flooding problems on this Himalayan river with unique behavioural characteristics.

As it has been flooding many area of Nepal and Bihar in India resulting as the annual flood affect about 21,000 sq km and causing huge damage of lives and livelihood every year, so it is known to be the Sorrow of Bihar, Koshi river has once again lived up to the epithet it has acquired over the years. This young river, which frequently changes its course has leashed the fury on the people of Bihar, this time in a never seen devastating manner. The Kosi has shifted its course 120 km to 133 km eastwards and has started flowing in its 300 years old bed which was abandoned due to the westward shifting in the course of the river. The Kosi has an old history of shifting westward. The westward shifting of Kosi has been in phases thus did not cause damage to such an extent. As predicted by the Kosi experts, researchers and by the inhabitants, this eastward shifting of its flow is sudden and turbulent. It has caught lakhs of people as well as authorities by surprise. More than 2 km breach in the embankment of Kosi in Kusaha, Nepal has resulted in this catastrophe. The three districts of Supaul, Araria and Madhepura have been worst affected with more than 25 lakh people. During this breach resulted in boisterous flood, thousands of people lost their lives and others lost their homes, properties and all.

All types of efforts are made on full swing to plug the breach in the bank to restore Kosi to its original course. The Government of Bihar and the Central Government are working hand in hand along with the government of Nepal to handle this crisis. The NGOs, many social worker groups start rescue and relief works to ease the effected people in the area.

**Keywords:** Megaflood, Embankment, Breach, Catastrophe, Gorge, Oscillation, Ridges, Emerges, Catchment, Barrage, Tributaries

## Introduction

We find cultural significance in the past as well as agricultural significance in the present of the River Kosi. The Koshi was also called Kausika in Rigveda. It flows in Nepal and Bihar (Northern India). It is a major tributary of the Ganges. One of the major tributary of it is the Arun, much of its course is in Tibet. This river is mentioned in the epic 'Mahabharata' as Kausiki. Seven upper tributaries of it join together to form the 'Saptakoshi River,' or 'Sapt Koshi,' which is popularly known as the

Koshi in single name. It was formerly known as 'Kausiki,' named after the sage Visvamitra, who is said to have attained the status of Vedic or 'Rishi' on the banks of this river. Visvamitra was a descendant of the sage Kusika. Visvamitra is credited with writing many well-known Vedic Hymns on the Banks of the Kosi where he had his hermitage — The Mandala 3, the Rigveda, and the Gayatri Mantra.

The Koshi, that is Kosi in Sanskrit; associated with many ancient spiritual stories. Kosi is mentioned in the Bal Kand section of Valmiki Ramayana as the Kausiki who is the form assumed by Satyavati after her death. Satyavati was the elder sister of Viswamitra, descendants of Kushak dynasty. In the Markendeya Purana, the Kosi is described as the primal force. Due to the violent nature of the Kosi during monsoon season, legend says that Parvati, the wife of Shiva, after defeating the demon Durg, became known as the warrior goddess Durga who transformed into Kaushiki. In Ramayana, the river Ganges is depicted as her elder sister.

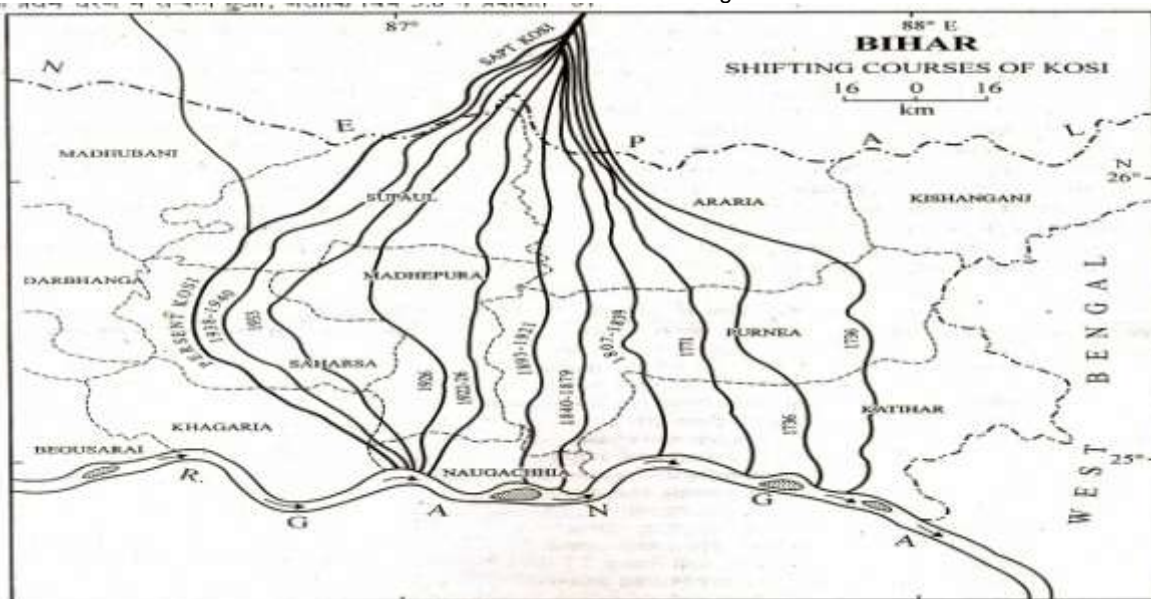
According to Mahabharata epic, the God of death took the form of a woman and resides on the banks of the river to limit population growth. Kosi resonates with the folklore of Mithila. The most important depictions of Kosi folklore are Kosi as a virgin absolutely care free and full of energy and as a frustrated wife of old hermit Richeek wandering in the Himalayas. Kosi is also invoked as the mother - 'Kosi Ma'. These images capture the contradiction that is inherent in the Kosi River as a source of life and

death, prosperity and destruction; a mother and an enchanting virgin.

The Koshi River drains the northern slopes of the Himalayas in the Tibet and the southern slopes in Nepal. From a major confluence of tributaries north of the Chatra Gorge onwards, the Koshi River along with its seven upper tributaries, is also known as Saptakoshi ; include the Tamur Koshi which originates from the Kanchenjunga area in the east, Arun River originates from Tibet and Sun Koshi originates from the Gosainthan area farther west. The tributaries of Sun Koshi from east to west are Dudh Koshi, Bhote Koshi, Tamba Koshi and Indravati Koshi respectively. The Dudh Kosi joins the Sun Kosi near the Nepalese village of Harkapur. At Barahksetra in Nepal it emerges from the mountains and becomes the Koshi. After flowing another 58 km, it crosses into Bihar, India, near Bhimnagar and again after flowing another 260 km it joins the Ganges near Kursela in Katihar district of Bihar.

#### The Changing Dimension and Shifting of its Course

The Saptakoshi is 720 km long and drains an area of about 61,000 km<sup>2</sup> in Tibet, Nepal and Bihar. In the past study period, several experts and authors proposed that the river has shifted its course for more than 133 km from east to west during the last 300 years. But in a review of 28 historical maps dating 1760 to 1960 revealed a slight eastward shift for a long duration, and that the shifting was random and oscillating in nature.



The three major tributaries meet at Triveni, from where they are called Sapta Kosi meaning Seven Rivers. After flowing through the Chatra Gorge, the Sapta Kosi is controlled by the Koshi Barrage before it drains into the Gangetic plain.

The Kosi alluvial fan is one of the largest in the world, and extends from Barahksetra across territory of Nepal, it covers 180 km long and 150 km wide area of north - east Bihar and eastern Mithila up to the Ganges. It shows evidence of lateral channel shifting exceeding 120 km during the past 250 years

with its at least twelve major channels. The river, which flowed near Purnea in the 18th century, now flows west of Saharsa.

#### Causes of Flood and the Resultant

The Recurrent floods are devastating to the economy of Bihar. Floods not only affects lives, livelihoods, productivity and security of existing investments in the affected area. The total 80% drainage from upper catchment area of Tibet and Nepal is responsible for the morphological activities in the downstream reaches as it receives an average

rainfall of 1456 mm. it brings huge amount of sediments with its flow every year causing the change in morphological behaviour of the river. The main problem of the flooding is governed by river sedimentation; that has gradually reduced the capacity of river to carry extreme flows that results as flooding in the densely populated plain area of downstream along with its bank.

The Kosi River is known as the "Sorrow of Bihar" has the annual floods affect about 21,000 km<sup>2</sup> of fertile agricultural lands thereby disturbing the rural economy. The Koshi has an average water flow (discharge) of 2,166 cubic metres per second. During floods, it increases to as much as 18 times the average. The greatest recorded flood was 24,200 m<sup>3</sup>/s on 24 August 1954. The Kosi Barrage at Bhimnagar, has been designed for a peak flood of 27,014 m<sup>3</sup>/s.

Extensive soil erosion and landslides in its upper catchment area have produced a silt yield of about 19 m<sup>3</sup>/ha/year. This is one of the highest in the world. Of major tributaries, the Arun brings the greatest amount of coarse silt, loose and unconsolidated materials in high proportion to its total sediment load. The river transports its load down the steep gradients and narrow gorges in the mountains and foothills where the gradient is at least ten metres per km. On the plains beyond Chatra, the gradient falls below one metre per km to as little as 6 cm per km as the river approaches the Ganges. As the current slows down and the sediment load settles out of the water and is deposited on its large alluvial fan that has grown to an area of about 15 000 km<sup>2</sup>. This alluvial fan extends upto 180 km from its apex where it leaves the foothills and across the international border into Bihar and on to the Ganges. The river has numerous interlacing channels that shift laterally over the fan from time to time. Without channelisation, floods spread out very widely. The record flow of 24 200 m<sup>3</sup>/s is equivalent to water a metre deep and more than 24 km wide, flowing at one metre per second.

The Kosi's alluvial fan has most fertile soil and abundant groundwater in a part of the world. The agricultural land is in great demand in this area. This produces almost all the major crops. Subsistence agriculture balance the threat of starvation with that of floods. As a result, the flood-prone area is densely populated and subject to heavy loss of life. India has more flood deaths than any country except Bangladesh.

#### **2008 Bihar flood At a Glance**

On 18 August 2008, the Kosi river picked up an old channel it had abandoned over 100 years previously near the border with Nepal and India. Approximately 2.7 million people were affected as the river broke its embankment at Kusaha in Nepal, submerging several districts of Nepal and India. 95% of the Koshi's total flowed through the new course. The worst affected districts included Supaul, Araria, Saharsa, Madhepura, Purnia, Katihar, parts of Khagaria and northern parts of Bhagalpur, as well as adjoining regions of Nepal. Relief work was carried out with Indian Air Force helicopters by dropping relief

materials from Purnia in the worst hit districts where nearly two million persons were trapped. The magnitude of deaths or destruction were hard to estimate, as the affected areas were inaccessible. 150 people were reported washed away in a single incident. Another news item stated that 42 people had died.

The Government of Bihar convened and constituted a technical committee, headed by a retired engineer-in-chief of the water resource department to supervise the restoration work and close the breach in the East Kosi afflux embankment. Indian authorities worked to prevent widening of the breach, and channels were to be dug to direct the water back to the main river bed.

The fury of the Koshi river left at least 2.5 million people marooned in five districts, 35 blocks, 231 panchayats, 1067 villages and inundated 650 km<sup>2</sup>. The prime Minister of India declared it a national calamity. The Indian Army, National Disaster Response Force (NDRF) and non-government organizations operated the biggest flood rescue operation in India in more than 50 years.

#### **A Step to Mitigate The Problems: Multipurpose Projects**

The National Flood Control Policy in 1954 follows the disastrous floods of 1954 in a large part of the Koshi river basin compelled for the planning to control floods through a series of dams, embankments and river training works. The Kosi project was thus conceptualized on the basis of investigations between 1946 to 1955. The work has been done in three continuous interlinked stages- the first was a barrage to anchor the river that had migrated about 120 km westward in the last 250 years laying waste to a huge tract in north Bihar and to provide irrigation and power benefits to Nepal and India. The second part was to build embankments both below and above the barrage to hold the river within the defined channel. The third part envisaged a high multipurpose dam within Nepal at Barakshetra to provide a substantial flood cushion along with large irrigation and power benefits to both countries. This was followed by the Kosi Agreement between Nepal and India that has been signed on 25 April 1954 and revised on 19 December 1966 to address Nepal's concerns. Further letters of Exchange to the Agreement between the two countries identified additional schemes for providing benefits of irrigation. While the first two parts of the plan were implemented by the Government of India, the Koshi High dam, the linchpin of the whole plan, for various political reasons has yet precluded any action for several years but has since been revived under a fresh agreement, in a modified form for further investigations and studies.

#### **Kosi Barrage and Irrigation**

Koshi Barrage, also called Bhimnagar Barrage, was built between 1959 and 1963 and straddles the Indo-Nepal border. It is an irrigation, flood control and hydropower generation project on the Kosi River built under a bilateral agreement between Nepal and India. The entire cost of the project was borne by India. The catchment area of the river is 61,788 km<sup>2</sup> in Nepal at the barrage site. The

highest peaks lie in its catchment. About 10% is snow-fed. The Eastern Canal and the Western Canal taking off from the barrage were designed for a discharge capacity of 455 cubic metres per second to irrigate 6,125 square kilometres and 210 cubic metres per second to irrigate 3,566.1 square kilometres, respectively. A hydropower plant has been built on the Eastern Canal, at a canal drop 3.6 km from the Koshi Barrage, to generate 20 MW. The Western Kosi Canal provides irrigation to 250 square kilometres in Nepal. A valuable bridge over the barrage opened up the East-West highway in the eastern sector of Nepal.

#### **Aim of the Study**

The objective of the study in my paper is to draw attention of planners, researchers and ultimately of the concerned government agencies to find the root-cause for the recurrent floods and changing dimensions of the River Koshi and that is in my view, heavy siltation by the river on its bed. Thus, it is urgent to find the ultimate solution accordingly and necessarily to upkeep channels of the river clear and sunken so as to give a way to flow the river without any hindrance with the help of modern technology.

#### **Conclusion**

The focal point of Bihar flood is the river Kosi's immense alluvial, extending some 180 km from the river exit from the Himalayas and the foothills in Nepal, down to its confluence with Ganges in Bihar. The laws of geology and physics caused rivers to course back and forth across such fans. The problem posed by the Kosi are due to meandering and its westward shifting that can be controlled by constructing a dam on the upstream in Nepal so that a controlled volume of water can be released into downstream that will not result into devastating flood

and the frequent change of the dimension and the direction of the River Koshi

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