Koshi Flood Disaster

Background

The Koshi Basin is the largest river basin of Nepal. It originates from the Tibetan Plateau of China. There are seven major rivers which join the Koshi and drains a total area of 69,300 km^2 up to its confluence with the Ganga in India (29,400 km^2 in Tibetan autonomous region of China, 30,700 km^2 in Nepal and 9,200 km^2 in India. The Koshi river is also known as the "Sorrow of Bihar". Floods from the Koshi river in the past have created havoc in the downstream area of Nepal and India leading to loss of lives and property and causing widespread human suffering. The river has also experienced frequent change in course as shown in Figure 1. This year intense rainfall in the Koshi basin resulted in a breach of the embankment resulting in severe flooding of the surrounding areas of Sunsari district of Nepal. Many points of the embankments were considered to be quite vulnerable and erosion of the spurs had started to occur a week or two prior to the breach. Experts claim that the lack of timely maintenance of the spur/embankment has resulted in the breach.

The highest flood recorded in living memory in the river is reported to be 24,200 m^3/sec on August 24, 1954 and the Kosi Barrage has been designed for a peak flood of 27,014 m^3/sec. Due to extensive soil erosion and land slides in its upper catchment by factors both natural and human, the silt yield of Koshi is about 19 m^3/ha/year accounting to 40% of the total sediment load of the Ganges system and is considered to be one of the highest in the world. The average discharge of the Koshi at Chatara (about 45 km north of the Koshi barrage) in the month of August is about 4400 m^3/sec as shown in Figure 3. On 18th August when the embankment breached the discharge at the Koshi Barrage is reported to be about 4200 m^3/sec which is below the monthly average discharge. This figure supports the claim that it is due to the structural failure of the embankment that led to the flooding rather than an extreme rainfall event.

This report provides a preliminary assessment of the impacts of the Koshi flood disaster and rainfall forecasts for the next three days.

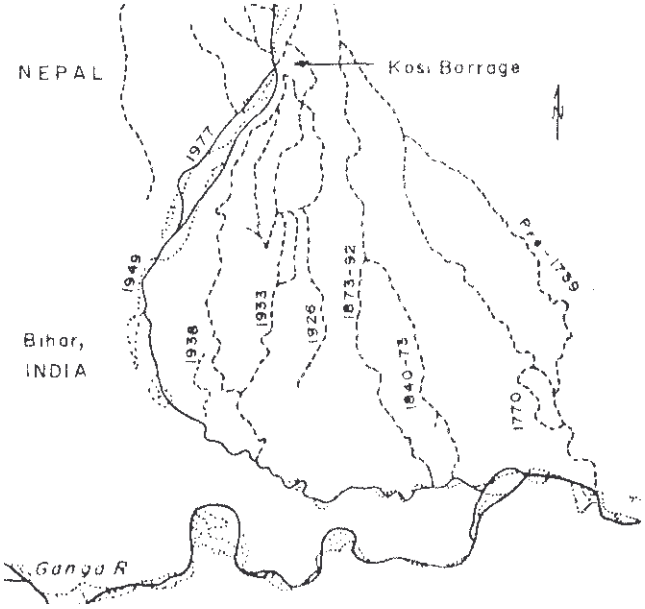
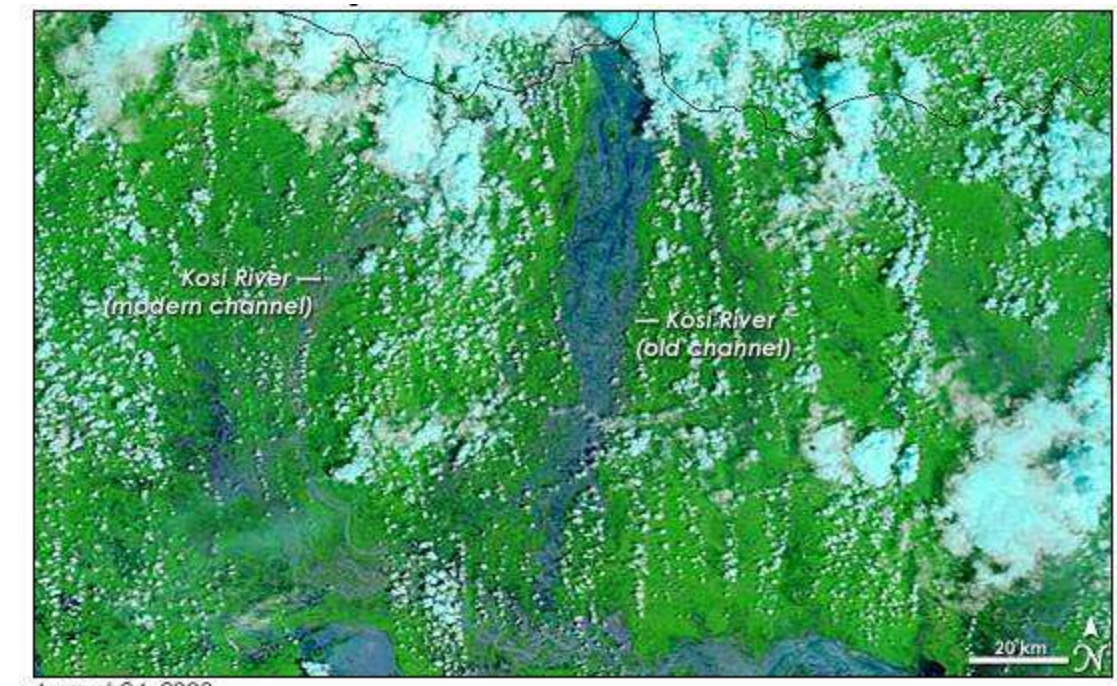


Figure 1 Changes in the course of Koshi River over its alluvial fan (1736-1977), Source: WECS 1987



August 24, 2008

August 8, 2008

Source: NASA Earth Observatory

Figure 2 Satellite images of the Koshi River before and after the breach of the embankment

When we compare the satellite images with Figure 1 which documents the change in course of the Koshi River the current flow of the river after the embankment breach is following the course of around 1926.

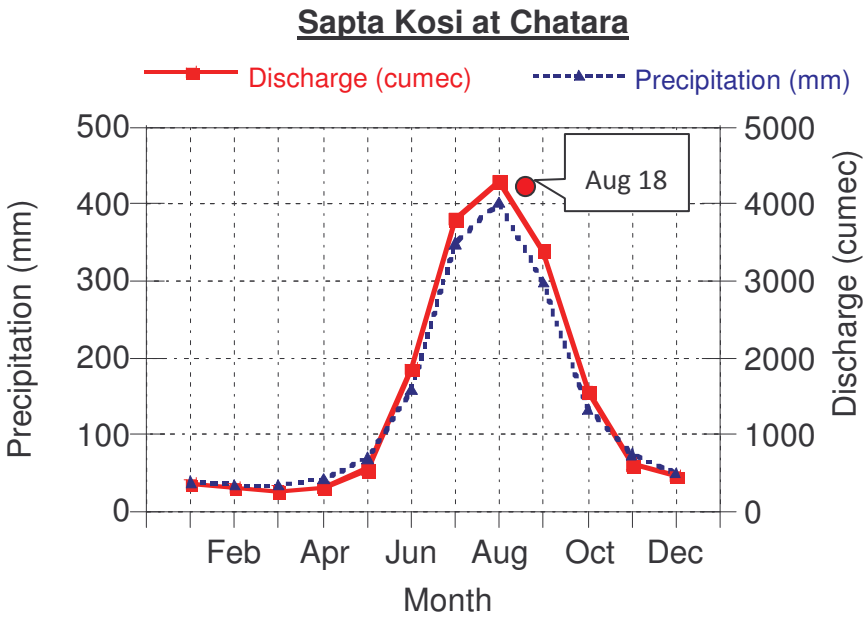


Figure 3 Hydrograph of discharge at Chatara (Sapta Kosi) and Precipitation
Source: Bhusal, 1999 and Alford, 1992

Location of the Breach

The breach of the left embankment is about 12 km north from the Koshi Barrage. The breach of the embankment has led to the inundation and severe flooding in Sunsari District affecting six village development committees (VDC) in Nepal and 14 districts in Bihar, India. Location of the breach is shown in the Figure 4.

Preliminary Assessment of Impact of Flood Disaster

The damage of the Koshi floods is not limited to Nepal only. Considering the transboundary nature of floods loss of lives and property have been incurred both in Nepal and India. A preliminary assessment of the impact based on various reports as of August 25 is given below.

Nepal

Loss of lives

According to media reports the number of lives lost so far varies from 4 to 6 with many reported missing. However, the total number of dead is yet to be ascertained.

Loss of Agricultural land

According to the District Agriculture Office around 6000 hectares of agricultural land has been affected. The village wise estimate is as follows:

Haripur - 2064 hectares

Sripur - 1892 hectares

Paschim Kushaha - 860 hectares

Laukaha - 776 hectares

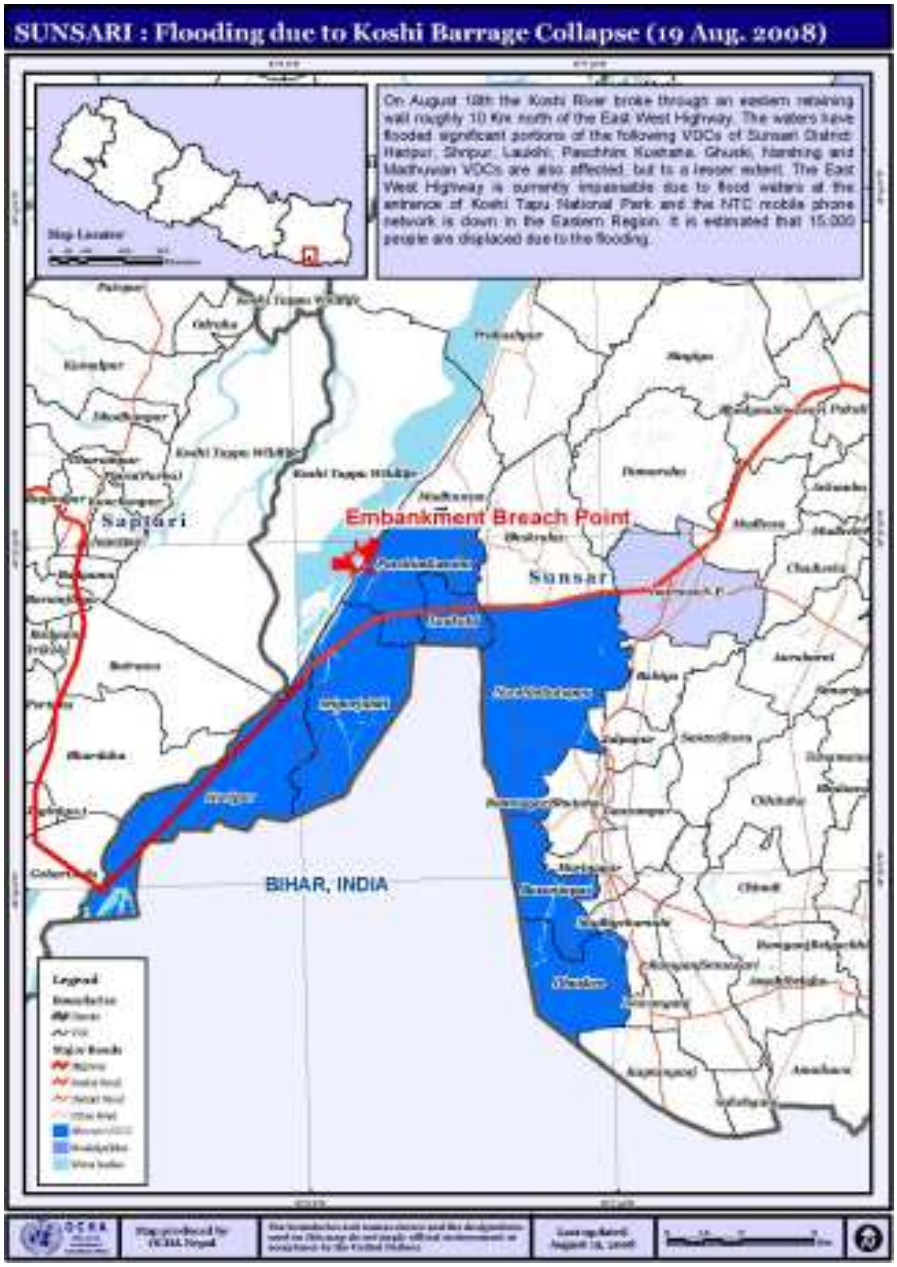


Figure 4 Location of the Breach and affected villages

Source: UN/OCHA Nepal

Loss of Agricultural Products

According to the District Agriculture Office the floods have damaged standing crops worth more than US $ 3.7 million. The preliminary estimates of damage are as follows:

Paddy field – US $ 2.6 million

Vegetables – US $ 350,000

Banana Crop – US $ 65,000

Jute Crop – US $ 290,000

Fish Farming – US $ 363,000

Affected and Displaced

The flood water is reported to have submerged more than half a dozen villages which include West Kusha, Haripur, Sripur, Laukahi and Bokraha villages. The total number of affected people in Nepal is estimated to be over 70,000. According to the Ministry of Home Affairs 40,378 people of 7102 families have been displaced. Most of the temporary houses have been washed away while permanent houses have been inundated. Water and sanitation remains to be a critical issue. Malaria, cholera and water borne diseases are rapidly spreading making it difficult for the flood affected victims. It is reported that eye disorder such as conjunctivitis is also affecting some of the victims. Many children are reported to be suffering from pneumonia.

Infrastructure

It is estimated that around 4 km of the East West Highway has been damaged. This is resulted in disruption of all traffic and vehicular movement from East to West.

India

The floods in the Koshi River have hit 14 districts of Bihar – Sahasa, Muzaffarpur, Katihar, West Champaran, Patna, Nalanda, Khagaria, Sheikhpura, Purnia, Saran, Begusarai, Supaul, Araria and Madhepura.

Loss of lives

The floods have claimed 42 lives in Bihar, India as of August 25. There are still many reported missing. Muzaffarpur district with 11 deaths accounts for the largest number of reported deaths so far though Supaul district is the most severely affected district.

Loss of Agricultural land

Preliminary reports indicate that more than 35,000 ha of crop area have been affected. Detailed assessment of the damage is being undertaken.

Affected and Displaced

Reports claim that more than 1 million people in Bihar have been affected by floods due to the embankment breach. A total of 121 villages have been affected. Nearly 70,000 people have been

evacuated to safer places with the help of more than 1000 boats. As of August 22 in Supaul district itself 30,000 households have been displaced.

Present Situation

Threat of Koshi changing course

Initial breach of the embankment was on 18th August. Since then the length of the breach has been increasing now estimated to be about 3 km. The major portion of the Koshi flow is now flowing across the embankment with less than 25% through the barrage. Till the flow subsides the reconstruction and repair of the breached embankments is difficult to be carried out. If timely repair and reconstruction is not carried out there is a likelihood of the river changing its course.

Rescue and Relief in Nepal

The Nepal government, International and National NGO's, donor community and the civil society are engaged in providing rescue and relief to the flood victims. The main challenge at present is to rescue all the trapped victims from the flooded areas and to provide food and other immediate facilities to the rescued people. People have been rescued from roof and tree tops. Army helicopters, boats, ropeways and even elephants from the adjacent Koshi Tappu (wild life reserve) have been used to rescue the flood affected victims. As the floods have swept away a road section access to some affected areas has been difficult. Around 30 relief camps have been set up.

Apart from the short term relief a long term challenge remains to resettle the displaced people. As many hectares of cultivable land on which the affected people's livelihood depended upon have been converted into wasteland apart from resettlement livelihood options have to be also looked into by the government.

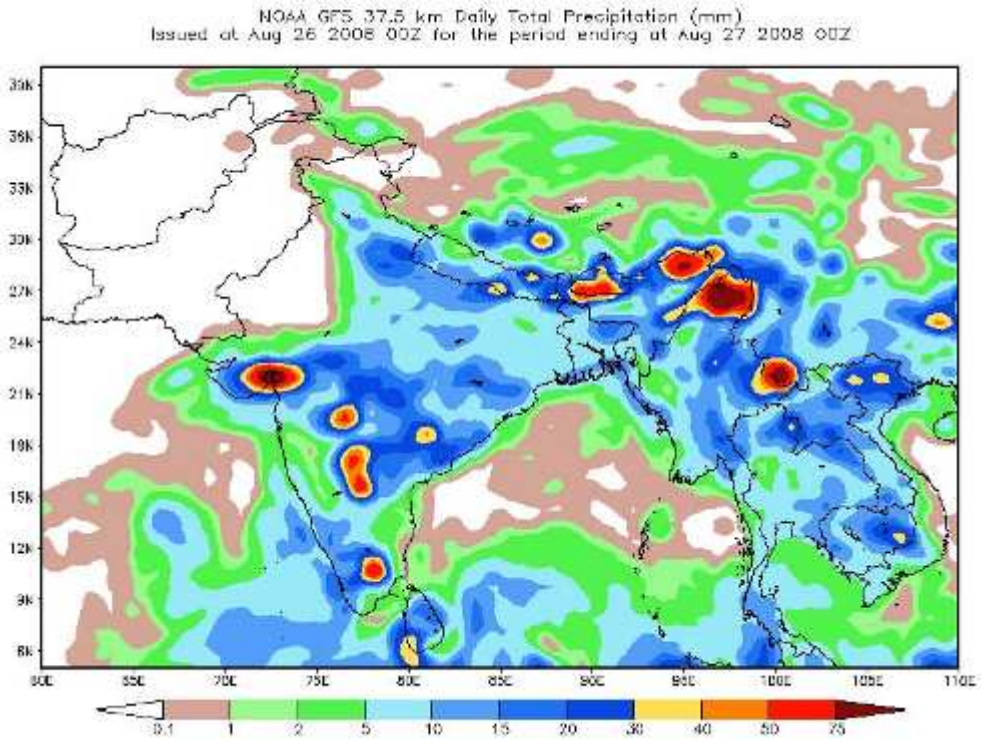
Rescue and Relief in India

Around 60 relief camps have been set up in Supaul, Araria and Madhepura districts. A total of 74 health centres and 20 cattle centres are functioning round the clock to help the affected. Airforce choppers have airdropped relief materials in the flood-ravaged villages of Supaul, Araria and Madhepura districts. National Disaster Response Force and the state police were engaged in evacuating the marooned people to safe places

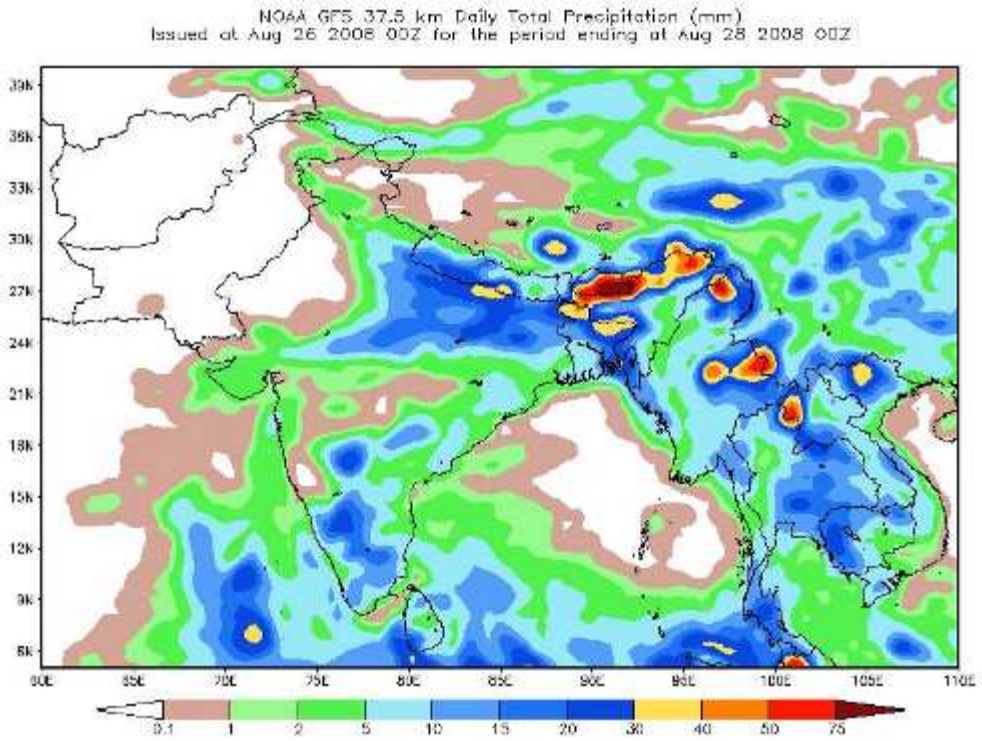
Rainfall forecast

The rainfall forecast obtained from NOAA/Climate Prediction Centre and the National Centre for Medium Range Weather Forecastin (NCMRWF), India indicates that rain is likely to persist in some areas of the Koshi Basin. The flow in the Koshi River is not likely to subside soon as more rain is likely to be witnessed in the next few days. The Indian Meteorological Department (IMD) also forecasts continued rainfall in the Supaul District which is expected to gradually taper off after 29th August. According to the forecast issued by the Department of Hydrology and Meteorology on 26th August the axis of the monsoon trough is running towards the foothills of the Himalayas which will cause rainfall in the eastern region.

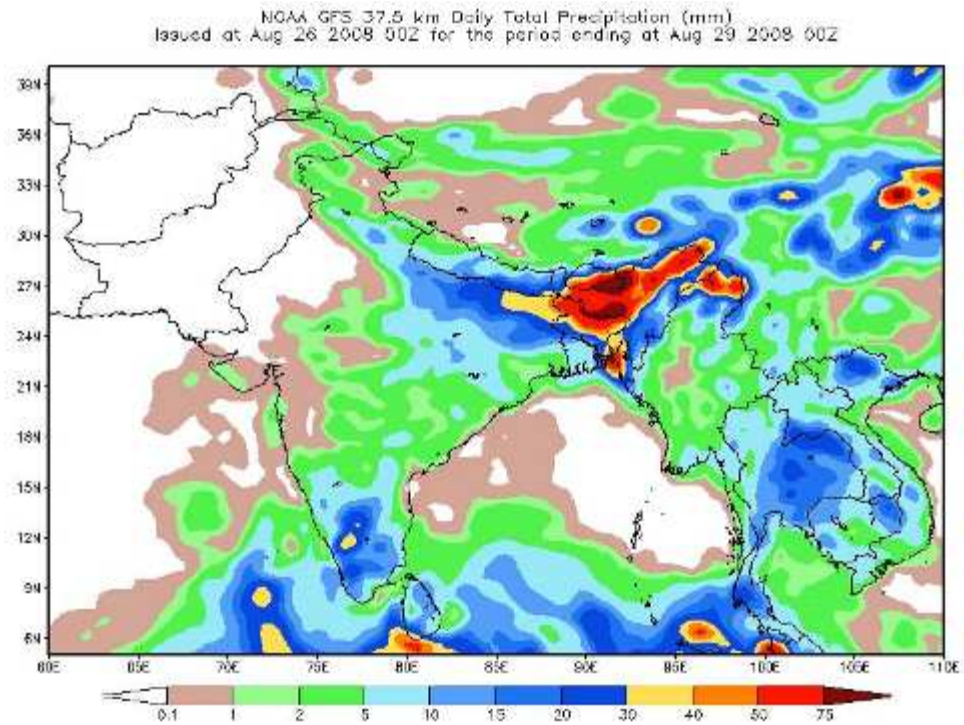
1 Day Forecast

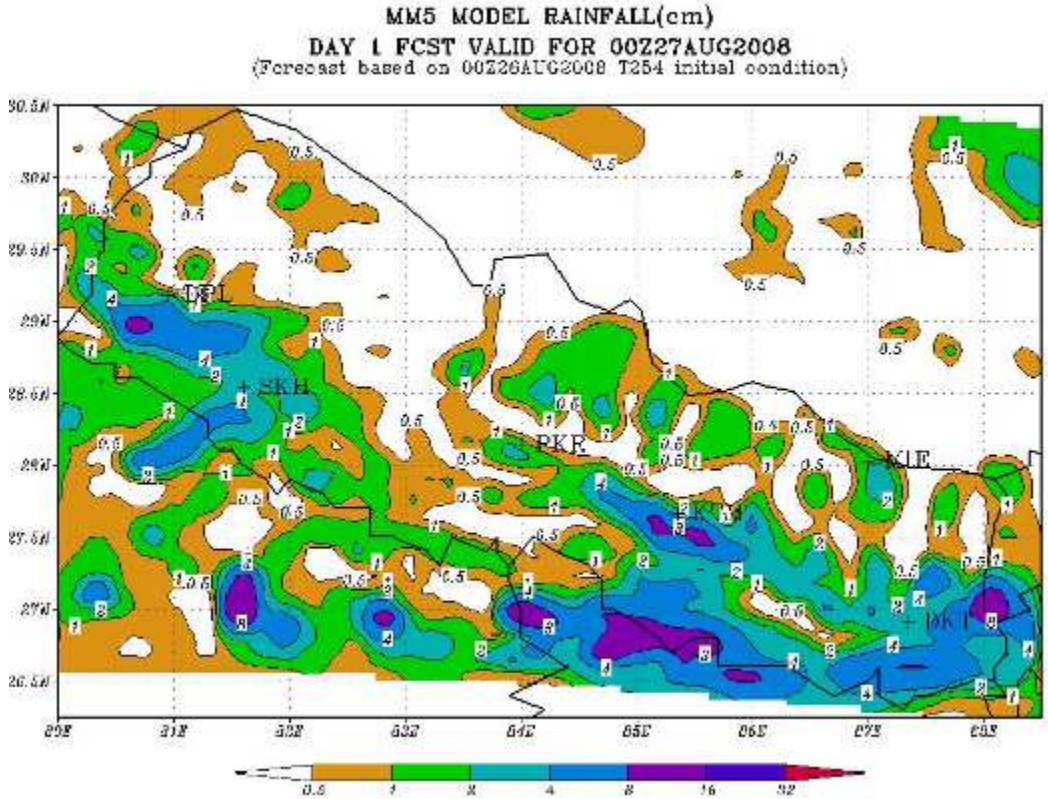


2 Day Forecast

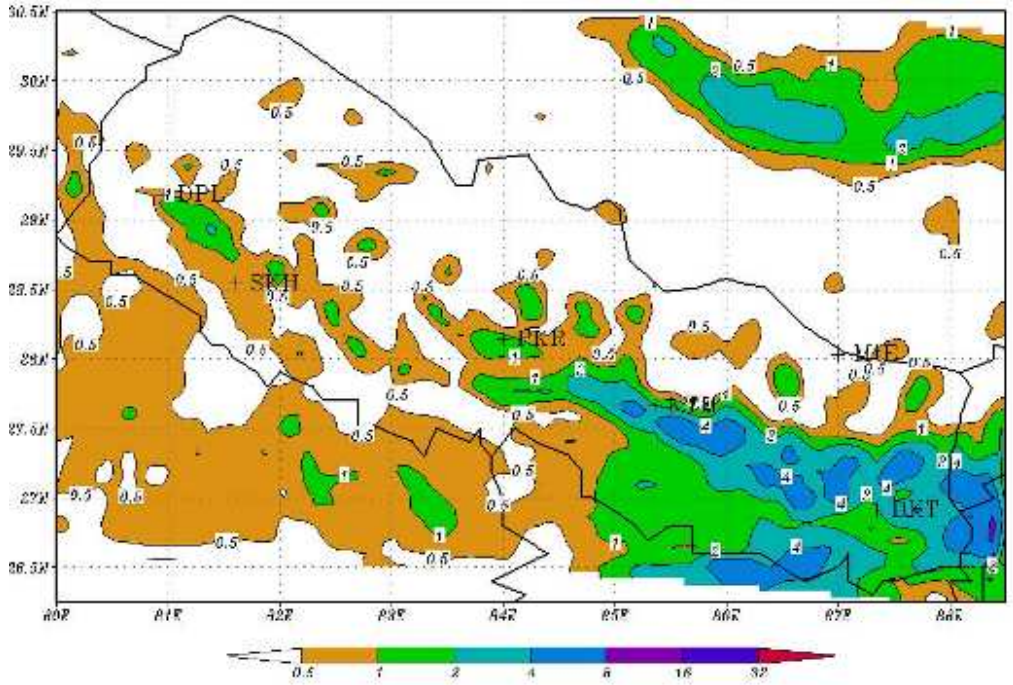


3-Day Forecast





MM5 MODEL RAINFALL(cm)
DAY 2 FCST VALID FOR 00Z28AUG2008
(Forecast based on 00Z26AUG2008 T254 initial condition)



MM5 MODEL RAINFALL(cm)
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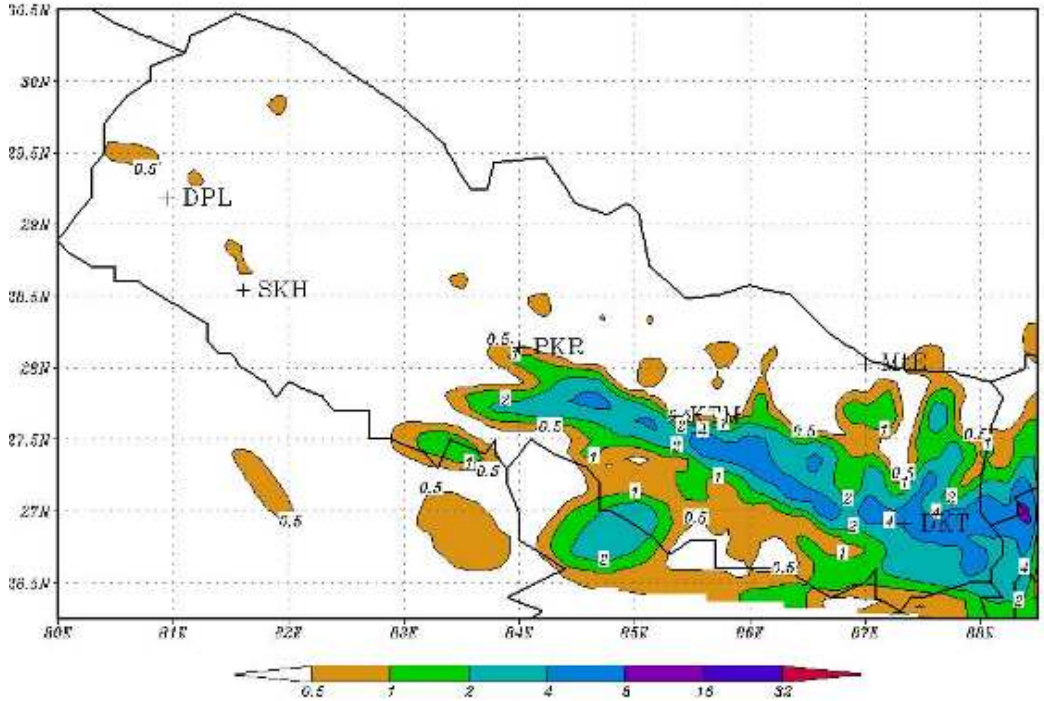

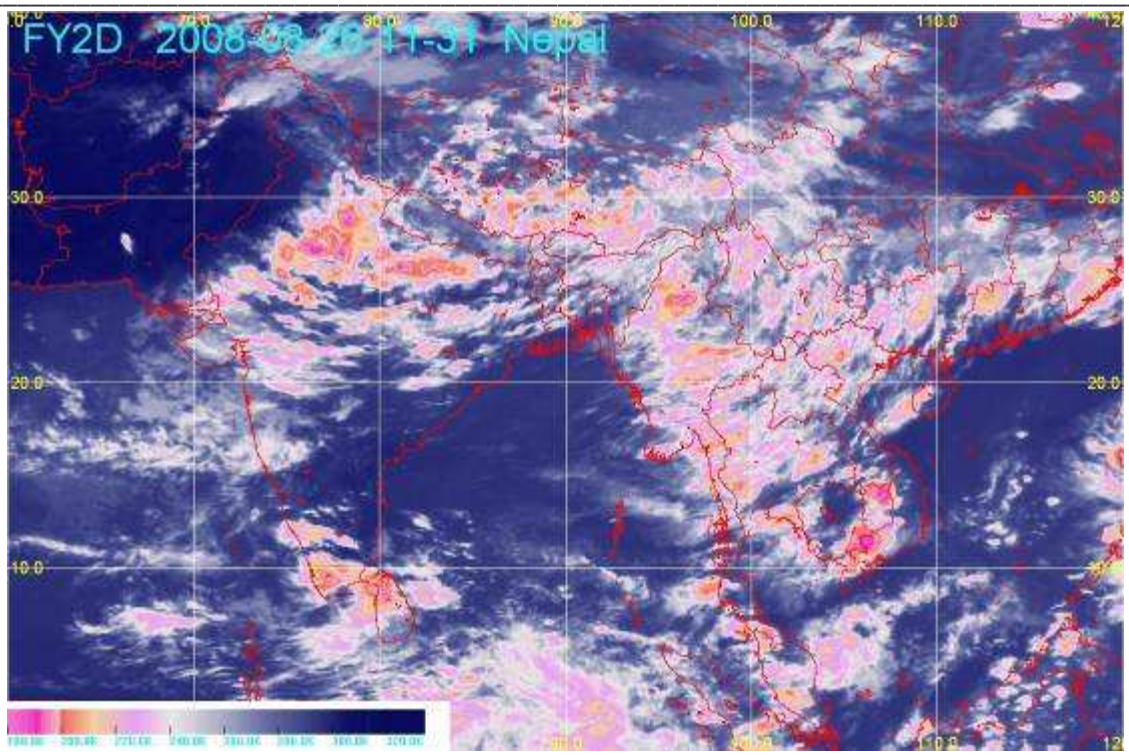

INDIA METEOROLOGICAL DEPARTMENT: Weather forecast downstream of the flood affected area of Nepal in Bihar, India.

MULTIMODEL ENSEMBLE BASED DISTRICT LEVEL WEATHER FORECAST

ISSUED ON: 27-08-2008

VALID TILL 08:30 IST OF THE NEXT 5 DAYS

DISTRICT : SUPAUL

STATE : BIHAR

PARAMETERS	ENSEMBLE FCST				
	DAY-1	DAY-2	DAY-3	DAY-4	DAY-5
	28/08	29/08	30/08	31/08	01/09
Rainfall (mm)	25	35	15	12	13

http://www.imd.gov.in/section/nhac/distforecast/supaul.htm

Treaty and Agreement on the Koshi

Following the disastrous floods of 1954 in large part of the Koshi river basin India and Nepal signed a treaty is 1954 on the Koshi. Kosi Barrage, also called Bhimnagar Barrage after the name of the place where it was built between the years 1959 and 1963 straddles the Indo-Nepal border, in Nepal. It is Irrigation, Flood control and Hydropower generation project on the Koshi river built under a bilateral agreement between Nepal and India. This treaty was revised on 19 December 1966 to address the concerns of Nepal. The Kosi barrage with earth dams across river, afflux bunds and embankments above and below the river confines the river to flow within embankments. Embankments on both sides downstream of the Barrage with a length of 246 km have been constructed to check the westward movement of the Koshi river. The embankments have been kept wide apart, about 12 to 16 km, to serve as a silt trap. Inside Nepal a 32 km long and 30 m wide embankment was built in the pyramid shape between Bhantabari and Barachettra Village Development Committee. The Government of Nepal has initiated efforts to repair the damage in the Koshi embankments in coordination with the Indian team. In order to address the flooding problems and ensure such a disaster does not occur again the government of Nepal and India is likely to jointly review the treaty and agreement of the Koshi.

Sources:

Various Media reports- Himalayan Times, Kathmandu Post, The Hindu, Rising Nepal, Nepali Times

UNOCHA situation reports

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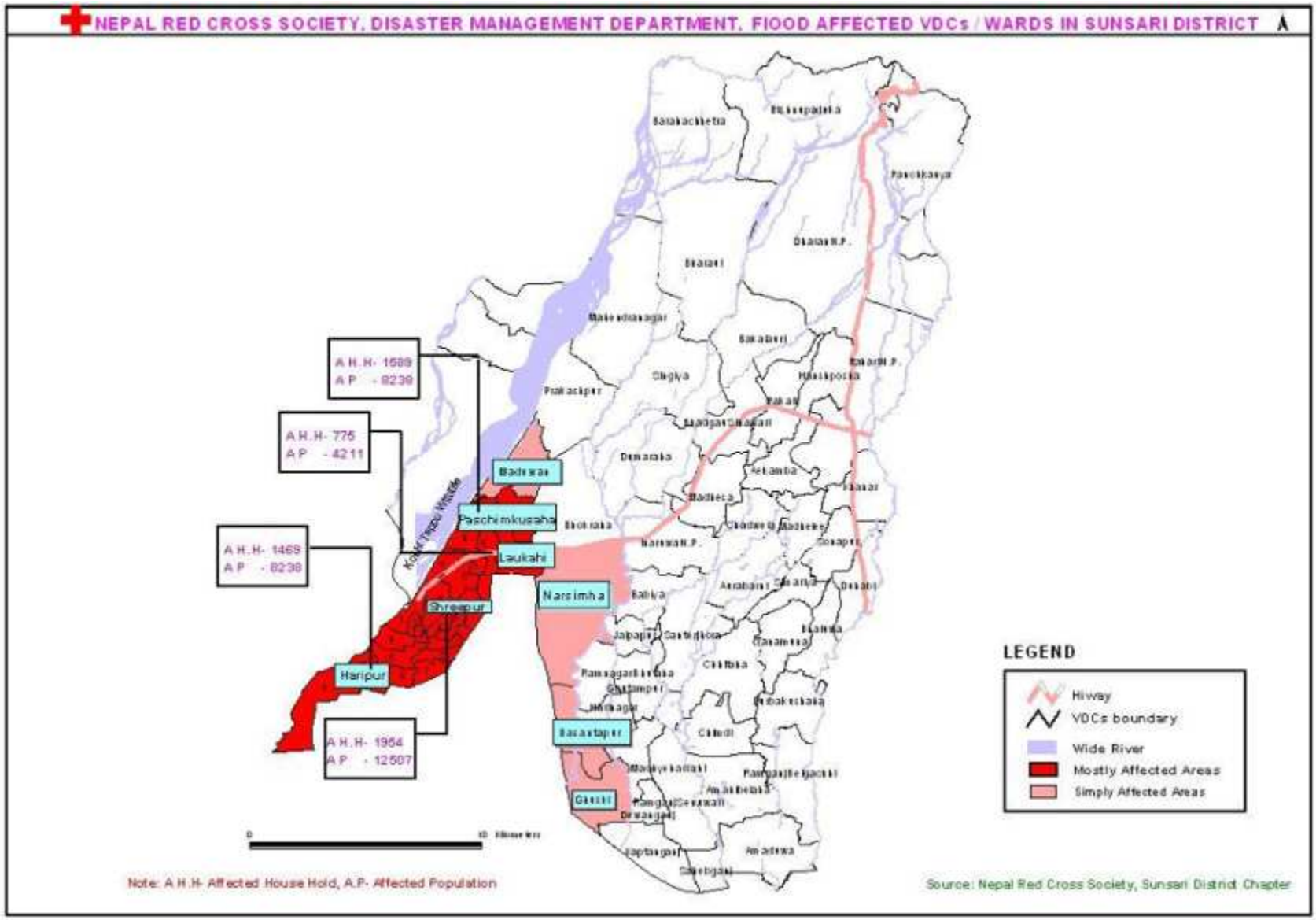

Map Received 25 August, 2008

Koshi Floods: Nepal

Koshi Floods: Bihar, India