Institutional Dysfunction and Challenges in Flood Control: A Case Study of the Kosi Flood 2008

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The Kosi flood disaster of 2008 in Bihar and also in Nepal highlights two key issues relating to flood control. The first is the failure of the structural approach to flood control on the Kosi and the second is institutional dysfunction with respect to trans-boundary flood management. This article discusses the key reasons for the failure of flood management in the Kosi, through stakeholder interviews and observations in the aftermath of the flood. The institutional context comprises several challenges such as trans-boundary politics between Nepal and India, the internal politics of Nepal, intra-state politics in India, the inherent weaknesses of the Kosi treaty, structural flood control strategy and the lack of connection between governmental decision-making bodies, implementation agencies and civil society.

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The Kosi floods of 2008, caused by an embankment breach at Kusaha village of Sunsari district in Nepal, was disastrous. The embankments were built by India in 1959 as required by the 1954 Kosi treaty between Nepal and India. The treaty provided for construction of embankments in Nepalese territory to control flooding both in Bihar state within India, and a section of Nepal bordering with India. The recent floods raise two main issues: (1) Are the flood control measures appropriate for the unique nature of the Kosi river? (2) To what extent can the flood be attributed to the institutions managing the Kosi river? This is of critical importance if similar floods are to be prevented and/or managed better in the future.

The unique characteristics of the Kosi river and existing flood control measures have been extensively discussed by Dixit (2009) and Sinha (2008) and also by Kale (2008), Reddy et al (2008) and Gyawali (2008).[1] However, although all authors refer to the role of the institutions involved in the management of the Kosi river, not one analyses them. The research presented here seeks to address this gap by assessing the role of the institutional mechanisms established to deal with the challenges of the Kosi river under the Kosi treaty. It focuses, in particular, on the Nepali perspective.

This article is based on field research carried out between November 2008 and January 2009 in Nepal. Three Nepalese villages (Shreepur, Haripur and Paschim Kusaha) severely affected by the 2008 Kosi embankment breach were visited. In addition, 50 semi-structured interviews were conducted with different stakeholders including government officials and flood victims in Nepal. Four interviews were held with Indian officers from the Kosi project office in Birpur, Bihar, the liaison officer from the water resource department from Bihar, and a senior official from the embassy of India in Nepal.

This paper first reviews the impact of the Kosi embankment breach of 2008 along with the key points made in the literature. This is followed by an analysis of the relevant institutions managing the Kosi river. Finally, it concludes with suggestions for better flood management in the Kosi basin.

The Kosi Flood of 2008

On 18 August 2008, the Kosi river breached its embankment and displaced 45,000 people from three severely affected villages (Haripur, Shreepur and Paschim Kusaha) of the Sunsari district of Nepal (minutes of the United Nations Office for the Coordination of Humanitarian Affairs-UN OCHA, 29 March 2009).[2] About 3.065 million residents from 1,704 villages in north Bihar were similarly affected (Mishra 2008b), and around 4,648 ha of

agricultural land and crops were washed away in Nepal (minutes of UN OCHA, 29 March 2009). Sand deposited by the flood ranged from three to seven feet (personal observation) and will hamper agricultural activities for many years to come. At the embankment breach in the Nepali village of Kusaha, the landscape appears desert-like. Visits to the shelter camps in Nepal provided graphic images of the devastating impact of the flood on its victims' emotional, physical and economic well-being.

The damage caused by the Kosi flood of 2008 is the highest in five decades of flood history in Bihar (Kale 2008) and according to a Nepali senior officer from the Ministry of Home Affairs and member of the Central Disaster Relief Committee, the worst in the entire flood history of Nepal (I_3, 2009).[3] The event raises several questions: Why did the embankment breach in 2008 lead to such a devastating flood? Is this likely to be a one-off event, or an indicator of what is likely to happen more often in the future?

The Kosi river is described as a unique river system demanding specific flood control measures (Gyawali 2008; Kale 2008; Sinha 2008; Dixit 2009). Previous articles by Ajaya Dixit (2009), Rajeev Sinha (2008) and D K Mishra (2008) as well as other publications by Kale (2008) and Reddy et al (2008) discuss in detail the hydrogeology of the Kosi river and the flood measures taken. Therefore, we will provide only a short summary. The Kosi basin rises from 8,000 m above sea level (ASL) to 95 m ASL and comprises wide-ranging geological and climatic characteristics (Dixit 2009). The river is highly volatile with variable discharge (Kale 2008; Sinha 2008). About 50% of the Kosi basin lies 4,000 m ASL and only 16% of the Kosi basin lies below 120m ASL. This implies that there is not enough space to accommodate the enormous run-off generated by 84% of the Kosi basin (Kale 2008). The Kosi is one of the heaviest sediment-carrying rivers (80 million m^3/year) due to cloudburst, Asian monsoon, mass wasting, and Himalayan landslides. The basin is also seismically active with tectonic movement (Dixit 2004 and 2009; Kale 2008; Sinha 2008; Reddy et al 2008; Gyawali 2008). The low hydraulic gradient of the Kosi river, 1:5000m (Reddy et al 2008), cannot flush these enormous sediments. Instead, the Kosi shifts to a new course seeking a higher hydraulic gradient (Reddy et al 2008; Sinha 2008; Kale 2008; Dixit 2009). Thus, flooding either by high discharge or by shifting of the Kosi river course is a natural phenomenon that remains devastating to the people of Bihar.

After severe floods in 1953-54, social and political pressure led the Indian government to prioritise the issue and negotiate the Kosi treaty. Subsequently, embankments for flood control were built along the Kosi river although some engineers at the time felt that given the high sediment load in the Kosi river, embankments might not be the best solution (Mishra 2008b; Dixit 2008).

With the embankments completed in 1959, the sediment load had nowhere to go and being deposited within the embankments, over time it increased the height of the river bed by up to four metres above the surrounding land (Mishra 2008a; Dixit 2008). Moreover, the morphology of the river changed considerably and the basin lost its natural drainage system (Dixit 2009). As the river sought to continue its flow unrestricted, the power of the water continually put pressure on the weak points in the embankments. Consequently, the embankments breached several times in different locations (see Mishra 2008 for details). It could be argued that instead of controlling flooding, the embankments have aggravated the conditions in the Kosi river (Mishra 2008a and 2008b; Sinha 2008; Gyawali 2008; Kale 2008; Dixit 2009). The embankments gave a false sense of security (Mishra 2008a; Kale 2008; Sinha 2008; Gyawali 2008; Dixit 2009).

Nevertheless, the 2008 flood is different from previous floods in that past embankment breaches were mostly accompanied by high discharges along the Kosi river. In 2008, the embankment breached during a period of below average discharge compared with the same time period in previous years (I_4, 2009).[4] Therefore, this is not a flood caused by high discharge brought with Asian monsoon, cloudburst and landmass movement from the Himalayas. In addition, the 2008 flood breached in Nepal and for the first time upstream of the barrage. Several authors argue that a lack of priority and urgency in maintaining these structures contributed to the embankment breach in 2008 (Mishra 2008a; Thakkar 2009: see end note 2; Dixit 2009).

Hence, Dixit (2009) calls for a paradigm shift from structural flood control to flood resilience. This is echoed by Sinha (2008) who calls for a move to flood management instead of flood control while Kale (2008) calls for better regional cooperation for improved flood management in the Kosi river. Another issue these authors signal is the management of the trans-boundary Kosi project for flood control. Dixit (2009) argues that institutional dysfunction and governance deficit allowed the 2008 flood to happen. Gyawali (2008: 5) refers to the Kosi flood as the outcome of "an unholy marriage of wrong technological choice, bad institutional arrangements and half a century of political misconduct". Moreover, Himanshu Thakkar (2009)[5] and Mishra (2008b and 2008c) argue that the Kosi embankment breach is the outcome of negligence of duty and lack of accountability at different levels.

In sum, the literature on the Kosi highlights two challenges – the technological choice and the institutional design. This paper elaborates only on the institutional dynamics of flood control along the Kosi river. First, we show the lack of awareness, warning and preparedness to deal with flood risks along the Kosi river. We then present the complex institutional and communication mechanisms of the Kosi project and highlight the institutional challenges in managing the Kosi river. Finally, this paper identifies how lessons learned may be used to improve the management of the Kosi river in the future.

Reasons for the Severity

Lack of Awareness, Warning and Preparedness for Flood Disaster: The fear and rumour of embankment breach starts with every monsoon in the Sunsari and Saptari districts of Nepal where the embankments begin. The flood victims in Nepali villages explained that: "there have been rumours of probable embankment breach for many years but it did not breach so we did not believe it until it happened" (Shreepur village, 18 December 2008). A flood victim living near the breach pointed out: "in the evening prior to the embankment breach, villagers told me about rapidly weathered embankments; when I went to see the location, the river had touched the eastern embankments and the water level was rising,

however, I was not too worried as the embankments were still there. I never thought it would breach the next day" (Kusaha village, 20 December 2008). Villagers appear to trust the embankments and have little of awareness of the risk of breach under specific conditions. According to the Nepali senior officer from the ministry of home affairs, there is no flood warning system in Nepal nor has flood forecasting been developed ($I_{41,}$ 30 January 2009).

However, there were indications that an embankment breach was imminent. An army officer from the Kosi Tappu Wildlife reserve in Kusaha village, Nepal where a portion of the embankment lies, informed the local authority about the weathering of the embankment a few days previously ($I_{6,}$ 2008).[6] The Kosi project office in Birpur, Bihar already knew that the Koshi had diverted to the eastern embankments and that Kusaha point was vulnerable from the first week of August 2008. However, the chief engineer of the Kosi project reported that everything was fine until 16 August 2008 (Thakkar 2009: see end note 5). There were news in local newspapers from Sunsari district about the rapidly weathered spurs at Kusaha in Nepal on 16 August 2008 ($I_{7,}$ 2008).[7] In the night prior to the embankment breach, local people from Kusaha village made several calls to the local newspaper warning of the probable danger (I_{7}, 2008). However, the local authority did not feel any urgency to evacuate the people to safety.

The embankment breached around 12.55 pm on 18 August 2008. While some fled, others were reluctant to leave their inundated houses and belongings for fear of theft ($I_{6,}$ 31 December 2008). The flood victims said: "it was only after the embankment breach that the news spread like wildfire and everybody was running here and there. We could not take any of their belongings" (I_{4}, 25 December 2008). The flood victims were thankful at least that the breach was not at midnight, which would have greatly reduced their chances of survival. The lack of flood preparedness was confirmed by officers from the ministry of home affairs, who explained that Nepal was not prepared for, or able to adequately anticipate, this kind of disaster ($I_{3,}$ 10 January 2009). He pointed out the reason being a lack of financial resources.

In Bihar, news coverage revealed that flood preparedness and rescue efforts were poor and that assistance was provided a week after the disaster took place. Mishra (2008a) also mentions shortcomings in flood preparedness and rescue work in Bihar.

Probable Embankment Breach Not Prioritised: By the first week of August 2008 and possibly before, the Kosi project office in Birpur, Bihar which has the responsibility of maintaining the embankments, already knew that the Kusaha point in Nepal was vulnerable (I_{8}, 2008[8]; Thakkar 2009: end note 4). On 16 August local authorities in Nepal ($I_{61,}$ 2008), the Indian embassy in Kathmandu (I_{9}, 21 January 2009)[9], the liaison office of the state government of Bihar (GOB) (I_{10}, 20 January 2009)[10] in Kathmandu, and the Ministry of Water Resources in Nepal (I_{11}, 25 January 2009)[11] were informed of the matter. The central government's ministry of water resources in Nepal instructed local authorities in Sunsari district to cooperate with the Kosi project office for maintenance works. However, the newly appointed chief district officer (CDO) of Sunsari was unaware of this. In a meeting with the chief engineer from the Kosi project, on 16 August 2008, he, however, agreed to cooperate with the local authority in Nepal. In addition, local people and an army officer from Kusaha village in Sunsari district approached the local authority of Nepal several times after 16 August but maintenance work did not start. From 16 August to the morning of 18 August, there were more than 48 hours to act on the visible signs of this impending disaster. As only spurs 12.9 and 12.11 were weathered by the Kosi on 16 August, a concentrated effort could have possibly averted the embankment breach and the subsequent devastation. However, the warning from the local people was not heeded, the danger was underestimated, and time was spent debating in meetings rather than taking action.

Lack of Monitoring and Maintenance of the Embankments: According to the Kosi treaty, the water resource department (WRD) of the government of Bihar is responsible for maintaining the embankments up to 32 km upstream of the barrage in Nepali territory. Moreover, the Kosi High Level Committee (KHLC), under the chairmanship of the Ganga Flood Control Commission (GFCC) in Patna is responsible for monitoring the protection work carried out under the Kosi project. It was the responsibility of the KHLC to recommend further protection measures to be implemented before the next flood season (I_{12}, 30 January 2009).[12] The two Nepali members of KHLC should have been informed of, and invited to, joint monitoring arrangements in Nepali territory. According to the senior officer of the Nepal ministry of water resources, it was agreed at a meeting of the Joint Committee on Water Resources (JCWR) between Nepal and India in 2001, that the embankments were defunct and needed strengthening. But after the 2007 monsoon, there was no communication by KHLC to the Nepali members (I_{12}, 30 January 2009) or from the Nepali members to the KHLC, with the result that no joint monitoring was undertaken. In this period of time, the priority of the Nepal government was focused on the peace agreement with the Maoists and bringing them into the political mainstream. According to the officer in the liaison office of the Kosi project in Biratnagar, Nepal, some Indian officers came for a site visit in the Kosi Project area in Nepal without informing their Nepali counterparts in advance. Apparently they did not detect any problem and returned to India. The Nepali members did not investigate whether the monitoring was done or not. Such a lack of communication between Nepal and the Kosi project, WRD, GOB demonstrates a lack of genuine interest in monitoring the embankments.

In a report submitted to the Kosi enquiry commission regarding accountability for the Kosi embankment breach of 2008, Himanshu Thakkar from the South Asia Network argues that based on evidence, the KHLC did not do their duty from 1 October 2007 until after the end of the monsoon period of 2007. He further stated that three consecutive letters, dated 1 April 2008, 25 April 2008 and 12 June 2008, were sent by the Ganga Flood Control Commission (GFCC) to WRD, GOB asking for a report on protection work. However the WRD, GOB did not respond to these letters. Instead, the chief engineer reported on 16 and 17 August 2008 that the embankments were safe (Thakkar 2009: see end note 5). By the end of April 2008, the maintenance work should have been completed before the snow melt of the Himalayas

reached the Kosi. Maintenance work undertaken in the monsoon season of August was not effective.

According to literature reviewed and interviews made, maintenance and monitoring of the Kosi project was apparently not prioritised by the Kosi project, WRD, Bihar. Newspaper reviews (Gyawali 2008: 5), Mishra (2008) and Dixit (2009) mentioned ongoing corruption in the name of maintenance and monitoring in the Kosi project. Neither were there systems of accountability and compliance in place to ensure actual implementation of embankment maintenance activities.

The Nepali government was also negligent in this matter. Although the maintenance and monitoring of the embankments in Nepalese territory is India's responsibility according to the Kosi treaty, the people living there are Nepalis. The first victims of a flood would be the Nepali people and their land. One of the senior officers from the Nepali Department of Water Induced Disaster Prevention (DWIDP) explained that:

> 32 km upstream of the barrage is India's responsibility (albeit in Nepalese territory) and GOB has the responsibility and the right to operate here. We cannot touch those parts and we do not have budget for monitoring and maintenance of those embankments(I_{17}, 30 January 2009).

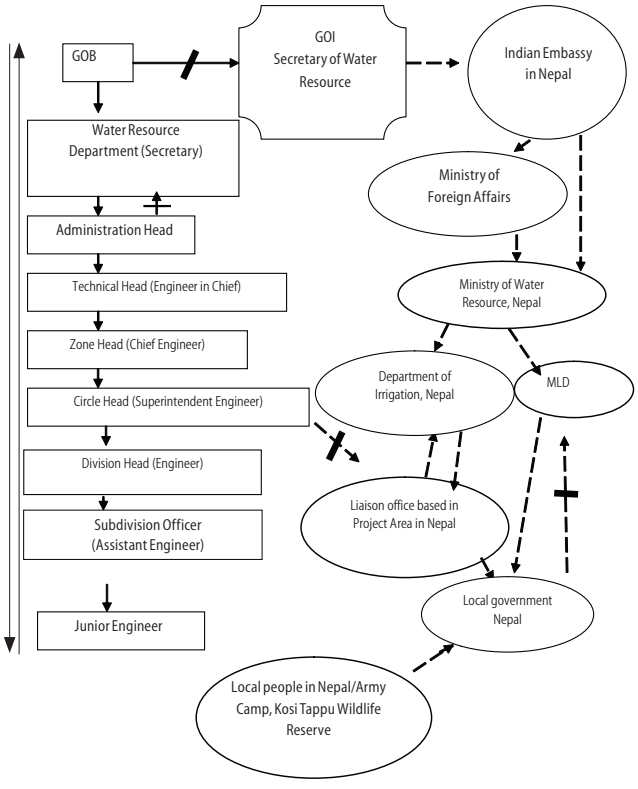
Every Nepali government officer interviewed provided a similar argument and said that the maintenance was neither their responsibility nor that Nepali authorities prioritise this matter.

However, they do agree that maintaining law and order in the Kosi project area in Nepal is the responsibility of the Nepali government. The Kosi project, Birpur, GOB claimed that they could not do the maintenance work in the first week of August due to local law and order problems in the Nepali area. Senior officers from local as well as the central government of Nepal said that they were not aware of such problems and that the government of India did not make any attempt to communicate this with the government of Nepal. The ministry of home affairs said they were not informed about the problem of law and order in the project area. Only on the 16 August did the Indian embassy of Nepal communicate with the Nepali ministry of home affairs and the ministry of water resources of Nepal about the need for cooperation in maintenance work in the Kosi project area of Nepal.

The contractors appointed by the Kosi project office, WRD, GOB came to maintain the embankments in the peak monsoon period in 2008. According to local people and a local journalist (I_{56}, 19 December 2008), there was a strike in Sunsari district, Nepal called by political extremist groups forbidding any transportation and movement. It is understandable that nothing could have been done during the strike period due to the risk of physical harassment. In the words of an assistant engineer of the Kosi project in Birpur, Bihar: "everybody loves their life so nobody would take that risk and do the work". The strike was over on the 14 August 2008 leaving three full days and four nights to act before the embankment breached.

According to the flood victims, the embankments in Nepal were not maintained for seven or eight years (I_{14}, 20 December 2008). Moreover, corruption among Nepali and Indian contractors affected the effectiveness of maintenance work (Interviews, Mishra 2008; Gyawali 2008; Bharati 1997 cited in Dixit 2009). A junior officer from the Kosi project office

Chart 1: Communication Mechanism for the Management of the Kosi Project within WRD, GOB and between GOI and GON and Gaps in Communication before 2008 Embankment Breach



Source: Field research 2008-09. The dotted line means institutional hierarchy in Nepalese side as well as Nepal and India. Whereas the non-dotted line means the institutional hierarchy in Bihar government and Indian government.

(I_{51}, 24 December 2008) alleged that less than half the maintenance budget is actually spent.

The consequences of the negligence described above are that there are 3.5 million flood victims from Bihar and 45,000 from Nepal. The misery and trauma they are facing today could possibly have been avoided if things were done honestly and on time. Moreover, this was not the first embankment breach; the past history of embankment breaches should have made officials anticipate possible breaches and act more effectively (Mishra 2008a). Although the disaster was foreseeable, the embankments were allowed to weaken. Not only do the people living on the banks of the Kosi have to deal with the dynamic hydrogeology of the Kosi river (especially the sediment loads), they are also not protected by the institutions managing this river. While the former needs to be subject to high quality scientific and technical analysis, the latter calls for institutional analysis.

Complex Communication Mechanisms and Gaps of the Kosi Project: Nepal and India signed the Kosi treaty in 1954 for the primary purpose of flood control along the Kosi by building embankments under the Kosi project, although irrigation and hydropower production were included in the treaty. The treaty was signed by the government of India (GOI) and government of Nepal (GON). However, the authority for the execution of the Kosi project was given to the WRD, GOB. The GOI does not interfere in the functioning of the Kosi project as it is a state matter of Bihar (I_{12}, 30 January 2009). When there are issues to be discussed with Nepal, the WRD seeks guidance from the GOI (I_{9}, 21 January 2009). There is no involvement of the Nepali government in the Kosi project other than one liaison and land acquisition office in Biratnagar, Nepal. The office is run by Nepalese staff appointed by the Nepali ministry of water resources and financed by the Kosi project, WRD, GOB.

Chart 1 shows the communication mechanism and the management organo-gram for the Kosi project in WRD, GOB. The lines of communication can be described as lengthy, indirect and complex. We identify two major problems: (1) bureaucratic hierarchy, and (2) trans-boundary sensitivities. With regard to bureaucratic hierarchy, when action in the field is needed, field-level officers do not have sufficient authority to act without seeking approval further up the management hierarchy (I_{8}, 24 December 2008). As shown in Figure 1, the communication from the junior officer to the decision-making authority is lengthy and has to pass through several levels of authorisation before it reaches the WRD secretary where a decision can be taken. This obviously entails a huge loss of time.

Trans-boundary communication between Nepal and India suffers from discontinuity. The maintenance of the embankments in Nepal is the responsibility of the WRD in Bihar. None of the local Nepalese officers have the authority to directly communicate with the WRD, the GOB or GON. But the WRD, as part of GOB, also does not have any direct communication mechanisms with the GON. The liaison office of the Kosi project in Nepal organises the communication between the WRD and the local and central authority in Nepal. However, the local government of Sunsari district in Nepal is not directly involved in the communication process for the Kosi project despite the eastern embankments of the Kosi river in Nepalese territory being located in this district. This is because the local government falls under the ministry of local government (MLG), and the Kosi project falls under the ministry of water resource's jurisdiction. The ministry of water resources must communicate with MLG that, in turn, must communicate with local government. The 2008 Kosi flood has exposed the continuing challenges in the communication processes; these channels are complex, slow and ineffective.

Furthermore, field research indicates that the messages communicated may be incorrect or incomplete. The chief engineer of the Kosi project, WRD, GOB gave the impression that the embankments were under control as of 16 August 2008 (Thakkar 2009: see endnote). The GOI was not aware of any problems along the Kosi in the Nepali territory because communication from both the field-level officers in Bihar as well as Nepal did not reach it in time. Neither did the Kosi project office, WRD, GOB seek cooperation from the liaison office in Nepal nor from the central government from Nepal and India until it was too late. They might have underestimated the probable disaster. Thus, both the GON and GOI were unaware of the deteriorated conditions of the embankments. It is known that local people and the army camp informed the chief district officer in Nepal of the worrisome state of embankments. It was only on 15 August, that the WRD informed the Indian embassy in Kathmandu of the situation and requested full cooperation from Nepal.

Complex and Exclusive Institutional Design of the Kosi Project: The Kosi project was designed and proposed by the GOI but managed by the WRD of the GOB. The barrage and embankments are in Nepalese territories; however, their maintenance and monitoring is managed by the Kosi project as per the Kosi treaty. The Kosi treaty clearly states that Nepal as a sovereign country should be consulted by GOI and GON and informed before taking any action in Nepalese territory. The GON currently has no management influence on this project. The institutional design allows Nepal to avoid taking responsibility for important activities in its own territory despite the moral imperative for the sovereign government of Nepal to ensure the well-being of her people.

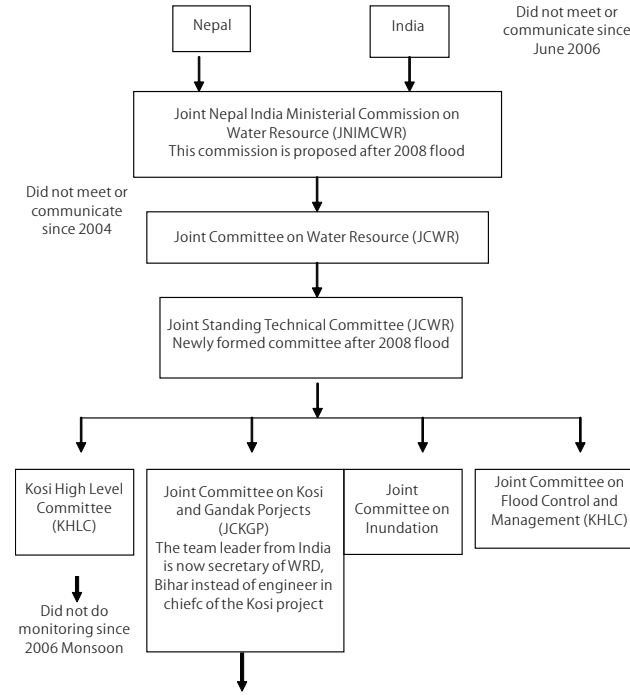
A further level of complexity is that the Kosi treaty is signed by both GON and GOI, while the responsibility for execution of the Kosi project is assigned to the WRD, GOB. There is no direct link between the province of Bihar and the national authority of Nepal at the same political level. Therefore, despite having full control over operations including emergency work in Nepalese territory, WRD Bihar must first consult the GOI, which then consults the GON before undertaking any infrastructure maintenance. This institutional mechanism is problematic and hinders immediate decision-making.

For the water sector the two countries are institutionally linked through the joint committee on water resource (JCWR) between Nepal and India that oversees several other projects and a number of rivers including the Kosi. The two main committees related to the management of the Kosi project are shown in Chart 2. These include the Joint Committee on Kosi and Gandak Projects and the Kosi High Level Committee (KHLC).

Local governments of both countries are not represented, nor do they have direct access to these committees. They are not informed about the decisions and actions authorised by these committees (I_{81}, 24 December 2008). Also communication between the different offices is not very smooth. For example, as the KHLC is responsible for monitoring and making recommendations for the maintenance of the embankments along the Kosi, it tried to assess the maintenance from the Kosi project. Despite continuous correspondence to the WRD the KHLC obtained no reply (Thakkar 2009 and $I_{6,}$ 31 December 2008) for reasons not known. It seems that the central committees have little information from the local or state level on the functioning of the projects. This results in a lack of coordination, accountability, communication or ownership of the project leading to a lack of timely action.

The evidence indicates that there are too many bilateral committees between Nepal and India under the JCWR. The JCWR meeting, after the 2008 flood, acknowledged the complexity of having too many committees and their ineffectiveness ($I_{12,}$ 28 January 2009). There has been a modification of the institutional mechanism between Nepal and India for managing water resources as illustrated in Chart 2. However, there is not much difference to the previous institutional design ($I_{4,}$ 30 January 2009). As shown in Chart 2, one ministerial level bilateral committee is proposed above the JCWR and a joint technical standing committee (JSTC) is formed below JCWR. This has been described as a three-tier institutional mechanism between Nepal and India on water resources

Chart 2: Institutional Framework between Nepal and India for Managing the Kosi River and Gaps in Institutional Function



Source: Field Research 2008-09.

(minute of JCWR on 29 September 2008). It was felt that issues could not get full attention because of the lack of authority for making decisions and implementing them in JCWR level ($I_{4,}$ 20 January 2009; $I_{11,}$ 25 January 2009 and $I_{121,}$ 30 January 2009). Therefore for discussing issues on water resources between Nepal and India at a higher level, a joint India-Nepal ministerial commission on water resource was proposed at the meeting of JCWR on 29 September 2008. This proposed body would bring the issues to the national parliaments for extensive discussion in order to seek solutions through political consensus. Similarly, JSTC is formed between two countries at a technical level. All the technical issues will be discussed through this committee. JSTC has the responsibility to assess the tasks of the other subcommittees between Nepal and India on water resources. In the modification of the institutional framework after the 2008 floods, it was proposed to cut the committees and merge them for better functioning (Minute of JCWR, 29 September 2008). However, the new institutional mechanism is also centralised and there is no inclusion of local government, local people and diverse stakeholders. Thus, the institutional mechanism is not inclusive.

Interviews and the minutes of the JCWR meeting of 29 September 2008, indicate there are gaps in institutional functioning. The gaps are lack of decision-making power and full authority for the senior officers of the Kosi project office, lack of responsibility and accountability of the Kosi project office and gaps in supervision of the tasks carried out by the Kosi project office. In addition, there is no mechanism of penalty and compliance for the dereliction of the duties. These gaps are discussed here. The head of the Kosi project lacks the authority for giving a "go ahead" for the maintenance and monitoring of the embankments ($I_{8,}$ 24 December 2009 and $I_{12,}$ 30 January 2009). It is very difficult

to get a "go ahead" from the monitoring and maintenance department ($I_{8,}$ 24 January 2009).

Since 2004, there has been no meeting of the JCWR which should have been conducted every year. Thus there was no sharing of the problems, issues and progress of any projects between Nepal and India and hence neither of central governments was aware of the issues. A senior officer of the ministry of water resources and department of irrigation said that India did not want to have any bilateral talks after the king of Nepal took over the country in 2004. A senior officer from the Indian embassy said there was no proper government in Nepal to have bilateral talks with. However, this is not a credible reason, since there was a government representative and the Indian government had cordial relationships with the Nepali government (Dixit 2009).

Similarly, JCKGP had not met since June 2006. Thus the issues regarding the Kosi project which should have been discussed at least annually were not communicated for nearly two years before the embankment breached on 18 August 2008.

The KHLC under WRD, GOB chaired by the chairman of GFCC was responsible for monitoring the damage caused by the monsoon and recommending any necessary works. However, KHLC had not done this since the monsoon of 2006 ($I_{11,}$ 25 January 2009 and $I_{12,}$ 30 January 2009). This is also noted by Thakkar (2009) in his letter to the Kosi Enquiry Commission. However there is no mechanism of penalties and compliance for not doing complying with the prescribed duties. Therefore, there is clear gap in the functioning of the institutional design in place to manage the Kosi river and the project.

The points made above are an indication of the institutional dysfunction in managing the Kosi river for flood control. However, this dysfunction is a result of institutional challenges that will be elaborated below.

Major Institutional Challenges

Trans-boundary Politics between Nepal and India: All the rivers from the Himalayas and the hills of Nepal cross the border and enter India. India is an emerging power in south Asia and has a major influence on the political environment of Nepal. India has been successful in claiming its share from all the major rivers of Nepal under a number of treaties (Dixit 2008). Joint projects are under construction and included in plans, however, Nepal's financial dependence on India has prevented Nepal from being an equal partner in sharing the benefits from its rivers. India's main interest in the Himalayan rivers from Nepal is for irrigation of the whole north belt of India while Nepal wants to export hydroelectric power to India. At the same time, Nepalese people face up to 16 hours of load shedding in the winter and in the monsoon. Moreover, water analysts in Nepal argued that India is not desperate for hydropower from Nepal confirming that irrigation is the main interest. Flood control has always been the catalyst for signing treaties; however, it can be argued that flood control is secondary to the main interest. The irrigation department leads the joint projects on a number of different rivers, embankments for flood control are secondary to this purpose.

Internal National Politics of Nepal, Bihar and India: Many changes and challenges have occurred in the internal politics of Nepal in the last 15 years. Law and order has suffered from the Maoist insurgency, the king's takeover and peace process and the transformation of the kingdom to a republic in 2008. In the period during the peace process, there was no authoritative government. The country had just become more peaceful after the Maoists signed the peace accord in 2007. However, this was marred by the presence of different armed powers in the Terai demanding an autonomous Terai. This has not just affected the peace of mind of Nepali people but also every sector of life including the maintenance of the Kosi embankments.

Alleged bribery and corruption (Gyawali 2008, Bharati 1997 cited in Dixit 2009 and Mishra 2008a)[13], confirmed by field research, has played a role in the Kosi project for half a century. This has reduced the effectiveness of flood management processes and has also led to a politicisation of the issue where local labour difficulties and strikes are cited as the cause for not being able to maintain the embankments.

With regard to India, the nature of the relationship between GOI and GOB is beyond the focus of this paper but may be relevant to management of the Kosi river. In this scenario, trans-boundary relationships are not easy. The Kosi river and project have suffered from the internal political environment in Nepal and the intrastate political relationship between Bihar and India.

Weakness of the Kosi Treaty

The Kosi treaty, originally designed to help control flooding of the Kosi river contains no specific clause for flood control mechanisms or compliance in cases where the flood control structures either fail or are damaged. The institutional mechanism of the Kosi project does not apportion any responsibility for the maintenance and monitoring on the Nepali side of the river even though some parts of the embankments are in Nepali territory. Therefore, when the embankments breached in Nepal, it proved difficult for India to provide timely action to repair the damage in Nepali territory as there were no provisions for such measures in the Kosi treaty. The issues of jurisdiction of land and sovereignty were simply not addressed.

There is no clear description in the treaty for dealing with a flood when it does occur. There were no contingency plans in place should the embankment breach. There is merely a maintenance plan for the embankments, the responsibility for which fell to India. Nepal had the responsibility of keeping law and order in the project area under her territorial jurisdiction. Given that a breach was not anticipated there were no compensation schemes for the people who would be affected by the flood if the embankment was breached. In short, the possibility of the occurrence of a future flood was not addressed. Respondents opined that the overconfidence over the output of the embankments is one of the many reasons. Moreover, there are still no policies and strategies legislated in Nepal for disaster or risk reduction which the Nepal government claimed that it is working on it (Prime Minister of Nepal, 15 October 2009, *Himalayan Times*, p 2).

The Kosi treaty was signed by Nepal and India and decisions were made at a national level. Local governments, local people

and civil society were not included in the process of decision-making or in the management of the Kosi project; nor are they included in the new institutional design. Neither the local people ($I_{14,}$ 1-30 December 2008),[14] nor the local government and community based organisations are aware of the detail of the Kosi treaty ($I_{15,}$ 18 December 2008).[15]

Need for Review of the Kosi Treaty

Since some of the authority to take action comes from the Kosi treaty, this paper suggests that it would be appropriate to review the Kosi treaty. Following points need to be considered.

Goals of the Kosi Treaty: The Kosi treaty was born with the main objective of flood control along the Kosi. However irrigation became prime focus for both of the countries and irrigation departments lead the Kosi projects. There are no institutions especially set for disaster preparedness under the Kosi treaty and the Kosi project. Thus it needs to be internalised inside the Kosi treaty for the Kosi river.

Monitoring: The treaty needs to be amended to show clearly when, who and how monitoring would be conducted. The division of costs for maintenance, monitoring and accountability procedures to ensure that these budgets are effectively spent is needed. In addition, it is important to define clear roles and responsibilities for the local authorities and people when drafting such strategies. These actors would feel a sense of ownership of the embankments and understand their importance. This ownership and awareness might lead to better on-site monitoring as it would not call for long distance visits and may even reduce the cost of the monitoring carried out by the state government. In addition, those embankments which are in Nepali territory could be monitored by Nepal, thus creating greater accountability and will remove the complications of India working in Nepali sovereign territory.

Maintenance: The treaty could be amended to clearly explain the responsibility for every aspect of maintenance. It would help if the treaty is clear about when and how this work is to be carried out. As Nepal is the first victim of any disaster upstream of the barrage, it would be easier for the management of the Kosi project if Nepal would be given responsibility for maintenance of embankments that are in Nepali territory. Funding arrangements will have to be reviewed and money to carry out the above tasks reallocated appropriately. However, there needs to be much more intensive cooperation between those undertaking maintenance activities in both countries.

Accountability and Transparency: The treaty needs to be amended to clearly define accountability for performing specific tasks and responsibilities. As there is strong suspicion of corruption in the Kosi project, there is the need for clear systems for financial accountability. Institutions would be more responsible for the assigned tasks if there would be clear penalties enforceable by national and/or international law for those who do not adhere to them.

Compensation: The mechanism for compensation of flood victims needs to be addressed and schemes to generate finance to enable this could be defined and implemented. Such schemes could include insurance schemes, micro-financing and so on.

Institutional Arrangements: The process of institutional design of flood management in the treaty could include multi-stakeholder participation across different levels. It could consider the participation of local people, local government, community-based organisations; interdisciplinary academics, state government and central governments. This could be achieved by establishing a river basin commission made up of these stakeholders. Clear decision-making procedures should be set up and better multi-level governance systems.

At present there are many bilateral committees in the middle of the hierarchy for the management of the same river. This has caused an overlap of responsibility for many tasks and the output of these committees has not been satisfactory. A streamlined division of responsibility and authority to actors at different levels of governance, and emergency procedures that can bypass hierarchical lines of communication are recommended. However, this does not imply that specific committees cannot be established with clearly delineated roles and reporting tasks. A committee is needed with an overall coordinating function but the power to take action on defined tasks would remain within these "task oriented" committees.

Local authorities from Nepal and Bihar could thus be empowered to take decisions and implement them at a time of urgency.

Communication Mechanism: The current communication mechanism is indirect, lengthy and unaccountable. The treaty could be amended to allow for more direct communication from the Kosi project, WRD, GOB with the GON at both the local and central levels. In addition, more direct communication from the central level of Nepali government to the local government needs to be less bureaucratic in times of urgency. In the 55 years that have passed since the Kosi treaty was drawn up, there has been major progress made in communication technology and this progress should be taken into account in the redesign process.

Conclusions

This paper has argued that the disastrous 2008 flood on the Kosi river calls for an examination of what went wrong and how can such a flood be prevented in the future. It focuses only on the institutional aspects and demonstrates that the seriousness of the flood can be attributed to five direct reasons, namely, the lack of local awareness and disaster preparedness, lack of anticipation and prioritisation given to the possibility of an embankment breach, lack of monitoring and maintenance of the embankments, the hierarchical communication mechanism, and the exclusive and complex nature of the institutional design for dealing with the Kosi. These reasons can be further attributed to three higher-level challenges. These include the nature of transboundary politics between Nepal and India, the internal national politics of Nepal, Bihar and India, and the inherent weaknesses of the now-outdated Kosi treaty.

The paper suggests that some of these challenges can be addressed by making the goals of the Kosi treaty more comprehensive, by ensuring a clear division of responsibility between the two national governments and the local governments, and accountability mechanisms to ensure that activities listed are implemented. A new feature would be compensation mechanisms. The institutional arrangements should be redesigned and streamlined to allow for better decision-making processes and communication processes.

A technical solution such as embankments has proved to have exacerbated flooding along the Kosi river. The 2008 flood is a wake-up call highlighting the urgent need to find alternative solutions to the flood problems of the Kosi. Multi-stakeholder participation involving local people and local government in the process of decision-making and implementation is one way forward. In addition, clear tasks, more direct communication, accountability and enforcement need to be prioritised for ensuring all affected are responsible for the matters of the Kosi.

NOTES

1 Interview given by Deepak Gyawali to reputed national daily of Nepal (*The Kathmandu Post*, 1 September 2008, p 5). Gyawali is the former minister of water resource in Nepal and founder of Nepal water conservation foundation.

2 UN OCHA is hosting General Coordination Meeting (GCM) among different relief organisations, local governments and donors since the embankment breach. In this meeting stakeholders meet and discuss issues and gaps in relief activities and status of flood victims.

3 To keep the respondents anonymous we only provide code and date of the interview.

4 Interview held on 30 January 2009 with a senior officer from Department of Hydrology and Meteorology, Nepal. He is also the member of JCKGP.

5 Submission to the Kosi Enquiry Commission on Kosi embankment breach 2008 (10 March 2009).

6 Interview (31 December 2008) with a senior officer, Sunsari district office, Sunsari, Nepal. He is also the chairperson of District Disaster Relief Committee.

7 Interview (17 December 2008) with a local journalist and a community-based organisation. The journalist is based in Sunsari district and he is the witness of ongoing events before and after the Kosi embankment breach 2008. UPCA Nepal and Abhiyan Nepal are two community-based organisations interviewed for this research.

8 Interview (24 December 2008) with an engineer, Kosi project Birpur, Bihar, India. He was interviewed during the closure of the Kosi embankment breach 2008.

9 Interview with a senior officer from Indian Embassy, Kathmandu, Nepal.

10 Interview with the liaison officer, WRD, GOB, Kathmandu, Nepal.

11 Interview with the Joint Secretary, Ministry of Water Resource, Nepal.

12 Interview with a senior officer from Department of Irrigation, Nepal. He is also the member of KHLC and team leader of JCKGP from Nepal.

13 See D K Mishra's "Serpent Tied Around Neck: Kosi Embankment". Here Mishra has listed all the previous embankments breached and the circumstances before and during the breaches.

14 Interview with flood victims in Kosi flood-affected areas in Nepal. Nearly 20 flood victims were interviewed from three affected villages.

15 Interviews with community-based organisations and local government officers.

REFERENCES

Dixit, A (2004): "Floods and Vulnerability: Need to Rethink Flood Management", *Natural Hazards*, 28, 155-79.

– (2008): "Two Neighbours Water Course" (Nepali language), (Kathmandu, Nepal: Action Aid Nepal).

– (2009): "Kosi Embankment Breach in Nepal: Need for a Paradigm Shift in Responding to Floods", *Economic & Political Weekly*, 7 February.

Gyawali, D (2008): "Whither Kosi River?", *The Kathn Post,* 1 September, p 5.

Kale, V S (2008): "Himalayan Catastrophe that Engulfed North Bihar", *Journal of the Geological Society of India*, 7: 713-19.

Mishra, D K (2008a): "Serpent Tied Around the Neck: Kosi Embankment" (Hindi language), (Patna, India: Freedom from Floods Campaign).

– (2008b): "Bihar Floods: The Inevitable Has Happened", *Economic & Political Weekly*, 6 September.

– (2008c): "The Kosi and Embankment Story", *Economic & Political Weekly*, 15 September.

Reddy, D V, D Kumar, D Saha and M K Mandal (2008): "The 18 August 2008 Kosi Embankment Breach: An Evaluation", *Current Science*, 95(12): 1668-69.

Sinha, R (2008): "Kosi: Rising Waters, Dynamic Channels and Human Disasters", *Economic & Political Weekly*, 15 November.

Thakkar, Himanshu (2009): "Submission to the Kosi Enquiry Co on Kosi Embankment Breach 2008 (10 March 2009)" by the South Asian Network, Rivers and People.