

# Floods, Himalayan Rivers, Nepal: Some Heresies

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The strategy of building embankments to constrain river flow and to prevent floods in north Bihar has proven to be questionable and flawed. Reliance on a dam-and-reservoir system for that purpose only offers limited protection and even greater risks of flooding in case of damage. Learning to cope with floods and managing a transition to a system that does not rely upon the embankments any more seems to be the rational course of action.

What has been happening in Bihar during the past three months is a heart-rending human tragedy; and it is continuing. Thousands of lives have been lost; a multiple of that number have been rendered homeless; homesteads, lands, livestock, and livelihoods have been destroyed; the kharif crop has gone, and when the waters recede, if there has been heavy sand-casting, the rabi crop may also prove impossible. Other consequences such as the outbreak of diseases have not yet made themselves fully felt. This has been rightly described as a national calamity, but it does not follow that it is a natural one. Nor is it unprecedented: heavy floods in the Kosi and the resulting human misery have happened several times before. Even the river changing its course is not something new. What is dismaying is that no lessons seem to have been learnt.

Taking the disaster aspect first, it does appear from all accounts that there was no timely information about the floods to the people likely to be affected, no precautionary evacuation, no state of preparedness for disaster, and no prompt response when the disaster struck. It seems probable that if information and response had been prompt and adequate, the extent and severity of damage and suffering could have been significantly less. In 2004, India earned the world's praise at both the official and non-governmental organisation (NGO) levels for the manner in which it responded to the aftermath of the tsunami. Why then did we fail to repeat that performance in Bihar in 2008? This will need to be gone into thoroughly.

Leaving that aside, the prime concern now is rescue, relief, rehabilitation, the provision of essential supplies such as food and water, medical help, shelter, and so on. There have been some NGO efforts, and the state and central agencies seem to

be bestirring themselves at last. One must hope that hereafter the action will not be found wanting either in adequacy or in a sense of compassion and urgency.

## Causes, Immediate and Original

What brought this disaster about? Three facts seem clear. The breach occurred in an embankment upstream of the barrage in Nepal; when it occurred, the flood was well below the design capacity of the embankment; and following the breach, the river changed its course. The breach itself can be attributed to poor maintenance. The fact that it occurred when the floods were not particularly heavy can be explained by the fact that the deposition of silt had reduced the capacity of the structure. And the change of course by the river was probably due to the fact that the waters emerging from the breach could not find their way back to the river because of embankments lower down: they then started flowing down old disused channels. Given all the relevant circumstances, one might say that the disaster was waiting to happen. The hypotheses offered here would need to be established through careful examination.

The charge of poor maintenance has led to mutual recriminations between Indian and Nepalese officials. Considering that the barrage and embankments were Indian structures on Nepalese soil, and that the responsibility for maintenance was clearly that of India in terms of the old Kosi agreement, it appears *prima facie* that the failure here is largely that of India. If cooperation from the Nepalese side had been wanting, the question arises whether the Indian officials brought it to the notice of higher levels in both countries and highlighted the dangers involved. These are matters to be gone into in a proper inquiry in consultation with Nepal.

Incidentally, we must take note of a conflict here. As a result of the breach and the subsequent floods in Bihar, some 30 lakh people have been affected. But, if the embankment had not breached and the flood-waters had travelled along the earlier course, some 15 lakh living between the embankments would have been affected. How did this dilemma

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arise? Why were people living within the embankments? The reason is that the protected area beyond the embankments had got waterlogged and so the people who had moved there had gone back to their original habitations. This only goes to show that the decisions to build a barrage and embankments on the Kosi were probably wrong.

### Understanding Floods

Let us move on to the rationale of flood control. From time to time there are floods in various parts of this country, and sometimes they are very heavy and cause much loss of life, livelihoods and property. Whenever this happens, it generates a strong feeling that something should be done about this problem. Starting from the proposition that the problem, i e, floods, should not be allowed to happen again, administrators and engineers decide that the river needs to be controlled, and come up with proposals for embankments and dams. Is there anything wrong in that reasoning?

To answer that question, we must first distinguish between avoidable and unavoidable floods. When Delhi or Mumbai gets heavily flooded with the first monsoon showers, the cause is inadequate or badly designed or poorly maintained or carelessly blocked drainage systems, or the ill-considered diversion of natural drainage channels. These are floods caused by human error or failure or negligence or folly, and are entirely avoidable. Floods are also sometimes caused by bad dam management, and these too are man-made. The Orissa floods of September 2008 seem to fall into this category. When we describe a flood as man-made, the implication is that appropriate measures at an earlier stage could have averted or minimised the flood.

That does not apply to periodical river-floods. These are natural phenomena arising from various factors. There could be seasonal floods because of heavy and continuous rains in the monsoon period; flash floods from cloud-bursts; floods resulting from the sudden release of waters held up by blockages caused by landslides in the mountains; and so on. *These floods cannot be prevented.* They have occurred before and will occur again. They can be of varying

magnitudes and intensities, and the regular floods, i e, those other than freak events, are classified by probability of recurrence (once in 20 or 100 or 1,000 or 10,000 years). When the flood-waters come, the river needs space to spread and accommodate them. That space is known as the natural flood-plain of the river. If we occupy the flood-plain or build structures on it, or try to jacket the river within narrow confines, we are asking for trouble.

### Embankments: Wrong Thinking

If habitations or structures or activities have already – unwisely – come up in areas that are likely to be flooded, and the option of moving them to other areas is not available, some degree of protection through bunds or embankments may be inescapable. However, it seems clear that wisdom lies in avoiding such situations. Generally speaking, it is preferable to let the river flow and have its space, and refrain from constraining it through embankments.

There are many reasons for that statement. Assuming that an embankment is properly maintained – a questionable assumption – it might still give way in an exceptionally heavy flood. That is the nature of embankments. Embankments tend to fail and have to be rebuilt repeatedly at enormous cost, often a multiple of the original cost of building them. Even if they do not break down, they might still cause various problems. The engineering assumption in the Kosi case and elsewhere was that the jacketing of the river would increase the velocity of the waters leading to a scouring of the river-bed, and that the river would find extra space for itself. Experience has not borne out that assumption. The jacketed river might proceed to attack areas further downstream. The embankment that prevents the river from spreading also blocks drainage from either side into the river, leading to the emergence of waterlogging and even flooding in the areas “protected” by the embankment (as already mentioned). Sluices are no answer because the deposition of silt leads to a rise in the level of the river-bed, with the river flowing above the level of the ground on either side: instead of waters from outside flowing into the river through the sluices, the river waters will tend to

flow out. While it might be possible to cite some specific instances in which embankments have done some good without doing much harm, they are in many cases remedies worse than the disease.

### What about Dams?

It might be argued that the objections that apply to embankments do not apply to dams. The argument for flood-control through a dam is that a dam will create a reservoir which will provide space for the temporary storage and gradual release of floods, thus moderating them. Data could be produced to show that this has actually happened in some cases. However, this is not necessarily or even often the case. Theoretically, a dam could be built exclusively for flood-control and operated entirely and strictly for that purpose. However, that is a purely hypothetical case. A dam-and-reservoir project is generally built for multiple purposes (irrigation, power-generation, flood-control, etc), and there is a conflict inbuilt into such projects. Flood-control would require the intended space in the reservoir to be kept vacant for accommodating flood-waters, whereas irrigation or power-generation would require the reservoir to be as full as possible; and the latter, being gainful economic activities, are apt to prevail over flood-control. If the space meant for accommodating floods is not available when the flood comes, the gates will have to be opened in the interest of the safety of the dam, and the downstream area might experience a greater flood than it would have done if the dam had never been built. This, as mentioned earlier, would be a man-made disaster; and it has actually happened more than once.

Even if a multi-purpose dam is operated with due regard for flood-control, and the flood cushion is maintained, the flood-moderation that this can offer is very limited. The contingency of heavy floods (not necessarily exceptionally heavy) posing a danger to the dam and compelling the opening of the gates is ever present. *The question is whether a limited protection under normal circumstances is worth the enhanced risk involved in non-normal circumstances, which are by no means infrequent.* This is an inherent danger in all dams. The danger is all the

greater in the case of Himalayan rivers. In the Himalayan context, if not elsewhere, "flood control" is a fallacy.

### 'Hydro-Power Potential'

Leaving flood-control aside, it could be argued that dams have in any case to be built for hydroelectric power. The general thesis is that there is a huge hydro-power potential (some 80,000 megawatts out of which the economically exploitable quantum is reportedly around 48,000 megawatts) in the (Nepalese) Himalayan region; that hydro-power is "clean", i.e., non-polluting; that the energy economy needs a proper balance between thermal power and hydro-power; and that it follows that several large dams and reservoirs must be built on the Himalayan rivers in Nepal. This proposition is so widely accepted that it might seem strange or perverse to question it. However, the claim that hydro-power is "clean" is very debatable; and while the energy economy may require a "peaking" component, it does not follow that the only route to this is through hydro-power. These matters will need extended discussion which is not feasible within the scope of this article, but two points may be made.

First, the very concept of a huge hydroelectric potential in the Himalayan rivers is fallacious. There is no such natural potential in a running river; it exists only in a falling river, i.e., in a waterfall. In a running river the hydroelectric potential is not natural but man-made: it is created by a dam. The statement that there is a hydro-power potential in the Himalaya can therefore be translated as "there is a technical possibility of building dams".

However, and this is the second point, the potential for building dams means also a potential for ecological damage, human misery and possible disaster in the event of heavy floods. The dangers are particularly acute in the Himalayan region, given the friability and proneness to mass-wasting of the mountains, the huge load of sediment that the rivers carry and the added danger of seismic activity. While the project-planners might claim that they have answers for all these problems, the precautionary principle would suggest that we leave the Himalayan rivers alone.

The ideas of flood-control and hydro-power potential have led to the formulation of a number of large projects to be located in Nepal, such as Karnali, Pancheswar and Sapta Kosi, and these have been the subject of talks between India and Nepal for several decades. It is therefore necessary to say something about India-Nepal relations. Those relations have been badly mismanaged on both sides. That is a complex subject which cannot be fully discussed here, but confining ourselves to water, let us take a brief look at the past.

The Kosi/Gandak agreements of the 1950s were not inspired by any large visions of "regional cooperation"; they were essentially projects conceived by India to meet its requirements or solve its problems, with some benefits to Nepal included. That was the way (myopic, in hindsight) the projects were designed with Nepal's agreement, but they were subsequently criticised in Nepal for conferring substantially more benefits on India than on Nepal, though this was inevitable given the relative magnitudes of cultivable areas in the two countries.

The projects also suffered from poor design, inefficient implementation and bad maintenance (not to mention corruption); even what was promised was not delivered either in Nepal or in India. The Kosi/Gandak agreements, initially signed in 1954/1959, were amended in 1966/1964 to take care of Nepalese concerns, but the sense of grievance was not wholly removed. The bitterness generated by these experiences coloured all subsequent dealings between India and Nepal. Suspicion and mistrust grew and became a massive impediment to good relations between the two countries. The Indian handling of that difficult and complex situation can hardly be said to have been wise or sensitive. The Tanakpur episode made things worse. Eventually, a new chapter in Indo-Nepal relations seemed to open with the Mahakali Treaty of February 1996. Unfortunately, that treaty, signed after extensive consultations with a view to avoiding the mistakes of the past, has remained a dead letter, contributing to a worsening of India-Nepal relations rather than a dramatic improvement as had been hoped. The

old acrimony has now been revived by the Kosi floods.

### Suggestions for the Future

Against this tangled background, what should we do? This writer would respectfully venture to make to the government of India two maverick suggestions:

(i) scrap the old Kosi and Gandak agreements and the 1996 Treaty on the Mahakali, all of which are unpopular in Nepal; stop talking about Karnali, Pancheswar, Sapta Kosi, etc; do not try to enter into any more treaties on large projects on the Himalayan rivers; and (ii) do not seek excessive closeness; let not Nepal feel threatened; aim at friendliness, correctness and a reasonable distance. Nepal has felt smothered by excessive closeness; let us try distance for a change. It may pave the way for a new and better closeness in due course.

There are good reasons for those two sets of propositions. First, India has been talking to Nepal about Karnali, Pancheswar and Sapta Kosi for over three decades, perhaps four, with no results. The factors that have stalled these projects have not disappeared. Besides, whenever an agreement or treaty has been signed, it has done more harm than good to India-Nepal relations. If India enters into a new treaty, say on Sapta Kosi, that treaty will become the subject of a controversy before the ink on the signatures is dry. Wisdom would lie in not creating new opportunities for misunderstandings. Second, India does not really need these projects. There are alternatives insofar as energy and irrigation are concerned; in any case old-style canal irrigation needs a radical review; and, as already argued, the notions of "flood-control" and "hydro-power potential" are fallacies, and the Himalayan rivers are best left alone. As for cooperation with Nepal, there are many possibilities other than big projects on the Himalayan rivers.

### What Do We Do?

If embankments and dams are best avoided on the Himalayan rivers, what then can we do about floods? We can learn to live and cope with floods, and perhaps even benefit from the silt that they bring. This is not a counsel of despair. One is not arguing that calamities must be accepted and suffered fatalistically. Consider what we do in the

case of earthquakes or hurricanes or tornadoes or tsunamis. Does anyone say that they should be stopped or prevented from happening or controlled? What everyone would say is that they should be predicted, anticipated, and prepared for; that there should be timely information, a state of preparedness for disaster, the minimisation of damage and prompt and adequate response by way of rescue and relief when the disaster actually strikes. Exactly the same point applies to floods. In addition, we can also learn from well-established traditional coping practices evolved over centuries by communities accustomed to periodical floods. It may be added that whatever we do must be done in an open, consultative, participatory manner, fully involving the people concerned right from the beginning.

That wisdom is for the future. What do we do about structures already built? If we repair the damage to the embankment in Nepal and try to put the Kosi back into its old course, we are (a) ignoring the plight of the people living between the embankments, and (b) running the risk of a recurrence of a major disaster in the future. On the other hand, if we do not rebuild the structures but let the river find its natural course, we might be putting at risk a large number of people who are living and pursuing their livelihoods in areas earlier "protected" by the embankments. That is indeed a difficult choice, but it is not really a dilemma, and the argument that we cannot put the clock back is not necessarily valid. Having realised the errors of the past, there is no escape from reversing them

over a period of time very carefully, minimising the pain of readjustment to the extent possible. That applies to global warming and climate change, and it applies equally to the fallacy of "flood-control".

### **Postscript**

Following prime minister Prachanda's visit to India in September, one hears once more references to a high dam on the Kosi and big hydroelectric projects. It appears that no lessons have been learnt from the past. In this ambience the unorthodox suggestions put forward in this article will probably receive no attention at the official level in either country. However one hopes that there are people in both countries who will take note of what has been said here.