Journal of Politics & Governance,
Vol. 5 No. 3, September 2016, Pp. 49-56
ISSN: 2278473X

Hydro-Fever in the Upper Tista Basin and Issues of Regional Environmental Security

Vimal Khawas*

Abstract

Transboundary Tista Basin forms a part of the larger Brahmaputra Basin in the Eastern Himalaya. In recent times, traditional symbiotic and intimate human-environment relationship in the Tista Basin has been increasingly put to danger by diverse undercurrents of development. Besides other forms of development including improper expansion of agriculture and irrigation, unscientific construction of roads and buildings, unplanned urbanization etc., the Central and Provincial Governments of India are vehemently underway with series of hydropower projects particularly within Sikkim-Darjeeling catchment of the basin. This has resulted in imbalances in the environment and various ecological systems there in.

Keywords: Tista (Teesta) basin, Hydropower, Environmental Security, Transboundary water Management, Sikkim, Darjeeling, India

[This essay is part of the larger research work being conducted under project '*Hydropower development in the context of climate change: Exploring conflicts and fostering cooperation across scales and boundaries in the Eastern Himalayas'* funded by Netherlands Organisation for Scientific Research (NWO).]

Introduction

Transboundary Tista River flows the Eastern Himalayan landscape and is the fourth major river after the Ganges, Brahmaputra and Meghna in the Eastern South Asian region. It flows the entire length of Sikkim and carves out some of the profuse and verdant Himalayan temperate and tropical river valleys. As it flows down, the river forms border between Sikkim and West Bengal. It flows about 172 km in the hilly region of Sikkim and Darjeeling (India). The river criss-crosses for about 98 km in the plains of West Bengal (India) and another 134 km in Bangladesh before joining Brahmaputra in Bangladesh. As it traverses down, Tista receives water from a large number of tributaries on either side of its course forming a complex and dynamic river basin and a unique eco-region often referred to as 'Tista Eco-region'.

Regional Significance of the Tista River Basin

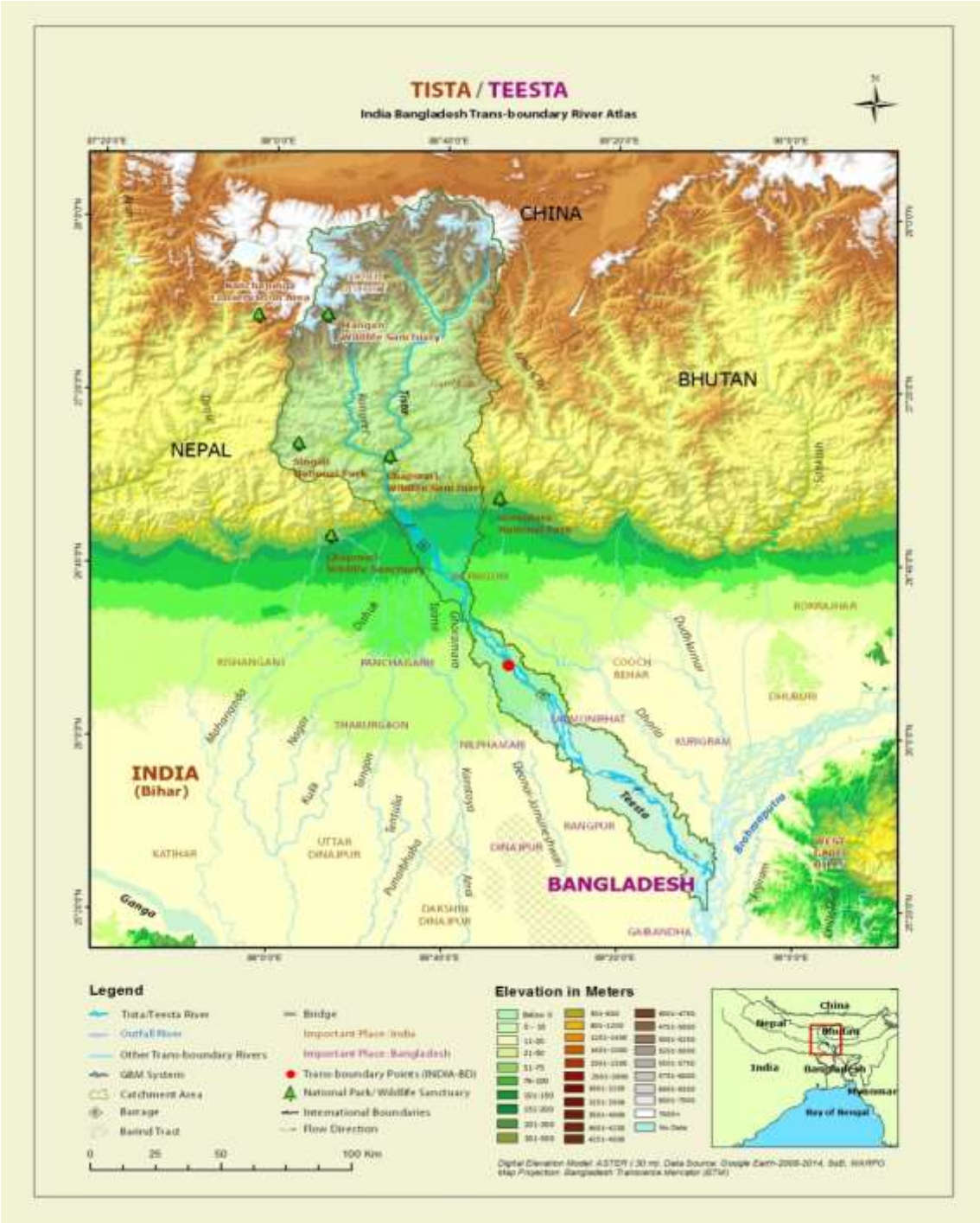
Tista (Teesta) Basin forms a part of the larger Brahmaputra Basin in the Eastern Himalaya. The river drains a total geographical area of about 12159 km². Around 2004 km^2 of the basin (about 17 percent) area lies in Bangladesh with the rest being in India. The Eastern Himalaya is considered as an important global 'biodiversity hotspot'. The region besides being source of varied forms of natural/bio-resources also acts as a global ecological sink.

Further, the basin has been home to several social groups in Sikkim, northern West Bengal (India) and Bangladesh since historic past. Starting from the Lepcha Tribe, Ethnic Bhutias and the Ethnic Nepalis

* Faculty, Dept. of Geography, Sikkim University, Gangtok, India **E-mail:** vimalkhawas@gmail.com

in Sikkim-Darjeeling Himalaya to the agrarian communities of North Bengal and Bangladesh, the region is the source of livelihood for several socio-cultural groups. The basin has been the source of etho-cultural and ethno-religious basis for many social groups in Darjeeling-Sikkim region.

Tista is the primary source of water to the agricultural crops of in Northern West Bengal and North Western Bangladesh. Besides, other associated livelihood options including rafting, sand/stone mining and fishing to name only few have thrived across the basin since long. Tista basin, therefore, provides the significant human and environmental security to the region and its geography milieu.



Source: IUCN (cited at thethirdpole.net)

Overview of Tista River Basin

Geographical Region	Political /Administrative Region	Basin Area (Sq Km)	Percentage Share	
Hills	Sikkim	6930	57.0	83.5 (Share of India)
	West Bengal (Darjeeling)	1121	9.2	
Plains	West Bengal (Jalpaiguri and Coochbehar)	2104	17.3	
	Bangladesh	2004	16.5	16.5 (Share of Bangladesh)
Total		*12159*	*100.0*	

Drivers of Hydropower Development

The traditional symbiotic and intimate human-environment relationship in the Tista Basin has been increasingly put to danger by diverse undercurrents of development in recent times. This has resulted in imbalances in the environment and various ecological systems there in. Besides other forms of development including improper expansion of agriculture and irrigation, unscientific construction of roads and buildings, unplanned urbanization etc, the Central and Provincial Governments of India are vehemently underway with series of hydropower projects particularly within Sikkim-Darjeeling catchment of the basin.

The mega hydropower projects proposed in the area are part of the Government of India's program of dam construction to create another 200 billion cubic metres of storage through the 50,000 MW Hydroelectric initiative launched in May 2003. It is part of the Central government's master vision of the north-eastern region as 'India's Future Power House', with around 168 dams planned. The potential for hydro development in India as proposed by the government is immense and a modest estimate of the same has been assessed at 84044 MW at 60 per cent load factor - if about 148,000 MW is the installed capacity. The North Eastern region including the Tista region contains the sizeable share of this with 59000 MW.

Considering huge untapped hydel potential of the Tista, Rangit and their numerous perennial tributaries, the Central and Provincial governments see huge opportunity to mobilize flow of capital investment through public, private or joint sector. Therefore, apart from development of various small, mini and micro hydel projects, several mega projects have been awarded to NHPC, NTPC and private developers in the last one and half decades.

From these projects, the State governments of Sikkim and West Bengal will get 12 percent of free power. As per reports, Sikkim hopes to yield approximately INR 2000 crore per annum by tapping into 'the enormous hydroelectric potential' of the basin within the State. Besides contributing to the growth and development of the country, Sikkim visualizes of a prosperous Sikkim with the revenue earned.

However, mention should be made that the number of mega projects in Sikkim allotted to public and private sectors has been lowered radically from around 27 in 2006-07 to 16 in 2014-15. Important reasons cited in this regard include critical social, ecological, geological and financial considerations. Reportedly, the Sikkim-Nepal earthquake of September 2011 played significant role in bringing down sizeable numbers of hydro-projects in the Sikkim Himalaya. The data recorded in the official documents indicate that number of ongoing mega projects came down from around 25 in 2010 to about 18 by 2012. Accordingly, the identified hydro capacity of the Sikkim Himalaya has been lowered from over 5200 MW to around 4200 MW as per the recent reassessment study of the Central Electricity Authority (CEA, 2014).

In the Darjeeling region, out of three mega projects one (TDLP III and IV) is already commissioned. Others are in various stages of construction. Further, the Chief Minister of West Bengal has recently announced four more projects in Darjeeling catchment of the Tista basin. Consequently, the Sikkim-Darjeeling catchment is now expected to produce over 6000 MW of electricity within the next few decades.

Hydro Electric Potential Development in the Upper Tista Basin *As on 31.7.2014*

Region/ State	Identified Capacity as per reassessment study		Capacity Under Operation		Capacity Under Construction		Capacity Under Operation + Under Construction		Capacity yet to be taken up under construction	
	Total (MW)	Above 25 MW	MW	%	MW	%	MW	%	MW	%
Sikkim	4286	4248	669.0	15.75	2622	61.72	3291	77.47	957	22.53
West Bengal	2841	2829	272.2	9.62	160.0	5.66	432.2	15.28	2396.8	84.72

CEA, 2014 [MW: Megawatt]

Issues of Regional Environmental Security

The biggest concerns at the moment are the varied impacts of such gigantic development ventures on the regional environmental security in this fragile region and its neighbourhood. The recent tectonic events in Sikkim (2011) and Nepal (2015) and the consequent disasters have further challenged the very idea and future of hydropower dams in the region. These seem to have either been overlooked or their impacts underplayed by respective EIA reports.

Earthquake: There are concerns that building hydro-dams may lead to river-induced seismicity in this geologically young and seismically active region. The Darjeeling-Sikkim catchment of the basin is located in the high-risk seismic zone IV of the Indian seismic zoning map and therefore had been active seismic region in historical times. Recent major earthquakes in Nepal (April 2015) and Sikkim (September 2011) measuring 7.8 and 6.8 in magnitudes have clearly exposed the region's wherewithal with regard to earthquake disaster.

The Nepal earthquake of April 25, 2015 and series of aftershocks thereafter have reportedly damaged about 14 hydropower plants across Nepal resulting in a loss of 150 megawatt (MW) of electricity. In this regard, Sunkoshi Hydropower plant has apparently suffered serious damage with its 3-km canal suffering from multiple leakages. Environmentalists, activists and researchers in the region have long been warning against too many constructions of mega dam projects in the upper Tista catchment.

The fragile geology coupled with mega hydro-dams could further induce earthquakes and the resultant landslides and flash floods could result into a disaster. The central government, provincial governments and hydropower companies may, however, dismiss the earthquake related concerns as fear mongering. Yet, a contingency plan for disaster management in the event of earthquake is a far cry for almost all the hydro-projects in the area!

Scholars across the world have reported the performance of various types of dams under earthquake shaking. Their studies show that concrete dams may be subject to severe cracking, movement and opening of joints that may render the dam unserviceable or may require major repairs. However, till date there is no recorded failure of concrete dam as a result of earthquake shaking, although our experiences with the seismic behaviour of mega dams are still limited. We have, however, to be aware that each dam is a model located at a site with special site conditions and hazards. Based on the observation of the earthquake behaviour of other dams, it is still very difficult to make a prediction of

the extent of damage that could occur in a particular dam. At the present time, we are still in a learning phase as very few large modern dams have been exposed to strong earthquakes.

Landslides: It may be noted that Sikkim-Darjeeling segment of the Tista basin is featured by a number of active and dormant landslides. A cursory glance at landslide statistics gives us a fearful idea of the enormity of damage done and the ever-present threat to life and property in the region. In the last one-century more than 10000 slides have been registered in Darjeeling region alone. Thousands of lives have been lost and the overall economic development of basin negatively impacted.

Mention should be made here that heavy and spontaneous rain on June 30 and July 01, 2015 triggered a string of landslides across Darjeeling Himalaya killing over 40 people. According to Praful Rao, President, *Save the Hills*, 'Kalimpong was pummeled by torrents of rain starting from approximately 20:00 hrs. I watched the clouding as it formed over us and remained almost stationery much like the clouding over Uttarakhand in 2013. Kalimpong received almost half (226 mm) the entire July month's average rainfall (548.7mm) in the 06 hours'. *Darjeeling Together*, an initiative of the people of Darjeeling to help the people affected by the recent landslides, has placed the following preliminary figures on the impacts of landslides: villages affected: 165, people affected: 94797, houses damaged: 1907, people in relief camps: 2360. Initial report of the district administration has calculated property loss to the tune of INR 12 crores in the Darjeeling region.

According to a recent study of Wadia Institute of Himalayan Geology, Dehradun, the Sikkim Earthquake (2011) triggered several hundred landslides in Sikkim, Nepal, Tibet and Bhutan Himalaya. In the Indian Territory, the earthquake-triggered landslides were reported as far as 100 km away from the earthquake rupture zone. Within Sikkim, the study reported over 350 new landslides in the post-earthquake period.

Notably, after impoundment and pondage by the dam, the water level in the area will rise considerably. As a consequence, the strength parameters of the slope mass will decease and it may become susceptible to destabilization thus triggering new landslides and further destabilisation of already active slides. A live example of such a situation is seen along the National Highway between Tista Bazar and 27 Mile near Rambi in Darjeeling region where TDLP-III regularly impounds water for several weeks, although it claims to be a run-of-river project (RoR), threating livelihood security of the riparian settlements in the area.

This is no great news for a region already facing the cost of short-sighted mountain development.

River Erosion: It is also important to highlight here that of all the Himalayan Rivers, Tista reportedly has the highest sediment yield. According to Centre for Science and Environment (1991), it approximately, brings down 98 cum of silt per hectare of its catchment per year giving an annual denudation rate of 9.8 mm per year. And surprisingly, this is among the highest denudation rates estimated for any river valley in the world. Scientists have estimated the average denudation rate for the Darjeeling Himalaya alone in the order of 0.5 mm to 5 mm during a normal year. But during a year of catastrophic floods such as 1968, the denudation rate for that year can possibly go up to 20 mm. It may further be noted that the effects of erosion and sedimentation provide favorable conditions to river shifting. River Kosi has shifted by about 150 km to the west during the last two centuries. According to Hunter's Statistical Account of Bengal, Tista was originally a river of Ganga basin. Tista, which at present flows into Bangladesh to meet up with the Brahmaputra used to flow into the Mahananda and the Ganga in Bihar about 220 years ago. In 1787, due to incessant rain followed by heavy flood and devastating earthquake Tista shifted its course to Brahmaputra basin. If such sudden river capture occurs today, thousands of villages will be swept away in a gigantic flash flood inflicting incalculable human and environmental insecurities.

Sediment Yield of Himalayan Rivers

River	Sediment Yield (cum/ha/yr)
Ganga (at Farakka)	04.33
Arun	11.91
Sun Kosi	27.30
Tamur	60.76
Kamla	28.72
Kosi	16.32
Ramganga	17.30
Brahmaputra (at Pandu)	07.81
Dihang	07.95
Tista	**98.40**
Burhi Dihing	17.73
Lohit	34.20
Manas	07.85
Subansiri	10.91
Pagladiya	31.40
Indus	-
Chenab	25.20
Sulej	06.00
Beas	15.10

Source: cited from CSE, State of India's Environment: Floods, Flood Plains and Environmental Myths, Centre for Science and Environment, New Delhi, 1991, pp 51

Ecological Degradation: The degradation of the basin's environment and ecosystem due to varied drivers of development primarily hydro is emerging as major concerns for ecologists and environmentalists. It is feared that construction of dams, fluctuation in natural river discharge and diversion of river waters through closed tunnels are gradually changing the ecological settings of the upper Tista basin. Further, submergence of valleys, deforestation, pollution of fresh water sources and improper sewage disposal are other pertinent factors that are affecting the basin's ecosystem devastatingly. Consequently, the rich biodiversity and high level of endemism are under threat in the upper Tista basin. Conservation and management of natural resources base are therefore critical for the region. Scholars have grouped major threats to the basin biodiversity under five interacting categories: over-exploitation, water pollution, flow modification, destruction/degradation of habitat and invasion by exotic species.

With global scale environmental changes being superimposed upon all of them things become murkier! River ecosystems and riparian communities of the region are experiencing the disastrous effects of the hydro-companies' actions of dam building including blasting, tunneling, water diversion, road construction and muck dumping. Environmental activists are of opinion that dancing and roaring Tista will be silenced and rich biodiversity in the basin will be lost for all time to come if current development paradigm of the region is not arrested. This is a very serious issue both to our coming generations and us. It is further disheartening for all of us who live within Tista basin and with historical, socio-cultural and emotional linkages with the region that *National Geographic* has listed Tista River among eight mighty global rivers that run dry because of human overuse.

Further, with the impacts of global warming becoming more apparent, Tista basin perhaps is most in-tune to the signs of change brought about by climate warming. There are copious instances where people across the spaces of Tista Basin have narrated revealing insights on how changes in the regional climate are affecting their lives and livelihood. In this connection it is important for us to understand the glacial behaviour, snowmelt run-off and monsoon rainfall in the basin. Information on glacial behaviour and its impacts is necessary to analyse the impacts on downstream population and the environment and to gauge the economic and environmental viability of projects in the region. The

information on melt water yield and its chemical and sediment characteristics is vital to the safety and maintenance of the hydroelectric installations and reservoirs/dams in the region. SW Monsoon plays a very significant role in the water regime of the basin. Its deviation will render devastating impacts both on water regime and health of the numerous hydro-projects in the region.

Transboundary Issues: As an international river, there have been serious issues on table with regard to sharing of Tista water between India and Bangladesh. Besides several existing and proposed hydro-dams in the Sikkim-Darjeeling catchment, the Government of West Bengal has diverted almost entire Tista Water via artificial canal at Tista (Gajoldoba) Barrage in Jalpaiguri to irrigate its thirsty North Bengal leaving little or no water for Bangladesh. Given the number of hydropower dams planned upstream farmers down streams are not sure how long they will continue to get water when they need it.

As a lower riparian country of the basin, Bangladesh has been regularly voicing its concern for the equitable sharing of the transboundary Tista River. But it is still to be achieved despite several meetings between Bangladesh and Indian governments. Tista water sharing agreement was to be signed during the then Prime Minister Manmohan Singh's visit to Bangladesh in September 2011. It was, however, postponed at the last minute due to objections by West Bengal Chief Minister Mamata Banerjee. Recent visit of Indian Prime Minsiter Narendra Modi to Dhaka largely revolved around addressing long pending land boundary issues. Bangladesh, however, is hopeful of settling Tista water sharing issue sooner than later. It now wants to build on the recent goodwill and camaraderie generated by Modi's visit.

Experts often project that the next 10-15 years shall witness depressing intra and inter-State water disputes if policy makers both in India and Bangladesh do not come up with viable solutions for the sustainable management and sharing of Tista Water. There is, therefore, an urgent need to re-look India’s neighbourhood policy!

Select References

Bilham R, VK Gaur and P Manohar. 2001. Himalayan Seismic Hazard. *Science*, 293:1442-1444.

CSE.1991. *State of India’s Environment: Floods, Flood Plains and Environmental Myths.* New Delhi: Centre for Science and Environment.

DSC. 2010. Acceptable Earthquake Capacity For Dams, Dam Safety Committee. New South Whales (Available at: http://www.damsafety.nsw.gov.au)

DTE. 2015. After 7.9 Shock, *Down To Earth*, May 16-31, p22.

Government of Sikkim. 2015. Annual Report 2014-15. Energy and Power Department, Gangtok

Gupta, Vikram; AK Mahajan; VC Thakur. 2011. A study on landslides triggered during Sikkim Earth of September 18, 2011. *Himalayan Geology*, 36 (1): 81-90

Haque, M. Inamul. 2011. What happened to Teesta water?. *The Daily Star*, September 27 [Available at http://archive.thedailystar.net/newDesign/news-details.php?nid=204060]

Homer-Dixon, Thomas. 1999. *Environment, Scarcity and Violence*, Princeton: Princeton University Press.

Hukil, Roomana. 2014. India-Bangladesh Relations: Significance of the Teesta Water-Sharing Agreement, Institute of Peace and Conflict Studies. 23 April. http://www.ipcs.org/article/india/india-bangladesh-relations-significance-of-the-teesta-water-sharing-agreement-4403.html [accessed on November 02, 2015]

Khawas, Vimal. 2015. Pathways for Climate Resilient Livelihoods: The Case of a Large Cardamom Farming in the Dzongu Valley of the Tista River Basin, Sikkim Himalaya. In W. Lealfilho (Ed) Climate Change in the Asia Pacific Region. Springer International Publishing, Switzerland, pp: 319-334

Khawas, Vimal and Pribat Rai. 2015. Earthquake Disaster and Vernacular Construction: Experiences from the Sikkim Himalayan Earthquake. *Journal of Development Management and Communication*, 02(02): 175-183

National Geographic. 8 Mighty Rivers Run Dry From Overuse.

http://environment.nationalgeographic.com/environment/photos/rivers-run-dry/#/freshwater-rivers-teesta-1_45148_600x450.jpg (accessed on November 24, 2014)

Roy, Pinaki. 2015. Fresh hopes for Teesta water sharing pact. *thethirdpole.net*, February 25. http://www.thethirdpole.net/2015/02/25/fresh-hopes-for-teesta-water-sharing-pact/ (accessed on November 25, 2015)

The Daily Star. 2015. Teesta Flows above Danger Level: 30 thousand marooned in Lamonirhat, NilphamariJuly 03, http://www.thedailystar.net/country/30-thousand-marooned-lamonirhat-nilphamari-106852 (accessed on November 02, 2015]

The Telegraph. 2015. Bengal to raise water release with Sikkim. *The Telegraph*, July 06 (North Bengal Edition)

Ullman, Richard. 1983. Redefining Security. *International Security*, 8: 129-153.