Hydropower Development in Teesta River Basin & Lessons for Regional Cooperation[60]

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Introduction

If energy cooperation is to take centre stage for the South-Asian regional cooperation agenda, it is hydropower that can be of immense importance. Its huge potential especially in the upstream riparian countries of the subcontinent namely, Afghanistan in the Northwest and Bhutan and Nepal in the North East has been well recognised. These are landlocked countries and with few options available for rapid economic growth. Developing their hydropower potential and feeding it to the neighbouring energy starved subcontinent offers an opportunity to alter and rapidly develop their economies. . India too is endowed with some of these upstream riparian areas which comprise of its north eastern states and the state of Himachal Pradesh.

Table 1: Hydropower Potential, Installed Capacity and Utilization

Country	Hydropower Potential Mega watts	Installed Capacity	Utilization %
Afghanistan	NA	NA	NA
Bangladesh	775	230	30
Bhutan	50000	120	1.4
India	300100	29500	10.5
Maldives	0	0	0
Nepal	42915	527	1.2
Sri Lanka	2000	1250	62.5
Pakistan	40000	6500	16
Total	2,94,330		

Source: Adapted from Sankar et al SARI/Energy report based on country reports up to 2004

Hydropower Potential, installed capacity and utilization (Table 1) in some of the South Asian Association for Regional Cooperation (SAARC) countries were considered as the major drivers of development on a global scale. Countries at various stages of development were looking at hydropower development as an option that facilitated the use of their own natural resources for the growth and modernisation of their economies during this period. However, the fact that hydropower development comes with the baggage of negative environmental and social costs such as; displacement of large numbers of people, excess silt accumulation in reservoirs and inadequate hydrological assessment started to become apparent in the 1980s. 'Narmada Bachao Agitation' is a

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major mile stone in this context with reference to India. That the benefits through this development driver do not necessarily trickle down to the poorest became a growing concern leading to development of new paradigms with respect to benefit sharing vis-a-vis hydropower projects. Sharing of benefits in the long run became a guiding principle and broadening of the focus from mere power generation to integrated water and land resource management were advocated as best practices in the hydropower sector.

Albeit, despite several negative externalities and social costs, associated with hydropower generation it continues to remain the largest renewable energy contributor in the world. There are countries in the world such as Brazil and Norway that remain completely dependent on hydropower generation to meet their energy needs even today. In India too, one can witness an increasing thrust towards hydropower development since the 1990s. Consequently, there is a simultaneous evolution of a benefit sharing mechanism. Thus in the context of hydropower generation there is a need to evolve an integrated approach. Such an approach should look at the river basin as one whole unit and involve basin wide multi-stakeholder consultations at various levels and at various stages right from the planning stage, designing to execution of such projects if viability and long term sustainability are to be important objectives. It is a well-known fact that action or excess utilization or appropriation of water in one part of the basin can have a disproportionately negative impact on other parts of the basin thus making the integrated river basin approach essential in planning designing and implementation of any hydropower project; be it a storage project or run of the river.

This paper focusses on these issues and illustrates various concerns that need attention if regional cooperation is to work. . It does so by examining the Teesta V, a run of the river Hydropower Project on Teesta River in Sikkim in eastern India. This paper is divided into three sections. Section 1 focusses on the energy needs and demands of South Asia and places hydropower development in India in this context. Section 2 discusses hydropower development in the Sikkim state of India and outlines the major issues and concerns. Section 3 looks at the sustainable hydropower development alternative based on lessons from Teesta V from the regional cooperation perspective.

1. Energy Needs and Demands of South Asia

South Asia experienced sound economic growth in the decade 2000-2010. Due to this, despite the traditionally, very low per capita energy use rate, the demand has been growing at a rate of five percent. (Siddiqui 2008). It is estimated that South Asia's energy needs are likely to rise three times compared to today in the next 15-20 years. (Gippner 2010; Ahmad 2010) (see table 2). In the wake of this energy need and with the certain countries like Bhutan, Nepal and Afghanistan having the potential for energy surplus, regional cooperation becomes an area of high priority. However, due to the politics of the region and ongoing conflicts, regional cooperation is certainly not an easy proposition. Currently, the hydropower trade in SAARC countries is limited to 5620 Giga Watt Hours (GWH) between Bhutan- India and 339 (GWH) between India and Nepal (SRETS: 2010)

In principle there is recognition and acceptance of this need. However, not enough effort is being made and not enough options are being explored in this direction barring a few exceptions such as the ones mentioned above. Despite a number of studies on regional cooperation for energy, very few go beyond recommending negotiations at the national level amongst the diplomats and policy makers. For instance, a study such as SRET recommends regional trade and cooperation agreement amongst SAARC countries along with legal regulatory frameworks and reliable data base building to promote energy trade. (SRET: 2010). The Regional Report Energy for South Asia, recommends strengthening of SAARC Energy Centre to facilitate regional, planning, research, training and trade.

It also recommends setting up financial institutions to support infrastructure development in SAARC countries, (Energy for South Asia, Regional Report: 2005). A few studies spell out the need for setting up dispute resolution centres and/ or attributing some role to civil society organizations. (Obaidullah: 2010 and Tripathi: 2012). However, in the context of energy cooperation especially in the case of hydropower an integrated river basin approach that involves stakeholders at multiple levels is a necessary prerequisite.

Table 2 Commercial Energy Demand by 2020 in South Asia

Item	Unit	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka
Electricity Demand Forecast (2020)	MkWh	3877	72791	6876	1755685	1571	8076	251039	23867
	TJ	13957.2	262047.6	24753600	24753.6	5655.6	29073.6	903740.4	85921.2
Oil Demand Forecast (2020)	mtoe	3.483	11.6	0.62	246.9	1.661	1.61	30.94	7.82
	TJ	145826.244	485668.8	25958.16	10337209.2	69542.748	67407.48	1295395.92	331594.56
Gas Demand Forecast (2020)	mtoe	0.92	44.03	0.0	101.88	0.0	0.0	72.75	0.0
	GJ	38518.56	1843448.04	0.0	4265511.84	0.0	0.0	3045897	0.0
Coal Demand Forecast (2020)	mtoe	0.0	0.9	0.11	447.6	0.0	0.78	13.9	7.0
	GJ	0.0	37681.2	4605.48	18740116.8	0.0	32657.04	581965.2	293076

Source: Adapted from Tripathi, 2011.

2. Hydropower Development in India

In the global context, water has been used for mechanical power since ancient times. However, water mills came into vogue during the industrial revolution period in Europe and it was only in the second half of the 19th century that generation of electricity through water and its transmission became a practical possibility. In India, the first hydropower project was set up, on Cavuery River in South India that started transmitting electricity in 1902 to gold mines owned by the consortium of British Companies that were 90 miles away from the power station. From the 1900s to 1970 hydropower was considered as one of the major drivers of development in the world.

In India, the demand for power has been growing at the rate of 5.74% in recent years. During 2005-2006 the demand was 632 BU in terms of energy and 93.21 (GW) in terms of peak power requirements. The availability of power has been continually falling short of the demand and, as a result, the country is experiencing power shortages of varying degrees in different states or regions Rao: 2006)). Around 2005-06, 84% of the houses were electrified however, only 43.5 % of the households had access to electricity with per capita consumption of electricity relatively low of the order of 600 kilowatt per hour (Ramnathan and Abheyagunavardhana, 2007).

Although India has immense economically exploitable hydropower potential of over 84,000 MW at 60% load factor (148700 MW installed capacity), and stands fifth highest in the world in terms of its hydropower potential, (Ramnathan and Abheyagunavardhana, 2007). Of this enormous potential, it has harnessed only about 15% until the first five years of the twenty first century, with another 7% in the pipeline. Although the ideal Hydro: Thermal power mix for India has been recommended to be at 60:40(Sharma, 2010). 78% of the potential remains un-harnessed due to many issues and barriers involved in large-scale development of Hydropower in the subcontinent (AHEC 2006). Recognizing the energy needs of the country and the untapped hydropower potential, the Government of Independent India started utilizing its hydropower potential as early as the

1960s, which was in tune with the global trend at that time. This is clear from the fact that in the early years after independence India's hydropower share in the energy mix in 1963 was 50%. However, this declined to about 21% by 2010 (Saxena and Kumar 2010).

Once again, in order to correct this hydro- thermal power mix ratio to meet the grid requirements and peak power shortages, the Government of India started undertaking several measures and as part of such measures, announced a hydropower policy first in 1998 and thereafter in 2007. The government began to promote hydropower development during this period which became apparent through the policy and some of the recommendations made by various committees appointed to accelerate this process. For instance, the projects that involved a lesser risk element and entail lesser capital investment were to be considered for development in the private sector. The public sector was to take up (a) multipurpose projects (b) projects involving inter-state issues and in inter-state river systems, (c) projects involving cooperation with neighbouring countries (d) projects for complementary peaking with regional benefits and (e) projects in the north-eastern region etc. (Standing Committee, 2005). Many hydro projects are located in troubled areas and infested by militancy and terrorist activities. Recognizing this, an urgent need was expressed to off-load indirect cost components by amendments with regard to security expenditure being charged on to the project cost. Only, the recurring expenditure incurred on security, once a project goes on stream was to be charged on the project developer (AHEC, 2006).These recommendations of the standing committee clearly show the eagerness with which the policy makers were trying to woo private players as well as the public sector hydropower developers. Which in turn led to the overlooking of several provisions for public participation and consultation for transparency and lack of adherence to environmental safeguards while setting up the projects.

2.1 Hydropower Development in the North East India

As is clear from the above discussion, hydropower development has been given high priority in India's development plans since the last two decades. Within this new strategic plan the Northeast has been given priority attention. Hydropower development is considered desirable or rather necessary for the region from two perspectives. First, for the well-being of the people of the region and for its potential contribution to the Indian economy. Second, to the fostering of links and economic relations with neighbouring countries. Table 3 shows the extent to which capacity addition was done during the 11th five year plan in the northeast region of India. As per the demarcation of regional power grids in India, the north eastern power grid comprises of seven states whereas the Sikkim the eighth state comes under the eastern regional grid. Sikkim contributes the maximum in this grid to the tune of 510 megawatt of energy.

Table 3: Target vs Achievement of Hydropower Capacity Addition in North East Region & Sikkim in 11th Five Year Plan, India

State	Target	Achievement as on 30-9 2011
Assam	**537**	**0**
Arunachal Pradesh	**0**	**0**
Meghalaya	**126**	**0**
Tripura	**0**	**21**
Manipur	**0**	**0**
Nagaland	**0**	**0**
Mizoram	**0**	**0**
Total NER	**663**	**21**
Sikkim	**1209**	**510**

Source: Report of the Working Group on Power for Twelfth Plan (2012-17) Ministry of Power, GOI January 2012. Note: All figures in Mega Watts.

The River originating in China flows through the two Indian states of Sikkim & West Bengal before entering Bangladesh and spilling itself into the Bay of Bengal. En-route it supports diverse ecosystems fostering a variety of socio- economic, cultural and political milieu. The current hydropower development approach that is in place certainly doesn't acknowledge the variety of geographies and ecosystems of the region and it can certainly go much further in addressing the diverse socio-cultural and economic needs of the people in the region. This issue is covered in next section.

2.2 Spurt of Hydropower Projects on Teesta & Its Socio-economic and Environmental Impact

Sikkim has innumerable streams and rivers flowing down the glaciers, providing abundant potential of hydroelectric power projects. The river Teesta, which is the main river of Sikkim falls from an elevation of about 3600 m to about 300 m over a distance of 175 km. It is estimated that Sikkim has a potential to produce 8000 MW seasonally and about 3000 MW power during winter months (see table 4). Earlier, most of the projects were under a joint venture between state run corporations. However, the new trend is to privatize the sector with private parties bidding for contracts.

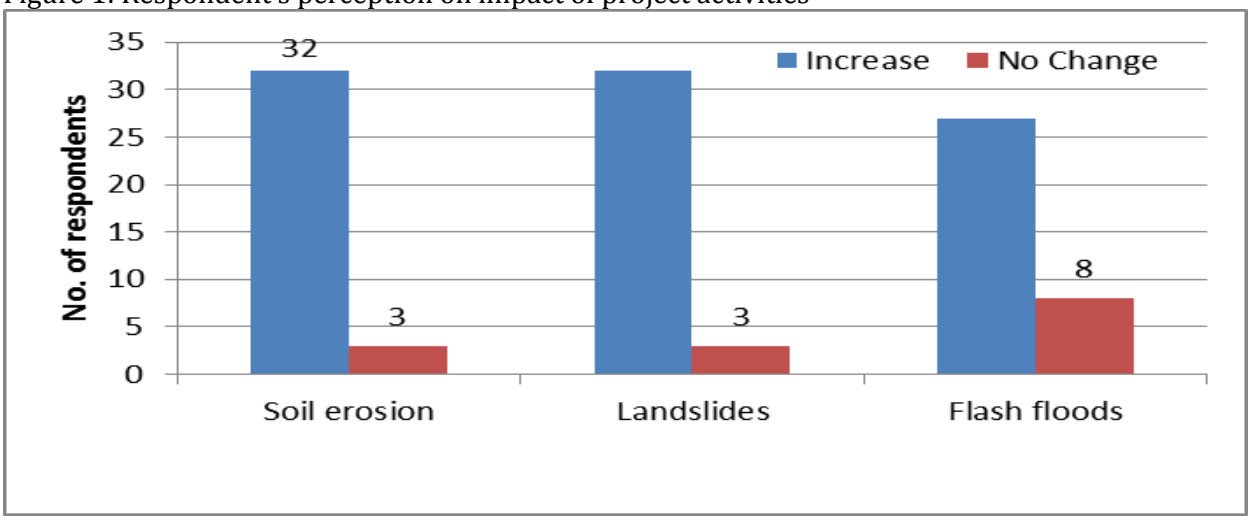
Table 4: Number of schemes on Teesta River with installed capacity

Name of the Scheme	Installed Capacity [MW]	Year of commissioning	Being developed under
Teesta I	280	2011-12	JV
Teesta II	330	2011-12	JV
Teesta III	1200	2011-12	JY
Teesta IV	495	2011-12	JV
Teesta VI	500	2011-12	JY
Teesta V	510	2006-07	CPSU
Lachen	210	2011-12	CPSU
Panan	300	2010-11	JV
Rangyong	117	2011-12	Private
Rongnichu	96	2010-11	Private
Sada Mangder	71	2010-11	Private
Chujachen	99	2009-10	Private
Bhasmey	32	2010-11	Private
Rolep	36	2009-10	Private
Chakhungchu	50	2010-11	Private
Ralong	40	2010-11	Private
Rangit II	60	2010-11	Private
Rangit IV	120	2010-11	JV
Dikchu	54	2010-11	Private
Jorethang Loop	96	2010-11	Private
Lingza	120	2010-11	MoU not signed
Thankgchi	40	2010-11	Private
Bimkyong	99	2011-12	Private
Bop	90	2011-12	Private
Ting	70	2010-11	Private
Rateychu Bakcha chu	40	2010-11	Private
Tashiding	60	2011-12	Private
Total	5248		

JV: Joint Venture, CPSU: Central Public Sector Undertaking
Source: Annual Report 2008-09. 2009. Energy and Power Department. Government of Sikkim, Cited in Khawas and Joshi, 2011

However, the spurt of hydropower projects in Sikkim began to spread discontentment among the common people of the state soon after its initiation (Bhutia: 2012 and ACT, 2013). The root cause of this could be attributed to the neglect of provisions for involvement of the affected people and lack of transparency in this development process. Also equally important was the negative socio-economic and environmental impacts that began to manifest as a fallout of this development. In order to understand the perceptions of people affected directly by the hydropower projects a study was conducted in the area directly affected by NHPC (National Hydro power Corporation) Teesta V and two other private developers, namely Lanco and Madhya Bharat Corporations. The study was conducted via a household survey, focused group discussions and key informant interviews. Although with a small sample size of 40 households within a total of 54 sq km from upstream and downstream of the immediately project affected area, the study gathered project affected peoples' perceptions on a variety of issues. These issues ranged from their livelihoods to their health, culture and surrounding ecosystem. For example their perceptions regarding the hazards from the project were as follows (Figure 1):

Figure 1: Respondent's perception on impact of project activities



Source: Rao, 2013.

Out of total respondents surveyed, 35% revealed that there is an increase in the number of landslides and soil erosion, while, 30% of the respondents were of the opinion that the frequency of flash floods have increased owing to frequent release of water from the hydel dams.

95% of the respondents were of the opinion that the effect of negative externalities are increasing in the form of landslides, soil erosion, pollution, accidents and deaths incidents in and around the project areas. Of the total upstream and downstream respondents surveyed 97% of the respondents acknowledged that traffic congestion has increased due to influx of people and movements of light and heavy vehicles carrying load in the projects / construction sites. About 94% of the respondents opined that pollution has increased in the last 5-6 years. While 69% of the respondents are of the view that road accidents have increased over the last 5 years. However, only 40% of the respondents believe that deaths have increased, while 60% think that it has not increased. In a major accident, 8 people were killed due to the collapse of the Rangchang Bridge near Dikchu as a consequence of the heavy-weight vehicle (80 tonnes) of the Hydropower Company while crossing the bridge.

These are run of the river projects and are supposed to be environmentally benign. However, for instance in case the project under study for 510 MW capacity project a 17km long tunnel has been dug, it bypasses 23km long river course. 80% of the respondents expressed that local water sources particularly rural springs / streams have disappeared completely in the last 5 years due to heavy tunnelling and explosive activities. The locals perceived that ground water has been lost due to leakage from the tunnels. Besides this the locals also expressed that agricultural yield in return has declined significantly over that last 5-6 years. Around 40-50% of the respondents indicated that the water resources have decreased both in terms of flow and numbers (springs and springs). 77% of the upstream/downstream respondents complained that their health conditions have deteriorated due to increased pollution and contamination of the water sources.

All the respondents strongly argued that the tunnelling and explosion during tunnel construction have triggered landslides, mud slides, and created cracks in the cliffs or in the agriculture field and/or in the forest areas. The impacts of tunnels still continue especially in cultivated ecosystems, agroforestry systems and in the surrounding forest ecosystems. People have also observed changes in the phenology of some of the socio-economically important species.

Although these are only peoples' perceptions and more scientific studies need to be undertaken to assess the impact on the ecosystem especially the declining water resources and consequent deterioration of biodiversity and agriculture productivity, one can safely conclude from the study that there are mixed feelings among different stakeholders about the impacts of projects on their lives. In fact it is only after protests and a continuous struggle by the affected citizens with the help of various civil society organizations that the Government of Sikkim seems to have woken up to respond to some of their demands. Several studies done by civil society organizations such as the independent people's tribunal on Dams, Displacement and Environment and several other media reports are a testimony to this. (Bhutia 2012, ACT 2013, Vagholikar & Das 2010)

Yet there is still much to be desired in terms of proactive policies and strict monitoring of existing policies with regard to environmental safeguards and peoples' participation from the government and power developers. Many demands with respect to adequate level of peoples' participation in design, planning and implementation of the project have not been addressed. Stricter provisions for monitoring, transparency, acknowledgement and redressal of the negative impact of the project on the ecosystem will demonstrate the sensitivity of the government and power developers towards the livelihoods and health of the people.

3. Lessons for Regional Cooperation

If one looks at the development of hydropower from the country's energy needs at large, it is not difficult to understand the zest with which Governments are forging ahead to set up these power plants and why they are wooing private investors for investment. Situated in remote areas with little infrastructure it indeed is a challenge to bring in investment and set up these power plants. As a result, compliance with the environmental safeguards, public hearings, public consultations with participatory approach which are supposed to be an integral part of the implementation process still remain a far cry. Even if these processes are mandatory on paper, the actual implementation is not done with sincerity and in the true spirit. They remain sheer formalities.

The need for power generation is hardly a matter of debate. However, the way in which these power plants are being set up, the execution of these projects - right from the planning, design, to construction and operations - is a matter of concern amongst the local population and within the

neighbouring states. However, if regional cooperation is to be the goal then acknowledgement and a proactive approach to address the concerns would be of the utmost importance. It will demand strong political will and multi-stakeholder involvement with an "integrated river basin" approach. This in turn will involve joint committees and shared vision. If the study above is looked at as a microcosm of the larger hydropower development scenario in the South Asian region there are a lot of lessons that can be drawn from it for the larger sub continental picture especially with its implications for its viability/success, long term sustainability and as a tool to foster regional cooperation. For instance, currently, water is a state subject as per the Indian constitution and hydropower development is in the concurrent list. During the study there was no record found at the state level which showed any consideration of the impact of hydropower projects in the downstream areas in the neighbouring state of West Bengal or extreme downstream riparian areas of Bangladesh. In order to engender regional cooperation and the viability and long term sustainability of the projects authentic basin wide impact assessments are highly desirable.

Another important aspect would be multi stakeholder participation in the entire process. In the case of Teesta river basin it is not only the Government of India but also the state Governments of Sikkim, West Bengal and Bangladesh along with their affected people need to be involved at various stages in the process via various means such as multi stakeholder consultations. These consultations if present only at the level of technical details and technical solutions pose a danger of becoming obsolete or redundant especially when they are not acceptable to the affected people. As witnessed in the case of Teesta V, projects developed without adequate consideration of their impact on the affected people lead to discontent among the people. Lack of their engagement and enthusiasm results in long delays in execution and tend to be highly inefficient/unattractive in terms of revenue earnings to the developers and the states as well.

In order to assure success and long term sustainability it is very important that a holistic approach is adopted that will consider the socio-economic, cultural and environmental aspects cutting across different sections of the affected people. In order to have meaningful multi-stakeholder participation, availability of authentic data and information regarding water flows, rainfall, sediment deposits, flood forecasting, and warnings becomes essential. This is an area that needs to be improved upon. Benefit sharing at the local level as well as at the transboundary level could be another way to foster regional cooperation. Nile Basin initiative is often quoted as perhaps the best example where benefits are shared equitably amongst the basin countries with a focus on sustainable development rather than on water alone (Salehin, Khan, Prakash & Gurung Goodrich, 2011).

Apart from this the world has seen successful models with respect to energy and regional cooperation such as the model in Europe as well as in South Africa. (Tripathi 2011). The South African model – South Africa Power Pool was started in 1995 with twelve member countries to promote regional integration by putting energy development at the centre. Although initially there were a lot of doubts about its viability, today it has proved to be a successful model and thus lessons can be drawn for the South Asian subcontinent especially due to many similarities between the two regions in terms of economic backwardness, ongoing conflict etc.

Already India has entered into successful hydropower cooperation with its neighbouring country Bhutan. Many lessons can be drawn from this model as well. Thus in a region like South Asia which is ridden with continuous disputes and conflicts over geopolitics, if regional cooperation with regard to hydropower has to be successful and long-lasting it will take much more than negotiations among the diplomats and policy makers at the higher echelons of neighbouring

countries of the region. Recognizing that such a vital area requires focused attention, a specialised working group was formed in 2004 (SAARC). Since its formation the working group met five times and made important recommendations. As a result of these efforts the establishment of SAARC Energy Centre was announced through the Dhaka Declaration in 2005. It started its work in Islamabad in 2006. The concept of the SAARC energy ring was also floated during the 12th SARRC summit. Cross border electricity interconnection is one of the focus areas of the SARCC energy ring. During the fifteenth SAARC summit in 2008 in Colombo, Srilanka this vision to establish the energy ring was discussed and the need was again reiterated (Raza 2013).

However, such efforts alone are not going to lead to the desired results. A multipronged approach is the need of the hour. Track two and track three diplomacy could also be used for this purpose wherein efforts are made to educate and sensitize stakeholders at multiple levels with regard to the importance of regional cooperation. Hydropower generation like the African model can in turn be a central theme for regional cooperation (Rahman *et al*. 2011; South African Power Pool, n.d.). We can attempt to generate a virtuous cycle – one where regional cooperation leads to hydropower potential development – and the latter in turn fosters regional cooperation.

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