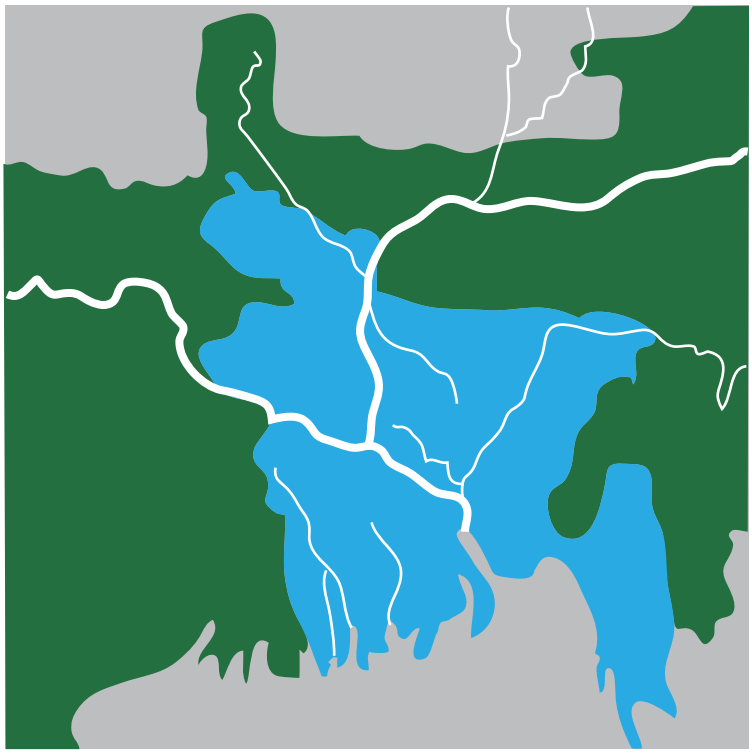
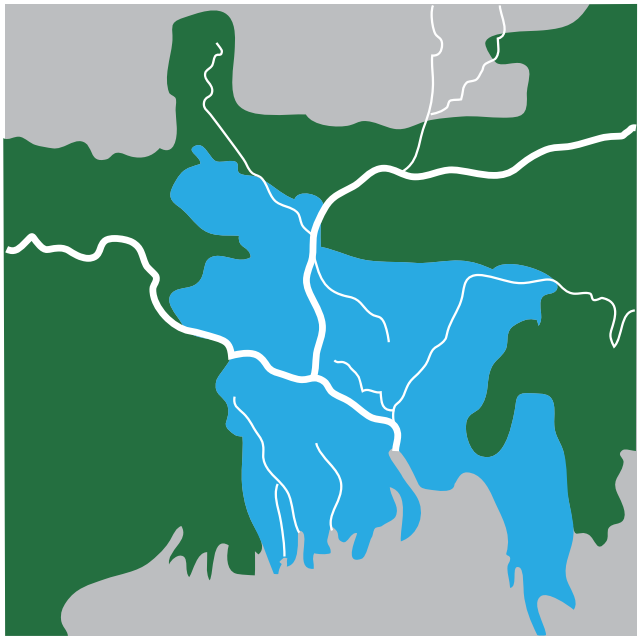
RIVERS OF PEACE



RESTRUCTURING INDIA BANGLADESH RELATIONS

Strategic Foresight Group

RIVERS OF PEACE



RESTRUCTURING INDIA BANGLADESH RELATIONS

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PREFACE

At the superficial level, relations between India and Bangladesh seem to be sailing through troubled waters. The failure to sign the Teesta River Agreement is apparently the most visible example of the failure of reason in the relations between the two countries.

What is apparent is often not real. Behind the cacophony of critics, the Governments of the two countries have been working diligently to establish sound foundation for constructive relationship between the two countries. There is a positive momentum. There are also difficulties, but they are surmountable.

The reason why the Teesta River Agreement has not been signed is that seasonal variations reduce the flow of the river to less than 1 BCM per month during the lean season. This creates difficulties for the mainly agrarian and poor population of the northern districts of West Bengal province in India and the north-western districts of Bangladesh. There is temptation to argue for maximum allocation of the water flow to secure access to water in the lean season. The reality is that the problem of water scarcity in the lean season can only be solved through joint efforts for augmentation and conservation of water. It would require application of many innovative techniques and technologies across the basin. Such a joint augmentation plan would require that the agreement is signed in the first place in a way that protects the environmental flow of the river and the remaining water resources are shared by India and Bangladesh in an equitable and reasonable manner. The signing of the agreement sooner rather than later is most in the interest of the poor people of northern districts of West Bengal and north-western districts of Bangladesh.

The treaty would also have broader implications for the holistic management of all shared water resources of 54 trans-boundary rivers between India and Bangladesh. It took 20 years to negotiate the Ganges Treaty. It took 18 years to finalise the Teesta treaty. At this rate, India and Bangladesh will require almost 900 years to negotiate treaties for the remaining 52 rivers. There has to be a more efficient way than negotiating a separate treaty for each river. The bilateral agreement in 1972 to establish Joint Rivers Commission for collaborative development of all shared rivers has sown the seeds for holistic and cooperative management of rivers. At present, the body created by this treaty is neither Joint nor a Commission. It has turned into a structure of parallel national committees which treat shared water resources in a competitive, and not collaborative, manner. It is essential to restructure the Joint Rivers Commission to turn it into an integrated mechanism for cooperation in the best interest of rivers and people. Such a mechanism will ensure that long term sustainable management of water resources is more crucial than short term politics. However, creating such a mechanism will depend on the wisdom and foresight of politicians, both from Governments but also from the Opposition of the two countries. Water is not about rhetoric. Water is about reason. Water is about life. The sooner the decision makers realise this, the easier it will be possible for them to harness the water resources in the best possible way.

Moreover, cooperation in water resources will lead to many other mutually beneficial initiatives. Eco-tourism, power trade, navigation, connectivity, disaster management are some examples. Ultimately, it will lead to peace and security between the two countries.

The proposals made in this report are developed from comprehensive experience in water diplomacy. We initiated work on water on the advice of an international conference on *Responsibility to the Future*, which was co-hosted by SFG with the United Nations Global Compact, inaugurated by the President of India and attended by delegates from 25 countries in June 2008. We have since published reports on the crucial role played by water in many parts of the world, including *The Himalayan Challenge* which looks at future water security in the Eastern Himalayan River Basins, comprising of Bangladesh, China, Nepal and northern India. Our report *The Blue Peace* proposes how the water issue can be transformed from crisis to an opportunity in the Middle East. We steered a High Level Group and Blue Peace Media Network for supporting cooperative measures for sustainable water management between five countries in the Middle East. Our report *Blue Peace for the Nile* was discussed by the international donor community at the World Bank headquarters.

Our recent report, *Water Cooperation for a Secure World*, examines the dynamics between water and security. It is based on the analysis of 205 shared river basins in 148 countries. It has attracted worldwide attention.

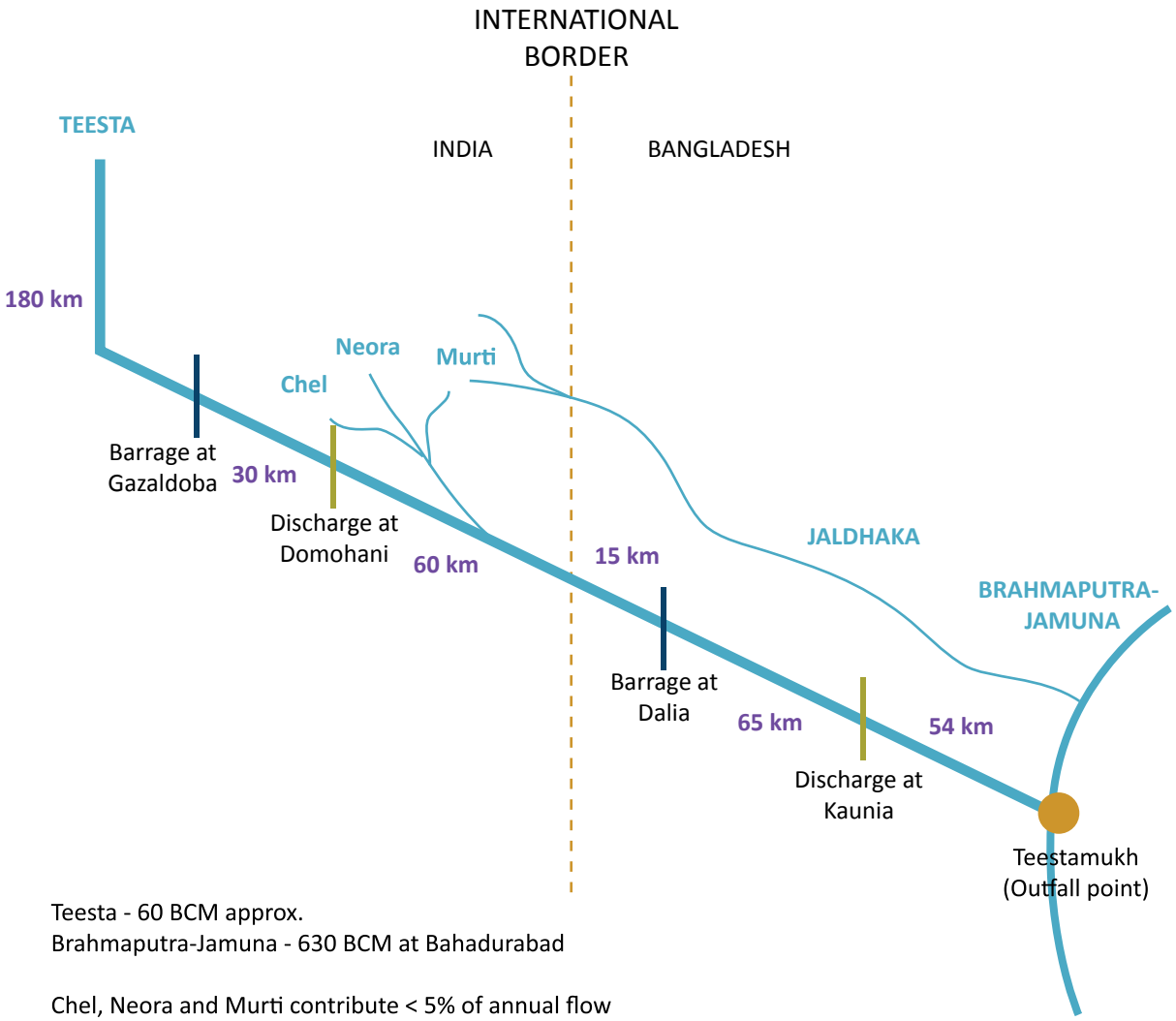
Our contribution to the India Bangladesh discourse on water relations draws from our deep experience in water diplomacy around the world and particularly in Asia, the Middle East and Africa. In addition, our experience and base in South Asia has helped us to have incisive understanding of the local realities in the two countries. Thus, this report is a result of our worldwide exposure to hydro diplomacy and insight in regional realities. We particularly benefitted from a roundtable held on 1-2 July 2013 in Mumbai attended by representatives of ruling establishments and opposition parties as well as eminent experts from India and Bangladesh.

We hope that the analysis and recommendations in this report will be considered in a positive way for finding the way forward in bilateral relations. There is tremendous goodwill and positive sentiment in India and Bangladesh towards each other. If recommendations in this report are implemented, it will be possible for the two countries to overcome some of the irritants and forge ahead on a collaborative path of peace and prosperity in the region. In the short run, farmers of northern parts of West Bengal and Bangladesh will benefit. In the long run, two important countries in South Asia will craft a new shared future and hopefully set an example for others.

October 2013

SUNDEEP WASLEKAR
President, Strategic Foresight Group
Mumbai

CONTENTS



Teesta - 60 BCM approx.
Brahmaputra-Jamuna - 630 BCM at Bahadurabad

Chel, Neora and Murti contribute < 5% of annual flow

CHAPTER 1
OVERVIEW

India and Bangladesh share a total of 54 rivers between them, including the Ganges, and the Brahmaputra. Most of these rivers are perennial in nature, owing to glacier melt, making the Indo-Bangladesh region (North and North East India and Bangladesh) a water rich region.

India's total water resources as of 2010 stood at 1907.8 BCM. The West Bengal government's State Water Policy released in 2011 posits that the gross water resources of the state is 145.72 BCM. The paper also suggests that including rainfall, surface water received from other states and water from the Bhaghirathi for navigation, the 'ultimate water resource' of the state is 176.98 BCM. This accounts for over 7 per cent of the total water resources in the country. Bangladesh's total water resources as of 2010 stood at 1211 BCM, with 21 BCM accounting for the total groundwater resources of the country. This means that 1190 BCM was the total of the river runoff in Bangladesh.

Bangladesh has a total of 230 rivers of which 57 are trans-boundary. Of those 57 rivers, 54 are shared with India. Three major river systems flow from India into Bangladesh, namely the Brahmaputra which joins with the Jamuna to become the Brahmaputra-Jamuna river system, the Ganges and the Meghna. The Brahmaputra-Jamuna measures 630 BCM in annual runoff at Bahadurabad. The Ganges at Hardinge Bridge measures 360 BCM in annual runoff. The Meghna's

annual runoff measured at Bhairab Bazaar is 150 BCM. All totalled, these three river systems account for 1140 BCM, or 95.8 per cent of the total river runoff in Bangladesh. The remaining rivers in the country only contribute 50 BCM to the country's water resources.

Due to the terrain, a majority of the 54 trans-boundary rivers between India and Bangladesh follow a similar path. The entire region is characterized by numerous inter-connected rivers that end in the delta in Bangladesh before they flow into the ocean. Tributaries and distributaries of rivers feed into and out of more than one of the 54 rivers at times. Most of the smaller rivers join one of the major rivers, the Ganges or the Brahmaputra. Rivers like Jaldhaka, Sankosh, Torsha and Raidak all flow along similar districts and join the Brahmaputra just a few kilometres from each other.

Despite being perennial in nature, the high rainfall in the region means that most of the rivers in the area are predominantly rain-fed. As a result, the rivers shared by India and Bangladesh are characterized by high seasonal variability. This means that the flow of the rivers differs greatly between the dry season and monsoon season. For example, the Brahmaputra River, the largest shared between the two countries, has a seasonal variability of 1:12. Every year, rivers flood during the monsoon months, causing harm to people and property. Likewise, every dry season, rivers shrink considerably, with some even drying up in places along its lower reaches. This variability is causing damage to the economy of the region, predominantly to agriculture, fisheries and navigation.

Since 1972, water relations between the two countries have been works-in-progress with both parties attempting to achieve equitable water sharing. From time to time, differences have cropped up over the sharing of the trans-boundary rivers and efforts have been made to redress them. India and Bangladesh signed the 'Statute of the Joint Rivers Commission' on 17 March 1972 which governs all rivers common to both nations. The agreement led to the establishment of the Joint Rivers Commission comprising of a chairman and three members. The Commission liaises with governments to ensure joint efforts and also works on the sharing of water resources, irrigation and flood control measures. While a treaty on the Ganges was signed in 1996, a water sharing agreement on the Teesta River, after years of deliberation, was ready to be signed in 2012.

1.1 History of Ganga Agreement

The sharing of Ganges had been a bone of contention between India and Bangladesh since the 1950s when Bangladesh was still East Pakistan. In 1961, India announced the construction of the Farakka barrage. Several expert level meetings took place on the issue but India continued with the construction. The ministerial level meetings only commenced in 1968 and there were five such meetings held until 1970. However, this did not produce any substantial results. India completed the construction of the barrage in 1970.

After Bangladesh became an independent state in 1971, talks resumed with India and the two nations reached an agreement in 1972 to establish the Joint Rivers Commission (JRC) "to develop the waters of the rivers common to the two countries on a cooperative basis." The JRC was empowered to conduct comprehensive survey of the shared rivers between the two nations as well as formulate and implement joint flood control, hydropower and irrigation projects. Nevertheless, the question of sharing of Ganges water was left out of the purview of the JRC as the problem had acquired political dimensions.

India and Bangladesh began their negotiations on Ganges in 1973. The Prime Ministers of the two countries met in 1974 and made a joint declaration on augmentation of the Ganges River. However this did not help in resolving the deadlock over the issue of water sharing during the lean season. In 1976, the President of Bangladesh referred the matter to the UN General Assembly which later called upon both the countries to enter into negotiations and settle the dispute by peaceful means. The subsequent negotiations led to the signing of the 1977 treaty, which was to be valid for a period of five years. This agreement was extended until 1988 after which the countries failed to either extend or enter into a new water sharing arrangement.

After a series of negotiations, when the political situation favoured regional cooperation, the treaty on sharing Ganges water at Farakka was entered into in 1996 by the two countries. The treaty stipulates a method of division of the river waters during the lean season. This treaty led to the formation of the Joint Committee of Representatives, responsible for data collection, monitoring and implementation of the provisions of the treaty. This treaty will remain in force for 30 years and can be renewed with the mutual consent of the parties. The parties can also call for a review of the treaty every five years; however this has not been called for by either nation so far.

1.2 Timeframe of Teesta Agreement

Since the settlement of the Ganges issue, the Teesta River has become a source of discord.

In July 1983, India and Bangladesh entered into an ad hoc agreement which stipulated that 36 per cent of the Teesta water would go to Bangladesh while 39 per cent would be India's share. However, the agreement was not implemented. Ever since, there have been several high-level political meetings and discussions, the most recent being in 2010, during the 37th meeting of the Joint Rivers Commission at the ministerial level.

In this meeting, the two countries decided to sign an agreement on Teesta water sharing by 2011 and for that purpose, a draft agreement was exchanged between the parties. The draft stipulates that India and Bangladesh would each get 40 per cent of the actual flow available at Gazaldoba Barrage in West Bengal while 20 per cent of the actual flow available at Gazaldoba would be reserved as environmental flow. According to the draft agreement, the Indian share of the Teesta water would be made available at Gazaldoba, while the Bangladeshi share will be at Teesta Barrage (Doani in Bangladesh). A formula sharing the water is given in the agreement in Annexure-I of the Draft Teesta Agreement. The draft agreement deals with the period of flow between 1st of October to 30th April which is commonly referred to as the lean period or the dry season. The sharing arrangement can be reviewed at an interval of five years as required. A party can seek the first review after 2 years, once the interim agreement comes into force. This provision will help towards ensuring that sharing of the water is not at a constant. The agreement also provides for the establishment of a Joint Committee which will help in implementing the provisions of the agreement, as well as act as a forum for dispute resolution. The two countries have an option to ensure that when there are changes in the flow of river due to natural reasons or exigencies such as drought, the governments may work out a mutually beneficial sharing arrangement.

The signing of the agreement on Teesta waters was one of the objectives during Indian Prime Minister Manmohan Singh's visit to Bangladesh in September, 2011. However, the Chief Minister of West Bengal opposed the agreement and unexpectedly dropped

out of the Prime Minister's entourage to Bangladesh by stating that water was a State subject under the Indian Constitution, and the state needed to give its consent to the central government prior to any agreement with Bangladesh. Thus, the negotiations on the draft Teesta agreement failed to fructify and the treaty has remained unsigned by the parties ever since.

In recent years, there has been increasing pressure on both sides of the border regarding Teesta and its distribution. The importance of this river is felt most in Northern West Bengal and Northwest Bangladesh, especially to a rural population of about 30 million who are highly dependent on its use for domestic and agricultural consumption. The Governments of India and Bangladesh seem to be in favour of signing the Teesta Agreement and there appears to be some movement forward.

While water relations between India and Bangladesh have been contentious at times, they have not been sources of conflict thus far. However, rising negative and inflammatory rhetoric due to misinformation or lack of information is a cause of concern at present.

Too Much, Too Little

Bangladesh has 57 rivers and its total water resources are approximately 1211 BCM. The surface to groundwater ratio is 1190: 21, meaning that 98 per cent of Bangladesh's water is surface water.

Most of the country's rivers are rain-fed and have a voluminous supply of water, often flooding during the monsoon season. However, due to the high seasonal variability of the rivers, including the Brahmaputra and Ganges, frequent incidents of water scarcity and drought occur. Seasonal variability can be as high as 1:12 in the rivers, meaning that most rivers experience between 80-90 per cent of their annual flow in the monsoon months between June and September. Due to the inability to store this water, much of Bangladesh's river resources are drained into the sea without being used by the population.

The question of building storage facilities is often raised. However, construction of large-scale storage projects is not possible as there are dense populations living within these river basins. Building such facilities would cause severe displacement as seen in the case of Kaptai Dam which is said to have displaced about 100,000 people. Also, the flat terrain of the river basin regions does not permit the construction of such structures, further exacerbating the issue.

Bangladesh's groundwater too is compromised due to issues such as arsenic contamination in groundwater and salt water intrusion.

Arsenic contamination in groundwater occurs naturally in Bangladesh and is a serious public health issue. The World Health Organization's standard level of arsenic in drinking water is 10 parts per billion (ppb); in Bangladesh, the acceptable level of arsenic is 50 ppb and most parts of the country are at a maximum of 500 ppb. Around 35 million people are exposed to arsenic contamination from drinking water, and one in five deaths in the country have been linked to arsenic exposure. Due to the widespread presence of arsenic in groundwater, local communities rely heavily on rivers for agricultural and domestic consumption and use.

Further, the sea level rise owing to climate change is leading to salt water intrusion into coastal aquifers, estuaries and other fresh water resources in Bangladesh, which is one of the lowest altitude countries in the world. Seepage of saltwater into fresh water resources is also resulting in acute water shortage in the region.

It should be noted that there is a significant amount of water wastage due to inefficient water management. Across the domestic, industrial and agricultural sectors, there is inefficient use of water resulting in increased pressure on water resources. Every year, thousands of litres of water are wasted due to conveyance losses, weak infrastructure and lack of water conservation methods in place. These factors also significantly contribute towards the problems relating to availability fresh water in a water rich country like Bangladesh.

CHAPTER 2
TEESTA

2.1 The Teesta River

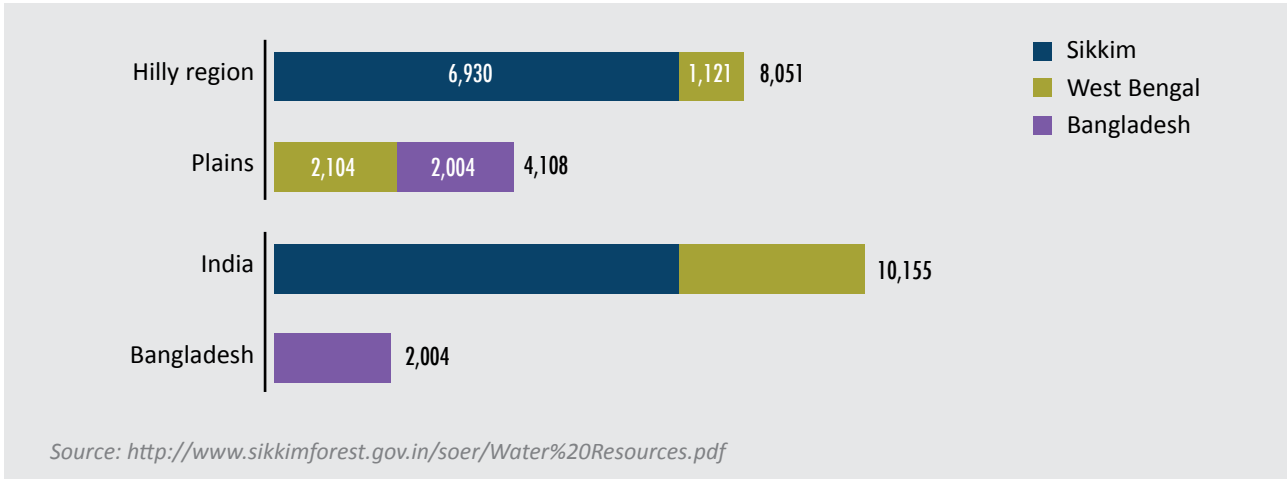
Journey of Teesta

The length of the Teesta River is approximately 404 kilometres. The Teesta River travels through three states in two countries, originating in Sikkim, and traveling through West Bengal and finally merging with Brahmaputra River in Bangladesh.

The river begins its journey in the glacial mountains of Sikkim at an elevation of 5280 metres. The Teesta River begins as Chhombo Chhu at Khangchung Chho, a glacial lake situated at the tip of Teesta Khangse glacier, at an elevation of 5280 metres in the state of Sikkim. The glacial lake is at the snout of the Teesta Khangse glacier which descends from the Pauhunri peak. The Chhombo Chhu flows towards the east and joins the Zemu Chhu, thereby becoming the Lachen Chhu. At Chungthang, Lachen Chhu and another river Lachung Chhu join to form the Teesta.

The Teesta is made up of several tributaries. These include Zemu, Lachung, Rangyong, Dikchu, Rongli, Rangpo and Rangeet in Sikkim. Through its course in Sikkim, the minor western flank tributaries include Lachung Chhu, Chakung Chhu, Dik Chhu, Rani Khola, and Rangpo Chhu; minor eastern flank tributaries in Sikkim include Zemu Chhu and Rangyong Chhu. The Rangeet River is the main

Catchment Area of Teesta River in km²



Source: http://www.sikkimforest.gov.in/soer/Water%20Resources.pdf

tributary which joins it at Teesta Bazaar in West Bengal, on the border of Sikkim and West Bengal.

The tributaries in West Bengal include Karalla River which joins Teesta near Daspara in Jalpaiguri Town and the Leesh and Geesh rivers, which also join Teesta before Gazaldoba in West Bengal. The tributaries that join it after Gazaldoba in West Bengal include Chel, Neora and Murti on the eastern flank.

In Bangladesh, the main tributaries of the Teesta River are the Buri Teesta and the Trimohini before it joins Brahmaputra (Jamuna) in Bangladesh.

In general, the tributaries on Teesta's eastern flank are larger in number but shorter in course. These tributaries drain heavily glaciated areas and large snow fields. The ones on the western flank contribute more to the discharge of the river as they are longer with larger drainage areas. These tributaries start from semi-permanent, smaller snow-fields.

The total catchment area of the Teesta River basin is approximately 12,159 km². About 2,004 km² of the basin (or about 17 per cent of the total catchment area) lies in Bangladesh with the remaining being in India.

Geography of Teesta

Drainage map of Teesta River basin in Sikkim
Source: http://www.actsikkim.com/docs/CCS_I_Introductory_Volume.pdf

i) Teesta in India

In Sikim, Teesta drains most of the state. In West Bengal, the Teesta River passes through the northern areas comprising mainly of the districts of Cooch Behar, Jalpaiguri, Darjeeling, Uttar Dinajpur, Dakshin Dinajpur and Malda. Together, these districts are known as North Bengal.

Drainage Basins of West Bengal

Source: Water Resources and its Quality in West Bengal, Status of Environment Report, West Bengal Pollution Control Board, 2009 (WBPCB, 2009)

ii) Teesta in Bangladesh

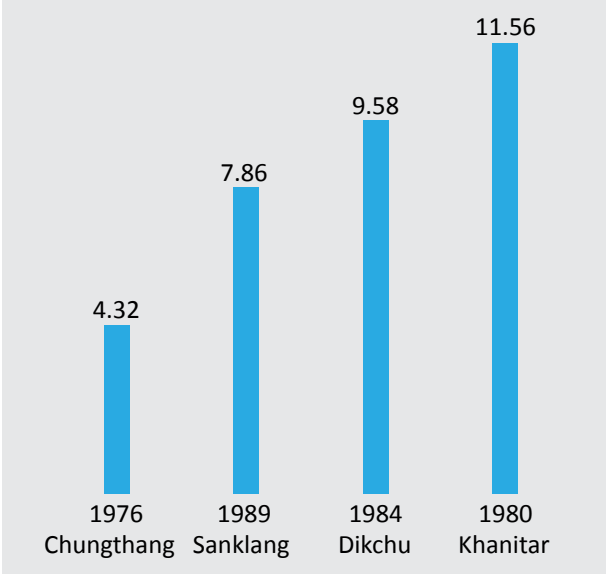
In Bangladesh, the Teesta River flows through the Rangpur Division, before joining the Brahmaputra River. The river primarily flows through the districts of Lalmonirhat, Nilphamari, Rangpur, Kurigram and Gaibandha. The Teesta River joins the Brahmaputra River (known as the Jamuna in Bangladesh) at Fulcherry.

Teesta River in Northwest Bangladesh
Source: http://www.countrywindow.net/index.php?id=156

Hydrology of Teesta

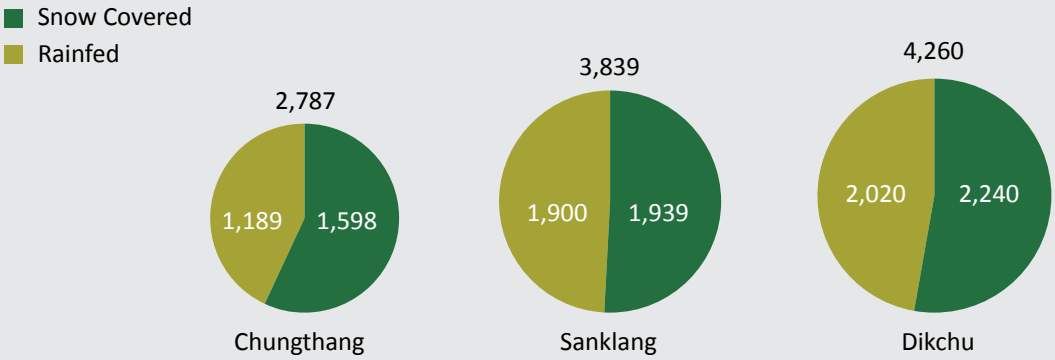
Estimates have suggested that the Teesta River has a mean annual flow of approximately 60 BCM. A significant amount of this water flows during the wet season i.e. between June and September. The importance of the flow and seasonal variation of this river is felt during the lean season (October to April/May) as the average flow is about 500 MCM per month. Consequently, there are floods during the monsoons and droughts during the dry periods. This drastic difference in river flow impacts the lives of the population residing in the basin in terms of health, food security and income.

Mean Annual Runoff of Teesta River at various sites in Sikkim, India (BCM)



Source: http://www.sikkimforest.gov.in/soer/Water%20Resources.pdf

Details of Snow-covered and Rainfed Areas (km²)



Source: http://www.sikkimforest.gov.in/soer/Water%20Resources.pdf

The Teesta River is highly variable as far as its course is concerned. Geologists have warned that another earthquake in the region may alter Teesta's course yet again. Even though Teesta doesn't flow through a seismological active area, an earthquake may increase the number of glacial lakes which could definitely alter the course of the river.

Glaciers of Teesta

There are approximately 84 glaciers in the Teesta River basin, covering an area of 440.30 km² which are distributed in 10 sub-basins. Of the 84 glaciers, 61 (126.02 km²) are less than 5 km² in area; 11 (64.32 km²) are between 5-10 km²; 7 (80.75 km²) are amid 10-15 km², 3 (50.05 km²) are between 15-20 km², and 2 (119.16 km²) are spread across more than 20 km². Moreover, total permanent snowfields are 251.22 km². Hence, total area under glaciers and permanent snowfields is approximately 691.52 km². The total glacial and snow cover stored water in the Teesta River basin is about 145.05 km². Some of the well-known glaciers are Zemu, Changame, and Khanpu.

Several glaciers feeding the Teesta are retreating and areas in the upper reaches of the Sikkim Himalayas are drying up with less snow cover. A study conducted by the Indian Ministry of Environment and Forests in 1990, found that 34 of Teesta's glaciers covered 305 km², but in 2004 the glacial cover on the Teesta basin was reduced by 4 km². Additionally, 23 of the glaciers studied showed signs of retreat; 8 were found advancing and 3 remained unchanged. This study also revealed the existence of 474 supra-glacial lakes, spread over an area of 70.02 km² in the Brahmaputra River basin; out of these, 61 are in the Teesta basin. This study showed that the Teesta basin has supra-glacial lakes covering an area of 10.37 km². It also has 2 moraine dam lakes, fed by glaciers, covering an area of 2.79 km². It was found that earlier the snow cover in the glacier that feeds the Rangeet sub-basin existed till April; but in 2007-08, no snow cover was found after February.

Recently, the upper catchment of Sikkim has witnessed several glacial lake outburst floods (GLOFs) that have been small and medium sized and a cause for concern. Studies suggest that this is primarily due to climate change, which is causing glacial retreat and melting. This process begins with intense flooding, followed by a decrease in water flow, eventually leading to a severe reduction in the river's flow.

The glaciers in the Teesta Basin are characterized into 7 glacier complexes: Chhombo, Yumthang, Lamgpo, Zemu, Talung, Rathang and Rel. These

complexes comprise more than 710 km^2 of area, i.e. almost 10 per cent of Sikkim's total area. The glacial lakes comprise more than 21 km^2 of area, wherein Gurudongmar Lake is the largest and Chho Lhamo Lake is the highest.

Of the 84 glaciers in the Teesta Basin, the East-Rathong Glacier is a healthy one that feeds the Rathong Chhu River at 4,674 meters, which flows towards the east as the main tributary of Rangeet River. Between 1976 and 2009 (33 years), it had retreated by 460 meters, and between 1997 and 2009 (12 years), by 234 meters. It should be noted that the East Rathong is a South facing glacier with a steep slope while Zemu is east-facing and has a gentle slope, thereby displaying greater effects of global warming in the former than latter. In 2008, the total area of the East Rathong reduced from 6.72 km^2 to 4 km^2. Currently, climate change is increasing the number of glacier fields but decreasing the total area of glaciated regions. Studies suggest that the increase in glacial retreat will cause tributary glaciers to disjoin from main glacial bodies and become independent. The last three decades has witnessed 9 per cent loss in glacial length from the primary glacial body.

It is important to note that the exact contribution of glaciers to the Teesta is not known, and a thorough study of the glaciers and their overall contribution to water resources in this region is strongly required.

Aquifers in the Teesta Basin

The aquifers that run beneath the Teesta and feed it have not been mapped adequately. As a result, it is unknown how many aquifers there are, their volume or how exactly they impact the river.

Some studies suggest that during the dry season, the shallow aquifers situated beneath the Teesta River floodplains are the only source of freshwater. Teesta's water flow is a primary contributor to the aquifers, and its surface water has a direct impact on its ground water availability. Any change in the surface water flow will affect the underground aquifer as well. Therefore, there is a strong correlation between surface and groundwater resources in the Teesta floodplain.

Distortions with regard to water flow have been reported. These distortions are said to be caused by regeneration where there is an increase in surface level water due to the spurt in aquifers. However, there is no assessment that has been conducted as yet. With the changing demographics and increasing demand for water, there is a growing dependence on groundwater resources such as aquifers. For instance, the aquifer which supplies water to the Teesta Barrage Project area is said to be over exploited by human and agricultural activities. There are several on-going studies regarding this but the outcomes are inconclusive.

It is widely known that there is immense arsenic contamination in ground water in many parts of West Bengal in India and northwest Bangladesh. With regard to the Teesta Basin, there is arsenic present in areas such as Siliguri-Jalpaiguri in West Bengal. Interestingly, this is the location where Teesta meets the alluvial plain after descending from the Himalayas. It should be noted that in addition to the Teesta River, this specific floodplain includes the Mahananda-Balasan Rivers and Jaldhaka along with its tributaries.

Rainfall in the Teesta River Basin

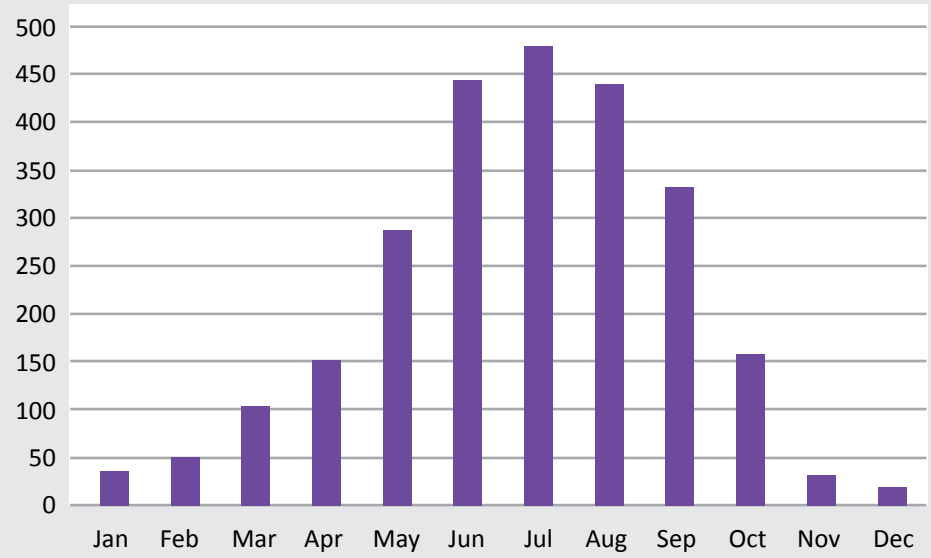
Rainfall in crucial to the Teesta River Basin as the river and its tributaries are mostly rain-fed in nature, especially once the Teesta crosses into West Bengal. The mean annual rainfall in the Teesta Basin ranges from 1200 mm in the upper valleys of Lachen and Lachung to 2500 mm in the remaining basin.

Rainfall in Sikkim

In the Teesta Basin in Sikkim, the monsoons are between June and September. The mean annual rainfall in Sikkim is 2,534 mm. Sikkim experiences a maximum of 480 mm of rainfall in July and minimum of 19.1 mm of rainfall in December.

There are 15 rainfall monitoring stations in the Basin at different altitudes ranging from 132 metres at Dentam to 3,841 metres at Chhangu. During the monsoons, Chhangu experiences the most rainfall with an average of 100.9 rainy days, followed by Gangtok with 99.1, Rongli with 98.1 and Yumthung with 96.2 rainy days. The total number of rainy days is highest in Singhik with 172.7 days and lowest for Gyalzing at 124 days. The annual mean number of rainy days in Sikkim is 148.3 days.

Rainfall (in mm) in Sikkim



Source: http://www.sikkimforest.gov.in/soer/Water%20Resources.pdf

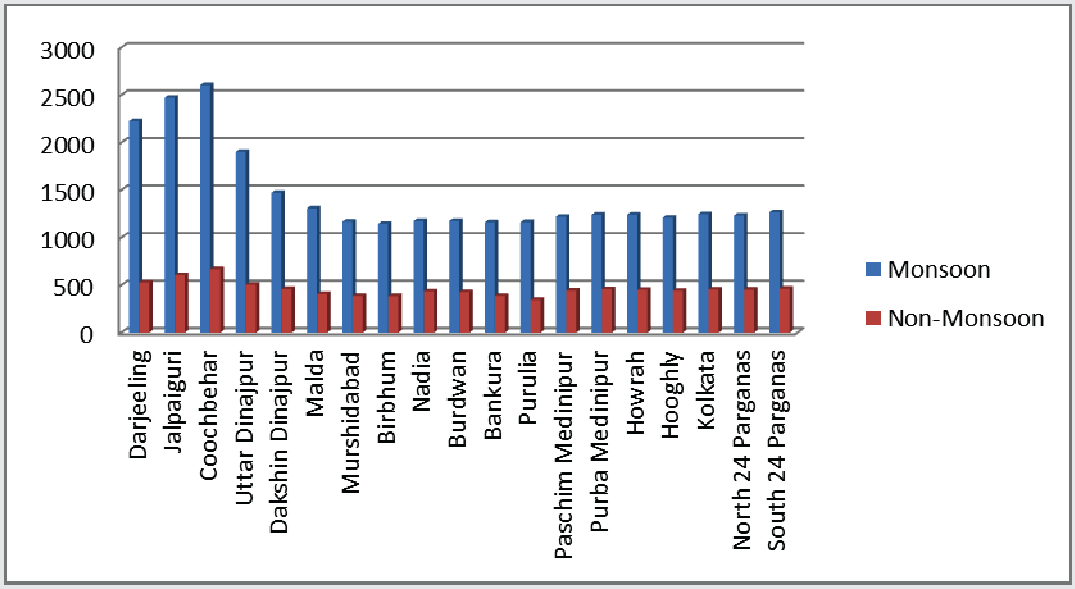
Rainfall in West Bengal

In northern Bengal, from Darjeeling to Malda, rainfall ranges from 25.51 mm per day to more than 44.51 mm per day. In southern Bengal, rainfall ranges from 25.51 mm per day to less than 21.51 mm per day.

The mean annual rainfall during the monsoons in West Bengal is 25,115.4 mm and non-monsoons is 7,321.9 mm.

West Bengal experiences a maximum of 2604 mm of rainfall in Cooch Behar and minimum of 1143 mm in Birbhum during the monsoons. During the non-monsoon season, Purulia receives the least rainfall at 344.3 mm and Cooch Behar the most with 667.6 mm of rainfall.

Monsoon and Non-Monsoon Rainfall in Different Districts of West Bengal (in mm)



Source: http://www.nicra-icar.in/nicrarevised/images/State%20Action%20Plan/West-Bengal-SAPCC.pdf

Rainfall in Bangladesh

Bangladesh experiences the Monsoon season from June to August, whereby the heaviest rainfall is along the coastal and hill areas. The Northwest region of Bangladesh has poor rainfall compared to the rest of the country primarily because the amount varies each year and in different parts of the region. The mean annual rainfall in the Northwest is 1,971 mm, while the rest of the country is 2,300 mm.

The Rangpur station has recorded the mean annual rainfall is 2,270 mm, of which 1,294 mm takes place from June to August.

According to rainfall data from 1972 to 2002, there appears to be a growing trend of lesser number of rainy days providing the same or more total rainfall. In sum, there appears to be more intense rainfall over shorter periods of time.

In the past decade, there has been no significant change in maximum and minimum summer temperatures in northern Bangladesh. However, the Northwest part of the country witnessed a decline of 0.1-0.3 °C in winter temperatures. Experts believe that the decrease in winter rainfall and increase in evapo-transpiration will considerably reduce the moisture content of the topsoil in the Northwest.

Temperature in the Teesta River Basin

Sikkim

In the sub-basin, the mean daily maximum temperature varies from 20.7°C in January to 26.8°C in September. The mean daily minimum temperatures range from 7.5°C in January to 10.7°C in April to 13.3°C in October to 14.5°C in July.

West Bengal

In the sub-basin, the mean daily maximum temperature varies from 18°C in January in Darjeeling to 43°C in April and May in Bankura and Purulia. The mean daily minimum temperatures range from -5°C in January in Darjeeling to 28°C in May in Uttar Dinajpur and Dakshin Dinajpur.

Bangladesh

In the sub-basin, the mean daily maximum temperature varies from 20°C in January to 29°C in April and June. The mean daily minimum temperatures range from 9°C in January and February to 19°C in July, August and October.

Seasonal Variation of the Teesta

The Teesta, like all perennial rivers in the Ganges-Brahmaputra sub-basin or the Himalayan region, is characterized by a high seasonal variation. This is due to the fact that while the glacier melt at the source allows the river to flow all season long, the river's volume is almost entirely contributed by rainfall during the monsoon or wet season. Thus, while the Teesta covers almost all of Sikkim in area, the volume of the river is still relatively low until it is joined by the Rangeet as it is primarily glacier-fed until that point. However, due to the lack of studies on the Teesta's source glacier region and the lack of detail on the exact contribution break-up of glacier melt and rainfall to the river, it is hard to determine the precise seasonal variation.

The Ganges experiences 85 per cent of its total annual flow in the monsoon period of June-September in India. The Yamuna in India is almost 90 per cent fed by rainwater. The Brahmaputra's dry season to wet season water ratio is 1:12 and the Meghna in Bangladesh experience around 84 per cent of its total annual runoff between June and October.

We can therefore assume that the Teesta's seasonal variation falls within this range, and closer to the Brahmaputra, whose tributary it is. If we assume that the seasonal variation stands at the rate of 1:10, then we can assume that 10/11th or 90 per cent of the river's volume falls in the June-September monsoon season, i.e. 54 BCM. This means that the lean season or October-May is a mere 6 BCM.

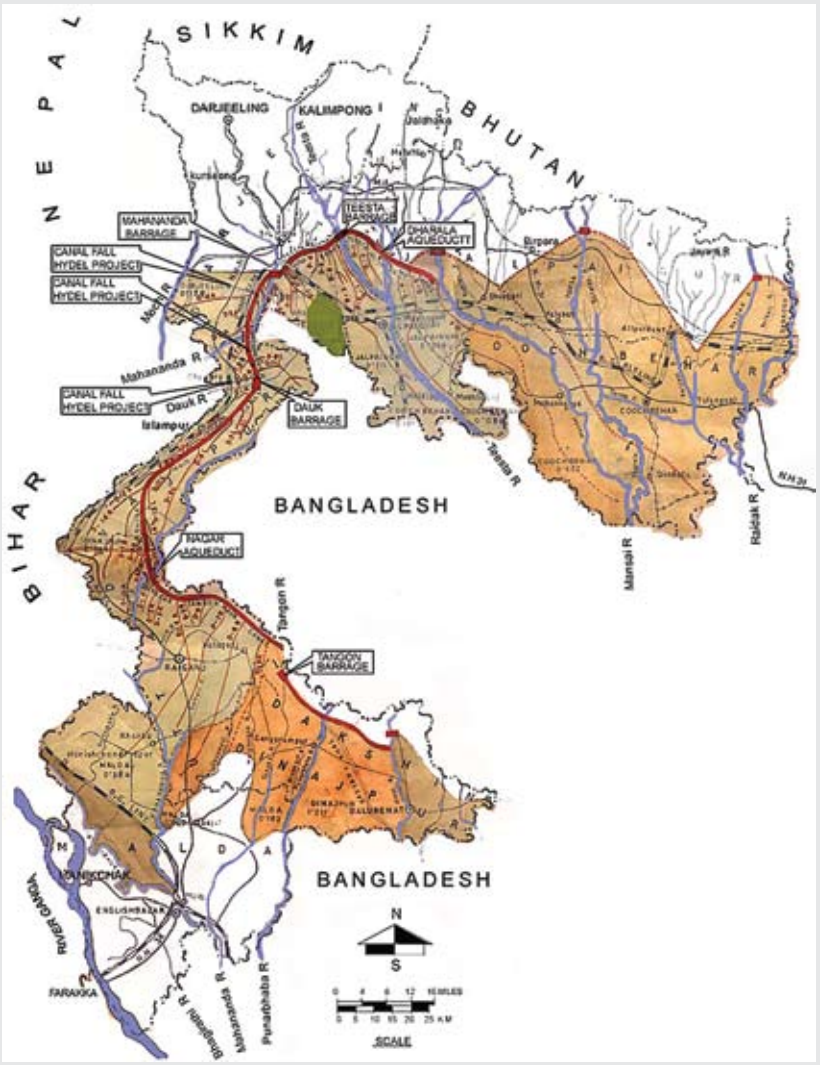
2.2 Dams and Barrages

In India, the main barrage on the Teesta River is the Gazaldoba Barrage in Jalpaiguri, which releases water into the Teesta River entering into Bangladesh and into the Teesta Main Canal. This barrage is on the confluence of the rivers Teesta and Karalla. The river enters Bangladesh at Burigram which is about 72 km from the Gazaldoba Barrage.

The Gazaldoba Barrage is part of the Teesta Barrage Project, which is one of the largest irrigation projects in eastern India. Once completed, this project is likely to irrigate approximately 922,000 hectares of land in 6 districts of north Bengal and develop 67.50 MW of electricity. The Teesta Barrage Project was initiated in 1976, and till date, only some sections of it have been completed including the Gazaldoba Barrage at Jalpaiguri, and the barrages on Mahananda and Dauk rivers.

In 1990, Bangladesh constructed a barrage on the Teesta at Dalia in the Lalmonirhat district. The barrage is at the Doani-Dalia point. The Dalia Barrage is part of the Teesta Barrage Irrigation Project, along with a canal head regulator, flood embankment, irrigation canal networks, and drainage channels. This 2-phase project has a planned command area of 750,000 hectares and irrigable area of 540,000 hectares. Only Phase 1 has been completed so far with a command area of 154,250 hectares and an irrigable area of 111,406 hectares.

There are also 2 hydro-electricity dams in Sikkim, including one at Kulekhani. The Teesta Low Dam (TLD) Project, producing 332 MW of electricity, is split into four stages with two in Sikkim and the other two in West Bengal. The Indian government has plans to construct other dams over the Teesta River.



Map of the Teesta Barrage Project in India
Source: http://wbiwd.gov.in/irrigation_sector/major/teesta.htm

The Teesta Barrage Project in India was planned in three phases in 1975-76 with the aim to create 9.22 lakh hectares of irrigation potential and 67.50 MW of hydropower from canal falls for north Bengal. After close to 35 years and a cost overrun of 2200 per cent, the project is still in Stage 1 of its first phase (first phase is to have two stages of implementation).

The project has four barrages which have been constructed – over River Teesta as Gazaldoba, over River Dauk at Chopra and two pick up barrages over Mahananda and Fulbari Rivers. As of December 2009, Teesta Mahananda Link Canal, Mahananda Main Canal and the Dauk barrage are completely constructed, as is 70 per cent of Teesta Jaldhaka Main Canal. It is clear that while the main canals have been built, a lot of work is remaining in the construction of the branch canals and distribution channels. The irrigation potential of the project in the 1st sub-stage is around 5.27 lakh hectares annually.

One of the main problems faced by the government

to increase coverage of the Teesta Barrage project is the issue of land acquisition. As of 2011, there were more than 150 cases filed by people who felt victimised by the land acquisition process.

Many news reports suggest that the scope of the Teesta Barrage project in India has been highly exaggerated. Critics suggest that the area of the Indian Teesta Irrigation Project must be reduced to a realistic figure as too large an area will lead to major conveyance loss.

The biggest criticism is that water from the Gazaldoba barrage is being diverted to other basins leading to inter basin transfer leaving very little to flow down to Bangladesh. In focus is the Teesta Mahananda Link Canal where news reports from Bangladesh blame India for diverting water from the Teesta, throughout the Mahananda into the Mechi River in Bihar.

Bangladesh

The Teesta Barrage Project (TBP) is the largest irrigation project in Bangladesh. The idea for this was conceived during the British era in 1945 although the Dalia barrage construction started only in 1979 and that of canal system in 1984-85. The project planned in two phases was aimed at providing irrigation water for 749,000 hectares of cultivated land through a network of a 110 m canal head regulator, 708 km irrigation canal networks, 380 km drainage channels and 80 km flood embankment. The command area of this of this project is 750,000 hectares while the irrigation potential is 540,000 hectares.

This project has helped increase coverage of crop land under irrigation so much so that around 63 per cent of the total cropped area in the flood plain is irrigated in comparison to the Bangladesh national average of 42 per cent. The irrigation potential currently is around 111,000 hectares.

Teesta Irrigation Project Status

Description			Total Project	Completed Part (Dec'09)	Balance Part (After Dec'09)	Locations of the Command
			Lenth (km)	Lenth (km)	Lenth (km)	Districts
Left Bank Canal	TJMC	Main Canal	30.31	20.521	9.789	Jalpaiguri, Coochbehar
		Branch Canal	491.43	9.11	482.32	
	TMLC	Main Canal	25.75	25.75	0	Jalpaiguri, Coochbehar
		Branch Canal	332.27	215.7	116.57	
Right Bank Canal	MMC	Main Canal	32.22	32.22	0	Darjeeling, N-Dinajpur
		Branch Canal	303.29	69.29	234	
	DNMC	Main Canal	80.2	26.695	53.505	N-Dinajpur
		Branch Canal	768.93	33.81	735.12	
	NTMC	Main Canal	42.20	0	42.20	N-Dinajpur, D-Dinajpur, Malda
		Branch Canal	385.56	0	385.56	
Total			2492.15	423.096	2059.059	

Project status of 1st Sub Stage of Phase –I as of 2010

Source: http://www.banglarmukh.com/BanglarMukh/Download?FilePath=/alfresco/d/d/workspace/SpacesStore/5d56a88e-2ae2-47a1-8f00-bc91bd9c34bc/Report.pdf

While, the Teesta Barrage project has managed to get more land under cultivation it is unable to provide 100 per cent irrigation. Reports suggest that this is because of lack of enough quantity of water at Dalia barrage in comparison to the irrigation requirement.

2.3 Water Flow between Gazaldoba and Dalia Barrages

There are several rivers that run parallel to the Teesta River and eventually join the River Jamuna. These include River Jaldhaka, River Torsha, River Raidak and River Sankosh. Also, beyond the Gazaldoba Barrage in India, and before entering Bangladesh, there are a few streams which join the Teesta, mostly due to overflow during the monsoons. These include River Neora, River Chel and minor streams from River Murti. River Murti is the main tributary of the Jaldhaka River which runs parallel to the Teesta River and joins the Dharla River in Bangladesh. The Teesta enters Bangladesh at Dalia, which lies in the district of Nilphamari, and continues flowing till it joins the Jamuna (Brahmaputra) at Chilmari in Kurigram District.

It is important to note that these additional streams are small and almost negligible in their volume. Estimates suggest that at most, they contribute about 5 per cent to the total amount of annual run off of the Teesta River.

CHAPTER 3
ECONOMY

3.1 Economic Profile of Ganges Brahmaputra Basin

The two major Himalayan river basins – the Ganges and the Brahmaputra are trans-boundary river systems which flow through India, China and Bangladesh. To understand the Teesta River Basin, it is essential to understand the ecosystem it belongs to.

Covering an area of over 1.7 million km^2, the Ganges-Brahmaputra-Meghna (GBM) Basin is home to around 630 million people. The population density is very high and is growing at a fast pace. Reports suggest that the GBM river basin houses the largest number of poor people in the world in one region. The population is mostly rural as of now, but is urbanizing at a rapid rate. In the Ganges River Basin, it is estimated that over 32 per cent of the population will reside in urban centres by 2025, with the percentage going up to 47.3 per cent by 2050. It is likely that the pressure on the river systems will increase rapidly in tandem with its growth.

The primary occupation of the countries in the GBM river basin is farming. In the Ganges river basin, the demand for water is the highest from the agricultural sector accounting for more than 90 per cent of the consumption, while the industrial and domestic sectors consume around 5 per cent each. In

the Brahmaputra region, while China's agricultural sector has comparatively lower consumption rates, consumption of water for agriculture in north-east India, Bangladesh and Bhutan is very high. Around 35.1 million hectares of land in the GBM region is equipped for irrigation mostly by surface water (67 per cent) and the rest (33 per cent) by ground water. The main crops grown in the Himalayan River Basin are rice, wheat and maize with other supplementary crops like rubber, banana, tea and cotton. Some of the other economic sectors in the GBM region are hydropower generation, tourism and small scale industries dependent on agricultural raw materials.

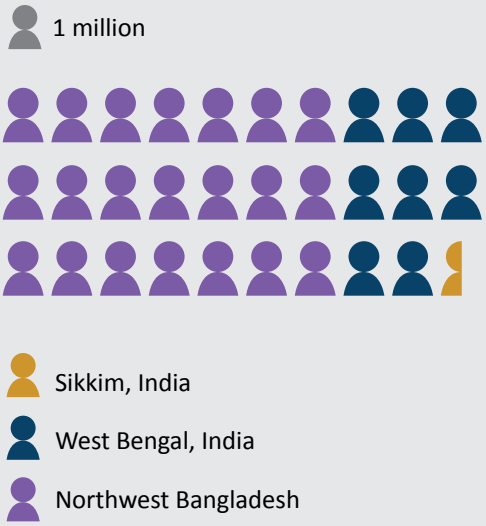
While the GBM region has rich reserves of natural resources, it suffers from poor planning. In the last couple of years there has been some debate about sustainable development and habitat management but there is a long way to go to achieve this.

The characteristics of the larger GBM Basin are represented in the Teesta River Basin Overall the agriculture sector in the Teesta basin region employs the maximum number of people. Gradually, as the economy urbanizes, there is a visible shift away from agriculture towards the other two sectors. GDP-wise, the services sector seems to be the biggest contributor, especially in Sikkim and West Bengal. The Indian side of the Teesta River Basin, though not highly industrialized on its own, is more developed when compared to the basin in Bangladesh.

Demographics

Overall, this region is densely populated with the Teesta River Basin being home to around 30 million people. The population density of the basin is low in Sikkim with only 2 per cent of the basin population based in the state. This is also due to the mountainous nature of this region. 71 per cent of the population of the Teesta River Basin is based in Northwest Bangladesh which has an almost flat topography and 27 per cent in West Bengal which is a mix of hilly areas as well as plains.

a. Population in the Teesta River Basin (in million)

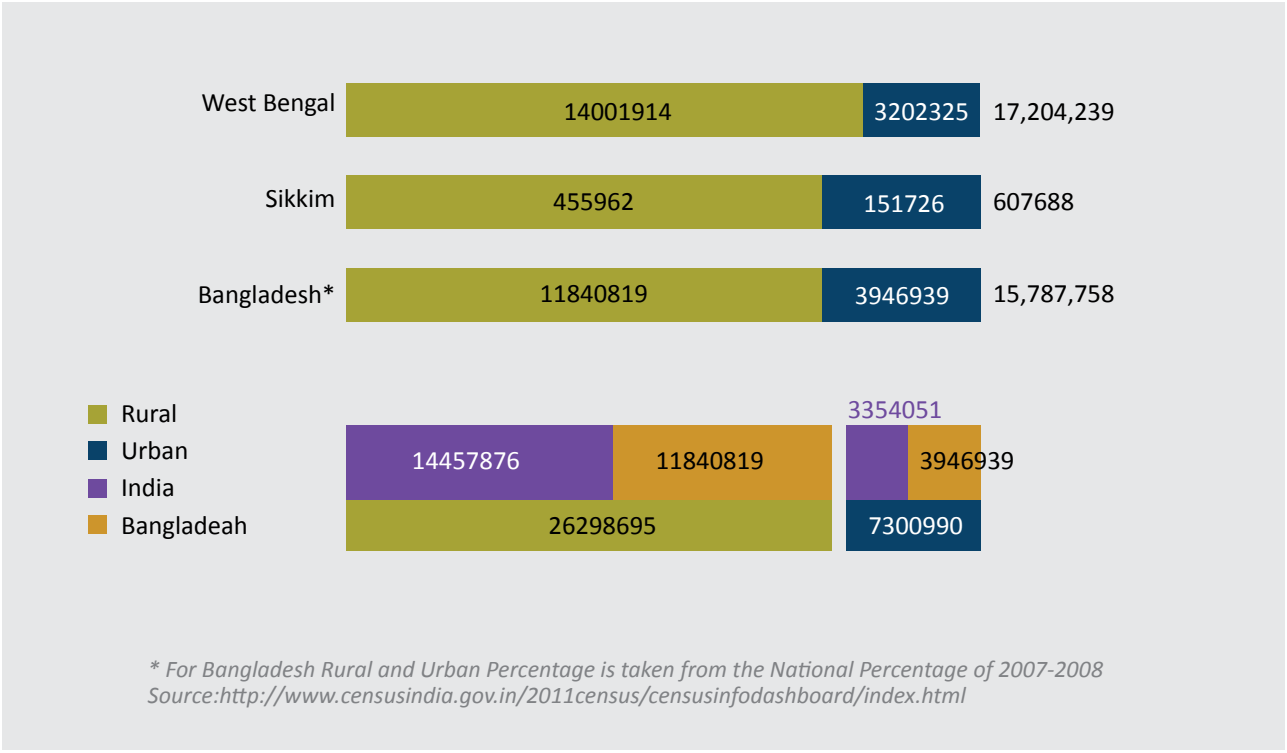


Source: Various

The Teesta basin includes only 5 districts of the Rangpur division in Bangladesh. In India, the entire area of West Bengal's 6 districts is not included in the basin.

Around 78 per cent of the population in the Teesta River Basin is rural and the remaining 22 per cent urban. The rural areas in the region are underdeveloped on both sides of the border with the people being highly dependent on the river and its ecosystems for their survival. Overall, a larger percentage of the basin population of West Bengal is rural when compared to the basin populations of Sikkim and Bangladesh.

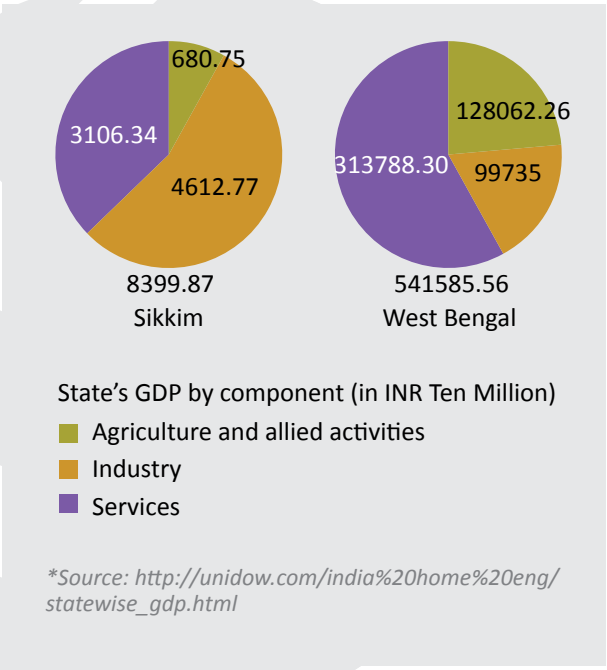
b. Rural/Urban Divide amongst the basin population



** For Bangladesh Rural and Urban Percentage is taken from the National Percentage of 2007-2008*
Source:http://www.censusindia.gov.in/2011census/censusinfodashboard/index.html

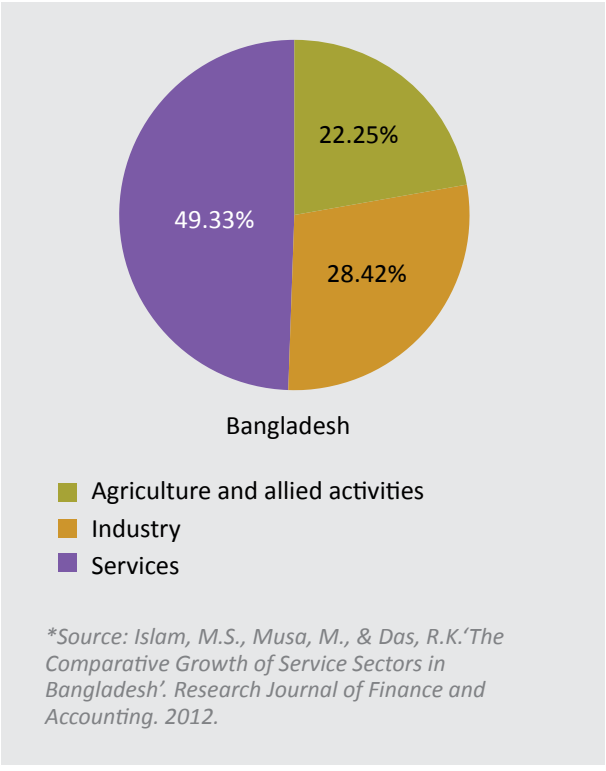
3.2 Means of Livelihood

c. Sector-wise GDP of Sikkim and West Bengal, 2012*



**Source: http://unidow.com/india%20home%20eng/statewise_gdp.html*

d. Sector-wise GDP of Bangladesh, 2012 (as a percentage to total GDP)*



**Source: Islam, M.S., Musa, M., & Das, R.K.'The Comparative Growth of Service Sectors in Bangladesh'. Research Journal of Finance and Accounting. 2012.*

Agriculture

Agriculture is the lifeline of the people in the Teesta River Basin. Paddy is the main crop grown across the basin, especially in West Bengal and Bangladesh. West Bengal is the biggest producer of rice in India.

Average cropping intensity (refers to raising a number of crops from the same field during one agricultural year; ratio between net sown area and gross cropped area) in the Indian side is around 169 per cent while in the Bangladesh side it is close to 200 per cent. The cropping intensity of 200 per cent in Bangladesh means that in any given agricultural year, an average of 2 crops is grown. This means that the land use efficiency is higher in Bangladesh as compared to that in India. Factors such as irrigation, fertilizers, early maturing high yielding variety (HYV) of seeds, and selective mechanization like use of tractors and pumping sets affect cropping intensity. One of the main reasons for the high cropping intensity in Bangladesh has been the predominant usage of HYV seeds across the country. According to the Bangladesh Rice Research Institute (BRRI), HYV seeds were used in approximately 80 per cent of the total cultivable area in Bangladesh in 2012.

However, high cropping intensity, which also influences fertilizer application, causes a decline in land productivity over the years.

India

District	Cultivable Area (ha)	Gross Cropped Area (ha)	Net Sown Area (ha)	Cropping Intensity (%)
Jalpaiguri	353000	546000	336000	163%
Darjeeling	157000	194000	132000	147%
Uttar Dinajpur	279000	488000	276000	177%
Dakshin Dinajpur	188000	308000	186000	166%
Cooch Behar	258000	521000	251000	207%
Malda	282000	443000	216000	205%
North Sikkim	11231		11231	
South Sikkim	38581	38581	21740	126%
East Sikkim	10500	31900	18100	150%
West Sikkim	16600	29600	16600	178%
Total	1593912	2600081	1464671	168.78% (avg)

Bangladesh

Division	Gross Cropped Area (ha)	Cropping Intensity (%)
Dinajpur	1112177	193%
Gaibandha	604701	198%
Kurigram	559889	207%
Lalmonirhat	355175	199%
Nilphamari	551750	203%
Panchagarh	441009	188%
Rangpur	913759	207%
Thakurgaon	678879	190%
Total	5217339	197.6% (avg)

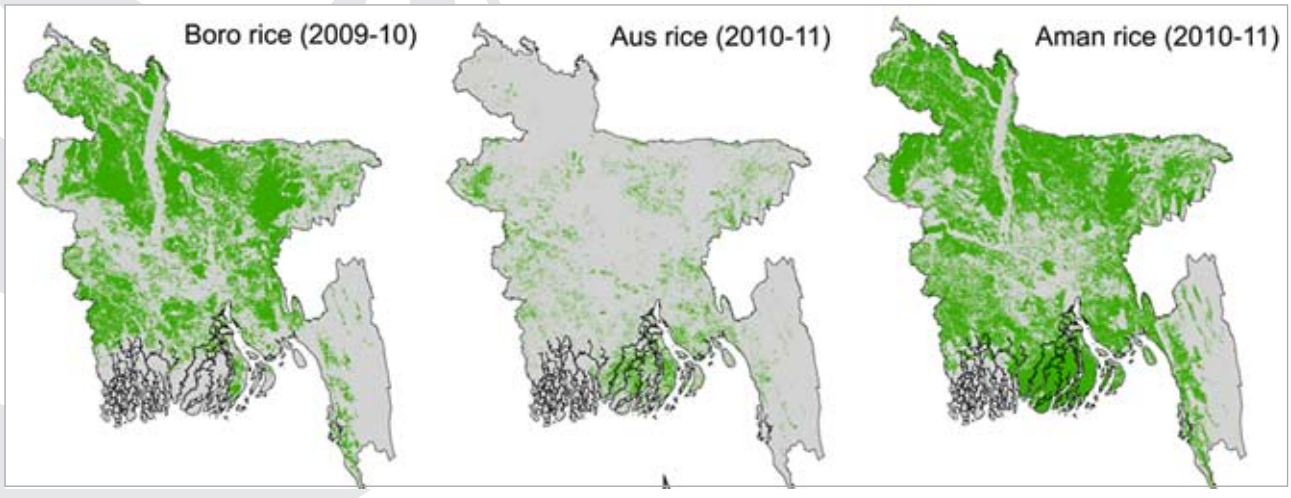
** Nilphamari, Panchagarh and Rangpur do not include non-farm agricultural holdings.*

In Sikkim, agriculture contributes about a third to the State Domestic Product. Around two-thirds of the overall work force in Sikkim depends on agriculture and allied activities, with only 16 per cent of the geographical area available for cultivation. Other than cereals and pulses, many cash crops are grown in Sikkim including cardamom, ginger, orange, potato, flowers and off-season vegetables. Sikkim produces the highest amount cardamom in India.

The main crops in North Bengal are rice, wheat, jute, potato and maize. As common practice, rice in West Bengal grows in three seasons - Aus (autumn rice), Aman (winter rice) and Boro (summer rice). Boro Rice is mainly produced in Uttar Dinajpur, Dakshin Dinajpur and Cooch Behar. Pulses are mainly grown in Malda district. Jute is grown predominantly in Cooch Behar and Malda. Jalpaiguri produces the most potato in North Bengal.

On the Bangladesh side, the main economic activity of the Rangpur division is agriculture and the main crops grown include rice, jute, wheat, tobacco and potato. The main rice growing seasons in Northwest Bangladesh are Aman (July to December) which is predominantly rain-fed and Boro (November to May) which depends on irrigation. The Teesta Barrage project has helped provide irrigation during the Boro season. With increase in irrigation, more paddy could be bought under cultivation. The Rangpur division is a major potato exporter and in 2011, over 5000 tonnes of potatoes were exported to countries like Singapore, Malaysia and Saudi Arabia from Rangpur.

Rice Growing in Various Seasons in Bangladesh

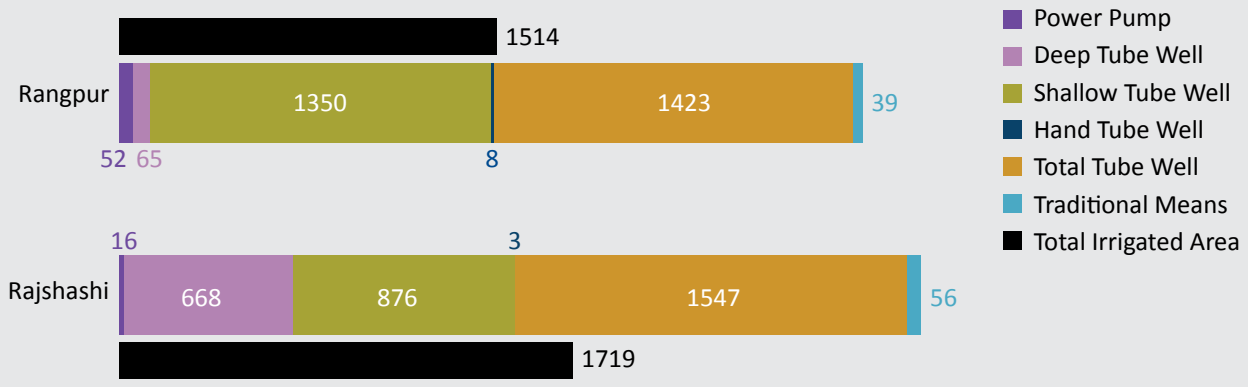


Source: http://irri.org/index.php?option=com_k2&view=item&id=11680:rice-cropping-patterns-in-bangladesh&Itemid=100242&lang=en

Northwest Bangladesh is a drought-prone region and it is Bangladesh's stand that water available on their side is inadequate during the lean season (January-February). It also tends to get flooded during the monsoon season. Crop production here is governed mainly by moisture supply from rainfall and soil storage. Hence, unreliable rainfall places limitations on the crop production. The crop damage from drought is many times higher than the damage from flood.

Region-wise Irrigated Area Under Different Means

Bangladesh (2007-2008) (in '000 acres)



Source: http://www.bbs.gov.bd/WebTestApplication/userfiles/Image/SY2010/Chapter-04.pdf

India (2005-2006) (in '000 acres)

Region	Jalpaiguri	Darjeeling	Cooch Behar	Uttar Dinajpur	Dakshin Dinajpur	Malda
Government Canal	58.38	2.43	1.70	2.59		1.313
Tank	2.12		5.87	6.00	10.36	7.449
Deep Tube Well	2.31		22.29	9.88	6.32	82.623
Shallow Tube Well	4.35	2.01	50.25	122.30	5.73	9.096
River Lift Irrigation	8.86	4.21	14.31	6.92	5.84	
Open Dug Well	3.44	0.20	6.56			24.894
Others	14.12	0.09	5.52			125.375
Total Irrigated Area	93.58	8.94	106.50	147.69	28.25	

Total: 510.335

Source: http://www.wbagrimarketingboard.gov.in/irrigation/jalpaiguri%20district.html

As the Teesta River basin region urbanizes, there is likely to be a shift from the agriculture sector to industry and services.

Industry

Overall, the Teesta River Basin is not industrially developed. On the Indian side, Sikkim is not a highly industrialized state even though a number of small and medium-scale units have been promoted over the years. These include the Sikkim Time Corporation (SITCO) and the Government Institute of Handicraft and Handlooms. Set up in 1977, SITCO is one of the first industrial units to be set up in Sikkim for the assembly for watches. The Government Institute of Handicraft and Handlooms was launched to promote and preserve the arts and crafts of Sikkim.

In West Bengal, the manufacturing industry contributes about 10 per cent to the state's GDP, but North Bengal has only a few manufacturing units. The district of Cooch Behar has units that manufacture canned pineapples, jute twine, fruit juice, fertilizers, mustard oil and soy nuggets. There are also a number of plywood and veneer manufacturing units in operation. The industry in Cooch Behar has shown the highest industrial growth amongst the districts of North Bengal. One of the main reasons for the slow growth of industry in this region has been the lack of infrastructure development and limited transport and communication facilities.

Overall, the Rangpur division in Bangladesh is not highly industrialized. Saidpur, in Rangpur division, is an important commercial hub. Furnished with an airport, the city boasts of a railway workshop which is the largest railway workshop in Bangladesh. Medium and heavy industries are growing in Saidpur especially crockery, fertilizer, oil from recycled tyres, light metal works and agriculture.

Tea Plantations

India is one of the largest tea producers in the world and both Sikkim and West Bengal are important tea growing states within India. Though Sikkim has only one tea estate called 'Temi Tea', run by the Sikkim industry department, it is counted amongst the very best in the country. The garden produces about 100 metric tonnes of tea per year.

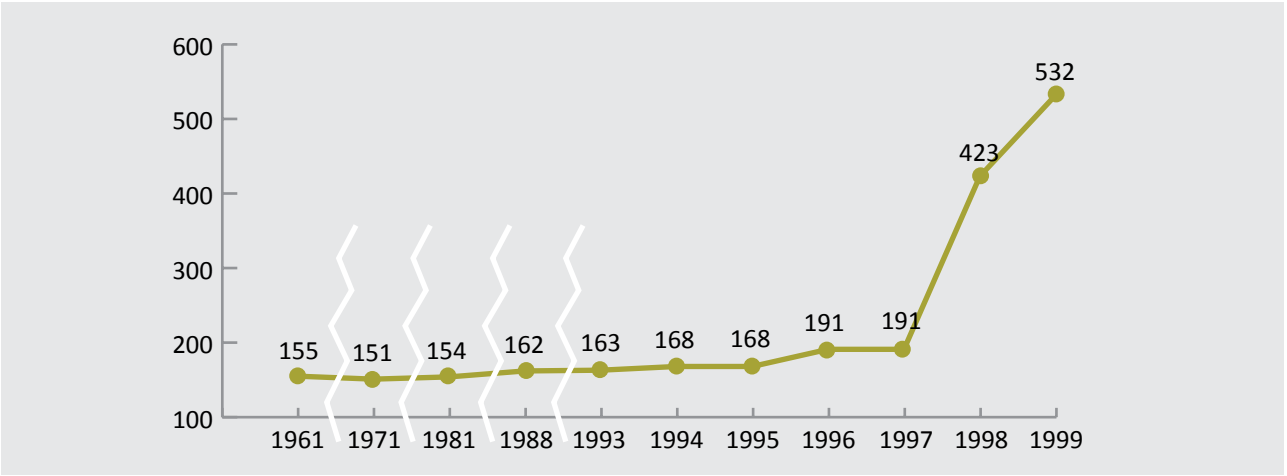
West Bengal is India's second largest tea producing state and accounts for approximately 24 per cent of the country's total tea production. North Bengal and especially Darjeeling is the primary tea producing area in West Bengal. Darjeeling is known the world over for Darjeeling tea. There are over 78 tea estates in the Darjeeling hills that produce over 9 million kilogrammes of tea every year and give employment to approximately 50 per cent of the population in the district.

Over the past few years, paddy fields in North Bengal are being replaced by tea plantations because tea production yields higher profits. In the last decade, while tea production in this area has grown by 500 per cent, rice production has dropped by 13 per cent. This growth is visible from the figures on page 25.

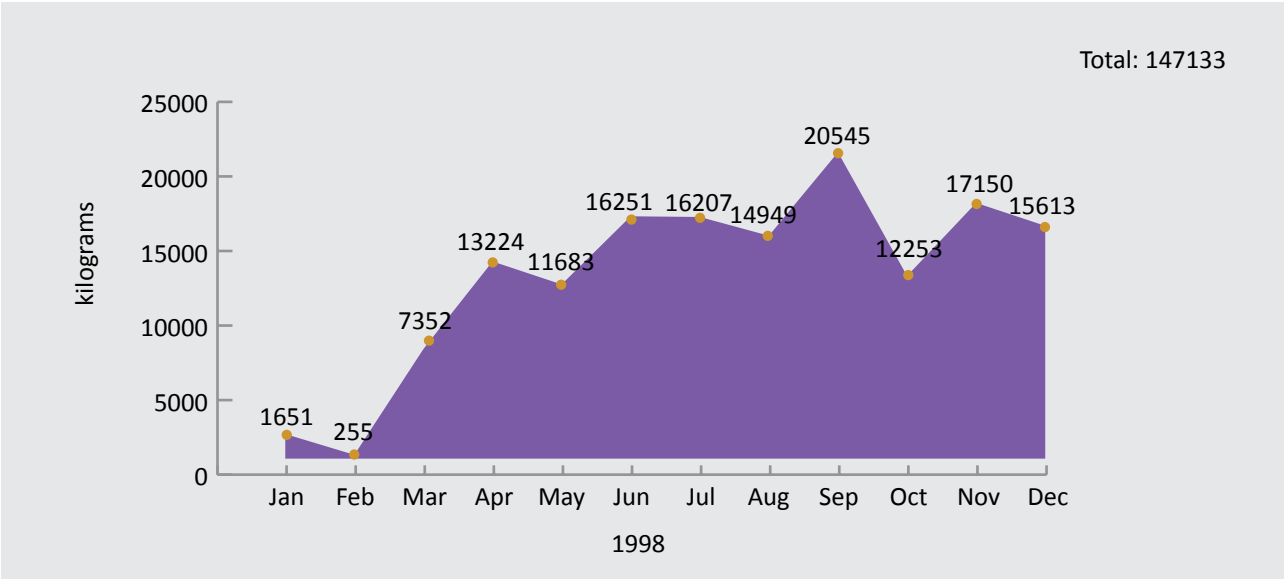
In a bid to improve the overall tea production in India (for past couple of years, Indian tea production has remained stagnant at 980 million kilogrammes), there are plans to boost the tea industry in North Bengal. In 2011, the Government of India cleared two foreign direct investment proposals from the Darjeeling tea industry; this FDI would be for production, distribution as well as export. In 2012, the Tea Board allocated Rs 150 crores for research and development work. Rs 350 crores has been kept for replacing ageing tea bushes which were affecting the production. Rs 20 crores has been earmarked for developing weather-resistant tea bushes.

Bangladesh is also a tea producing nation (in 2010, Bangladesh contributed about 1.4 per cent of the global tea production) but internal consumption

Growth in the number of tea estates in Jalpaiguri



Monthwise production of Tea in Jalpaiguri during 1998



makes up for 98 per cent of the country's total produce. There are about 172 tea estates in Bangladesh in total and the main tea producing districts are in Sylhet and Chittagong. However, the northwest of Bangladesh is not involved in tea cultivation.

Aquaculture

In Sikkim, aquaculture is an important economic activity, especially in the rural areas. Fishing is dependent on a number of freshwater resources including rivers, lakes and streams. There is great potential for development of aquaculture in Sikkim.

Fishing in North Bengal is mostly inland fish cultivation. The sector has a lot of scope for development. Data suggests that fish is brought in from Andhra Pradesh to North Bengal and covers 40 per cent of the total consumption in the area. The issues faced by this sector include lack of technology, lack of fishing infrastructure like trawlers and fish feed manufacturing units.

In Northwest Bangladesh over the past few years, the fishermen communities have reported a sharp decline in the fish population of the river. It is reported that a number of previously available common fish species are no longer found. Also, fishermen are able to report a high fish catch only for a period of five months in the year – from June to October. During the dry season, these fishermen are forced to seek livelihood opportunities as day labourers.

In addition to lack of water, fisheries in the Rangpur division are plagued by lack of fish preservation techniques related to technology, bad transport or storage facilities. Sanitation issues and lack of drainage facilities affect fisheries as well. Over the past few years, there have been programmes to develop the aquaculture in Northwest Bangladesh. From 2007 to 2009, the Bangladesh Fisheries Research Forum, Caritas Bangladesh, WorldFish Center, in collaboration with local government agencies and service providers ran a project, Fisheries and Aquaculture Enterprise Development of the Adivasi Communities of North and Northwest Bangladesh. The purpose was to increase fish production and generate alternative employment opportunities for the disadvantaged Adivasi communities. The project used small-scale aquaculture, and improved fisheries management practises to achieve their goal. Adivasi households from Dinajpur, and Rangpur districts, among others, were selected. Over the period of the project, fish production improved by five times and the average household income of the Adivasi population increased significantly. Other projects are also being carried out in this region to improve food security and provide livelihood options to impoverished communities.

Tourism

Sikkim is a major tourist destination in the country and earns a significant chunk of its revenue from tourism. In 2013, Sikkim is expected to attract approximately 10 lakh tourists. The government released the Sikkim Eco-tourism policy in January 2012 for the first time, under which the de-congesting of capital Gangtok and development of model villages has been envisaged.

The tourism industry has grown in North Bengal mainly due to private sector's involvement. As a result of the growth witnessed in the last few years, isolated and underdeveloped areas in the region have started becoming tourist destinations. These areas include the hilly and forest areas where there is scarcity of agricultural land and people have to depend on forest produce.

Tourism in Darjeeling contributes significantly towards the West Bengal tourism industry. 'Tea Tourism' is also being promoted in West Bengal, especially in Darjeeling, where tourists are encouraged to stay in bungalows within tea gardens. Tourists are also able to see the tea manufacturing process. Tea tourism generates alternate sources of employment to tide tea estates over in times of erratic weather which affects tea production.

Other than agriculture, North Bengal is also known for its eco-tourism, horticulture and timber. The other form of livelihood associated with the Teesta River, navigation, has also suffered due to reduced flow of the river. This has decreased the navigability of the river, leading boatmen to seek alternate employment opportunities during dry season.

3.3 Future GDP and Potential of Economy

Since the Teesta River Basin region is resource rich, it has immense potential to grow as an industrial hub. West Bengal is the sixth largest economy in India with a GDP of USD 96.570 billion in 2012. The

focus of the 2013 West Bengal Industrial Policy is to rapidly develop infrastructure to enable industrial growth. The government of West Bengal plans to use the Public-Private Partnership (PPP) model to develop roads, bridges, ports, airports as well as water transport.

According to the 2013 Draft Industrial Policy of West Bengal, the state government has envisaged the development of a NS-EW corridor from South Bengal to North Bengal and then to Northeast states. This project will have major hubs throughout with storage and godown facilities. These hubs, developed for the purpose of transport of goods and materials to North Eastern states, and Nepal, Bhutan, Bangladesh and Myanmar, will be connected to the rest of the country through railways and highways.

In October 2012, the Confederation of Indian Industry, in association with the West Bengal Department of Tourism, organized a North Bengal Conclave in Siliguri to promote North Bengal as an industrial space. The CII stated that this region has enormous growth potential in terms of small and medium enterprises (SMEs), and micro, small and medium enterprises (MSMEs). The SME sector could potentially play an important role in sustaining economic growth, increasing trade, generating employment, innovation, and fostering new entrepreneurship. Under the West Bengal Draft Industrial Policy, released in May 2013, it is clear that the government plans to move the focus from big industry to micro, small scale and medium enterprises (MSMEs). One major incentive given to the North Bengal region under this policy is a 100 per cent duty waiver on electricity for five years and then a 75 per cent waiver thereafter.

The government of West Bengal plans to open up the region to a host of investment opportunities, predominantly in the agro-based industries. Emphasis will be on improving infrastructure to facilitate profitable agriculture. The government of West Bengal has invited private investors to set up cold storages and farmer markets across North Bengal. The government also plans to develop IT and manufacturing industries in the region, along with boosting tourism.

In February 2012, the West Bengal government announced several projects for the development of North Bengal districts including tea, tourism and cottage industry. The tourism industry development would focus mainly on Darjeeling, Terai and the Dooars.

The mining sector is West Bengal also has the potential to generate unprecedented economic growth due to the high quantity and quality of deposits of minerals available. In tandem with India's plans to become the second largest producer of crude steel in the world, major investments have been planned for West Bengal, along with four other states.

3.4 Poverty in Rajshahi and Rangpur Divisions

The divisions through which the Teesta flows in northwest Bangladesh, specifically Rangpur and Rajshahi are poorer and less developed in comparison to the national average or other well-developed districts such as Chittagong based on indicators such as poverty rate, literacy rate, household expenditure and need for social safety.

Rangpur has the highest poverty rate in Bangladesh at 30.1 per cent while Chittagong has the lowest poverty rate at 13.1 per cent. There is also a lack of economic opportunities and income generation; Rajshahi and Rangpur have the lowest mean monthly household incomes at Tk 9,342 and

Tk 8,359 respectively. Consequently, the mean monthly household consumption expenditures are Tk 9,254 and Tk 8,298 for Rajshahi and Rangpur respectively. In contrast, Chittagong has the highest per capita expenditure.

Thus, families in Rajshahi and Rangpur earn lower than those in Chittagong, and consequently spend less on items like food and health services. They also require more intervention from the government through social safety programmes.

There is also a lack of schooling and educational facilities in northwest Bangladesh as most of it is rural. On average, the lowest literacy rate across the country is in Rangpur at 54.68 per cent while the highest in in Chittagong at 60.54 per cent. It is apparent that the districts of Rangpur and Rajshahi in northwest Bangladesh although well populated, are poor and underdeveloped. This is possibly due to the lack of facilities and declining income generation opportunities, making the people here unable to keep up with changing demographics and rising demands.

On a macro scale, however, the Bangladesh economy has been able to maintain a stable growth rate over the past few years despite internal and external shocks, including the recent global economic meltdown. It has been able to maintain 6 per cent plus growth rate in this past decade despite all odds, primarily due to the readymade garment (RMG) sector. Different studies predict that by 2021, Bangladesh will attain middle-income country status and by 2030, become the 30th largest economy in the world. This sustained growth of the country's economy has helped reduce the number of people below poverty line, from 49 per cent in 2000 to 32 per cent in 2010.

CHAPTER 4
CHALLENGES

It is possible to finalise the Teesta River Agreement soon. There are differences of opinion among the key stakeholders but these differences are exaggerated. These differences are not in the interests of the parties concerned, especially in the long term. Once the stakeholders realise that their interests are common, they will be able to reconcile their positions.

4.1 Teesta has been negotiated and finalized but not been signed

The Teesta has been negotiated for 18 years, and along the way different arrangements have been proposed. For instance, India and Bangaldesh entered into an ad hoc agreement on July 1983 which stipulated that 36 per cent of the Teesta water would go to Bangladesh while 39 per cent would be India's share. However, this agreement was not implemented.

During the 2010 negotiations, Dhaka had initially proposed equal sharing of Teesta water, keeping 20 per cent for environmental flow; i.e. India and Bangladesh would each get 40 per cent of Teesta's total flow. On the other hand India wanted 55 per cent of the water as well as a 15-year water sharing agreement on Teesta. Another formula articulated in the public debate in West Bengal was that India would retain 75 per cent of

Teesta river water while Bangladesh would receive 25 per cent. There were reports about how this would be beneficial for West Bengal as the earlier water sharing formula gave them only 39 per cent and this formula would give them a 36 per cent increase. However, this particular formula completely ignored the minimum environmental flow required to keep the river alive and flowing in its current route. Also, media reports of June 2011 suggested that both sides agreed that India would get 42.5 per cent and Bangladesh 37.5 per cent, leaving 20 per cent for run of the river.

The draft Teesta agreement in its current form provides that 20 per cent of the river flow will be set aside for the maintenance of environmental flow, while the remaining water will be shared equally through a 40-40 per cent distribution between India and Bangladesh.

The Government of India led by the Congress Party is in favour of signing the agreement. The principal Opposition party, BJP, has also indicated that it would sign the agreement should it be in power in future. Therefore, the main parties in India support the agreement, though there could be minor differences of opinion over some of the technical details. The Government of Bangladesh led by Awami League is also in favour of the agreement and considers it to be "on the table" to be signed. There are reservations about the agreement in some sections of the political spectrum in Bangladesh, as well as India.

The reservations to the agreement arise from concern for the plight of people, especially farmers, of the Northern districts of West Bengal state in India as well as Bangladesh in the Teesta Basin. The high variation in the Teesta often leads to water scarcity in these districts especially in January-February where the flow of the river is said to dip below the necessary environmental flow of the river.

These objections arise from an exceedingly emotional perspective of the situation at the cost of scientific rationality. First, environmental flow has to be guaranteed or else the river will dry up in future. Neither India nor Bangladesh has a choice in this matter. This is a need of nature and well appreciated in international law. Thus, of the 60 BCM average flow of the river per annum, about 12 BCM must be allowed to flow without interruption up till the point where Teesta merges with Brahmaputra. Secondly, once environmental flow is protected, the remaining 48 BCM can be negotiated by India and Bangladesh using various formulae. India will have to allow minimum one-third of the water share to flow to Bangladesh and Bangladesh cannot expect more than half of the water share from India. The difference between the minimum and maximum share that India can release for Bangladesh is less than 10 BCM, or only 1 per cent of the total flow of trans-boundary waters from India to Bangladesh through 54 rivers. When relations between India and Bangladesh are inherently positive and the two neighbours need each other, it is illogical for them to allow discord over 1 per cent of the total water flow and underutilise the huge cooperation potential in different fields. Third, there is a misunderstanding about some scientific facts. The opponents to the treaty in India argue that the flow is measured at Gazaldoba. However, more tributaries join Teesta before it crosses into Bangladesh, which add to the flow. There are only three tributaries on the eastern flank and they contribute hardly 5 or 6 per cent to the total flow, too negligible to be a factor. Fourth, the concern about depletion of resources in the lean season is very real. Therefore, it is imperative that India and Bangladesh develop a collaborative strategy to augment and conserve water resources. It is impossible for either country to implement such a strategy unilaterally. However, it is unrealistic to enter into a collaborative augmentation programme unless there is an agreement on allocation. Thus, the signing of Teesta agreement is actually essential

for solving the lean season problems of poor people in the Northern districts of West Bengal and North-western districts of Bangladesh, provided the two countries reach an agreement that the water allocation agreement will be immediately followed by the collaborative conservation and augmentation strategy.

Is the consent of the West Bengal government necessary under Indian Laws for the Union to enter into the Teesta Agreement?

The delay in signing the Agreement from the Indian side has political and legal angles. The political angles have been explained above. They basically relate to the failure to understand scientific facts due to obsession with genuine and emotive concern for people in the region. The legal issues are explained below.

Lord Atkin, in *Attorney General for Canada v. Attorney General for Ontario*, observed that the formation of a treaty was an Executive act while its implementation depended upon the legislature if the performance of the treaty involved a change in municipal laws. India follows a similar position. Pandit Jawaharlal Nehru, India's first Prime Minister, during one of the Lok Sabha debates in 1960 had observed that "…the treaty making power under the Constitution rests with the Executive Government. *Of course to give effect one has to come to the Parliament.* That is a different matter. So Parliament comes in. *But a treaty is completed the moment Government of India signs it."*

An examination of the constitutional provisions reveals that foreign affairs, including treaty-making, falls within the jurisdiction of the Executive and it has the sole power to negotiate, enter into and ratify treaties. Article 73 of the Indian Constitution states that the union executive has powers that extend to *"the matters with respect to which Parliament has power to make laws; and to the exercise of such rights, authority and jurisdiction as are exercisable by the Government of India by virtue of any treaty or agreement…"* Article 246 on the other hand enumerates the extent of the power of the legislature which includes having exclusive power on making laws with respect to matters in the Union List. The Union List has two entries which are of relevance here. Entry 10 states that the legislature has powers to make laws with respect to foreign affairs i.e. *"all matters which bring the Union into relation with any foreign country."* Entry 14 on the other hand states that the legislature can also pass laws with respect to entering into as well as on the implementation of the *"treaties, agreements and conventions with foreign countries."* It must however be noted that the legislature has until now not passed any laws in relation to foreign affairs of the nation or even treaty making. The Government of India has thus adopted the view that the Central Executive has an unfettered treaty making power.

The extent of the treaty making power of the Union under the Constitution of India has been examined by the Indian Judiciary as early as the 1950's. In *Union of India v. Manmul Jain*, it was observed that "making a treaty is an Executive act and not a legislative act…The President makes a treaty in exercise of his executive powers …"

While the act of Treaty making with a foreign power is an executive act, in certain circumstances legislative action for its implementation is required; else the treaty will not be regarded as the law of the land. For example, treaties that affect the rights of citizens require parliamentary legislation for the treaty to be fully operational in a domestic context. It must be however noted that the existence of parliamentary power is viewed by the executive not as a limitation on its power to make treaties, but as a performance limitation. In any case if legislation is required for the implementation of a treaty, the

Parliament has the freedom to enact suitable laws to give effect/implement the treaty as per Article 253 and Entry 14 of Schedule VII.

Article 253 read with Entry 14 confers powers on the Parliament to make laws for the whole or any part of India to implement a treaty or agreement entered into by the central government even if the subject matter falls solely within the state list. Thus the treaty implementing power overrides the Federal-State structure.

Article 253 states
"Legislation for giving effect to international agreements.-

Notwithstanding anything in the foregoing provisions of this Chapter, Parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or countries or any decision made at any international conference, association or other body."

The words *"Notwithstanding anything in the forgoing provisions of this chapters"* in Article 253 are important because it clearly indicates that in order to implement a treaty, the Parliament has the power to enact legislation even with respect to State matters given in the state list of Schedule VII. Under Article 253, Parliament has the power to legislate, irrespective of the scheme of distribution of power in order to implement a treaty. This means that if the Centre enters into a treaty, the Parliament has full power to legislate on the matter irrespective of whether the matter falls in the State list. Hence, the division of subject matter between the Centre and States does not become a hurdle to the external affairs of the nation.

Various judicial pronouncements over a period of time confirm this proposition.

In *Maganbhai Ishwarbhai Patel v. Union of India* Justice Shah of the Supreme Court observed that "if a treaty, agreement or convention with a foreign state deals with a subject within the competence of the State legislature, Parliament alone has, notwithstanding Article 246(3), the power to make laws to implement the treaty." [Note: Article 246(3)

"Subject-matter of laws made by Parliament and by the Legislatures of States.-
Subject to clauses (1) and (2), the Legislature of any State has exclusive power to make laws for such State or any part thereof with respect to any of the matters enumerated in List II in the Seventh Schedule (in this Constitution referred to as the "State List").]

In *P.B Samant v. Union of India* a writ was filed to stop the Union of India from entering into a treaty without prior sanction from the Parliament and state legislatures. This was specially so because the provisions of the treaty would have an effect on roads, bridges and communications which were state subject. The Court referred to Justice Shah's opinion on Article 253 given in Maganbhai [see above] and stated that "the observations leave no manner of doubt that in case the government enters into treaty or agreement then in respect of implementation thereof it is open for parliament to pass a law which deals with the matters which are in the state list. *In case, the parliament is entitled to pass laws in respect of matters in the State list in pursuance of treaty or agreement, then it is difficult to appreciate how it can be held that the Central Government is not entitled to enter into treaty or agreement which affects matters included in the State List"* Also, the court held that "it is difficult to accede to the contention that though the Parliament has power to enact laws in respect of matters covered by the State List in pursuance of treaty or the agreement entered into with foreign

countries, the executive power cannot be exercised by entering into treaty as it is likely to affect the matters in the State list." This was said in response to the contention of the petitioner that Article 73(b) prohibited Executive action on State lists without appropriate constitutional provision or legislation in this regard.

Given below are examples of state practice with respect to treaties that also have an effect on subjects in the state list.

- During the Lok Sabha debate on the India-Pakistan 1960 Indus Water Treaty, it was argued that considering that the Treaty imposed financial obligations, a consultation with the legislature should have been done. It was also argued that the power to ratify a treaty lay with the Parliament and not the Executive. These points were ruled out by the Speaker of the Lok Sabha who observed that entry and ratification of treaties is the prerogative of the government. The parliament may at times have objection regarding the ratification, however the 'primary right' of entering into a treaty lies with the executive under Entry 14 and the government's powers vested under the constitution cannot be taken away. It was also observed during the debates that Article 253 was merely an enabling provision.

- India signed the 1992 Convention on the Proclamation of Equality and Full Participation of People with Disabilities in Asian and Pacific Region. This gave power to the parliament to legislate in this regard in spite of the subject matter falling within the purview of the State List (Entry 9). Consequently, the 1995 The Persons with Disabilities (equal opportunities, protection of rights and full participation) Act was enacted.

- During the Uruguay round of the General Agreement on Tariffs and Trade (GATT) in the 1990s, the Government of India entered into agreements that had a bearing on the state list. The agreement on agriculture is one such example. Some state governments resisted the signing of the agreement stating that the executive had no authority as agriculture was a State subject. In 2001, West Bengal raised concerns about the signing of the Agreement by the Government of India without consulting with State government in spite of the fact that agriculture was a state subject. However, this did not prevent the executive from entering into the agreement.

- Government of Tamil Nadu filed a case in the Supreme Court challenging the Government of India's decision to sign the Uruguay Round final Act on GATT 1994. The State contended that the extent of the powers of the Executive extends to matters on which the parliament can make laws and not on matters with respect to which a state legislature has jurisdiction. The provisions of GATT would have a bearing on matters in the State List such as agriculture and public health given in entry 6 and 14 of the State List. Hence the Executive was not to enter into a self-executing treaty without taking the state into confidence or without a law passed under Article 253 by the parliament on the Subject matter. The case was later withdrawn by the State government.

- Similarly, the Free Trade Agreement with ASEAN was signed without Parliamentary and state approval in spite of the fact that the subject matter of the treaty was enumerated in the state list and would have an adverse impact on the farmers in Kerala.

There have been attempts made to insert parliamentary scrutiny on the treaty making power of the Executive. On 5th March 1993, George Fernandez introduced the Constitution Amendment

Bill of 1993 for amending Article 253. The bill among other things stipulated that the treaties and conventions are to be ratified by each house of the Parliament. Pranab Mukherjee, the then Minister for Commerce had said that seeking Parliamentary consent on treaty would raise several complications. For example the Treaty of Versailles entered into by the United States government after World War II was never ratified by the legislature. In this regard it is to be noted that in the United States a treaty may not be ratified without Parliamentary approval. He said that a similar conundrum would arise even in India. If the India-Nepal, India Bangladesh (Ganges) treaties required approval by the Parliament, it would have been extremely difficult to enter into the same. Hence this process of parliamentary approval is not practical.

Thus we see from the examination of the laws, precedents as well as practice that a State (Province) has very little say in the matter of treaty making and there are no provisions in the Constitution which envisages the involvement of States (Provinces) in the process. However, States can consult with the Central government through the Inter State Council which seems to be the only mechanism for 'cooperative federalism'. Nevertheless, this mechanism has not been used until now by any states.

The Central Government can refrain from exercising its right, as it has been done in the case of Teesta, due to its concern for people of the Teesta Basin. But if a future government realises that the cost of delay in signing such an agreement is very heavy in terms of India's potential security and connectivity advantages derived on account of a close relationship with Bangladesh and India's international standing, it may not be as patient and sensitive as the Government of Prime Minister Manmohan Singh. It may opt to use powers given by the Constitution of India to sign a treaty overriding local political opposition in the greater interest of the nation.

4.2 Lack of Nuanced Discussion in the Political Discourse Regarding Water Flow during the Lean Period

As highlighted earlier, the rivers shared between India and Bangladesh are highly seasonal and rain-fed. Hence, water is available in higher quantities during the peak season as compared to the lean or dry season which lasts from about October to April/ May. As a result of which floods are experienced during monsoons while severe droughts are seen during the dry periods. Hence, it becomes important to make arrangements of water sharing, especially during the dry period between upper and lower riparian nations.

In the case of Teesta, the estimated flow of river is 60 BCM. However its flow during lean period is roughly about 6 BCM. The problem therefore lies during this dry period where the population on both sides have to survive on very low amounts of water. Further, the region through which the Teesta passes is mainly agrarian. Therefore, the farmers face difficulties in growing their winter crops during the lean period. Considering the needs of the populations especially during the lean season, India and Bangladesh embarked to work out an arrangement for Teesta water sharing during this period of the year.

Hence, the draft agreement deals with water sharing only during the period between 1st of October to 30th April. A comparison of the 1996 Farraka agreement reveals that the two countries tend to enter into agreements which are focused upon specific periods of time in the year, which is usually the dry season.

However, in the political discourse, the question of sharing of Teesta does not feature this bifurcation of time period between lean and monsoon months. There seems to be no such clarity of approach when sharing arrangements are discussed. Political debates and methods of water sharing are based on the annual flow of water and do not account for seasonal variability. This approach is perhaps what makes it increasingly difficult for the two nations to agree upon a specific water sharing method.

Further, it is important to remember that the problem with regards to sharing of the Teesta River during the lean period is felt in very specific parts of India and Bangladesh i.e. the Northwest Bangladesh and North West Bengal. Nevertheless, in the political arena the specificity in terms of region is also not addressed.

If these specific details are appreciated, the two countries will realise that instead of delaying the signing of the Teesta Agreement, they should sign it at the earliest but simultaneously develop a joint strategy for augmentation of water resources to alleviate the plight of farmers in the winter season. In this respect, the interests of the two countries, and particularly political forces in the relevant provinces and districts are very much aligned. Their positions are not aligned because there is emphasis on politics of emotions at the cost of nuanced details of strategy for solving the problem arising from seasonal variations. It is therefore plausible to imagine that political positions will be aligned sooner rather than later.

4.3 Lack of Focus on the Political Discourse Regarding Poverty Alleviation and Development in the Teesta Basin

Issues relating to the sharing of water usually range from providing sufficient water to satisfying the needs of the dependent population for the purposes of drinking, sanitation and to maintain the environmental balance. But most importantly, water sharing issues revolve round the various uses relating to water which will help towards poverty alleviation and development.

In the case of Teesta as well, the issue of water sharing revolves round ensuring that water for the livelihood of the population is sustained and there is economic and social growth in the region. This is rightfully so, considering that the Teesta river basin is largely underdeveloped with a large section of the population being dependent on the river. The economy in this region is predominantly agrarian and this sector employs the maximum number of people. Agriculture in this area is highly dependent on monsoons which bring in excessive rainfall during peak season while there is very little water in the lean season. It is in this season that people are most affected due to loss of primary livelihood. Even in Bangladesh, there is great dependence on the Teesta river water for irrigation, agriculture, fishing, and navigation. For places like the Rangpur district, which is one of the poorest regions in Bangladesh, the Teesta forms a vital source of water. Further, lack of water leads to migration.

Hence, ensuring the multiple uses of the Teesta River which range from irrigation, navigation, fisheries, hydropower which would lead to economic and social growth becomes a priority for both the countries. This need to ensure development and alleviate poverty through the usage of the river finds itself in all political discourse relating to the sharing of the water.

The signing of the treaty on the Teesta River Basin will have far reaching consequences for both India and Bangladesh which will transcend the common debate about water sharing. By cooperating on

the Teesta River and looking at the entire basin as a single entity, underdevelopment across the countries can be collectively tackled. Development of various sectors could receive a strong boost, especially industries allied to the river. For instance, navigation, fisheries and agriculture are some common livelihood models on both sides which could potentially grow with help and support. India and Bangladesh have witnessed positive results from cooperation initiatives on various sectors earlier, and with this treaty they can further fortify their relationship making it stronger and more profitable.

CHAPTER 5
SOLUTIONS

The Teesta River Basin is in dire need of long-term and sustainable solutions that not only take into account each individual country's requirements but also the basin's requirements as a whole in the long term. In order to do this, a comprehensive agreement will have to be framed that is sustainable. Some of these solutions include augmenting lean season flow, creating a water-conservation culture in the region, research on crops that are less water-intensive, monitoring quality of water and storing of water.

5.1 Agreement for Water Sharing that Respects Environmental Flow

Environmental flow is defined as "the water regime provided within a river, wetland or coastal zone to maintain ecosystems and their benefits." To maintain the environmental flow of the river means to 'keep the river alive'. This entails preventing over-abstraction of the river water and to ensure that certain minimum flow of water in the river is maintained which:

a. Will help to make it run its natural course.
b. Will help the river to purify itself.
c. Will help to sustain the rivers ecosystem.
d. Will help in recharging ground water.
e. Will help in maintaining estuarine conditions.
f. Will prevent incursion of salinity.

The importance of maintaining environmental flow is recognised the world over. This is due to the fact that over use of the river, diversion and stopping it from reaching the sea has led to dire consequences. For example, the Aral Sea which was considered to be the 4th largest lake in the world started to shrink from the 1960s due to over abstraction during the Soviet regime. The lake has at present lost about 90 per cent of its water. This has led to desertification of vast tracts of land, climatic changes and most importantly a loss of livelihood. Hence, while the needs of the population dependent on the lake were fulfilled for a couple of years and there was a certain amount of development, this sustained for no longer than three decades.

The Colorado River which is considered to be the 'Nile of North America' falls 60 miles (96.56 km) short of emptying into the Sea of Cortez due to over abstraction and diversion. This led to the area becoming desert-like, endangering animal species, devastating the culture of the native Cocopah (the People of the River) and destroying the fishing industry, once sustained by shrimp and other creatures. In order to address this issue, the US and Mexican governments have amended their previous water sharing agreement which will help restore the river delta. This initiative is hoped to restore about 810 hectares (2,000 acres) of new wetland habitat for fish, shrimp, and about 400 species of birds in the future.

The recognition of the negative impacts of alteration of the natural flow of water has led to the development of about 207 methods created in countries around the world to determine the environmental flow. These methods have one integral theme in common; according to the Food and Agricultural Organization (FAO), it is to address "how much and which specific temporal characteristics, of the original flow regime of a river should continue to flow down it and onto its floodplains in order to maintain specified features of the riverine ecosystem." FAO has classified the various methodologies into four main categories:

(1) Hydrological: These represent the simplest set of techniques where, at a desktop level, hydrological data, as naturalised, historical monthly or average daily flow records, are analysed to derive standard flow indices which then become the recommended environmental flows (EFR). Commonly, the EFR is represented as a proportion of flow (often termed the 'minimum flow', e.g. Q95 - the flow equalled or exceeded 95 percent of the time) intended to maintain river health, fisheries or other highlighted ecological features at some acceptable level, usually on an annual, seasonal or monthly basis.

(2) Hydraulic Rating: Hydraulic rating methodologies use changes in simple hydraulic variables, such as wetted perimeter or maximum depth, usually measured across single, flow-limited river cross-sections (commonly riffles which are short and shallow streams that flow with increased velocity and turbulence), as a surrogate for habitat factors known or assumed to be limiting to target biota.

(3) Habitat Simulation: Habitat simulation methodologies also make use of hydraulic habitat-discharge relationships, but provide more detailed, modelled analyses of both the quantity and suitability of the physical river habitat for the target biota. Thus, environmental flow recommendations are based on the integration of hydrological, hydraulic and biological response data.

(4) Holistic methodologies: Holistic methodologies aim to address the water requirements of the entire "riverine ecosystem" (Arthington et al. 1992) rather than the needs of only a few taxa (usually fish or invertebrates). These

methodologies are underpinned by the concept of the "natural flows paradigm" (Poff et al. 1997) and basic principles guiding river corridor restoration (Ward et al. 2001; Uehlinger et al. 2001). They share a common objective - to maintain or restore the flow-related biophysical components and ecological processes of in-stream and groundwater systems, floodplains and downstream receiving waters (e.g. terminal lakes and wetlands, estuaries and near-shore marine ecosystems).

Experts have also listed other categories of classifying the methods which include - a) Look-up tables, b) Desk top analysis, c) Functional analysis, d) Habitat modelling.

In the Teesta basin, it is suggested that it would be best to avoid the disastrous consequences of unsustainable diversions and abstractions mentioned above. Hence, the water sharing agreement on Teesta must consider the environmental flow of the river before an agreed formula for water sharing, if the policy makers are considering the long term development of the region. However, there are alarming suggestions made by various stakeholders which propose to divide water in a certain manner completely ignoring the environmental river flow. Any suggestion to ignore the environmental flow would not withstand international judicial scrutiny. It would also harm the international standing of India and Bangladesh. Therefore such suggestions should be treated with caution.

The draft Teesta agreement in its present form reserves 20 per cent of the actual flow to maintain the environmental flow of the river while the rest is divided equally between the countries. It is proposed that this important provision must be fully endorsed and implemented in order to avoid the situations given above. Also, there are other water sharing agreements in the world which have provisions on maintaining the environmental flow, including the Mekong River agreement which specifically provides for minimum water flow to protect and sustain ecosystems. Respecting environmental flows is also seen in sub-national agreements such as the Murray Darling Basin Initiative in Australia. The inclusion and implementation of such provisions in the Teesta agreement would point out the foresight of policy makers towards long term sustainable development.

In the case of Teesta while there is already a required quantity of water agreed upon to maintain the environmental flow, a further study would also need to be done based on the numerous methods given in this chapter in order to determine the quantities of water required to sustain the river in a holistic manner, as well as the amounts of water that can be realistically shared between the two parties. Nevertheless, it must be reiterated that any water sharing agreement disregarding environmental flow would be a short-sighted effort to solve water issues between the two nations. Hence, environmental flow cannot be disregarded.

5.2 Measures to Augment River Flow during Lean Season

People living in the Teesta river basin face severe problems during the lean season. Hence, there needs to be a concerted effort towards water augmentation in order to ensure that sufficient amounts and quality of water is available during this period of time. Also important to note is the commitment made by India and Bangladesh in the Draft Teesta Agreement which states that the *"two governments recognise the need to cooperate with each other in finding a solution to the long-term problem of augmenting the flows of the Teesta during the dry season."* This recognition of the need to cooperate must lead to some concrete

measures being taken by both sides on actually augmenting the flow of Teesta river or conducting feasibility studies which would recommended how this process could be undertaken. There have been various measures that have been suggested in the past towards augmenting the river flow which include:

- Storing water upstream during flood season, recharge of groundwater and retrieval of water during lean months.
- Dredging and re-excavating common rivers including Teesta to ensure irrigation in Bangladesh.
- Linking the Sankosh River of Bhutan with Teesta to augment its flow.
- Tapping Brahmaputra waters to irrigate the northwest areas of Bangladesh.

While the suggested augmentation measures have not been implemented, it is proposed that India and Bangladesh constitute a committee of experts who will look into various techniques of augmentation that could be utilised in the case of Teesta. The committee of experts could either introduce innovative methods of augmentation or utilize the methods of augmentation carried out in other parts of the world. The methods given below are merely a demonstration of the practices carried out in the world. It will be left to the experts to decide which ones would be suitable in the case of Teesta.

a) Rainwater Harvesting

In many places rainfall is seasonal and disproportionate. In order to augment the current water resources, it is important to capture rainfall. It recharges the streams and groundwater with renewable fresh water. It also helps save energy utilized for pumping out groundwater (1 meter rise in water level saves 0.40 kilowatt hour of electricity) and mitigates droughts, and also reduces flooding by decreasing the surface area.

Rainfall harvesting potential depends on the quantity of rain, as well as the rainfall pattern. One of the models to calculate rainfall harvesting potential is:

Water harvesting potential = Rainfall (mm) x Area of catchment x Runoff coefficient

or

Water harvesting potential = Rainfall (mm) x Collection efficiency

Water quality of rainwater on average is very good but it needs to be monitored regularly. A lot of people use it directly for secondary domestic purposes like cleaning and washing, but it needs to be treated before drinking.

Rainwater can be harvested from the rooftops where it can be stored in tanks or used to recharge groundwater. It can be collected in paved and unpaved areas and in storm water drains. Rainwater harvesting can be done in both small and large ways in terms of simple roof water harvesting in individual houses or larger systems in educational institutions, stadiums, airports and high rise buildings.

b) Fog Water Harvesting

Under favourable climatic conditions, water collected from fog could be harvested. This technology has been deployed successfully in South American countries such as Chile, Ecuador, Peru and Mexico. Fog harvesting may be favourable due to low energy requirements, low capita investment as well as community participation. Nepal has already started working on developing fog harvesting technologies. India and Bangladesh could take a lead as well.

c) Watershed Improvement Techniques

It is important to preserve forests and plant more trees (reforestation) to capture water and prevent soil erosion through flooding and storms. In an experiment conducted in Darling Range of Western Australia in 1979-1986, it was noticed that due to reforestation, groundwater levels rose by to 1.2 meters even though the annual rainfall had reduced.

There are a number of techniques of Watershed Development, such as contour bunding and contour trenching, strip cropping and gully plugging.

d) Waste Water Treatment

Waste water treatment is an essential means to augment water. India and Bangladesh can take the example of Singapore which has a 100 per cent sewerage connection and puts wastewater through secondary treatment by advanced dual-membrane and ultraviolet technologies. Recycled water is further sent to industries and commercial projects for reuse. Presently, this meets 30 per cent of Singapore's total water demand. By 2060, NEWater is estimated to meet 50 per cent of Singapore's future water demand.

Whereas Singapore has developed plants for a large city, Israel has established decentralized plants to be operated at a community level. Israel has the highest reuse rate in the world (around 70 per cent). Aqwise Wise Water Technologies uses 12 mm biomass carriers in a process called AGAR (Attached Growth Airlift Reactor) in a biological plant. This works on a community-level because no new infrastructure is needed, and the costs are one-third of the conventional treatment plants.

South Africa introduced the Municipal Green Drop Certification Programme in 2008 as an incentive-based regulation for wastewater quality and wastewater management systems. In 2011, 821 wastewater systems were assessed by the Department of Water Affairs, of which 40 systems achieved the coveted Green Drop status.

India and Bangladesh would greatly benefit from implementing such measures which have been used successfully by other nations in the world.

e) Engineered Wetlands

This is an augmentation technique considered in Egypt where wetlands are seen as a low-cost effective system to treat wastewater. The Lake Manzala Engineered Wetlands Project (LMEWP) began in 1999 and concluded in 2007. The LMEWP is said to have been implemented at one fourth of the cost of a conventional treatment plant. Each year around 5 BCM of untreated sanitary wastewater and 12-13 BCM of drainage water enter the Mediterranean Sea from Egypt. This is something that India and Bangladesh can look into.

f) Shirpur Pattern Water Conservation

Shirpur is a district in Maharashtra where over-abstraction as well as the nature of soil resulted in depletion of water sources especially ground water. An innovative technique was developed which led to the increase in water tables and also the amount of surface water in this region. The aim of the project was to ensure that water is available during the lean period. The technique involved the following processes:

- Constructing check dams on all streams irrespective of their size, without gates and waste weir following the principle of 'ridge to valley'.
- Widening of small streams by 20-30 meters and increasing their depth by 10-15 meters.
- Introducing the surplus water stored in dams into dry dug wells of about 50 meters in depth.

This project is now being used as a model in the state of Maharashtra. It might worth considering using the same in other regions as well.

5.3 Small Methods and Facilities for Water Saving and Storage

As mentioned earlier, the Teesta Basin experiences water difficulties during the lean period. In contrast, it is highly rain-fed and has a voluminous supply of water during the monsoons. Therefore, in order to ensure adequate demand management, keeping in mind extreme seasonal variation, the existence of storage facilities is pertinent. However, the facilities cannot be large-scale as there is a large population that lives within the basin, and building such facilities would cause displacement. Small-scale storage facilities would be most suitable to the Teesta Basin, its terrain and people.

The most important factor to be considered prior to developing water saving facilities is the issue of arsenic contamination in groundwater. Upon addressing this issue, several local technologies can be used based on their simplicity and practicality. Some of them are easy to setup, while others require thorough field study and research.

Low Cost Tube Wells

Tube well technology comprises water harvesting along with hand pump mechanism, in order to provide a constant supply of water. This is particularly significant to hilly areas, especially Sikkim, wherein large quantities of water can be harvested by tapping deep seepage lines. The water is then carried for several miles, and can be useful in distant villages that are inaccessible to water resources. This technology is cost-effective and the per capita investment is merely INR 500 (USD 10) in comparison to conventional gravity flow piped water systems, priced at INR 3,000 (USD 60) per capita.

Groundwater Dams

The concept of Groundwater Dams dates back to the 1980s, where structures are built to restrict the natural flow of groundwater. Its function is similar to a surface water reservoir, except that the water is stored underground. The advantages of this system include minimizing contamination of water and evaporation. This is most beneficial to regions that experience heavy rainfalls in the monsoons and are almost dry for the rest of the year.

Unaccounted for Water

There is a tremendous amount of water wastage in India and Bangladesh due to weak infrastructure and pipe leakages. Studies estimate that India loses about 25-40 per cent of its water supplied to urban areas due to pipe leakages; similarly, Bangladesh's unaccounted for water is almost 45 per cent due to poor piping and water theft.

The implementation of better water management structure and practices will significantly help water conservation in both countries. This may additionally help balance the distribution of water in rural and urban districts. A possible mechanism to address this issue could be the use of remote sensing and monitoring applications. This helps assess surface water and ground water conveyance systems during the distribution phase, especially when detecting pipe leakages. This provides real time control and helps reduce the unnecessary loss of water.

5.4 Technology to Lessen Agricultural Water Usage and Ideas for Cropping Patterns

India and Bangladesh are both agrarian countries and consume large amounts of water for their agricultural practices. As a result of outdated and

inefficient irrigation systems, both countries waste lots of water.

A possible solution to this could be the use of new technology such as drip or trickle irrigation. The main advantages of this technique include controlled distribution of water in alignment with crop and soil requirements. This allows for increase in demand efficiency in sync with crop productivity. There are different types of drip irrigation systems, such as the bamboo drip irrigation system used in North East India and the solar drip irrigation system where a solar-powered pumping system is combined with drip irrigation.

As mentioned earlier, the Teesta Basin is more drought-prone than flood-prone. The Northwest of Bangladesh is in particular prone to regular droughts. Therefore, drought-resistant crops and overall cropping patterns should be thoroughly explored and understood. This could serve as an opportunity to indulge in technical exchange on agriculture and study of drought resistant crops jointly by both the countries.

Drought-resistant crops

In India, there is a new type of drought-tolerant rice called Sahbhagi Dhan being tested in Jharkhand. It can survive a dry spell of 10-12 days. Similarly, Nercia is a drought-tolerant rice variety crop that is a cross between an African variety and a high-yielding Asian one. In 2009, it was bought from Uganda and tested by Bangladesh. According to the Bangladesh Agricultural Development Cooperation (BADC), Nercia can withstand up to 21 days of drought and mature in 100 days in any crop season, giving 4.5 to 6.5 tons of yield per hectare.

Cropping Patterns

The cropping patterns and overall food security within the Teesta basin is of great importance to both Bangladesh and India. There is a direct correlation between irrigation, water availability and land use. In the Teesta river basin, the production of crops is impacted by excessive water during the monsoons and insufficient water during the dry seasons. There are several crops that do not need much water for irrigation but farmers prefer to continue practices of growing rice paddy that require 90 days of irrigation water. Soil erosion is a serious issue in the basin, as crops other than paddy, cardamom and vegetables are directly impacted by it. These include maize, wheat, barley and millets as they are grown in untreated, partly terraced or unlevelled terrace soil.

Due to varying cropping patterns and no clear food security plan, there is a vicious cycle taking place. In recent years, the production of number and variety of crops has greatly increased mainly due to demographic changes. This has led to a water shortage as the demand has surpassed the supply, and many crops require additional water for irrigation. As a result of water scarcity, crop production is slowly reducing, thereby causing lack of available food for communities and smaller incomes for farmers. Additionally, there are social and health problems, especially affecting the rural poor. Concurrently, the construction of buildings and industries has led to a decrease in availability of crop land. On the other hand, due to extreme clearing of land and cropping, there has been a significant decrease in biodiversity in these areas which in turn impacts the ecology and environment of the region.

Therefore, it would be useful for India and Bangladesh to cooperate and collaborate on joint action plans that will address cropping patterns that could be used throughout the basin, as well as water-saving irrigation techniques that could keep up with the increasing demand, and a long-lasting plan of action regarding food security for the basin

population now and in the future. The prospects for creating economic opportunities out of these measures should also be studied.

5.5 Water Conservation Culture

Every year, thousands of litres of water are wasted in both India and Bangladesh due to reasons like conveyance losses, outdated infrastructure, and lack of water conservation methods in place.

In both countries, in all three sectors – domestic, industry and agriculture – the water usage is extremely inefficient. Being agrarian nations, both consume large amounts of water for their agriculture. Due to inefficient and outdated irrigation systems, they waste lots of water. Additionally, both countries could make groundwater dams that help obstruct the natural flow of groundwater and provide storage for water underground.

The water use efficiency in Bangladesh's agriculture is extremely low – only an estimated 25-30 per cent of irrigation water is used by the crops while the rest is lost due to faulty flood irrigation system. There are estimates which say that in northern Bangladesh, boro rice farmers use 3000-5000 litres of water to produce 1 kilogram of paddy, while the actual requirement is only about 1500 litres. This over-usage of water and low water efficiency impacts the environment negatively by depleting water levels. Due to the heavy reliance on diesel operated irrigation pumps, the irrigation cost in Bangladesh is very high. This contributes to increasing production costs and decreasing farmer net incomes. Subsidized pricing of water in the two countries also contributes towards the careless attitude towards water usage.

As mentioned earlier, both countries also lose a lot of water to old and faulty water distribution infrastructure as well as water theft. In India, approximately 25-40 per cent of water supplied to urban areas is lost due to pipe leakages, while in Bangladesh this 'unaccounted for water' is estimated around 40-50 per cent.

With a high rate of industrialization, the industrial sector in these countries is also responsible for water wastage. The Indian steel industry, which is amongst the top ten steel producers globally, is one of the most water wasteful sectors; as compared to the world standard of 5 m3 water used per ton of finished product, Indian steel plants consume 20-25 m3 of water per ton.

According to World Bank estimates, India annually spends approximately USD 1.1 billion in subsidizing its water sector. Unfortunately, very little of this subsidy actually reaches the poor. This is because the water tariff structure does not discriminate between the rich and the poor; 60 per cent of the Indian poor do not have access to private water connections.

Both countries will benefit significantly with implementation of better water management structure and practices. These may also lead to better balance of water distribution between urban and rural areas. Use of remote sensing and monitoring applications to assess surface water and groundwater conveyance systems during distribution would help, especially by detecting leaky pipes. Replacing or renovating and maintaining the water distribution infrastructure will also reduce water being lost annually. Increased access to piped water is likely to decrease water theft.

Both countries also need to emphasize water conservation tools in their policy making, with support to rainwater harvesting and recycling at domestic, industrial and agricultural levels. Studies show that irrigation with conserved rainwater,

instead of dependence on groundwater may reduce the countries' vulnerability to climate change. Hence, water efficiency needs to be stressed at a policy level. As agriculture sector is the biggest consumer of water in both countries, best practices for irrigation (minimum tillage, mixed and relay cropping) as well as low water-intensive crops should be encouraged. The use of new technology such as drip or trickle or sprinkler irrigation to control water distribution in alignment with crop and soil requirements is likely to help. Derelict canals and ponds could be excavated for conservation of rainwater which could later be used for irrigation during dry months.

Also, in order to reduce water wastage, the pricing needs to be appropriate. With growing industrialization and urbanization in India and Bangladesh, the water demand is likely to grow over the next few years; hence, the pricing of water will impact the amount of water being used in each sector of the economy. The standard water tariff makes it impossible for the poor to take advantage of the water subsidy. Hence, a water tariff structure, which takes into account the large section of below poverty line population in these countries, will have to be implemented, so that the industry and agriculture sectors pay more for water, but poorer sections of the population pay less for domestic use.

India has had a rich history of water conservation as well as harvesting systems. Today, some of its traditional water conservation systems are being revived, especially in the drought-prone state of Rajasthan. This revival, if sustained over a period of time, could benefit the water-starved populations of this desert state by providing greater water and food security. There have been various initiatives to revive the traditional rainwater harvesting system *'paar'* in the Jaisalmer district. In the Alwar district, the technique being revived is the *'johad'* in which an earthen check dam is used to catch rainwater. Ingenious systems of rainwater harvesting such as *'kunds'* from Rajasthan and Meghalaya's bamboo pipe system to harvest stream and spring water and other successful examples could be promoted.

Rainwater harvesting is increasing being integrated into water management practices, especially in India. Certain Indian states such as Tamil Nadu, Rajasthan and Gujarat have made rainwater harvesting compulsory. At the Central Government level, India plans to implement a bill to make rainwater harvesting compulsory throughout the country.

Since 1997, the NGO Forum for Drinking Water Supply and Sanitation has installed approximately 1000 rainwater harvesting systems in Bangladesh, especially in the rural areas. Here, water collection is seen as a more viable alternative for providing safe drinking water due to high levels of arsenic in groundwater.

5.6 Water Quality and Use of Wastewater

Water quality in Northeast India and Northwest Bangladesh's rivers is higher in comparison with neighbouring regions, despite the fact that the Ganges, one of the biggest rivers of the region, is amongst the most polluted rivers in the world. Rivers like Brahmaputra and Teesta are relatively high in water quality. However, greater industrialization in the region, as well as increasing infrastructure development, could have an adverse impact on local water quality unless they are taken in to account in any potential water co-operation and water management agreements that India and Bangladesh make.

At present, there are only a few provisions for

water quality monitoring in the Teesta River. In general, except for the two large rivers (Ganges and Brahmaputra) river water quality is not rigorously monitored whereas groundwater quality in the region in both countries is. This is due the arsenic contamination of groundwater that is prevalent in the region. A 2010 report on water quality in Indian rivers shows that the highest observed total coliform in the Teesta was at 5×105 MPN/100 ml, significantly lower than rivers like the Ganges (14×105MPN/100 ml). The Teesta is said to meet the desired levels for conductivity, Dissolved Oxygen (DO) and pH. The water quality of Teesta was measured at various points - after the confluence of Lachen Chhu and Lachung Chhu at Chungthang, then after confluence with River Rani Chhu at Singtam, after the confluence with Rangi Chhu after meeting industrial effluents from nearby towns Ra, at Melli Downstream in Sikkim and at Siliguri. All proposed hydropower projects and barrages on both sides have provisions for water quality monitoring and water quality is presently monitored at both Gazaldoba and Dalia barrages.

In the future, if a workable arrangement is to be made between both countries for integrated river basin management, it will be vital to increase the monitoring of water quality along the stretch of the river on both sides. In order to do this, the number of sites of water quality monitoring will have be increased and adjusted periodically as greater industrialization takes place, especially if certain areas along the bank of the river become industrial hubs. Similarly, it will be important to monitor agricultural effluents (chemical pesticides and fertilizers) as they are dumped into the river and its tributaries. It will also be important to share this data amongst both countries, as well as with institutions and experts on both sides.

Also of importance in the coming years will be finding multiple uses for wastewater from industry, domestic usage and agriculture, especially during lean season, to reduce the amount of freshwater that is needed. Wastewater treatment is gaining wide acceptance now in many water-stressed countries. One emerging trend is that of constructed wetlands, similar to the naturally occurring Sunderbans. Constructed wetlands could be used for the treatment of industrial, agricultural and municipal water. Nanotechnology applications for wastewater purification are also being researched and used at present. Nanotechnology can be useful in detecting biological and chemical contaminants in water. They could potentially also be used in arsenic removal which would be highly useful for this region.

In California, irrigation water is re-used to irrigate other crops, or is stored to prevent it from reaching underground aquifers for re-use at a later stage. In India, wastewater re-use in agriculture is already underway with crops like cereals, vegetables, flowers, and fodder crops. Such water is also used in aquaculture which has a high potential in the Teesta River Basin. Bangladesh in 2012 commenced operation on a bio-electric wastewater treatment facility to treat water with effluents from the Dhaka Economic Processing Zone built and operated by Flagship Ecosystems Investment Private Limited (FESI). Such technologies are already locally available or can be bought from other countries like Singapore at a nominal price. In this regard, both countries could also co-operate to look into wastewater re-use and treatment in the region with funding and technical capacity coming from one or both countries.

Monitoring of water quality and finding multiple uses for wastewater in the Teesta River Basin is essential for the long-term water health of the region. Presently any discussions or debates regarding the river do not extend beyond few years and are extremely short-sighted. It will be

essential to take into account increasing demand due to a larger population, greater urbanization and industrialization, as well as dwindling water resources for the long-term, i.e. 2050, 2100 and beyond. In this case, preserving the quality of water in the Teesta and nearby river systems is vital and will have to be monitored more rigorously.

5.7 Resolution of Internal Differences

Internal differences in India led to the non-signing of the Teesta agreement. Such forms of internal differences in countries which causes a deadlock on trans-boundary water sharing is not a new phenomenon and it has been experienced and dealt with by many nations in the world. For example, the United States and Mexico entered into water sharing treaty for river Colorado in 1944. This was met with severe opposition from California which is one of the riparian states of the River Colorado and was reaping maximum benefits from the flow of the river. California did not agree to the amount of water allocated to Mexico under the treaty. Therefore it strongly opposed the treaty and tried to prevent the approval of the US Senate required for the treaty to be ratified. However, other riparian states in the US favoured the ratification for two reasons. They feared that if a settlement with Mexico is not reached; Mexico's use of water would increase in the future, thereby affecting their share of water. Also, they feared that non ratification of the treaty would greatly harm the "Good Neighbour Policy" which would have a bearing on trade relations as well. Thus the support received from other riparian states in the US together with the pressure from the White House overcame California's opposition. The US senate ratified the US-Mexico treaty in 1945.

Thus we see that while domestic problems exist within nations, this has however not overshadowed international relations when it comes to water sharing. It is reasonable for local and provincial political parties to be concerned about the impact of an international agreement on population in a specific region. But so long as concerns and interests are common, it should be possible to realign positions within and between countries. India and Bangladesh can use many innovative methods to sign the Teesta treaty while at the same time address genuine concerns of domestic opposition.

One such innovation was the decision of the United States and Mexico to agree upon a system of 'Minutes'. The Minutes are a record of the decisions taken by the International Boundary and Water Commission (IBWC) (established by the 1944 treaty) on water sharing as well as utilization issues. The Minute process provides the treaty with adaptability. It provides flexibility to the implementation process of the treaty keeping in mind the varying needs of both the nations. Considering that Minutes are mostly binding upon the two state parties, it also ensures that two nations keep their actions strictly within the limits drawn by the treaty and the IBWC. India and Bangladesh could look into adopting such methods which will help them to ensure that the treaty is not static and can adapt depending on the needs of the people and other exigent situations. This will further help towards reducing internal opposition.

5.8 Conclusion

The Teesta Basin has been a subject of debate for several years primarily due to the lack of consensus on the distribution of water. It should be noted that the current draft agreement solely focuses on the distribution of water during the lean season period. Meanwhile, political discourse strongly emphasises sharing water that is depleting during the winters, diversion of waters, and the ill-effects

of seasonal variation. These discussions are slow and short-sighted, and little importance is given to serious issues like augmentation of water and the conservation of the Teesta. Sharing a river also means sharing an eco-system. It becomes imperative that the eco-systems are jointly regulated, managed and rejuvenated. India and Bangladesh face similar issues in terms of environment and it is indeed a benefit of cooperation if they can capitalize on each other's strengths and expertise to protect the basin from further deterioration.

In order to make concrete progress, a long-term sustainable approach needs to be adopted. To begin with, it is pertinent to separate distribution of water from augmentation of water. These two issues are completely different and need to be addressed separately with equal importance. Additionally, the range of benefits, such as social, economic and environmental should be highlighted and pursued. Social benefits could comprise joint measures for economic development through skill training networks and promotion of local industries to tackle the problem of migration and illegal activities. Furthermore, there could be economic benefits through joint development of aquaculture, eco-tourism, twinning and cross-boundary farmer networks. Environmental benefits could include flood control, disaster management, joint monitoring facilities on trans-boundary water resources, and joint management of trans-boundary aquifers.

Lastly, all nations sharing trans-boundary rivers have experienced various challenges but more often than not have managed to resolve them. This is mainly due to sharing a common vision and looking into the interests of all parties, and achieving the same through joint cooperation and management.

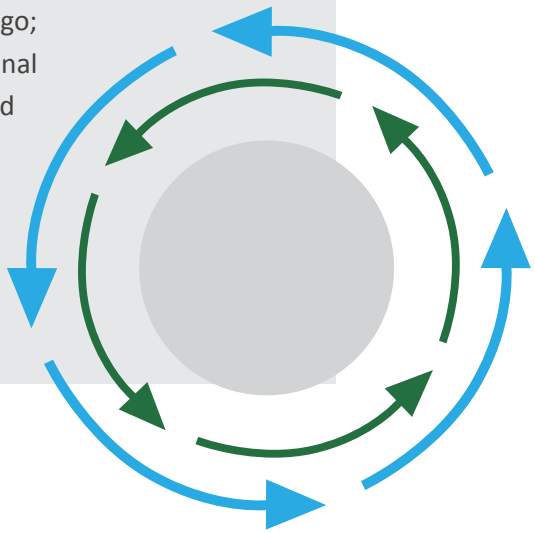
CHAPTER 6
RESTRUCTURING RELATIONS

There are immense benefits of cooperation for India and Bangladesh. Cooperation can help to regulate human and economic losses from floods, reduce the costs of generating electricity from hydropower by trading energy and achieve improved water quality through shared monitoring. By building trust and preventing water security-based conflict, there is potential for increasing cross-border trade and investment.

However, the benefits will not accrue by creating a regime of separate governance over water. If India and Bangladesh want to ensure sustainable development, there must be a joint endeavour towards Integrated Water Resource Management (IWRM) of all the trans-boundary rivers between the two nations. IWRM according to the United Nations *"is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."*

The concept of IWRM was developed a few decades ago; however it gained popularity after the 1992 International Conference on Water and the Environment (ICWE), held in Dublin. The flowing principles were adopted at the conference:

- Balancing socio-economic development with the protection of natural resources.



- Participatory approach i.e. management of water based on participation of all stakeholders.
- Strengthening the role of women in water management.
- Acknowledging the economic value of water.

These principles were later adopted as Agenda 21 in the 1992 conference in Rio which was attended by both India and Bangladesh.

In the context of India and Bangladesh, there already exists a road map for IWRM and the aforementioned elements exist in varying forms. There exists a degree of cooperation on water issues between the two nations which is evident from the legal instruments that have been in place since the 1970s. It would thus be beneficial for the two nations to take this cooperation further to first manage the Teesta River and in the long term look at the integrated management of all the common rivers that they share. However, at present the two nations are mainly looking at establishing a water sharing regime with respect to each river that they share. This is not feasible because there are a total of 54 rivers that are shared between India and Bangladesh.

Prior to the creation of Bangladesh in 1971, discussions regarding water sharing had already begun between East Pakistan and India. After the creation of Bangladesh, the two countries came together and signed the 'Statute of the Joint Rivers Commission' on 17 March 1972 which governs all rivers common to both nations. The Ganga is one of the major rivers shared between both countries and went through three short-term agreements from 1977 to 1988. It was only in 1996 that joint cooperation was reached through the Ganges Agreement, which remains in force for 30 years. This primarily revolved around sharing Ganges water at Farraka through a formula.

The Teesta has been under discussion since the 1980s between India and Bangladesh. Over the years, both sides have put forward different formulas for distributing the river water. In 2011, India and Bangladesh came close to reaching a conclusion on the draft Teesta agreement. However, the agreement still remains to be signed on account of reasons explained previously in this paper which have mainly to do with failure to understand the importance of augmentation efforts and greater good resulting from the agreement for bilateral relations, and particularly for the economic development of people in the bordering districts.

It should be noted that the first river agreement signed between India and Bangladesh took almost 20 years to reach. The next river agreement has taken about 25 years and is still unsigned and pending. At this rate, it seems that each river takes approximately 20 years to reach an agreement, and so the remaining 52 shared rivers will have official agreements by 3053 AD. Taking into account changing demographics, global warming, climate change, and other unforeseen happenings that are yet to occur, the year 3053 is too far to move towards.

It must be noted that some elements of trans-boundary water cooperation leading to IWRM have already been adopted previously by the two nations by the various agreements that they share (1972 Statue, 1996 Agreement on Ganges, as well as the Draft Teesta Agreement). Given below are those elements. They are acknowledged in the treaties between the two nations.

- **Equitable and Reasonable Utilization and an Obligation Not to Cause Significant Harm:** Articles IX and X of the 1996 Ganges Treaty emphasise the principles of equitable utilization and an obligation not to cause harm. Article IX states *"Guided by the principles of equity, fairness and no harm to either Party, both*

the Governments agree to conclude water sharing, Treaties/Agreements with regard to other common rivers." Article X mentions: "The sharing arrangements under this Treaty shall be reviewed by the two Governments at five years interval or earlier, as required by either Party and needed adjustments, based on principles of equity, fairness and no harm to either Party made thereto, if necessary." This provision has also been adopted into the Draft Teesta Agreement under its Article VIII. However, in both the treaties, there is not much scope for joint management as they follow a mere separation and a formula for sharing water. While this might be helpful to address short term issues, the long term solution lies in cooperating and jointly managing the resources.

- **Principles of Cooperation and Information Exchange:** All three agreements between India and Bangladesh have provisions on exchange of information on the flow of the river as well as flood data.

- **Peaceful Settlement of Disputes:** The provisions on dispute settlement is provided for in the three treaties, with the Draft Agreement having the most elaborate set of provisions on the same.

- **Water Quality and Environment Protection:** The Teesta draft has provisions to maintain the quality of the Teesta water. An interesting aspect of the agreement is Annexure-III which refers to the quality and standards of the waters of the Teesta River. These include Temperature, PH level, Turbidity, Dissolved Oxygen, Bio Chemical Oxygen Demand (BOD), Nitrate, Phosphate, and Faecal Coliform amongst others, the values of which are to be jointly decided by the parties. The Draft Agreement clearly stipulates that *"the two sides shall take all necessary measures jointly and separately to ensure compliance with the jointly agreed quality and standards of waters"* as set out in Annexure III. This is an important provision which will ensure that the two countries take efforts to maintain the health of the river and give it a priority. This is a commendable effort on both sides as such a provision which is important to sustain the water has never been included in any former treaties between India and Bangladesh. Maintaining the quality of water is also envisaged under the 1997 UN Convention on the Non Navigational Uses of International Water Courses.

- **Institutional Mechanisms:** RBOs are the most common means of trans-boundary water governance and they are designed to implement IWRM in trans-boundary water basins. India and Bangladesh also have RBOs, the main being the Joint Rivers Commission which governs all the 54 shared rivers between the nations. With the signing of the Teesta River agreement, there will also be constituted a Joint Committee which will govern the Teesta river. The two mechanisms can certainly help towards the introduction and implementation of IWRM.

6.1 Joint Rivers Commission

India and Bangladesh signed the 'Statute of the Joint Rivers Commission' on 17 March 1972. The agreement governs all rivers common to both the nations. The treaty contemplates the establishment of the Joint Rivers Commission which was envisaged as an overarching body to oversee all 54 shared rivers between India and Bangladesh. However, what was agreed upon in the Statute is not being adequately implemented on the ground.

Joint Rivers Commission as per the 1972 Statute

According to the statute, the JRC must comprise of a chairman and three members of which two

members shall be engineers. The chairman and members hold office for a period of three years. The chairmanship of the Commission is to be held in turns between India and Bangladesh on an annual basis. The two governments can appoint as many experts and advisors as it desires to the Joint Commission. Also, the mandate is for each government to provide the necessary support staff for the Commission's representatives to aid them in the discharge of their duties.

The treaty contemplates that the functions of the JRC will be as follows:

- Maintaining communication between the two governments to ensure joint efforts in order to maximise the benefits from the common rivers.
- Formulating proposals on:
  a) Advance flood warning
  b) Flood forecasting
  c) Cyclone warnings
  d) Coordinate research on flood control.
- Formulating flood control works and recommending implementation of joint projects.
- Studying flood control and irrigation projects so that water of the region can be used on an equitable basis.

Ordinary sessions of the Commission are to be held "as often as necessary" but generally it should be 4 times a year. The decisions taken by the Commission shall be unanimous. The meetings may take place alternatively in the two countries subject to the convenience of the government. Special meetings of working groups or ad hoc expert groups which are nominated by the governments can be arranged, if required.

The treaty contemplates that when differences arise with respect to the interpretation of the treaty, it should be referred to the governments who will in turn deal with them on a 'bilateral basis in a spirit of mutual respect and understanding.' It is unclear from the provision as to who would refer the dispute to the governments. Also, it does not provide for a specific mechanism by which the differences can be resolved. The only inference one can draw is that the agreement obliges the parties to address the issue through diplomatic processes. However, both the Ganges and the Draft Teesta Agreement provide that disputes regarding the implementation of the arrangements in the respective agreements could be referred to the JRC.

Joint Rivers Commission in Practice

Structure of the JRC: Two Parallel Bodies and Not a Joint Commission

The structure of the JRC as per the Statute recommends that there is one body with members from both the states. Also, the chairmanship of the JRC is held in turns between India and Bangladesh (see above). However, in practice there are two separate JRCs working in both countries with two separate Chairmen. Also, until January 1978, officials of the two countries were nominated as Chairman for the two sides, thereafter; the Chairmanship of the Commission was confined to the Minister of Water Resources. The office of the JRC is supported by a team of engineers, scientists and staff who provide expert services as well as secretariat support. Nevertheless, it is clear that the JRC is essentially two parallel bodies and does not function jointly. For example, the Bangladeshi JRC is headed by a chairman of its own nationality and has about 48 members. Until 27 June, 2000, JRC office was manned by officials of the Water Investigation Directorate of Bangladesh Water Development Board. From 28 June 2000, JRC began operating as an independent organisation under the Ministry of Water Resources. This is similar on the Indian side as well.

Meetings and Outcomes

The Joint Rivers Commission (JRC) since its establishment in March, 1972 until March 2010 has held 37 meetings. The issues mainly addressed at these meetings are:

- Sharing waters of common rivers
- Transmission of flood related data from India to Bangladesh
- Construction and repair of embankment and bank protection works along common/border rivers
- River Inter Linking project of India
- Tipaimukh Dam project of India (River Barak)
- Mahananda Barrage constructed by India.

However these meetings are highly erratic in nature. For example while the 36th meeting of JRC took place in 2005, the 37th meeting only occurred in 2010. This completely disregards the mandate of the Statute which states that the JRC is to meet on a quarterly basis. Also, while the JRC governs all 54 rivers, it chooses to concentrate on only on a few in practice.

Nevertheless, there several are notable achievements of the JRC which cannot be ignored and they are as follows:

1. The signing of the 1996 Ganges treaty is regarded as the most significant achievement of JRC.
2. The ad hoc sharing of the Teesta River water during the dry season was decided upon in the 25th meeting of the JRC which was held in Dhaka on 20 July 1983. This ad hoc sharing agreement was valid up to end of 1985.
3. The JRC undertook bilateral studies and investigations on flood control and water management with China, Nepal and Bhutan during the period 1988-1991.
4. The JRC played a significant role in bringing together the parties to consider signing the Teesta agreement. In 2010, during the 37th meeting of the Joint Rivers Commission at the ministerial level, the two states decided to sign an agreement on Teesta water sharing by 2011 and for that purpose the draft agreement was exchanged between the parties.

Recommendations to Revamp the JRC

The governments have a plethora of options which range from ensuring that the JRC follows the letter of the law as laid down under the 1972 Statute, to bestowing some additional functions or powers to the JRC. Article 4(ii) of the 1972 Statute states that *"The Commission shall also perform such other functions as the two Governments may, by mutual agreement, direct it to do."* Hence, India and Bangladesh can utilise this provision to revamp the JRC and equip it with better features which will help it to deal with issues relating to the management of water resources in an effective manner. In order to become effective, the JRC's functioning and practices will have to evolve to match the needs on the ground.

1. Establishing One Overarching Institution

India and Bangladesh will have to work towards implementing the provisions of the 1972 Statue which states under its Article 1 states "There shall be established an Indo-Bangladesh Joint Rivers Commission, hereinafter referred to as the Commission." A single body will ensure actual joint management of resources and strengthen cooperation. It will be able to effectively engage with various stake holders such as groups of farmers or fishermen dependent on the rivers on both sides. Having a single body will ensure that the decisions regarding management of river bodies are taken in an efficient manner.

2. Chairmanship of the Joint Rivers Commission

The Joint Rivers Commission thus formed will need a dynamic leadership which will help it to function in a manner agreed upon by the parties. Hence a careful consideration must be given to the person appointed as the chairman of the Joint Rivers Commission. The system of co-chairman should be done away with in order to ensure that the Commission functions as one body and not two parallel commissions. It is suggested that an eminent personality of Indian or Bangladeshi origin should be nominated alternatively on an annual basis for the post. This would ensure that the Commission has certain amount of autonomy to carry out its functions as per the mandate of the Statute and not get exceedingly influenced by short term political considerations.

Currently, the Ministers are joint Chairpersons. However, the Ministers, as well as Secretaries of the Water Resources Ministries, have a large set of responsibilities which makes it difficult to provide dedicated attention to the bilateral water issues between India and Bangladesh. Most of the issues that Ministers or Secretaries of the Water Resources Ministries have to deal with are domestic in nature. Having an independent Chairman will make it possible to give adequate and effective attention to the bilateral water issues. In any case, the Chairman will work in close consultation with the governments. An eminent person can bring political and moral weight to the decisions of the JRC. Thus, having an independent and prominent Chairman on an alternative basis will raise the profile of the JRC and enhance the possibilities of political support for implementing its decisions.

3. Secretariat of the Joint Rivers Commission

Empirical evidence shows that that River Basin Organisations (RBOs) across the world have functioning organisational structures including a Secretariat, Ministerial Council and expert committees. The exact structure is determined by the specific needs of the basin and the countries involved. An effective secretariat helps to coordinate meetings in a regular and timely fashion, to prepare background material for meetings, to follow up on decisions taken in the meetings and to liaise with different departments within and outside governments in the countries concerned. In the case of the revamped JRC, with an independent Chairman, it will be essential to have a full time Secretariat with one location, but with staff and experts from both countries. In South Asia, the SAARC Secretariat has set a precedent for a collaborative institution. It should be much easier in the case of the JRC to have such a body. The Secretariat could be in Bangladesh as it is the smaller of the two countries, or it could be in Kolkata, to be close to the basin shared by the two countries.

4. Establishing Expert Committees

The JRC is an umbrella organization that caters to all issues pertaining to shared rivers between India and Bangladesh. However, since there is a diverse range of issues, it might be useful to create independent expert committees focused on specific themes. For instance, several Indo-Bangladesh riverine systems are prone to floods and droughts that are detrimental to the population and infrastructure in the river basins. Also, most of the surrounding regions indulge in agricultural practices as a means of income and livelihood that rely heavily on water.

These expert committees could focus on subjects such as the following:

a. Disaster Management – focus on flood control, drought management, early warning systems, rescue and aid, recovery and response and post-disaster reconstruction.

b. Data Collection and Monitoring – focus on

sampling, testing, monitoring and assessment of the quality of water on a regular basis and also jointly monitoring the flow data (as against the current practise of separately measuring the flow data and merely exchanging the information).

c. Water Conservation and Augmentation – focus on implications of global warming and climate change, water conservation techniques, irrigation practices, cropping patterns, agricultural methods and ways of augmenting water flow.

The above three expert committees are mere illustrations of what can be done. It will be for the revamped JRC to determine the number of expert committees, their focus and their tasks. Also, the number and focus of expert committees can be expected to vary from time to time depending upon ground realities and needs.

5. Regular Meetings

It is important for the JRC to meet on a regular basis to provide and maintain a momentum for the work of the Commission. While the JRC is supposed to meet on a quarterly basis, the two nations can look into whether this is a feasible option and perhaps agree upon a biannual meeting. However, the time period thus agreed upon for the meeting must be strictly adhered to. Also, the meetings of the JRC should be encouraged to take place irrespective of the political climate in both the nations.

6. Considering All River Systems

The JRC will have to consider all 54 rivers as a single inter-connected system rather than as 54 different rivers due to the complex way in which these rivers flow; many often feed each other, have common tributaries and distributaries and some even follow similar paths. Rivers such as the Teesta, Jaldhaka, Sankosh and Raidak follow similar paths and all meet the Brahmaputra just kilometres from each other. Most of the smaller rivers end up feeding into the Ganges or the Brahmaputra. Thus, isolating the Teesta River to form an agreement on from its neighbouring rivers such as the Jakdhaka may not be an optimum solution. In order to find out how exactly these rivers are inter-connected and what are the different river systems that can be isolated from the others, it will be necessary to conduct a hydrological survey of the 54 rivers from source to sea on both sides of the border.

7. Joint Action

According to Article 4 Provision (i) (b) of the Statute, the JRC can recommend the implementation of joint projects. If taken forward, joint projects can include steps such as cleaning of rivers to protect their health, flood control mechanisms, joint action for disaster response, joint action for drought relief and setting standards for pollution control, to name a few. Joint projects are likely to be more effective as they will act on the river or river system as a whole, rather than on each side of the border. Joint action on issues such as disaster response will also result in rapid response in times of disasters and will aid the people who are directly dependent on the river.

8. Dispute Resolution Mechanism: Arbitration

Disputes between riparian countries on water sharing are common. However, it is important to resolve them in an amicable manner and within a short period of time. Having an effective dispute resolution mechanism in place will greatly help in the process. It is suggested that the two parties agree upon Arbitration as a means of dispute settlement. Arbitration is the alternative to a dispute resolution system via the means of a court. It has all the similar processes of the court but with greater flexibility. The parties can decide upon a suitable panel as well as the venue for the same. The decisions of the arbitral panel are often taken expeditiously as compared to other judicial means

and they are binding upon the states. Arbitration is neither as informal nor loosely binding as negotiations or mediation and is not as rigid as a court process.

It is worthwhile to note that the constitutions of both India and Bangladesh state that disputes need to be resolved by peaceful means and they must strive foster international peace and security. Article 51 of the Constitution of India states that "The State shall endeavour to — *(d) encourage settlement of international disputes by arbitration."* Similarly, Article 25 of the Constitution of Bangladesh states that in order to promote *'International peace, security and solidarity', "the State shall base its international relations on the principles of respect for national sovereignty and equality, non- interference in the internal affairs of other countries, peaceful settlement of disputes ..."*

This is also reflected in the 1972 Statute which states that the JRC has the power to resolve all disputes that arise with regards to the interpretation of the Statute. Those disputes that are not resolved are to be referred to the governments who will deal with the same using diplomatic process. The recommendation to agree upon an arbitration clause only furthers India and Bangladesh's commitment under their respective Constitutions as well as 1972 Statute.

9. Public Reports

The JRC presently has the requirement of submitting an annual report on the 31st of January every year. This report could be made public. If agreed upon, there could also be a way to increase public interest in the JRC by distributing this report to local civil society organizations, other government departments, academic institutions and eminent personalities in the region. In addition, the JRC may decide to come out with special reports as and when needed in its best judgement.

10. Relations with Parliamentary and Media Organisations

The revamped JRC can consider making special efforts to develop relations with parliaments and media organisations in India and Bangladesh. Experience shows that problems arise between the two countries due to misunderstanding and lack of transparent information. The parliaments and the media have linkages with common citizens. If the JRC makes special efforts to develop an active relationship with them, it will help build confidence, develop mutual appreciation of respective concerns of the two countries and help facilitate convergence of positions. This will help transform India-Bangladesh relations with regards to transboundary water from that of suspicion to the one of trust and good faith. It may even have positive implications beyond water relations. The revamped JRC can thus become an instrument of good relations between the two countries which have always desired to have a positive and constructive relationship but at times failed to do so.

6.2 Need for Shared Studies and Exchange of Information

There are several approaches and methods that could be undertaken to manage and foster better water relations between India and Bangladesh. These could include technical studies, information sharing and joint initiatives.

Changing Media Rhetoric

At the most basic level, the two nations could look at changing the various perceptions relayed by the media in their own country. Media plays an important role in the dissemination of information that leads to generation of public opinion which could be for or against cooperation between the two nations. Lack of or insufficient information also leads to speculation. This can be seen from various

news reports that have been published since the Teesta Agreement was left unsigned in 2011. These speculations range from installation of hydro power plants which would adversely affect the flow of river, unilateral diversions and deliberate attempts to cause floods. Therefore there needs to be sensitization of issues involving transboundary water in India and Bangladesh. Also, the involvement of the media will ensure the following:

1. Dissemination of information relating to the rivers and free access to such information.
2. Generating awareness amongst people which would be helpful in supporting measures taken in relation to the health of the rivers.
3. Ensuring the reduction of hostility between the two nations.
4. Verification of facts which create misunderstanding between the two nations.

With respect to verification, there are lessons to be drawn from a recent experience. The Indian government invited Bangladeshi journalists to India to examine the veracity of a rumour that was being propagated about India building a dam on one of the shared rivers which would heavily impact the Bangladesh side. The media persons were taken on a field trip in order to verify the presence of such a construction. This led to the quelling of speculation that would have caused misunderstandings between the two nations.

A concerted effort to bring media persons together has been undertaken by the Nile basin countries which facilitates the interaction of journalists between various nations. Such an effort, tailor-made for India and Bangladesh relations could be undertaken.

Indo Bangladesh Shared Rivers Box

The Indian and Bangaldeshi government can also look into the dissemination of information on river basins, projects, environment protection measures through the creation of specific modules on each river shared by the two nations in different languages suitable to be read by all people in the two countries. A similar exercise has been carried out by the Danube basin countries and is called the 'Danube Box', but it aims at rendering information to school children. Such an initiative has also been replicated in other places such the Saar Box in Germany, the Black Sea Box and the Orange River Box in Southern Africa. In the case of India and Bangladesh, it is suggested that such a project could be undertaken not just targeting school children but also others who are dependent on the shared rivers.

Knowledge Exchange on Transboundary Water Management

India and Bangladesh could greatly benefit by doing an analysis of the various transboundary water sharing mechanisms that exists between different nations in the world. This would help the two nations to explore further the possibilities of joint management and cooperation on all the rivers that they share. It is suggested that such a process of learning could be undertaken through the increased participation of the Joint Rivers Commission in the International Network of Basin Organizations (INBO). The INBO was established in 1994 to integrate various agencies which work on river basin management throughout the world and give them a platform to share their interests and experiences.

India and Bangladesh could also undertake such knowledge exchange programmes with other select transboundary organizations in the world, identify best practises and learn from them.

Glaciers Report and Analysis

Glaciers are an important source of water, especially for the early journey of the Teesta. Currently, there is no official information provided regarding the glacial contribution to the river flow. It will be extremely useful to study the regional glaciers and calculate their quantity in terms of length, depth and volume, and monitor their quality, especially with the growing threat of global warming and climate change. This information will beneficial both India and Bangladesh as it will allow them to understand the flow of Teesta better, and make informed and realistic arrangements and decisions regarding the river basin in the future.

Climate Change Adaptation Strategy

Climate change will have a major impact on the river basins in India and Bangladesh. It would thus be pertinent for the two nations to embark on a joint study on climate change and its implications on the basin. The study could enumerate on the impact of climate change on water resources shared by India and Bangladesh and methods to deal with the same. Such a study was undertaken by the Danube river basin countries.

Joint Disaster Management Initiative

India and Bangladesh both experience floods and droughts owing to the rivers they share. Mostly, both droughts and floods transcend boundaries, affecting both countries as well as their neighbours at the same time. It is suggested that a joint disaster management initiative would help in averting such humanitarian emergencies as well as deal with them. India and Bangladesh both are members of SAARC and were instrumental in establishing the SAARC Disaster Management Centre which aims to provide policy advice and build capacity in the areas of strategic learning, research, training, system development, expertise promotion and exchange of information. The SAARC Disaster Management Centre's framework was established to improve the region's disaster management capacity and disaster response.

India and Bangladesh could use this regional mechanism to cooperate on disaster prevention and management owing to the rivers that they share or work towards a bilateral mechanism. It is pertinent to note that joint measures on flood and drought prevention and management is also mandated by the Statute of the Joint Rivers Commission which under its Article 4.

6.3 Lessons from Around the World

History is replete with examples of countries cooperating to jointly manage their water sources. Given below are the examples of countries that have undertaken such joint management measures in spite of the existence of various deterrents such as domestic interests, federal structure, strained relations between nations and climate and environment related factors.

a) Peru and Bolivia

Peru and Bolivia share Lake Titicaca and have taken steps to ensure joint management of the resource. Presence of factors including extreme hydrological conditions, environmental degradation, insufficiently regulated water flow and the presence of poor people living in the lake basin led the two nations to look into options of joint management. Their efforts began as early as the 1950s when the two nations agreed to sign an agreement to constitute the Binational Autonomous Authority of Lake Titicaca (ALT). While Peru signed and ratified the agreement Bolivia did not ratify it for about 30 years. As Bolivia faced extreme drought and flood situations, it realised that cooperation and joint management was the way to move forward and thus ratified the agreement. However, even in the thirty year period when Bolivia had not ratified the

agreement, the two nations conducted coordinated studies and exchanged information keeping in mind the larger goal of conserving and sharing the river basin.

The interesting aspect of the cooperation between Peru and Bolivia is that they recognise the lake as an indivisible condominium, which is shared body of water owned by both the countries. Hence, the countries exercise exclusive and indivisible joint ownership over the surface water and the watershed of the lake region. This has reinforced high level of co-operation and political will. They also share the benefits of the Lake Titicaca in equal measure and have established compensation criteria in case there are bigger benefits for one country. This form of recognition and cooperation has gone a long way in reducing any form of conflicts over the water resources.

b) U.S and Canada

US and Canada share about 150 lakes and rivers most of which form the boundary between them. Due to reasons such as diversions by both the nations, as well as changing of the course of the water bodies, a need arose for the two countries to come to an arrangement on water sharing and water governance with respect to all the shared water bodies.

One of the impediments in their path to having an agreement in place was the federal structure of United States. The system of administration in the US and Canada is such that their provinces have control over water resources within their territory and may use it in a manner they deem fit. Hence coming up with a basin wide agreement was not feasible. However, signing a treaty on boundary waters alone was possible, as it fell completely within the jurisdiction of US federal government. Similarly, on the Canadian side it was deemed feasible to limit jurisdiction of the treaty to boundary water only. This would in turn allow the Canadian government to sign the agreement without consulting its provinces. Any concern for the sovereignty of the province being compromised, leading to them opposing the treaty, was put to rest.

When negotiations on the agreement between the two nations took place, the Canadian government placed conditions to mitigate the impact of any spatial restrictions. A litigation mechanism was put in place which would ensure that when transboundary harm occurs, an injured party of a country would have the same rights and legal remedies as the citizens of that country where the injury occurred. This allows Canadian citizens to file lawsuits against U.S. citizens in American courts of law. Canada also demanded that an arbitration clause as well as a reference mechanism be added in the agreement.

The aforementioned conditions were accepted by the US government. However, the reference mechanism was made to be contingent upon the mutual consent of the two state parties and its recommendations would not have a binding value. Subsequently, in 1909, the two nations signed the Boundary Treaty which led to the establishment of the International Joint Commission (IJC). The IJC has jurisdiction over all the shared water bodies between US and Canada.

c) Russia and Finland

Russia and Finland share about 20 trans-boundary rivers. The cooperation between Finland and Russia was consolidated through the 1964 Agreement for all rivers (Finnish Russian Agreement on the Utilization of Trans-boundary Watercourses). The agreement incorporates the principles of the International Law Association´s (ILA) Helsinki rules (1966) and envisages the equitable and reasonable sharing of water resources. It also covers a gamut of issues including floods, water scarcity, timber

floating, navigation, fisheries, pollution, water-related frontier guard issues, public health and economic considerations.

The agreement led to the establishment of the Joint Finnish – Russian Commission (JFRC). It governs all the water bodies shared between Finland and Russia similar to the IJC. This has facilitated a high level of trust between both countries. The Commission's long-term cooperation has been successful and well respected also in the field of water protection.

It is pertinent to note that the 1964 agreement continued to operate between Russia and Finland even after the dissolution of the Soviet Union. Regime change or even major events like disintegration of a nation did not prove to be an obstacle when it came to trans-boundary water cooperation. Also the structure of the Joint FRC is similar to JRC between India and Bangladesh. Finland and Russia each nominate three members (including chair), three deputy members, experts and secretary to the JFRC. The JFRC works jointly, takes decisions unanimously. Their decisions are binding upon the parties.

As a result of sustained cooperation between the countries, they managed to agree upon the 'Lake Saimaa and Lake Vuoksi Discharge Rule'. The rule stipulates the regulation of the amount of water flow during drought and flood period. This would keep a check on the overall losses in the Saimaa and Vuoksi basin due to the natural disasters. The rule was implemented in 1991.

d) Trade-offs

An effective means of bringing countries to cooperate would be to identify matters that the two countries will be willing to trade-off on in return for cooperation on water. Some of the examples of trade-offs which gave way to water cooperation are:

1. In the Syr Darya basin, Kyrgyzstan agreed to meet the irrigation needs of Kazakhstan and Uzbekistan during the agriculture season and also supply electricity while Kazakhstan and Uzbekistan would deliver energy (gas and coal) during winter to Kyrgyzstan.

2. In the Orange-Senque basin, Lesotho agreed to part with its share of water to South Africa in return for financial aid from South Africa to help in its development.

3. In the Rio-Colorado basin, the US agreed to finance Mexico's efforts towards improving water infrastructure in return for Mexico's cooperation on the revision of water allocation between the two states.

Such trade-offs can be identified even in the case of the India and Bangladesh which will bring them to cooperate on water sharing issues as well. Reports suggest that India and Bangladesh along with the Teesta agreement were also going to sign an agreement allowing transit access. While Teesta and transit need not be a direct 'give and take', it is important to create an atmosphere of trust and goodwill which motivates India to sign the Teesta Agreement overcoming all domestic odds and motivates Bangladesh to help India improve its connectivity with the people of Bangladesh, as well the North-eastern region of India. This need not be a zero-sum game. India can benefit from increased movement of capital, goods, and labour between its provinces. Bangladesh can benefit from increased Indian investments, transit fees and know-how transfer. Identifying more such points of trade-offs would help fructify a joint management arrangement between India and Bangladesh on water resources. Most significantly, such an approach would enhance stakes for both countries in each other's stability and progress.

Gradual Multilateralism

India-Bangladesh water cooperation can provide the foundation for broader cooperation in the Eastern Himalayan region.

Building a strong foundation of an India-Bangladesh water co-operation framework will be essential as the region's water dynamics are somewhat delicate at present. Initially, it may be more pragmatic to achieve trilateral co-operation with Nepal or Bhutan than it would be to form a multilateral co-operation mechanism covering the entire Eastern Himalayan region.

In April 2013, it was reported that India, Nepal and Bangladesh have decided to co-operate to exploit the hydropower potential of the Ganges basin. The proposal includes a provision for a Committee of Water Resources and Power Ministries for Nepal, India and Bangladesh (NIB). This Committee will have the highest decision-making power and will be subject to the governments of each country. The Committee will have Ministers for Water Resources or Irrigation as co-chairs and the Ministers of Power as co-vice chairs. The NIB Committee will have the support of a Technical Advisory Committee, made up of the Secretaries of Water Resources or Irrigation, Power or Electricity. The Technical Advisory Committee will also have a minimum of two technical experts on subjects like water resources management or power. Also on the Technical Advisory Committee will be a representative of the Foreign or External Affairs Ministry of each country.

At the same time, another proposal for India, Bhutan and Bangladesh to co-operate on the Brahmaputra was also announced. The three countries aim to work together to jointly develop and manage the Brahmaputra basin's total water resources and hydropower potential. This initiative has been named the Bhutan, India, Bangladesh (BIB) Initiative.

Bangladesh India and Bhutan also held tri-partite talks on water sharing in April 2013 in Dhaka, Bangladesh. Joint Secretary level talks were held for the Working Group on Water and Power and the Working Group on Transit and Connectivity. The meetings are part of an overall move by the three countries to jointly manage trans-boundary rivers, expand basin management of these rivers, improve connectivity for trade and services and explore the immense hydropower potential of region's rivers in a sustainable manner.

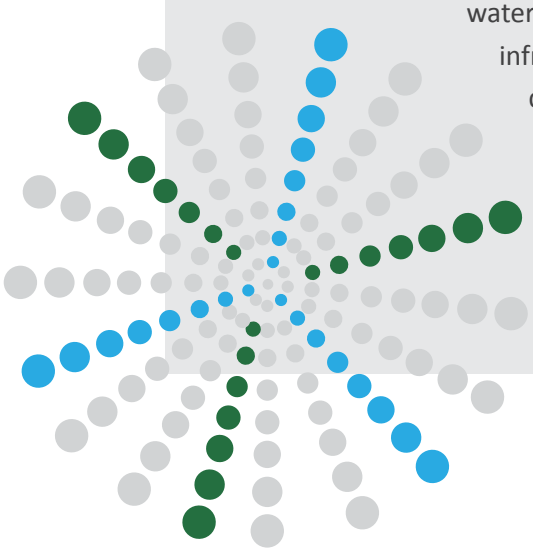
Gradual multilateralism may be easier to achieve, may be more practical and politically feasible in the region than the proposal of an over-arching multilateral body comprising of all regional players at the outset. Thus, starting with a strong foundation of India-Bangladesh co-operation, then adding Nepal and Bhutan may make it possible to extend the cooperation to the entire Eastern Himalayan region in the long run.

CHAPTER 7
BLUE PEACE

Co-operating on overall water security could pave the way for broader co-operation between India and Bangladesh, and then perhaps gradually, the Eastern Himalayan region in general. Strategic Foresight Group's Blue Peace approach advocates collaborative, comprehensive and sustainable solutions to trans-boundary water issues. It explores how water can be used as an instrument of peace rather than conflict. Building co-operation on water-based issues and then broader co-operation using this foundation is a way forward.

7.1 Improving Overall Water Security through Joint Action

Considering the geological setting of Northeast India and Northwest Bangladesh, there could be significant riverine problems in the near future, such as being parched during dry season, flash floods during the monsoon and overall water quality issues. These problems could lead to lack of water availability, damage and destruction to property and infrastructure, water-borne illnesses, fatal accidents and deaths. Several specific suggestions have been made in this regard elsewhere in this paper. Also, many other experts may have additional ideas to contribute. It may be worthwhile for India and Bangladesh to



consider publishing a Joint Water Paper on Water Security of the two countries with a focus on relevant geographies.

7.2 Maximising Benefits through Eco-tourism in North Bengal and NW Bangladesh

India and Bangladesh can work together to explore the eco-tourism potential of this region building on the cooperation they have already established in the Sunderbans.

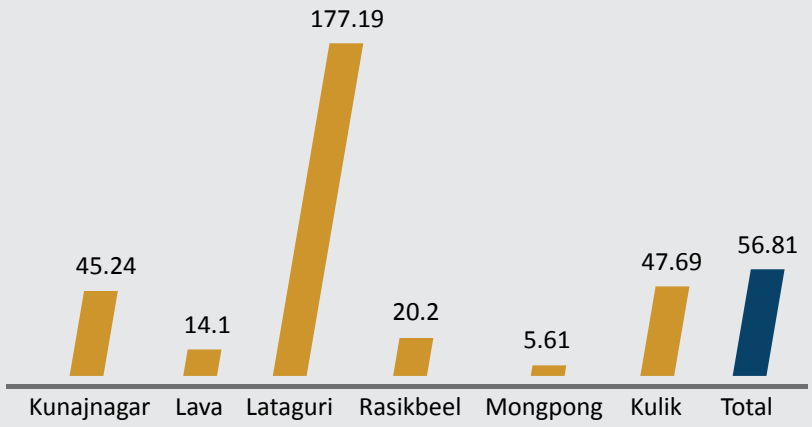
Eco-tourism generates revenue as it invites foreign exchange, and generates employment. The hospitality industry, transport sector as well as manufacturing industry (related to souvenirs and handicrafts) gets bolstered. As a result, eco-tourism development leads to economic development which empowers the local people. India and Bangladesh can maximise benefits from eco-tourism and introduce it as supplementary activity for added income.

North Bengal is home to many rivers such as the Teesta, Jaldhaka, Torsha, Sankosh, Mahananda, Raidak and Atrai and is rich in natural beauty such as forests, Himalayan foothills, tea gardens etc. As discussed earlier, the economy of this region is predominantly agrarian. Agriculture in this area is highly dependent on monsoons which bring in excessive rainfall during peak season while there is very little water in the lean season. It is in this season that people are most affected due to loss of primary livelihood. Supplementary activities can help fill in this gap. While, aquaculture is an option, eco-tourism is another sector which needs to be looked at as it can not only sustain the people of the region during lean season, but become profitable as well.

In North Bengal, most of the eco-tourism destinations have developed in the Jalpaiguri district. Eco-tourism has developed to a large extent in destinations like Lata guri, Kunjnagar, Jaldapara, Rasikbeel, Rajabhatkhawa and Kulik in West Bengal. Other places like Rupam Valley, Mongpong, Rasomati beel, Tekunia , Dakshin Khair bari, Sandakphu, Kalimpong and in Red Panda Camp of Neora Valley National Park have also seen the growth of eco-toursim.

As is seen from the table below, the growth of eco-tourism in North Bengal between 2001 and 2008 has

Growth rate percentage of eco-tourist inflow in North Bengal between 2001 and 2008



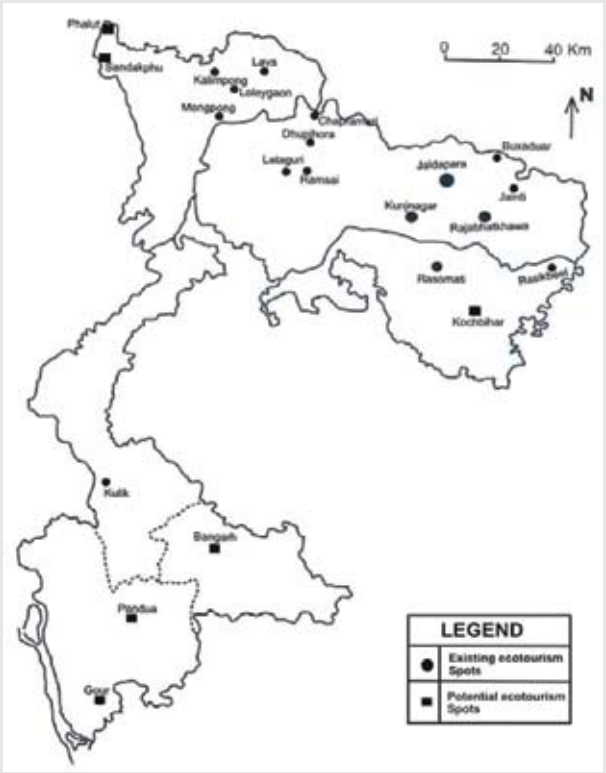
Source: Various

been 56.81 per cent. Lataguri has seen the highest leap in eco-tourists at a growth rate of 177.19 per cent. Lataguri is located near the Gorumara National Park and has been able to increase its revenue through tourism mainly due to the rich local biodiversity, surrounding ethnic villages like Saraswati forest village and Budhuram forest village, coordination between forest department and private entrepreneurs and the participation of local people in activities such as transport, hospitality and tourist guides. Even though the over-all growth rate of eco-tourism is high, the region is still not as well-known as other parts of the countries in terms of tourism. This shows the potential of growth in eco-tourism in the region, which if exploited, could bring about a supplementary source of income for its people and lead to the development of the entire region as a whole.

Likewise, in Bangladesh, there are potential eco-tourism spots including lakes, ponds, tea gardens and river beaches. Tourism destinations which have seen development are mostly in the Panchagarh district of the Rangpur Division and include Tetulia, Maharaja Dighi (large pond) at Bhitargarh, Bhitrar Shalmara, Shal forest of Bhitargarh and government forests on the banks of the rivers Chawai and Karatoya. The Panchagarh district also boasts of the biggest mango tree in the country. The Nilphamari district, famous for its Nilsagar Dighi (large pond), attracts migratory birds each year and hence, witnesses an annual influx of tourists. The Lalmonirhat district is also home to lakes and large ponds which are tourist attractions.

One of the biggest examples of the benefits of eco-tourism is the MoU between the Government of

Existing and Potential Ecotourism Spots of North Bengal



Source: http://www.chios.aegean.gr/tourism/VOLUME_6_No1_art14.pdf

According to the MoU, both countries aim to –

(a) Share relevant information between the concerned officials, forest and otherwise, of both the countries;
(b) Explore the possibilities of joint research and management projects;
(c) Share technical knowledge with the common goal of conservation and management of biodiversity of Sundarban;
(d) Organize joint tiger estimation at regular intervals;
(e) Execution of patrolling exercises by the Forest and other relevant Officials of both the Parties along the respective borders to prevent poaching or smuggling of derivatives from wild life;
(f) Promote capacity building exercise and exchange visits of Forest Officials of field level in order to better understand and share ideas and problems of management, biodiversity conservation, climate change adaptation and promotion of sustainable socio-economic development, and ecotourism;
(g) Exchange personnel for training and promotion of education in forestry, including at the Wildlife Institute of India, Dehradun financed by the Government of India.

the Republic of India and the Government of the People's Republic of Bangladesh on Conservation of the Sundarban signed in September 2011. The Sunderbans National Park is situated at the delta of three major rivers, the Ganges, the Brahmaputra and the Meghana at the point where they flow into the sea, crossing from India into Bangladesh. Around 62 per cent of the mangroves are in Bangladesh while the remaining 38 per cent are situated in India. As of 2010, Sunderbans was experiencing a sea level rise of 3.14 mm per year compared to the global average of 2 mm.

These aims can be taken forward to include other joint eco-tourism projects between both the countries. This MoU also emphasizes the importance of working on the entire river basin together.

There is tremendous scope for development of eco-tourism in this region. Basin-wide development of the river basin's eco-system is likely to enhance the potential of eco-tourism destinations in this area.

7.3 Mutually Beneficial Investments for Bangladesh and India

West Bengal is popular for its eco-tourism, horticulture, timber and tea production. Despite catering to a large fish-eating population, fish is currently imported from other parts of the country and covers almost half of the total consumption in the state. This is because there are certain obstacles such as lack of technology and lack of fishing infrastructures (trawlers and fish feed

manufacturing units) that hinder the smooth functioning of fish production. On the other hand, in Bangladesh, agriculture and fishing are the prominent livelihood activities. However, there is a lack of fish preservation techniques, technology, and bad transport and storage facilities. Both sides encounter similar problems regarding fish preservation and could make joint contributions to explore possible techniques and methods.

India and Bangladesh can increase their cooperation by contributing to mutually beneficial investments, such as community-based livelihood programmes. There are several opportunities for both sides to fill the void of their counterparts and gain from some information and technology sharing. For example, both countries are pursuing the creation of low cost indigenous technologies to mitigate the effects of arsenic-contaminated water. In the future, the successful development of these technologies could provide safe drinking water to rural parts of both countries that suffer from arsenic contamination in water. In the long run, the development of low-cost technology to remove arsenic from water sources could help in improving the health of people, especially the rural poor.

Indian and Bangladeshi companies and organizations can play a large role in facilitating exchange of ideas and furthering investments across the border, and gradually all over the countries. Presently, there is a serious trade and transit block, physically caused by bad transport mechanisms. This can be overcome by giving way to navigation and movement of goods across waterways, as it would drastically reduce time and cost. More importantly, it would give rise to employment and generate income amongst the locals.

7.4 Prevention of Illegal Cross-Border Migration

Limited economic opportunities have already led to large-scale migrations from the Teesta Basin, especially in Bangladesh. Frequently, this migration is more than just internal displacement from rural to urban areas and leads to a spill-over effect in neighbouring countries. The addition of changing climate to this equation has worsened the migration statistics.

Bangladesh has witnessed large scale migrations mainly due to the following:

- **Seasonal deprivation:** Seasonal deprivation or monga in Bangladesh stands for the insufficient food supply in the off-harvest season between September and November. Seasonal deprivation, floods, and cold climate have led to lower agricultural production which leaves insufficient stock of food during the period between harvest seasons. The staple in Bangladesh is rice and three rotations of rice are grown in most areas – Boro with harvesting period of March-May; Aus with harvesting period of June-August and Aman with harvesting period of December-February. Hence, the period of September-November witnesses shortage of food. This cyclical food insecurity leads to high rates of migration to cities like Dhaka and Bogra.

- **Climate change-linked migration:** Climate change is linked to the phenomenon of migration in any country. Bangladesh has already started witnessing the impacts of changing climate – frequent floods, cyclones, rising sea levels, desertification and soil degradation; Bangladesh is home to almost all the effects of climate change.

  According to UN estimates, by 2050, Bangladesh could lose approximately 11 per cent of its

land due to a sea level rise of 0.5 metres. This could potentially affect 15 million Bangladeshis. Experts say that by 2050, there may be about 250 million climate change refugees worldwide and out of those, approximately 20-30 million are expected to be in Bangladesh.

Climate migration to urban areas in Bangladesh is not new; people have started fleeing floods and soil degradation (due to rising sea levels) in the south and the droughts and desertification in the north of the country. Internal migration on such a high scale cannot be accommodated within the country, and hence, the spill-over effect is likely to be in neighbouring countries like India. At present, Bangladeshis form the biggest group of migrants in India. According to the 2001 census, around 3 million Bangladeshi migrants were living in India.

The movement of such large sections of economically productive population is detrimental to a country's economy. With thousands of working age people migrating to other countries, the percentage of working age population in the country goes down, resulting in a downward impact on the country's GDP. Economic cooperation between both countries in fortifying supplementary livelihood activities like aquaculture and eco-tourism will help reduce migration. Both the countries can establish skill training centres across the borders which can provide to its citizens the best available expertise available on both sides.

Smuggling is rife in the region and many times, this smuggling forms a part of illicit cross-border trade between India and Bangladesh. In North Bengal, timber is smuggled out of the forests of Dooars to the Dinhata-Gitaldaha area in Cooch Behar, close to the Bangladesh border. Such smuggling involving the timber mafia frequently results in crimes against forest officials and Indian paramilitary Border Security Force. Ivory is also smuggled from North Bengal. Parts of South Dinajpur in North Bengal are used for smuggling cannabis grown in Manipur to other parts of the country. Drugs (medicines such as psychotropic substances) are smuggled across the India-Bangladesh border and during bilateral talks; the two countries have also expressed concern over the same. As a result, India and Bangladesh exchanged a list of places on both sides of the border which are involved in the smuggling of drugs. Cross-border smuggling is also includes the smuggling of cattle where cattle are smuggled from India into Bangladesh. This cattle smuggling has also brought in the problem of counterfeit currency.

Along the border area, there is susceptibility to smuggling of arms and ammunition and the influence of extremist elements. The major causes for this susceptibility include poverty, unemployment, lack of education, and food insecurity. Taking advantage of such vulnerabilities, extremist groups recruit the disgruntled youth from this area and offer financial and other incentives in return. The easy availability of small arms and explosives contributes towards the success of these extremist groups.

Increasing economic activities and opportunities, as a result of cooperation between India and Bangladesh, are likely to decrease illicit activities such as smuggling and related crimes. This will also likely bring down the percentage of youth in the region susceptible to extremist elements. For instance, when Bangladesh stopped Hilsa exports to India, it was noted that smuggling activities increased over the borders which basically deprived Bangladesh of its foreign exchange and the people of West Bengal of Hilsa. Hence, trade barriers between India and Bangladesh need to be evaluated and reduced to an extent where only the most necessary ones are in places. The benefit of this move will extend from the economic sectors to social sectors as well.

7.5 Border Development

Attempts by both sides to develop the common border areas may also be possible as a result of overall water co-operation. An integrated approach for a border development program should necessarily be a joint operation if it is to succeed. Mutual co-operation between the governments of both India and Bangladesh is required to enact such programs and to empower those living in the border regions. Peaceful border areas with strong law and order and well developed economies will build confidence and reduce cross-border migration and illegal activities such as smuggling which take place on a large scale at present. The overall aim would be to make border areas thriving places where communities meet to exchange goods and services, rather than making them an area of separation.

A recent example of such border development is taking place between the governments of Thailand and Cambodia. In June 2013, they agreed to a comprehensive border development program as part of the joint Thai-Cambodian committee on border area development co-chaired by Deputy Prime Minister and Foreign Minister of Thailand and the Minister of Foreign Affairs of Cambodia. Thai officials state that they hope this would serve as a model to develop all of Thailand's border areas. The plans include special economic zones along the border, better connectivity through road infrastructure and railway lines, sale of electricity from Thailand to Cambodia meant specifically for the border areas and plans to ease cross-border trade and travel.

The Department of Border Management under the Ministry of Home Affairs of the central government of India has implemented Border Area Development Programs (BADP) through the state governments, especially for those states along sensitive border areas. It already has plans for internal development along border areas to protect vulnerable populations along the international border. For example, the state government of Meghalaya has the Border Areas Development Department which works on projects like road maintenance, water supply, education programs and security.

CONCLUSION

Overall, there is a positive movement in the relationship between India and Bangladesh. There are unresolved issues regarding trans-boundary water issues that should be addressed by both governments at the earliest, building upon the positive spirit that exists. Currently the issue of Teesta River agreement is an emotional issue for leaders and people from both countries resulting in different positions despite common interests. In the short term, it is important that the Teesta Agreement be finalized and implemented so that it can pave the way for a joint strategy for conservation and augmentation of water resources in the Teesta Basin and holistic and sustainable management of all water resources between India and Bangladesh. In order to do this, all parties will have to recognize the validity of protecting the environmental flow of the river for its long-term sustenance and ecology.

It is important to recognize that the poverty of people, in particular farmers, in Northern districts of West Bengal province in India and North-western districts of Bangladesh is a common concern of both countries. In order to alleviate their plight in winter when the flow of Teesta is relatively lean due to seasonal variations, it is important to have a joint programme for conservation and augmentation of water resources. It is also essential to examine use of new agricultural technology and cooperate in adjusting cropping patterns. The overall objective should be economic development of all people across the Basin.

Sharing a river also means sharing an eco-system. It is imperative that the Teesta eco-system is jointly regulated, managed and rejuvenated. India and Bangladesh face similar issues in terms of environment. They have experience in cooperation for protection of the Sunderbans. They can extend their experience of cooperation to the Teesta with suitable adaptation to the needs of the local geography and population. It is also necessary to go beyond cooperation in environmental protection to collaborative economic development, especially of small farmers and small entrepreneurs in the basin. The two countries can explore joint development of aquaculture, eco-tourism, farmer networks and adjustment of cropping patterns, flood control and preservation of aquifers.

While the Teesta issue has to be addressed in the short run, in the long run the countries cannot afford the approach of having a separate agreement for each river and wasting a number of years coming to an agreement on each individual river. There is a need to think in terms

of a comprehensive long term and collaborative approach which will be sustainable for all shared water resources. This approach will have to be based on the principle of comprehensive, sustainable, collaborative and integrated basin-management.

Sustenance of shared rivers is an issue of long term relevance to the people of India and Bangladesh. Governments come and go in any country. Rivers flow for thousands of years. Short term politics and priorities of a government in power should not come in the way of long term nurturing of the river. Therefore, it is necessary to create mechanisms which emphasis sustainable management of shared rivers on a scientific basis without being subjected to immediate politics. If political leaders allow the creation and meaningful functioning of such a mechanism, they will be able to address the concerns of their constituents for a real change. It is indeed necessary to shift from politics of rhetoric to policies of rationality.

In this regard, it is important to consider the value of institution building. Having institutions which are capable of handling such a large-scale basin management approach need to be built. The Joint Rivers Commission or JRC should be seriously examined and reviewed. It needs to be re-structured in such a way that it is effective in its mandate of managing trans-boundary water resources.

India and Bangladesh need medium and long-term visions to look at the future that can move from bilateral to multilateral co-operation in a gradual and pragmatic way. Any long-term vision for the region will necessarily have to take into account climate change and how it can be addressed to ensure future water security.

The media has an important role to play in relaying the intentions of the governments and bodies like the JRC to the general public and will have to be engaged in a positive way.

The sustainable management of water within and between India and Bangladesh is vital to the national interests of both countries. In the long run, large-scale cooperation along the lines of the economy, trade and transit can be achieved by using water as an instrument of peace-building as outlined by the Blue Peace approach.

Finally, it is important to bear in mind that countries that share rivers often have differences of opinion on specific aspects of allocation and management of water resources. While such different perspectives may appear political, they are often technical. It is common for differences to crop up in all parts of the world. It happens in North America, Europe, Southeast Asia, Africa, Latin America and Southern Africa. In all these parts of the world countries with opposite positions have been able to resolve issues on the basis of scientific assessment of the situation. The relations between India and Bangladesh are essentially positive despite minor irritants. The leaders and people of both countries realize that as important neighbours, they share a common destiny. If they come across specific difficulties in managing specific issues in their relationship, the way forward would be to find innovative ways to distinguish interests from positions, short term from long term, rhetoric from reality and politics from policies. The Blue Peace approach outlined in this paper provides a roadmap to transform trans-boundary water from a perceived source of conflict to a robust instrument of peace and cooperation. It is possible for the people of India and Bangladesh to adapt the Blue Peace framework, not because the alternative is a disaster, but because the people of the two countries have the capability to create a future of hope.

ANNEXURE

INDIA-BANGLADESH ROUNDTABLE CALLS FOR RESTRUCTURING OF THE JOINT RIVERS COMMISSION

An India Bangladesh Roundtable on Blue Peace in the Eastern Himalayas was held in Mumbai on 1-2 July 2013. It was convened by the Strategic Foresight Group and attended by 25 senior diplomats, Members of Parliament, former ministers and experts from India and Bangladesh. The roundtable took place at a time when relations between India and Bangladesh are improving, particularly since the visit of the Prime Minister of Bangladesh to India in 2010 and the Indian Prime Minister to Bangladesh in 2011. There are unresolved issues with regards to trans-boundary water resources which need to be addressed urgently and earnestly in the spirit of good faith and cooperation that currently exists between the two countries.

It is necessary and possible to finalize the Teesta river agreement, bearing in mind the importance of environmental flows for sustenance of the river and ecological security of the basin. However, in the long run it is not feasible to negotiate a separate agreement for each of the 54 trans-boundary rivers between India and Bangladesh. It is necessary to move towards integrated collaborative and sustainable management of all shared rivers between the two countries. It is necessary to apply the principles of Integrated Water Resource Management to the entire Ganges-Brahmaputra basin shared by India and Bangladesh.

The roundtable emphasized the importance of creating robust and sustainable institutions for collaborative water management which can withstand short term political dynamics. In this context, the current functioning of the Joint Rivers Commission is extremely inadequate as there are in effect two parallel national river commissions, instead of one joint commission. It is necessary to establish an India Bangladesh Joint Rivers Commission headed by a prominent Indian or Bangladeshi leader on an alternative basis. The Commission should have a team comprising of nationals from both the countries who can undertake necessary activities for sustainable management of shared water resources in a joint and collaborative manner. It is also important for the Joint Rivers Commission to have an arbitration clause with a well-defined mechanism to resolve differences and conflict of interest.

Considering that many of the rivers shared by India and Bangladesh originate from third

countries, it is also important to have a gradual multilateral approach towards including third countries in the process of water cooperation. The roundtable welcomed the trilateral talks between India, Bangladesh and Bhutan and the possibility of similar talks between India, Bangladesh and Nepal in the future. In the long term it would be necessary to explore ways of cooperation between all countries in the Eastern Himalayan river systems.

The roundtable emphasized the importance of taking into account the impact of climate change on water resources in the river basins shared by India and Bangladesh. As climate change can influence floods, droughts, sea level, rainfall and salinity, any long term planning for the sustainable management of water resources must take into account the potential impact of climatic and environmental factors.

Any effort for sustainable management for water resources in trans-boundary resources would only be meaningful if there is also efficient utilization and quality control of resources within the countries. Therefore the roundtable emphasized the significance of sound water governance and pollution control in domestic and international waters alike.

The participants in the roundtable were optimistic about the prospects of India and Bangladesh for sustainable management of water resources because of the new trends in cooperation for conservation and governance of natural resources. The two countries have already agreed on a programme of collaboration for preserving the ecology of Sunderbans, and particularly replenishing the fresh water supply to the area. There is also an agreement for joint Environmental Impact Assessment and sharing of information with regards to the Tipaimukh project. More such agreements are under discussion.

With this existing spirit of cooperation, it should be possible to construct sustainable institutions for cooperation such as the reinvention and restructuring of Joint Rivers Commission. Moreover, it will be appropriate to explore how water cooperation can be used as an instrument of broader economic cooperation by increasing connectivity, harnessing the energy potential, exploring eco-tourism and other innovative commercial activities for improving livelihood conditions of the people in the basin. The roundtable concluded with confidence in the prospects of bilateral cooperation between India and Bangladesh driven by cooperation in shared water resources achieving a momentum with support from all political forces and other stakeholders in the two countries.

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Strategic Foresight Group (SFG) is a think - tank engaged in crafting new policy concepts that enable decision makers to prepare for a future in uncertain times. Founded in 2002 to create new forms of intellectual capital, our body of work today encompasses over 50 countries, across four continents.

SFG has published over 30 in-depth research reports in English with some translations in Arabic and Spanish. We currently work within three areas of focus: 1. Water Diplomacy 2. Peace, Conflict and Terrorism 3. Foresight Methodology.

SFG analysis and recommendations have been discussed in the United Nations, UK House of Lords, House of Commons, Indian Parliament, European Parliament, Alliance of Civilization, World Bank, World Economic Forum (Davos), and quoted in over 2000 newspapers and media sources. Several Heads of Government, Cabinet Ministers and Members of Parliament have participated in SFG activities.

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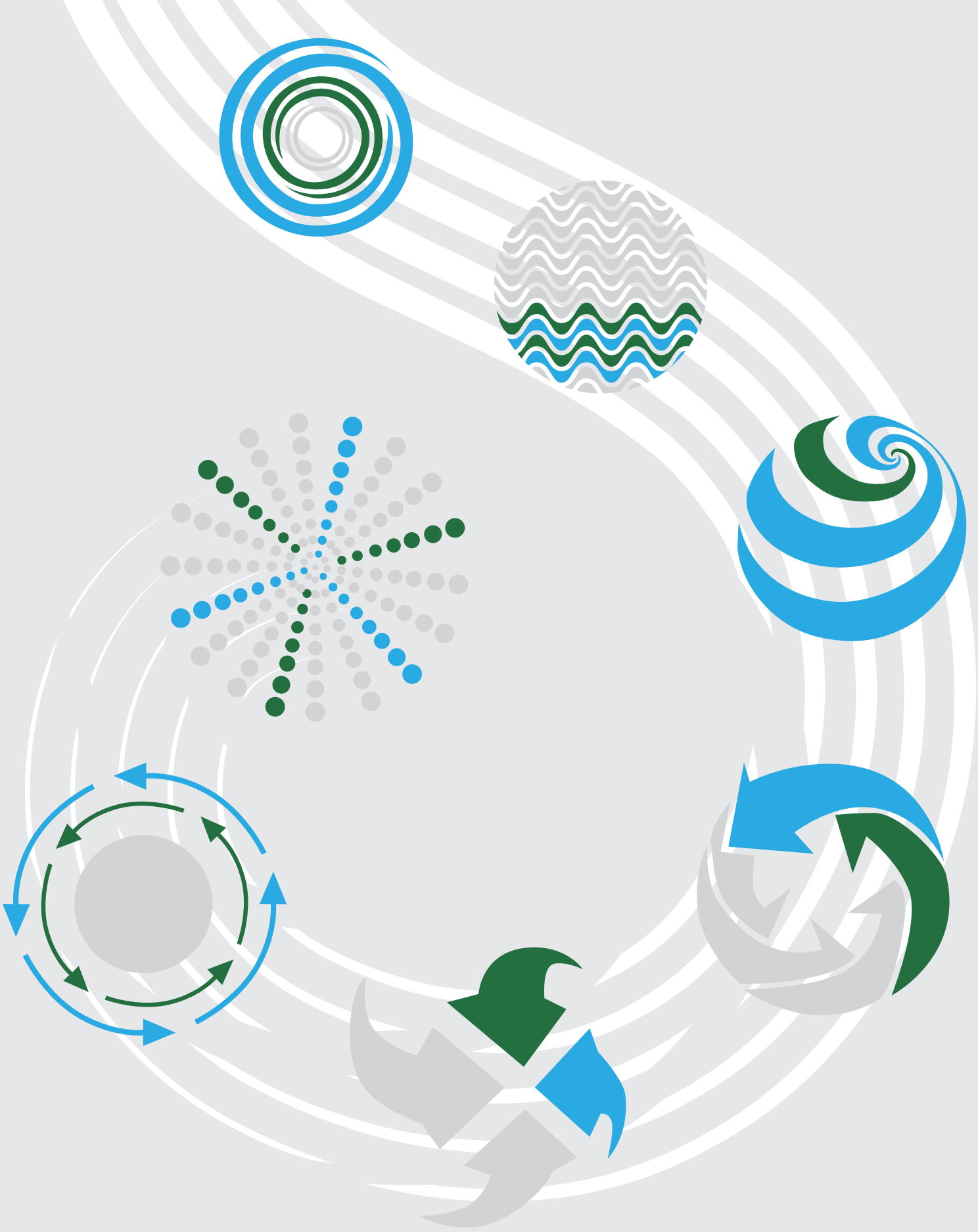

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