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Master thesis in Sustainable Development 2020/63
Examensarbete i Hållbar utveckling

Transboundary Water Cooperation between Bangladesh and India in the Ganges River Basin: Exploring a Benefit-sharing Approach

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DEPARTMENT OF
EARTH SCIENCES
INSTITUTIONEN FÖR
GEOVETENSKAPER

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Published at Department of Earth Sciences, Uppsala University (www.geo.uu.se), Uppsala, 2020

Contents

List of Acronyms

BBIN – Bangladesh Bhutan India Nepal
BISRCI – Bangladesh India Sundarban Region Cooperation Initiative
CBD – Convention of Biological Diversity
CRT – Columbia River Treaty
EIA – Environmental Impact Assessment
GBM – Ganges-Brahmaputra-Meghna
GMS – Greater Mekong Subregion
GSBA – Ganges Strategic Basin Assessment
IHA – International Hydropower Association
IPCC – Intergovernmental Panel on Climate Change
IUCN – International Union for Conservation of Nature
IWAI – Inland Waterways Authority of India
IWRM – Integrated Water Resource Management
JRC – Joint River Commission
LHWP – Lesotho Highlands Water Project
MoU – Memorandum of Understanding
MRC – Mekong River Commission
NBI – Nile Basin Initiative
NDTV – New Delhi Television Limited
OMVS – Organisation pour la mise en valeur du fleuve Sénégal
SADC – Southern African Development Community
SIA – Social Impact Assessment
SIWI – Stockholm International Water Institute
TFDD – Transboundary Freshwater Dispute Database
UN – United Nations
UNECE – United Nations Economic Commission for Europe
US – United States
WEF – World Economic Forum

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Karim, S., 2020: Transboundary Water Cooperation between Bangladesh and India in the Ganges River Basin: Exploring a Benefit-sharing Approach. *Master thesis in Sustainable Development at Uppsala University,* No. 2020/63, 48 pp, 30 ECTS/hp

Abstract:
Bangladesh and India share 54 transboundary rivers. Despite that, the transboundary water management between these two countries is heavily concentrated on the Ganges river basin, in which, mode of cooperation is still based on physical sharing of water. The study is developed on the argument that Bangladesh and India need a shift of focus in their current mode of transboundary water management from physical sharing of water to sharing of benefits derived from the use (and non-use) water in order to foster transboundary water cooperation in the Ganges river basin. Based on a single-case study, the research work aims to explore the scope of benefit-sharing in the transboundary water cooperation in the Ganges river basin and how benefit-sharing can be facilitated between these two countries. The findings show that the water negotiation in the Ganges basin would become much more complicated in the future, primarily due to the growing gap between the demand and the availability of water. The adverse impact of climate change will further deteriorate the situation. Besides, the changing nature of India's domestic politics and the growing internal conflict between its provincial states will weaken the Indian central government's authority to manage transboundary water resources jointly. Therefore, in the future, Bangladesh and India would find it difficult to elicit a positive-sum outcome from any water negotiation in Ganges river if they still focus on the volumetric allocation of water. The study suggests that inland navigation and water transit, multipurpose storage dam projects and joint management of the Sundarbans can be the potential areas for benefit-sharing in the Ganges basin. The study stresses the importance of shifting the policy outlook and developing institutional arrangements between Bangladesh and India to introduce and facilitate benefit-sharing in the Ganges river basin that will help to share benefits equitably, hence foster cooperation.

Keywords: Bangladesh-India Water Management, Benefit-sharing, Ganges River Basin, Sustainable Development, Transboundary Water Cooperation, Water Resource Management

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Summary:
Rivers can play a crucial role in promoting cooperation by sharing the benefits available in a river basin; or can be a source of tension among the riparian states, especially in the case of sharing of water. The conflict between Bangladesh and India in the Ganges basin is one such example, in which the issue of water allocation has caused a perpetual problem in the transboundary water management between these two countries. Despite sharing 54 common rivers, the water cooperation at the official level between these two countries mainly hovers around the Ganges river basin. Both countries are sharing the water of the Ganges river according to the Ganges Water Sharing Treaty, signed in 1996. Though the signing of the Ganges treaty has been considered as a big achievement in mitigating water-related disputes between Bangladesh and India, the treaty's singular focus on the volumetric allocation of the Ganges water is a big challenge for the riparian states that might produce a zero-sum outcome in future water negotiations.

The study aims to explore the scope of benefit-sharing in the transboundary water cooperation in the Ganges river basin and how benefit-sharing can be facilitated between these two countries. The main objectives of the study were to discuss the necessity of the benefit-sharing in the Ganges river basin; identify the potential sectors of benefit-sharing; and how to facilitate benefit-sharing between Bangladesh and India. The study uses Sadoff and Grey's work on benefit-sharing to establish a framework for riparian countries to share benefits and applies it first on the international river basins, and finally on the Ganges basin to highlight types of benefit Bangladesh and India can derive from the river.

The study argues that the water resources in the Ganges basin will come under tremendous stress from the growing water demand and inadequate water supply. The adverse impact of climate change will cause further deterioration of the already worse situation. In addition to that, India's domestic politics and its interstate conflict will limit the central government's ability to ink any future agreement with the riparian states without the approval of state governments, which will make future water negotiations even more difficult to produce a positive-sum outcome. The study identifies inland navigation and water transit, multipurpose storage dam projects and joint management of Sundarbans as the potential areas for benefit-sharing in the Ganges basin. To realise the benefit-sharing potential and facilitate it, the study suggests a shift in policy perspectives and institutional arrangements in Bangladesh and India. In addition to the regular exchange of information and joint assessment, the study highlights the need for basin-wide perspectives in national policies of the riparian states. It also stresses the importance of strengthening of Joint River Commission and utilisation of the sub-regional platforms to materialise the benefit-sharing arrangement in order to promote transboundary water cooperation in the Ganges basin.

The study demonstrates that benefit-sharing in the Ganges basin has the potential to provide adequate incentive to the riparian states to collaborate with each other for generating a positive-sum outcome and foster cooperation. The benefit-sharing arrangement will enable the riparian states to optimize the trade-off among present and future benefits that will make the transboundary water cooperation a win-win outcome for all.

Keywords: Bangladesh-India Water Management, Benefit-sharing, Ganges River Basin, Sustainable Development, Transboundary Water Cooperation, Water Resource Management

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1. Introduction

Rivers not only provide one of the precious natural resources on earth, i.e., freshwater, but also innumerable ecosystem services (Jain and Singh 2020). They are the source of various kind of benefits that include but not limited to food production, energy generation, navigation, and play a crucial role in sustaining the progress of human civilization. They work as an ecological system by supporting critical life- and landscape-nurturing functions; they also work as a physical and economic system that produce numerous economic and social benefits (Sadoff & Grey 2002). Rivers also carry political significance, especially when they crossed the national boundaries and shared by two or more nations (ibid).

Based on its management, rivers have the potential to promote cooperation by sharing the benefits available in a river basin or can be a source of tension among the riparian states. Conflict and cooperation in a shared river basin also depend on the amount of stress that is put on the basin's resources. The growing anthropogenic pressure due to various reasons, like population growth, increased economic activities, unsustainable urbanisation, coupled with climatic change is putting tremendous weight on the available water resources along with their sustainable use (IPCC 2007, 2010, 2018; Phillips et al. 2006). Besides, half of the freshwater resources in the world is shared by two or more countries, making water-related issues even more complicated and conflict-prone (Leb 2009; Sinha 2016; Wolf & Hamner 2000; Wolf et al. 2003). There was a time when people used to think that future wars would be fought over securing access to water resources (Swain 2015). Though, at present, the possibility of future "water war" among the nations is farfetched; but given the fact that over 260 river basins are shared by two or more countries, involving 145 states representing 90 per cent of the global population, any conflict on the management of shared water can have a global implication (Alam et al. 2009; Cooley & Gleick 2011; Leb 2009; Shah & Giordano 2013; Sadoff & Grey 2005; Phillips et al. 2006; Wolf et al. 2003).

In most of the cases, conflict in a transboundary river arises on the question of sharing of water among the riparian states. The conflict between Bangladesh and India in the Ganges basin is one such example where the issue of water allocation has caused a severe perennial problem in the transboundary water management between these two countries. Despite sharing 54 common rivers, the water cooperation between these two countries is heavily concentrated on the Ganges river basin. The only official agreement that exists between these two countries at the transboundary water level is also on the Ganges river, known as the Ganges Water Sharing Treaty.

1.1. Problem Formulation

One of the key limitations of the Ganges treaty is its sole focus on the volumetric allocation of the Ganges water between Bangladesh and India. It neither considers the environmental or economic drivers of the basin nor equipped with necessary means to cope with the future changes that might affect the hydrological regime of the river or its surrounding ecosystem (Gain and Giupponi 2014; Kasymov 2011; Pandey 2014; Rahman et al. 2019; Swain 2018). Besides, pollution and environmental degradation, mainly due to unilateral actions by the riparian states in the Ganges basin are reducing the quality of water resources that, in turn, is adversely affecting both human health and ecological balance of the river. Globally at the transboundary level, there is a growing trend of incorporating the issues of sustainability as well as climate change adaptation and mitigation in overall plans, policies and actions to make water resource management robust and environmentally sustainable (Earle et al. 2015). But, the static nature of the Ganges treaty does not allow accommodating the present and emerging challenges that works as a stumbling block to the sustainable utilisation of basin resources, limiting the scope of future cooperation.

The history of Ganges water sharing negotiation between Bangladesh and India is marred by several unsuccessful efforts. On several occasions, both countries failed to reach an agreement due to contradictory views that resulted in a zero-sum outcome for both countries and forced them to continue

sharing of the Ganges water without any operational mechanism for a long time. Given the importance of the Ganges river for both Bangladesh and India and the limitations of the present Ganges treaty, it is crucial for both countries to start exploring new modes of water management that will facilitate cooperation. The present study argues that there is a growing need for Bangladesh and India to shift their focus of transboundary water management from physical sharing of water to sharing of benefits derived from the use (and non-use) of water in order to foster cooperation in the Ganges river basin.

1.2. Background

The global water crisis is still one of the critical challenges that remain unresolved and pose a severe threat to the sustainability of human civilisation, biodiversity and ecosystem (Earle et al. 2015; United Nations 2015). According to the United Nations (UN) statistics, two billion people are suffering from acute water scarcity (United Nations, 2018). Therefore, achieving water security, by harnessing its productive potential and restraining its damaging impact, is now a top priority, forcing the countries to cooperate. Physical sharing of river water is still the most widely used arrangement by the riparian states to engage in water cooperation (Sadoff & Grey 2005). However, with the growing number of population and increasing water demand, many shared river basins are facing a problem to distribute water reasonably and equitably among the riparian states, leading to a higher possibility of water-related conflicts (De Stefano et al. 2017; Kawser & Samad 2016; Sadoff & Grey 2005). Although no full-fledged war has fought over water, there are instances of conflicts of various kinds and intensity centring around water throughout human history (De Stefano et al. 2010).

Conflict in a shared water resource can arise for various reasons, among which the availability of water is the most crucial one. The availability of water in a shared basin is a critical factor in determining the mutual relation between the riparian states. Water scarcity plays a pivotal role in several disputes between nations around the world, especially in the areas where the national water security is threatened by the availability of water (Sadoff & Grey, 2002). Notably, the places where water scarcity is prevalent, it is expected to have a higher competition to establish control over the water flows; and, when control over the flow is intense, the competition takes a conflicting shape (Gleditsch & Hegre 2000; Zeitoun & Warner 2006). There are numerous instances, like the Indus basin, the Ganges basin, the Aral Sea, etc., where lack of water availability provokes conflict among the riparian states. Besides, overexploitation by an upstream country can lead to water scarcity in downstream countries with adverse impact on life and livelihood, thus result in dispute among them. Moreover, the balance of power and power relations also determine the riparian states' interactions over a shared basin (Zeitoun & Warner, 2006). For example, in the case of the Nile, Jordan, Tigris, Euphrates and the Ganges, the power asymmetry between the riparian countries becomes an influential factor, leading to political tension over their shared water resources. In a nutshell, the conflict in a shared basin mainly depends on the water availability, water demand and the power relation between the riparian states; and, the probability of water-related conflict increases concurrent with higher population growth and development activities associated with the surging water demands (Pandey 2011).

Even though water-related conflicts exist around the globe, Wolf et al. (2003) have demonstrated with the help of Transboundary Freshwater Dispute Database (TFDD)[1] that the record of water cooperation is much higher compared to acute conflicts over shared water resources. McCracken (2017) defines cooperation as the coordination and collaboration between and among countries at a level where all of them collaborate in order to achieve a common interest that results in mutual benefits for both of them. Based on the mindset of the riparian states and their ability to properly manage a shared water resource, water can act as an entry point to trigger benefits like economic and social development, thus promote cooperation. The signing of agreements on several international river basins like the Mekong, Mahakali,

[1] The TFDD project is under the Oregon State University Department of Geosciences. Northwest Alliance for Computational Science and Engineering is also collaborating with Oregon State University in the project. The project database consists of a digital map of the world's 263 international watersheds and a compilation of 400 water-related treaties and 39 US interstate compacts.

Jordan, Nile, Senegal, Columbia, Orange-Senqu, etc., in the last couple of decades, demonstrates the potential of shared water resources in facilitating cooperation between and among riparian states (Earle et al. 2015). When the states start cooperating on a transboundary level, that opens avenues of opportunities for them by producing various benefits, like restoring water in the basin, reducing soil erosion, mitigating the impact of hydrological disasters, and widen the planning space and horizon that ultimately helps in achieving water, energy and food security (Rasul 2014; Tafesse 2009). However, there must be some incentives for cooperation, either in the form of reduction of complications associated with water scarcity, climate change, etc., or utilisation of mutual gains, like hydropower generation, environmental preservation etc., among the riparian states (Sadoff & Grey 2002). The likelihood to form a cooperative arrangement increases when the riparian states shift their focus from allocation of water to allocation of benefits, that provides greater scope and flexibility in achieving cooperative water management and decreases water-related tension (ibid). And given the complexity and scale of challenges in transboundary river basins, it always requires strong will and special effort from the riparian states to materialise the cooperation and make it resilient over time.

For the people of South Asia, the supply of water mostly depends on the Ganges-Brahmaputra-Meghna (GBM) River basin, shared by five countries, namely Bangladesh, India, Nepal, Bhutan and China (Akter 2016). Despite the vast availability of water resources in the basin, the failure of the riparian states to reach mutually beneficial agreements often resulted in conflicts (Earle et al. 2015). In many instances, the way in which the water resources in the basin are utilised in one country has resulted in a far-reaching adverse impact on nations located downstream. Besides, the water supply in the basin has huge Spatio-temporal variability, especially in the Ganges river, which has an abundance of water during the monsoon (June-October) and experiences very little flow during the dry season (November-May). Therefore, floods are very common during the monsoon period while the basin faces water scarcity in the dry season, making sharing of water among the riparian states extremely challenging and conflict prone. The sensitivity of these conflicts is on the rise over the years due to the increasing demand for water by the growing population in both Bangladesh and India and the decreasing of water flow in the river, especially in the dry season (Rahman et al. 2019). Besides, climate change is also looming large, pushing up the possibility of unpredictable flow regime that would further complicate the issue of water management and pose serious apprehension for cooperative water management between the riparian states in the future (Curtis et al. 2018; Earle et al. 2015; Jain and Singh 2020).

Within the GBM basin, 54 rivers are shared by two neighbouring countries, Bangladesh and India, among which, only the Ganges river is subject to an official bilateral treaty (Hanasz 2014; Nishat and Faisal 2000; Thomas 2017).[2] The Ganges river basin is home to more than 600 million people and supports a wide variety of biodiversity and a fragile ecosystem (The World Bank 2015). Sharing of the Ganges water is one of the long-drawn conflicts between Bangladesh and India that has affected the bilateral relationship between these two for quite a long time. The tension began rights after India completed the building of the Farakka Barrage on the Ganges river in 1975 with an intention to withdraw water from the Ganges and flow it to Hooghly river through a feeder canal in order to save the Kolkata port from siltation problem. The unilateral action took by India to build physical infrastructure in the upper reaches of the river severely undermined its relationship with Bangladesh at that time. Both nations made several agreements regarding sharing of the Ganges water since then, before the signing of the current Ganges treaty in 1996 for thirty years. Thought, the Ganges deal was a significant breakthrough in mitigating the water-related disputes between these two neighbouring countries, the sharing of the Ganges water is still a challenging and contentious issue that stresses the importance of revisiting the current approach of transboundary cooperation in the Ganges basin. Moreover, the discussion of the future format of the Ganges treaty needs to start well ahead of the termination of the current period so that a new agreement can be reached on time and operationalised right after the expiration of the previous one.

[2] Only recently, Bangladesh and India signed an MoU on the Feni river on 05 October 2019 that will allow India to withdraw 1.82 cusecs of water from the Feni river (Marathe 2019).

1.3. Aim and Research Questions

Given the context above, the study aims to explore the scope of benefit-sharing in the transboundary water cooperation in the Ganges river basin and how benefit-sharing can be facilitated between these two countries. The study will seek answers to the following research questions:

- Why is the benefit-sharing approach needed in the transboundary water cooperation in the Ganges river basin?
- Which are the potential sectors of transboundary water management in the Ganges river basin where benefit-sharing can be negotiated?
- How to facilitate benefit-sharing in the Ganges river basin between Bangladesh and India?

1.4. Research Objectives

The objectives of the study include –

- to explore the necessity of the benefit-sharing in the Ganges river basin;
- to identify the potential sectors of transboundary water management in the Ganges basin where benefit-sharing can be negotiated; and
- to suggest required actions in order to facilitate benefit-sharing between Bangladesh and India in the Ganges river basin.

1.5. Delimitation of the Study

The scope of the study will be limited to primarily on the benefit-sharing in transboundary water cooperation in the Ganges river basin between national governments. There is no denying that the local perspective is important in benefit-sharing and the stakeholders at the local level have to share the burden or enjoy the benefit of any joint initiative or cooperation. Besides, the riparian states' local-level dynamics and interests can play an influential role in water cooperation at the transboundary level. However, within the scope of this research work, the local perspective of benefit-sharing will not be covered.

Transboundary aquifers (groundwater resources) occupy a great significance in transboundary water management. A truly integrated water resource management involves both surface and groundwater sources. In case of the Ganges river basin, the potential of groundwater utilisation is also huge, and the basin is blessed with one of the world's largest groundwater aquifers (Rajmohan & Prathapar 2013; Sadoff et al. 2013). Nevertheless, the study will limit its scope on the surface water management in the Ganges basin and will not include the groundwater management in its analysis and discussion.

1.6. Significance of the Study

Most of the previous studies (Islam 2012; Nishat and Faisal 2000; Pandey 2012, 2014, 2016, 2018; Rahman 2008; Swain 2018; Thomas 2017) on the Ganges river have focused on the historical and socio-political context of water sharing, water conflicts between the riparian states and the implications of water-sharing agreements. Rahman et al. (2019) have tried to quantify the current status of cooperation by providing a statistical and quantitative analysis of the performance of the Ganges water-sharing treaty. Other studies (Baten and Titumir 2016; Curtis et al. 2018; Earle et al. 2015; Jain and Singh 2020; Moors et al. 2011) have examined the changing pattern of climate in the Ganges basin and its impact. Some authors (Afroz and Rahman 2013; Gain and Giupponi 2014; Mirza 1997, 2004; Rahman 2009; Rahman and Rahaman 2017) have highlighted the effects of physical alteration, especially the Farakka barrage, on the Ganges's hydrological regime. However, little effort has been made to explore the

possibilities of benefit-sharing in the Ganges river basin and its potential role in fostering transboundary water cooperation between Bangladesh and India.

Besides, the Ganges river bears special significance in the bilateral relation between Bangladesh and India. Therefore, the findings of this study might be not only helpful to find new opportunities for improving transboundary cooperation in the Ganges basin but also allow to explore the prospects of the benefit-sharing in other river basins, where water-related tensions exist.

1.7. Section Outline

- **Section One: Introduction**
  Section one introduces the research topic and describes the background, motivation, justification and the research problem. It also incorporates the aim and research questions of the study. The section also describes the significance of the study and research contribution and how the study delimits its boundary.

- **Section Two: Conceptual and Analytical Framework**
  Section two conceptualises the key concept of the study and describes the analytical framework.

- **Section Three: Methodology**
  Section three discusses the research approach and design.

- **Section Four: Literature Review**
  Section four presents a review of relevant literature.

- **Section Five: Results and Analysis**
  Section five presents the findings of the research and answers all three-research questions based on the data collected from primary and secondary sources.

- **Section Six: Discussion**
  Section six critically analyses the findings of the research with the help of the analytical framework. The section also discusses how the result is fitted to the broader context and whether it can be generalised.

- **Section Seven: Conclusion**
  Section seven concludes the research work. The section reflects back the research questions and highlights how those research questions are answered and analysed.

2. Conceptual Understanding and Analytical Framework

Water is an indispensable natural resource that cannot be circumscribed by political boundaries. Water in international rivers often crosses national borders. In case of a shared river basin, activities of one nation are likely to affect the water condition of other riparian countries. The transboundary nature of shared rivers creates a hydrological interdependency among its users. This hydro-interdependency exists in every shared river basin around the globe (Alam et al. 2009). If any country tries to act unilaterally in the basin, this dependency causes discord among the riparian states.

In recent times, the concept of benefit-sharing has become a widespread mode of promoting cooperation in a shared river basin (Lee 2015; Scheumann et al. 2014). The benefit-sharing approach challenges the core assumption of joint water management by viewing water as a flow that moves through space and time, instead of perceiving water as a stock for physical sharing (Turton 2008). It sheds light on the output derived from the use of water instead of considering water as an input to the system. By prioritising "multi-purpose uses" of water and the benefits associated with it, this approach catalyses cooperation in a shared basin instead of acting unilaterally (Kramer and Pohl 2016; Phillips et al. 2006; Soliev et al. 2015).

2.1. Understanding the Concept of Benefit-sharing

The primary idea behind benefit-sharing is to move from physical distribution of water to the distribution of the benefits derived from multifaceted utilisation of water (Sadoff & Grey 2002; Dombrowsky 2009; Hensengerth et al. 2012). Benefit-sharing promotes cooperation among the riparian countries by optimising and equitably sharing the benefits, which are connected directly or indirectly to the water resources or arising from its usage (Sadoff & Grey 2002; Phillips & Woodhouse 2009). By changing the focus from sharing of water to the sharing of benefits, advocates of benefit-sharing believe that this approach can turn a zero-sum outcome of a water negotiation to a positive-sum result. According to Qaddumi (2008), countries will be interested in a water agreement or participate in a collaborative framework if they can obtain positive gains or significant benefits compared to having unilateral action and feel that they will receive a fair share of the benefits. When countries focus on sharing benefits, it enables them to identify a far greater scope for engaging in a mutually beneficial cooperation mechanism.

Economic benefits, which provide the key impetus for collaboration, play a crucial role in benefit-sharing. According to Hensengenth et al. (2012), benefit-sharing approach views the utilisation of water in a shared basin from an economic perspective, as opposed to a quantitative term. They argued that states should properly utilise the river as a productive resource to maximise its economic benefits. The concept of sharing of benefits thus builds on the assumption that the riparian states, in a shared river basin, are more interested in the economic gains that water resources and its management create, instead of dividing up a fixed volume of water for themselves. Dombrowsky (2009) also believes that an economic perspective of the net benefits obtained from the utilisation of water can play a vital role in resolving transboundary water conflict as this could facilitate the riparian states to realise a win-win situation under certain conditions.

In addition to economic perspectives, benefit-sharing has other important aspects. To optimise benefit-sharing, it is crucial to explore all available benefits that can be obtained from a shared basin. Phillips et al. (2006) have stated that benefits can also be generated in environmental or security arenas where activities in different areas may have spill-over effects. Southern African Development Community (SADC) has identified eight categories of benefits available in a shared basin. These include: economic (economic development through enhanced economic activity, trade and commerce); environmental (protection of water resources); agricultural (increased agricultural production, goods and services); social (poverty alleviation); political (political cooperation and stability in the basin); hydrological (preserving ecological and seasonal flow regimes); physical (physical alteration in the basin through

structural changes); and commercial (increased trade and commerce in and outside the basin). (SADC, n.d., cited in Hensengenth et al. 2012) This diverse categorisation demonstrates that, in a shared basin, benefits can be of different types, like, economic, environmental, social, political or security related.

The success of benefit-sharing largely depends on recognising the full breadth of different kinds of benefits that helps to broaden the riparian country's scope of "basket of benefits". At the initial stage of negotiation, only a few benefits might be identified, which pave the way for further cooperation. Sustained and enhanced cooperation will provide the much-needed thrust to extend efforts for identifying additional benefits. As benefits from the basin start to become available, the harsh competition for water allocation begins to decline, which is replaced by more pragmatic and cooperative forms of positive-sum sharing. Benefit-sharing becomes fruitful when parties involved in the water negotiation have the belief that collaboration will help to optimise and maximise the benefits, which is not possible with unilateral actions (Phillips et al. 2006; McCaffery et al. 2016).

An instance of a successful benefit-sharing can be where one country wishes to produce hydropower in the upstream, while another riparian state wants to reduce the devastating impact of the flood in the downstream. Considered separately, this could emerge as win-lose outcomes, where riparian states only think about their respective benefits individually. The situation might not encourage either country to start negotiation for any cooperative arrangement. But when considered together, hydropower and flood protection, that could lead to a positive-sum outcome by identifying the basket of benefits from producing hydropower, that includes hydropower generation, flood control along with other additional benefits, like river training and building of water storage facility. The more different benefit-sharing scenarios are being explored, the higher the possibility to find a positive-sum outcome in a negotiation.

Finally, it is important to mention that benefit-sharing does not only mean the generation of benefits. It also looks at the distribution of costs. The cost of benefit sharing can be of different types. According to Qaddumi (2008), the cost of cooperation in a benefit-sharing framework including but not limited to institutional, financial, physical, political or any other cost decided by the negotiating parties. Along with the sharing of benefits, the riparian countries have to determine the appropriate mode of sharing of costs as well in a benefit-sharing arrangement.

2.2. Why Benefit-sharing Approach is Needed?

It is widely believed that negotiation on physical water allocation might result in a zero-sum outcome, as, in such a setup, water is considered as a finite resource, use of which will always prevent others (Sadoff & Grey 2005). Riparians stuck in a zero-sum dilemma when they believe that: they have no other options but to continue the status quo by sharing the resource that is diminishing, and there is less possibility of expanding the scope of utilisation of such resources (Phillips et al. 2008). Besides, overemphasising on the physical allocation of water overlooks the potential conflict among different sectors like energy, water and food in a shared basin that can produce negative externalities and reduce the potential for resource optimisation. The problem further degenerated when the number of stakeholders increases, amplifying the competition for access to the limited resources available in the basin (Uitto 2004).

Therefore, it is crucial to broaden the scope of water negotiation by focusing on the benefits available in a river basin. Lee (2015) have argued that the prospect of greater benefits through cooperation, as opposed to unilateral action, encourages riparian countries to engage in a collaborative mechanism. Sadoff and Grey (2005) also believe benefit-sharing in a shared river basin allows the riparian states with the flexibility to make a distinction between the physical allocation of the water and the economic distribution of benefits. This approach enables co-riparian countries to solve disputes by concentrating their focus primarily on generating benefits on a basin-wide scale that can be shared equitably among all (Arjoon et al. 2016). In addition to that, a changing focus from water allocation to sharing of benefits increases the opportunities for making optimum trade-offs among different sectors that lead to fruitful water negotiation and a positive-sum outcome.

2.3. How to Facilitate Benefit-sharing in Transboundary Water Cooperation?

Rivers are a multi-dimensional complex system, and every river poses unique characteristics. Therefore, there is no concrete template for introducing benefit-sharing that could be applicable to every shared basin. However, maintaining a status quo that is perceived as unfair is not conducive to start negotiation on benefit-sharing. Some actions have to be taken to facilitate the process among the riparian states. For some river basins, these actions can be commencing from the exchange of information and joint assessment to basin-wide river management. In other cases, these might include a shift in national policy to collective investment and co-ownership of water infrastructure by riparian counties (Sadoff & Grey 2005).

The exchange of information is key to any benefit-sharing mechanism. It enables the riparian states to realise a wide range of potential benefits that can be accrued from cooperation. Countries will be motivated to join in a benefit-sharing arrangement only if they are well aware of the positive gains (Scheumann et al. 2014). Without the exchange of the information, on which the hydrological and economic analysis will be based on, it won't be possible to move forward with benefit sharing. International water conventions like the 1997 UN Water Convention or 2004 Belin Rules have stressed the importance of the exchange of data and information. Thus, to facilitate benefit-sharing at the initiation stage, the exchange of information is essential.

In addition to the exchange of information, joint assessments conducted by the riparian states also help to understand the cooperation potentials under a benefit-sharing arrangement. Joint assessment help to utilise the data exchanged under a cooperative framework. It is a crucial step to build trust among the riparian states. A proper assessment increases the likelihood of identifying the sectors in which benefit-sharing can be negotiated and have a clear picture of the cost-benefit calculus. It also helps in reducing the possibility of technical controversies which may have emerged due to unilateral assessment findings.

The successful implementation of benefit-sharing approach also depends on the calculation of the total cost of cooperation and the net benefits obtained from that (Qaddumi 2008). According to Scheumann et al. (2014), riparian states need to determine beforehand whether mutual cooperation will produce a net benefit that will ultimately improve the condition of all negotiating parties (which they cannot achieve through unilateral action or maintain the status quo). The benefits, available in the shared basin, are not often equally distributed. This distribution depends on several factors, like riparian countries position in the upstream or downstream, modes of water usage, Spatio-temporal availability of water, socio-economic context, etc. In order to materialise benefit-sharing, it is crucial for the riparian states to come to an agreement on how the available benefits and its associated cost would be shared in an equitable manner.

Kramer and Pohl (2016) have discussed two approaches to make the sharing of cost and benefits fair and equitable. The first approach is making direct compensation. This can be done either by monetary means or through mutual ownership of the physical infrastructure. It can also be achieved by non-monetary terms like transferring water rights or services derived from the usage of water. Sadoff and Grey (2002) also believe an equitable benefit-sharing approach will require compensation that could involve transferring monetary benefits, introducing a new model of financing and investment, granting specific water usage rights, or non-water related goods and services. The second approach is connecting several benefits for cooperation in order to optimise trade-offs among different benefits and maximise their synergies. The main idea behind linking various opportunities is to overcome any possible deadlock in a water negotiation and increase overall resource efficiency.

Third-party involvement is another vital issue in the benefit-sharing approach (Hensengenth et al. 2012; Lee 2015; Qaddumi 2008). Third-party involvement can help to facilitate the cooperative framework among the riparian states. Though their involvement cannot alone create a conducive environment for benefit-sharing, they can provide incentives, directly or indirectly, to cooperate by providing financial, technical and administrative support, assisting in negotiation and mediation, facilitating investments in the development of water infrastructure and supporting trust-building initiatives among the negotiating parties.

Finally, it is important to understand that benefit-sharing is a complex endeavour that involves multiple interest groups with divergent interest (Nkhata 2018). Therefore, mutual trust among the negotiating parties is crucial for any benefit-sharing framework. Building trust among the parties is a long and painstaking process that often takes a vast amount of time. To be able to realise the full benefit and reach an agreement, the whole process must be given adequate time and priority. Establishing a joint water management body, regular consultation among the parties involved, dispute-settlement mechanism and the regular exchange of data and information can support the process of trust-building and facilitate the entire process.

2.4. Operational Definition and Analytical Framework

Based on the discussion above, the operational definition of benefit sharing for the study is developed as follows –

> *Benefit-sharing is a process to promote cooperation in a transboundary river basin by focusing on benefits derived from the multifaceted use (and non-use) of water instead of solely targeting the physical sharing of water. It enables the stakeholders of a shared basin to get a positive-sum outcome by negotiating on available benefits and sharing them equitably in order to achieve a win-win solution.*

Benefit-sharing is based on the argument that the multiple benefits derived from the usage and non-usage of water work as the motivating factor for cooperation in a shared basin. Sadoff and Grey (2002, 2005) have pioneered and advanced the concept of benefit-sharing. They have identified four types of cooperative benefits, i.e., increasing benefits to the rivers, increasing benefits from the rivers, reducing cost because of the rivers and increasing benefits beyond the rivers, that can be obtained from the river. The analytical framework that will be used in the study is based on Sadoff and Grey's (2002) categorisation of benefits, in which, benefits in each category work as a motivating factor for cooperation.

- **Type 1 Benefit (benefits to the river):** Cooperation in a transboundary river basin can help to improve the ecological sustainability of the watershed and enable better management of the surrounding ecosystem. Better coordination through collaboration allows the stakeholder to protect the river by reducing negative externalities which were present earlier due to unilateral action. This category of cooperative benefit is directly linked with the ecological sustainability of the river. Enhanced cooperation through joint effort improves water quality, restore the ecological flow of the river, preserve biological diversity, etc., hence, lay the foundation for riparian states to unlock other benefits from the river for further cooperation.
- **Type 2 Benefit (benefits from the river):** Benefit-sharing in a shared basin can help to obtain various economic gains. By taking a basin-wide perspective, the riparian states can unlock a wide range of economic opportunities from a river basin. Financial gains derived from benefit-sharing arrangement help to minimize sectoral trade-off among different sectors, like water, energy, land and food, and reduce negative externalities. The holistic view of benefit-sharing generates positive externalities by building synergies among various sectors and help to maximize economic gains, which works as a motivating factor for riparian states to elevate the state of cooperation even further.

- **Type 3 Benefit (benefits due to reduced costs because of the river): Type 3 Benefit (Benefits due to reduced costs because of the river):** Transboundary water cooperation can ease political tension and conflict in a shared basin, thus reduce the cost associated with disputes and conflicts. The possibility of future gains from collaboration drives the riparian states to bring a change in their policy perspectives from conflict to cooperation, out of which, substantial savings can be obtained, and the cost of non-cooperation can be avoided.
- **Type 4 Benefit (benefits beyond the river):** Substantial benefits gained from a river and reduced cost due to collaboration stimulate further cooperation among the riparians. Economic gains, coupled with the easing of tension encourage the riparian states to go for development on a basin-wide scale by developing regional infrastructure, integrating markets and trade, ultimately enabling transboundary cooperation goes beyond the river, even in sectors not related to water directly, like regional peace and security or regional economic integration.

The following table summarises the discussion on the analytical framework.

Table 1: Motivating Factors of Cooperation

Type of Benefits	Potential Gains
Type-1 Benefits to the river	Protection of the ecological health of the river and its surrounding ecosystem
Type 2 Benefits from the river	Economic productivity of the river
Type 3 Benefits due to reduced costs because of the river	Easing of political tension and conflict
Type 4 Benefits beyond the river	Economic integration, regional peace, etc.

Adapted from: Sadoff and Grey, 2002

3. Methodology

This study follows a qualitative research method by undertaking a deeper investigation into a single-case study. According to Tracy (2013), a qualitative research method explores the purpose and the driving force of a phenomenon, in which, the research is based on an in-depth explanation of context emerges from the in-field problems. It provides the researcher with an opportunity to collect detailed information about the phenomena and build a strong foundation for future research on that issue. The primary rationale behind choosing a qualitative research method for this study is the aim of the study, which requires a deeper understanding and in-depth analysis of the scope of benefit-sharing in a transboundary river basin between Bangladesh and India. That cannot be achieved with quantitative analysis. Besides, this study is based on semi-structured interviews with experts, where collected data is qualitative in nature and requires qualitative analysis.

A case study has been chosen to conduct the research, which Yin (2003) has described as a "single-case study" approach. The case study is an exploratory research technique aimed at detailed and intensive investigating of one or a few situations (Bryman 2012; Islam 2008; McNeill 1985; Tripathi & Shukla 2005). It places emphasis on details and provides valuable insight into problem-solving. It may prompt further, more wide-ranging research, proving ideas to be followed up later, or can generate some broad generalisation (McNeill 1985). The case that has been selected for analysis is "Ganges river basin". There are three reasons for choosing this specific case. First, the study aims to explore the scope of benefit-sharing in the Ganges river basin. Therefore, it is crucial to have a clear understanding of the physical geography, as well as the socio-political and economic significance of that particular river. Second, the water-sharing conflict in the Ganges river is the oldest and one of the long-drawn disputes between Bangladesh and India. And, finally, Ganges is the only river that has an official water-sharing treaty between these two nations. Considering the aim of the research and the long history of conflict and cooperation, along with its significance for both Bangladesh and India, the Ganges river basin has been selected as a case for analysis.

3.1. Data Collection

Fisher (2010) have argued for the collection of several types of data in research work, as it can increase the accuracy of information. For this study, both primary data and secondary data has been collected. The primary data has been collected through expert interviews. A comprehensive literature review has been conducted to collect secondary data.

3.1.1. Interview

A total of nine one-on-one interview sessions were arranged. The response from informants was obtained through a semi-structured questionnaire. The benefit of using a semi-structured design is illustrated by Bryman and Bell (2015), who believe this strategy enables the researcher to gather more information by having a flexible set-up. In a semi-structured composition, the answers of the informants are not bounded by fixed questions, which allow the informants to answer more openly. Besides, with the semi-structured questionnaire, the interviewer has the scope to clarify any answer by asking follow-up questions from diverse context. This technique is generally non-standardised, and the question during an interview session can be changed based on the context that helps to bring up additional information in connection with the aim of the research (Saunders et al. 2016). The questionnaire for the interview was divided into five parts, where different sections focused on eliciting answers for different research questions of the study. On two occasions, the questionnaire was sent in advance to the informants on request.

All the interviews were conducted between March 2020 to July 2020. The interview sessions lasted between 25 to 45 minutes. At the beginning of the research project, it was decided to hold face-to-face interviews, and the first interview was conducted accordingly. Unfortunately, due to the emergency

situation that emerged for the Coid-19 pandemic, the mobility was severely restricted because of national and international lock-down. Therefore, the remaining eight interviews were conducted over the phone and with various video-calling applications (e.g. Skype, WhatsApp, Google Meet). The methods were chosen based on the preference of the informants. All interviews were recorded with an in-built audio recorder available with the video calling app and the cellular phone. Besides, interview notes were taken as a backup to the recordings, which Poland (1995) believes is important to overcome any difficulties associated with the quality and clarity of the audio records.

Purposive sampling, a non-probability sampling method, has been employed to select the informants both from Bangladesh and India. Purposive sampling focuses on the strategic identification of samples, who are considered relevant to answer the research questions and can satisfy the aim of the study (Bryman 2012). Samples include experts from government and private sectors, academia, NGOs and research organisations, working in the field of water resource management and have substantial knowledge on the Bangladesh-India water relationship.

3.1.2. Literature Review

A comprehensive literature review was conducted to develop this report and support data collected from the primary source. According to Williams (2018), a comprehensive literature review help to develop the research work on a firm scholarly foundation by collecting a wide range of data from various sources. It gives credibility and authenticity to the data collected for the research work and provides direction to the readers and other researchers on how the results are obtained. The literature search for this study was divided into two parts. The first part focuses on developing the case for the research work by collecting information on the socio-political and geographical context of the Ganges river basin, and the history of conflict and cooperation between Bangladesh and India centring around the Ganges river. The following keywords were used to conduct the literature search - “Ganges river basin”, “Ganges water-sharing agreement”, “Bangladesh-India water relation”. The second literature search centred around the concept of benefit-sharing and how riparian countries in international shared basins have embraced benefit-sharing for enhancing cooperation. The keywords used for that literature search were - “Cooperation in the international river basin” and “Benefit-sharing in international rivers”. Uppsala University (UU) library search engine[3] was used to conduct the literature searches. The rationale for choosing the UU library search engine is its comprehensive searchability. UU library search engine allows the researcher to search academic books and peer-reviewed article from a wide range of scholarly publications. Snowball method was also employed to collect additional data from the selected articles. This method is a very effective strategy to obtain further information by selecting one key article as the starting point and systematically look forward in the paper other references that deemed relevant for the research work (Wohlin 2014).

3.2. Data Analysis

All recorded interviews were transcribed for thorough analysis. Intelligent Verbatim Transcription approach was followed to transcribe all interviews, which was done manually. This format provides a more readable transcript text while preserving the true voice and intended meaning of the informants (Chege 2015). Only the non-verbal communication, incomplete sentences and repetitions were not included in the transcribed text. Interviews, which were conducted in Bengali, were translated to English. Thematic content analysis has been used to identify similar patterns of answers from the data in order to categorise responses under different themes, which have been used to answers the research questions, especially the second and third question. Emphasis has been given on the repetitions to identify the recurring themes, which (Bryman 2012) has described as the most common way of conducting a thematic analysis.

[3] https://www.ub.uu.se/?languageId=1

3.3. Research Quality

Qualitative research can suffer from the issue of quality fulfilment as it is overwhelmingly influenced by physical and social setting where the research is conducted (Saunders et al. 2016). The validity and reliability of a quantitative study can be strictly controlled and properly measured, which is crucial for ensuring the replication and generalisation of the study. But, for qualitative research, the measurement is not the prime concern. Besides, it is very challenging to replicate the setting in which the qualitative study is conducted. Therefore, the issue of validity and reliability cannot always be strictly maintained in a qualitative study (Bryman and Bell 2015). For this study, the highest effort has been given to maintain the validity and reliability of the research work and uphold its academic merit.

3.3.1. Validity of the Research

The validity of research work is concerned with the integrity of the research conclusion and its possible generalisation to a wider context (Bryman 2012; Yin 2003). Validity entails that the researcher's observation is not substantially skewed from the theoretical framework that has been developed, and the research findings can be generalised beyond the specific research context (Bryman 2012). The focus of this research work was narrowed down to a single case study that allowed the researcher to do an in-depth investigation of the selected case and be more certain about the validity of the observation. Later, the findings of the data were linked to the conceptual and analytical framework, developed beforehand, in order to maintain research validity. Besides, all informants were carefully sampled from both Bangladesh and India who have substantial expertise in the field of water resource management and have profound knowledge on the dynamics of Bangladesh-India water relation. That validates the quality of the data collected from them. In addition, all interview transcripts were sent to the respective interviewees. The objective was not only to obtain their approval but also identify and correct any errors or inconsistencies that might happen during the transcription process. According to Mero-Jaffe (2011), sending of the interview transcripts to the interviewees is an effective way to validate their responses.

3.3.2. Reliability of the Research

Reliability of an academic work refers to what extent the techniques of data collection that has been employed in research or the analysis procedures is consistent with the research findings, meaning, the study can be repeated, across a different time period and different research instrument (Saunders et al. 2016; Sekaran & Bougie 2010; Yin 2003). However, qualitative research is influenced by the physical, social and behavioural setting and its surroundings, which make it challenging to devise a research tool that would be reliable over the different setting and can replicate the exact same outcome (Kumar 2011). For this study, reliability was sought by comprehensively noting down the entire process of data collection and data analysis, which was detailed in the methodology section so that the reader can have a clear understanding of the research procedure. All interviews were transcribed in a verbatim format and translated from Bengali to English to ruled out any confusion and obscurity. Besides, an elaborated discussion has been made in the second section to construct the operational definition of "benefit-sharing" and build the analytical framework in order to clarify the use of concepts in the study properly.

3.4. Ethical Consideration

Ethical consideration is a crucial part of any research work. Several aspects of ethical concerns, like voluntary participation of informants, maintaining their privacy and right to anonymity, ensuring confidentiality, refraining from doing any harm, need to be taken care to preserve the ethical integrity of any research (Babbie 1979; Islam 2008). The proper consent of the participants and their privacy is essential in this regard. For this study, at the initial contact, permission was sought from all informant on their voluntary participation. They were briefed on their right to withdraw from the study at any stage. They were also briefed about the purpose and objectives of the study before the interview

sessions. Prior consent was taken before the recording of the interviews. Audio transcripts were sent to informants to get their approval. The data confidentiality and the anonymity of the informants were maintained by using codenames for each informant in the main report.

3.5. Research Limitations

A common criticism of the qualitative research method is that it is too subjective and difficult to replicate (Bryman 2012). This study also suffers from this limitation. Moreover, the reliability of this study has been compromised by keeping the responses of the informants anonymous for the sake of their confidentiality.

Another major limitation of the study is its dependence on a single-case study approach that makes the findings of the study hard to generalise. Multiple-case study approach by taking more than one river basin as case studies might increase the validity and reliability of the research and enhance its generalisation ability. Besides, purposive sampling has been used to select the informants for interviews. This is a non-probability sampling method that compromises the validity of the study to generalise in a broader context.

4. Literature Review

The literature review of the study is divided into two parts. The first part is presenting the case, highlighting the physical geography and socio-economic significance of the Ganges river basin along with the history of conflict and cooperation between Bangladesh and India centring around the Ganges river. The second part of the literature review is developed on some of the examples of benefit-sharing in different international river basins around the world. The purpose of this section is to give the reader a detailed understanding of the problem and details of the case, along with a snapshot of how riparian countries in a shared river basin around the world are employing benefit-sharing to facilitate cooperation.

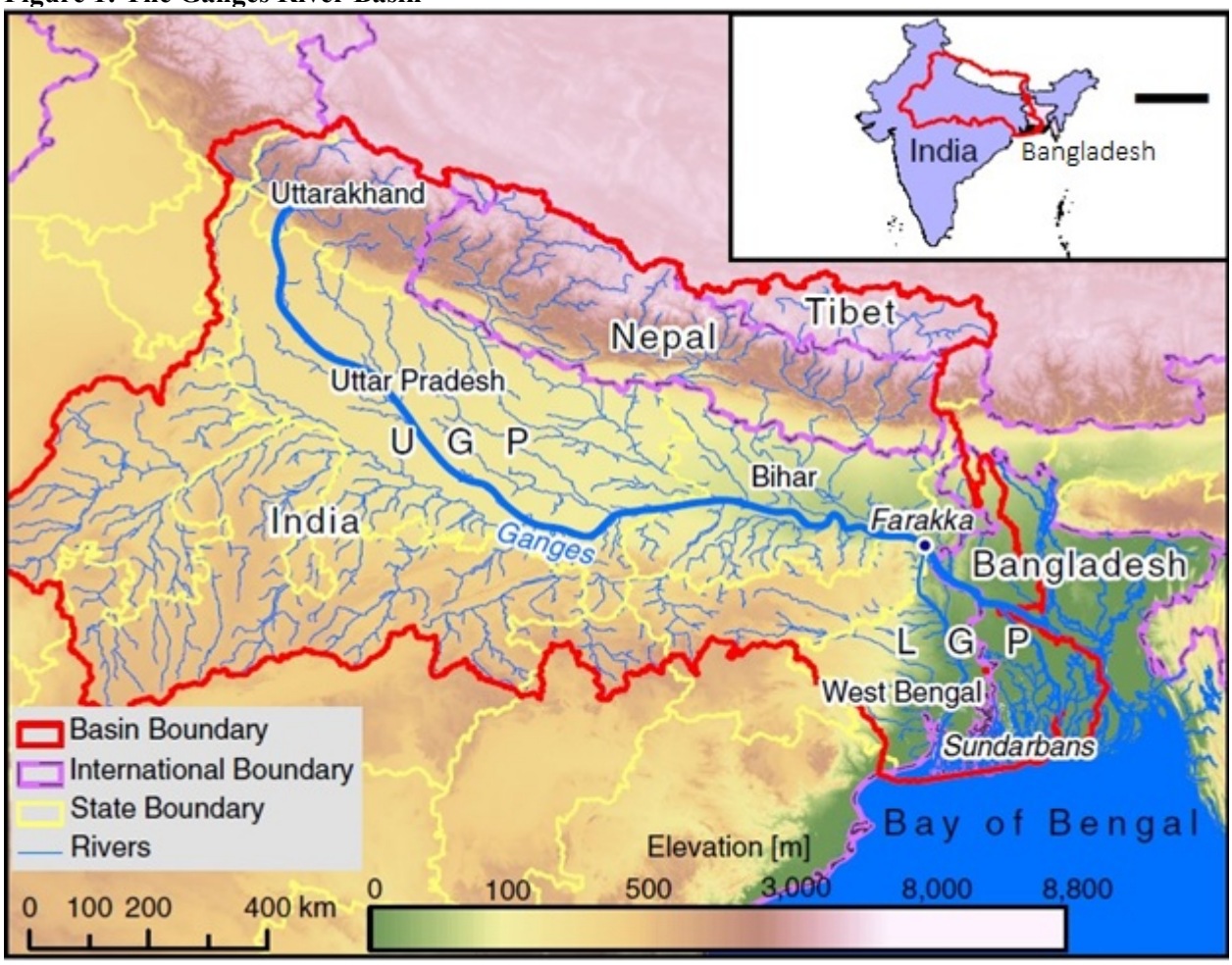
4.1. Description of the Case: The Ganges River Basin

4.1.1. Physical Geography of the Ganges river

The Ganges begins its journey at the Indian town of Gangotri, situated on the southern slope of Himalayas. Glaciers of the Himalayas supply approximately 30-40 per cent of the river water. Many of the tributaries of the Ganges, like Gandak, Karnali, Kosi, Mahakali, Bhagati, Babai, etc., come from Nepal, which contributes more than 45 per cent of its total flow and nearly 70 per cent of the dry season flow. For most of its length, the Ganges flows through India. It enters into Bangladesh through the north-western part where it takes the name Padma. It then flows 110 km southeast to meet the Brahmaputra river. The combined flow of the two rivers continue for 70 km downstream, where it joins with the Meghna river, and finally, finish its journey into the sea. About 50 km upstream of Bangladesh, the Bhagirathi-Hooghly, one of the distributaries of the Ganges, takes off where lies the Kolkata port. In its whole journey from India to Bangladesh, Ganger covers almost 2600 km. Figure 1 depicts the Ganges basin area that is spread across four countries, namely – Bangladesh, India, Nepal and China (Tibet), among which, India shares 79 per cent, while 4 per cent lies within Bangladesh. (Earle et al. 2015; Mirza 2004; Pandey 2016; Rahman and Rahaman 2017; Rahman et al. 2019; Sood and Mathukumalli 2011; Swain 2018).

The climate of the Ganges basin is governed by wet monsoon and high temperature with significant season variability. The basin experiences heavy rainfall from June to October and receives 80 per cent of its annual flow during that time, causing seasonal flooding both in Bangladesh and India. It is followed by a prolonged dry period from November to May when the basin faces water scarcity (Earle et al. 2015). The average annual rainfall fluctuates between 760 mm to more than 2290 mm from the western end to the eastern end of the river (Gin and Giupponi 2014).

Figure 1: The Ganges River Basin



Source: Khan et al. 2014.

4.1.2. Socio-economic Significance

The Ganges basin is densely inhabited; approximately 400 people live in its per square kilometre (Akter 2016; Rai 2013). Life and livelihood of roughly 445 million people are directly or indirectly depends on the basin (Jain and Singh 2020). This number is expected to reach more than 720 million by 2025 (Hosterman et al. 2012). Apart from the socio-economic importance, the river has deep cultural and religious significance and regarded as one of the sacred places for the people of the Hindu religion. The river flows through 11 Indian states where lies more than 50 major urban centres. One-third of India's surface water comes from the Ganges basin, among which 90 per cent is used for agricultural activities and food production (Jain and Singh 2020). Forty per cent of India's GDP is generated within the Ganges region (World Bank 2015). The Ganges is crucial for its distributaries like the Hooghly-Bhagirathi. These rivers work as the lifeline for Kolkata port, one of the major river ports in India. The Ganges is also contributing to the energy sector of India by providing 2000 MW (installed capacity) of hydroelectricity (Amarasinghe et al. 2016; Swain 2018).

In Bangladesh, life and livelihood of nearly 40 million people, which is one-fourth of the country's total population, depends directly on the Ganges river basin (Swain 2018). The basin's fertile soil contributes significantly to the agriculture and food production of Bangladesh. It supports the river-fed irrigation along with recharge of groundwater. Besides, it is a crucial inland water transportation route of the country. The Sundarbans, the largest single block mangrove forest, is situated at the mouth of the Ganges basin. The forest supports a large number of flora and fauna, including some endangered species, and a vital source of many ecosystem services.

4.1.3. The History of Conflict and Cooperation in the Ganges Basin

The history of water cooperation in the Ganges basin is scarred by the prolonged dispute between Bangladesh and India. The conflict rolled out in 1951 when India unilaterally decided to pursue the project of constructing a barrage at Farakka point, located only 18 kilometres upstream from Bangladesh border. The main objective was to build a 38-kilometre-long feeder canal in order to increase the water flow in the Bhagirathi-Hooghly river by diverting 40,000 cusecs of water (equivalent to 1133 m3/s) from the Ganges. Despite the objection from then East Pakistan (now Bangladesh), India proceeded with the project in 1962 which completed in 1970. The Farakka barrage started its operation on a trial basis in 1975 for 40 days. From 1976, India unilaterally started operating the Farakka barrage on a regular basis by diverting water from the Ganges during the dry period. Both countries began to negotiate to reach an agreement on the sharing of the Ganges water (Abbas 1984; Earle et at. 2015; Swain 2018).

The Ganges water negotiation became complicated when both Bangladesh and India placed their respective demand for water from the Ganges. The average minimum flow was projected only 55,000 cusecs at the Farakka point in the dry seasons of 1975. India planned to withdraw 40,000 cusecs, whereas Bangladesh's demand was the entire flow. The water situation during the dry season got worse due to the unilateral diversion of water in the upstream that fuelled further tension between the two countries (Earle et al. 2015; Treadwell & Akanda 2009).

The first agreement between Bangladesh and India regarding the sharing of the Ganges water was signed in 1977 for a five-year period (*Agreement on Sharing of the Ganges Waters at Farakka and on Augmenting its Flows*, 1977). After its expiration, two short-term MoUs were signed in 1982 and 1985 for a two-year period each. After 1988, there was no formal agreement to regulate the sharing of Ganges water until 1996 due to the conflicting demand between the two countries. Both of them were unwilling to make any concession on their respective positions, and there was no scope for third party involvement in the negotiation as India was adamant to its strict bilateral negotiation policy (Islam 2001; Pandey 2016).

After passing eight years without any formal agreement, Bangladesh and India managed to sign the Ganges River Water Sharing Treaty in December 1996 (*Treaty Between India And Bangladesh on Sharing of the Ganges Waters at Farakka*, 1996). For the first time, both countries agreed to come under a cooperative arrangement for a period of 30 years. The treaty outlined a specific water-sharing formula, based on which the dry season water flow is to be shared. According to the treaty, if the Ganges flows below 70,000 cusecs at the Farakka point, Bangladesh and India will equally share the available water. If the flow stands between 70,000 to 75,000 cusecs, Bangladesh will get 35,000 cusecs, where India will be giver the balance of the flow. If the water flow crosses over 75,000 cusecs, India will receive 40,000 cusecs, and the balance of flow will be given to Bangladesh (*Treaty Between India And Bangladesh on Sharing of the Ganges Waters at Farakka* 1996).

Summary of the Literature

The review of the literature demonstrates that the Ganges plays a vital role in both Bangladesh and India by providing water, supporting transportation, food production and river-based commerce and economic activities in their respective countries. The river also bears great importance for the biodiversity and ecosystem of both countries. So, the river has enormous potential for benefit-sharing on a transboundary level that can contribute significantly to the water-energy-food need of people in both Bangladesh and India. However, the literature on the history of cooperation shows that the cooperation framework between these two countries in the Ganges basin is exclusively based on the physical sharing of water. Due to that, both Bangladesh and India are being deprived of utilising other available benefits of the Ganges basin. Over-dependence on physical water sharing mechanism is also making the water negotiation really difficult for both countries to produce a positive-sum outcome.

4.2. Benefit-sharing in International River Basins

Application of benefit-sharing in the international basin is increasing. Now, more than ever before, there is a growing focus on the sharing of benefits instead of physical sharing of water in a shared basin. Many scholars have recorded the successful cases of the benefit-sharing in the shared river basins like the Mekong, Senegal, Columbia, Orange-Senqu, the Nile, etc.

4.2.1. Senegal River Basin

Cooperation in the Senegal river has been described by Alam et al. (2009) as a perfect representation of a benefit-sharing approach from theory to practice. The Senegal river basin offers good practices of benefit-sharing where comparatively underdeveloped economies from Africa come together under a common platform to cooperate by sharing multiple benefits. The river basin is shared by four countries, namely Mali, Mauritania, Guinea and Senegal. The riparian countries established the Organisation pour la mise en valeur du fleuve Sénégal (OMVS) in 1972 (initially established by Mali, Mauritania, and Senegal, in which, Guinea became a party in 2005) to manage the Senegal river basin jointly. The cooperation among them centred around the development of hydropower plants and dams under OMVS with a legal framework to regulate the river flow, generate electricity, facilitate navigation and protect the environment where benefits are shared equitably (OMVS n.d.; Sadoff & Grey 2002; Sedeqinazhad et al. 2018).

The joint management of the Senegal River was envisioned at a time when development activities in the Senegal river basin were facing major difficulties due to lack of economic opportunities, frequent occurrence of natural disasters like floods and droughts, low agricultural production, and lack of access to affordable energy, especially for the industrial sectors. Besides, Mali, Mauritania and Senegal were interested in augmenting their energy production by generating hydropower. The expansion of agricultural activities was another major area of interest for Mauritania and Senegal, while Mali was looking for the opportunity to increase the navigability of the river for transportation. With those objectives in mind, the riparian countries established OMVS, under which two dams were built. None of the riparian states was in a position to finance the proposed dams by their own. Therefore, the development of the OMVS created the space for the international donor community to get engaged in the cooperative framework. The Diama Dam was built on the river delta spanning the border of Mauritania and Senegal for the management of flood, irrigation, the supply of potable water and prevention of seawater intrusion. The Manantali Dam, located in Mali, was built to generate hydropower, support agriculture through irrigation and facilitate river transportation. The riparian countries were the co-owner of both dams, where costs and benefits were shared in an equitable manner (Hensengenth et al. 2012).

The cooperation framework, developed under OMVS, helped to obtain multiple benefits from the river, like improvement of water supply, generation of electricity, etc. The development due to the enhanced cooperation ultimately helps to elevate the living condition of the people of the riparian states. Besides, co-ownership of the water infrastructures, built under the programme, help to reduce political tension among the riparian states. The instance of the de-escalation of tensions between Mauritania and Senegal can be mentioned in this regard. Not only that, but the accompanying regulatory, institutional and physical infrastructure under the cooperation framework help to build trust among the riparian states that catalyse further cooperation on a much larger scale (Alam et al. 2009; Hensengenth et al. 2012; Yu 2008).

So, the Senegal river basin is a great example where expected benefits served as an incentive for cooperation among the riparian states by expanding their options of negotiation and engaging in a trade-off between present and future benefits. Countries came under the umbrella of a transboundary river organisation to cooperate in order to achieve food security, ensure sustained economic growth and get access to cost-efficient electricity. The equitable sharing of benefits along with the political solidarity

among the riparian states help to consolidate cooperation that goes beyond the boundary of the water sector. The joint vision of the riparian states and their joint management of the river allow them to share the cost and benefits that ultimately produced a win-win outcome for all (Alam et al. 2009; Kramer & Pohl n.d.; United Nations 2015)

4.2.2. Columbia River Basin

The Columbia River Treaty (CRT) is another instance of successful water cooperation in an international river based on benefit-sharing. The CRT outlines the way Canada and the United States (US) interacted with each other in order to reach a win-win consensus by focusing on multiple benefits derived from the Columbia river basin. The Treaty was signed in 1964 to develop and operate four large dams primarily with the objective of generating hydropower and controlling flood (Tarlock & Wouters 2007).

The Columbia river basin emerged as a major concern for both Canada and the US after the second world war due to its periodic and devastating flooding events. Especially, the basin's moderately densely populated settlements, agricultural lands, and the urban-industrial facilities located in the lower Columbia river floodplain became highly vulnerable to flood risks. Besides, Canada's plan to exploit the Columbia river to generate hydropower poses a threat to the US's hydropower generation capacity at downstream. Therefore, the US was interested in influencing Canada to change its upstream water utilisation strategies to safeguard and enhance its downstream hydropower production and strengthen its flood protection schemes. The negotiation between these two riparian states generated a fruitful outcome when they signed the CRT, based on the idea of joint development of the river basin following the benefit-sharing principle. The cooperative mechanism of the CRT comprises the building of four storage dams (three in Canada and one in the US) to produce hydropower in Canada and provides downstream facilities to the US by regulating the river flow (Hensengenth et al. 2012; Yu 2008).

The treaty managed to produce substantial benefits, both for Canada and the US, in the form of controlling flood, establishing new hydropower plants, increasing efficiency of the existing power plants and facilitating joint river management. In exchange for the upstream storage built in Canada, the country received additional electricity produced in the hydropower plants located downstream in the US. Canada also received economic compensation based on the value of the flood damage reduction in the US. The collective management of the Columbia river basin demonstrates how focusing on net benefit can significantly increase the mutual advantages for contracting parties, which cannot be achieved with unilateral ventures (Yu 2008; Hensengenth et al. 2012; United Nations 2015).

4.2.3. Orange-Senqu River Basin

The Orange-Senqu river is another good example of mutual cooperation where the execution of the benefit-sharing principle has produced a win-win outcome for the riparian states. With the help of the Lesotho Highlands Water Project (LHWP), two of the riparian countries, Lesotho and South Africa, took advantage of the geological factors by establishing water infrastructure in order to optimise the basin's resource utilisation and equitably share the project's benefit. The project was developed by harnessing the river water to generate hydropower and regulate the river flow. The project is a prime example of securing of net benefits from cooperation for both countries in a shared basin (Hensengenth et al. 2012; Sadoff & Grey 2002; Sedeqinazhad et al. 2018).

The LHWP consists of six dams, 200 km of water canals and associated water infrastructure, including hydropower plants and pumping stations, on the upstream of the Orange-Senqu River. The objectives of the LHWP were - transferring water from the Orange-Senqu River to South Africa; generating hydropower for Lesotho. In addition to economic benefits from water royalty, the plan allows Lesotho to reduce its heavy reliance (about 90 per cent) of energy imports from South Africa by generating 2,000 GWh of electricity annually. For South Africa, the benefits include the supply of river water to

its water-scarce Gauteng region. This project develops a win-win situation by allowing South Africa to improve its water security and enabling Lesotho to ensure its energy security and economic development. (Hensengenth et al. 2012; Yu 2008).

4.2.4. Mekong River Basin

In Asia, an application of the benefit-sharing approach can be seen in the Lower Mekong region where riparian states are party to the Mekong River Commission (MRC) Agreement, signed in 1995 (Nakayama 2000; Phillips et al. 2006; Sinha 2018). MRC Agreement brings four riparian countries of the Mekong basin under a common platform by focusing on benefits obtained from the Mekong river. According to article 1 of the MRC, riparian countries will cooperate in developing "…irrigation, hydropower, navigation, flood control, fisheries, timber floating, recreation and tourism, in a manner to optimize the multiple-use and mutual benefits of all riparians and to minimize the harmful effects that might result from natural occurrences and man-made activities (Mekong River Commission, 1995)." Myanmar and China, the other two riparian states of the Mekong river, are involved with the MRC as "dialogue partners".

Greater Mekong Subregion (GMS) programme is a much more comprehensive plan that allows all six riparian states to work together under a standard economic cooperation programme. Lee (2015) have elaborated how the cooperative relationship between China and other Mekong riparian countries have evolved under the programme, which has produced a substantial socio-economic benefit to the riparian states. The enhanced cooperation galvanises China to invest more in the basin that helped downstream countries, especially Lao PDR and Cambodia, to reap the benefit in the fields like transport, telecommunication, education, health and human resource development. Under the GMS programme, the riparian states focus on two core areas of cooperation, i.e., transport and energy. In transportation, four of the Mekong riparian countries – China, Myanmar, Thailand and Lao PDR – agreed to enhance navigation facilities in the basin. The energy sector focuses on generating hydropower for the Mekong power grid for energy trading (Greater Mekong Subregion 2019; Lee 2015).

Cooperation in the Mekong river basin is a great illustration of how non-water issues, along with water issues, can help to resolve conflicts regarding water by focusing on various benefits. The palpable benefits work as a catalyst for China to come to the discussion table with other riparian states and engage in cooperation. The development of a monetary and non-monetary mechanism for sharing benefits in the Mekong river basin help to unlock a list of shared agenda for all riparian states that ultimately provide impetus to solve different conflicting issues in the whole basin (Lee 2015; Sinha 2018).

4.2.5. Nile River Basin

Nile River is the world's longest river that flows through ten countries, among which, four are considered as water-scarce (Nile Basin n.d.). The hydrology of the Nile river is characterised by its tributaries which pass through different climate zones and vulnerable to multiple floods and drought events. The riparian states of the Nile basin are highly dependent on the water from the Nile river for their economy, which is still reliant on agricultural output. The riparian states have a long history of political and diplomatic conflict, which makes the management of the Nile extremely difficult and problematic (Earle et al. 2015).

In spite of the Nile's complex hydrological and hydro-political setup, the riparian states in the Nile basin managed to form the Nile Basin Initiative (NBI) in 1999 to enhance cooperation by focusing on sustainable utilisation of the Nile basin resources, based on the idea of benefit-sharing. The shared vision objective of the NBI is "to achieve sustainable socio-economic development through the equitable utilisation of, and benefit from, the common Nile Basin water resources." The NBI includes several programmes and investment projects to improve the water resource management by focusing

not only on water sector but also taking into consideration the other related sectors, like agriculture, energy, environment, fisheries, etc. Issues related to climate change adaptation and mitigation are also integrated into various programmes of the initiative. (Earle et al. 2015; NBI 2020).

The NBI is intending to enhance cooperation by taking several initiatives, like bridging the knowledge gap among the riparian states, strengthening planning and monitoring tools, promoting integrated water resource management, facilitating irrigation and drainage facilities, supporting climate change adaptation and mitigation plans in the basin etc. (Earle et al. 2015; Tafesse 2009).

Summary of the Literature Review

To recapitulate the discussion above, it can be said that the potential gains, both in monetary and non-monetary terms, derived from sharing of benefits, work as the primary motivation for the riparian states to involve in a cooperative arrangement. The riparian states focus on the benefits of water utilisation instead of centring their focus on the physical allocation of water. And, by concentrating on the distribution of benefits, they unlock greater scope for identifying mutually beneficial arrangements. The following table summarises the whole discussion of the benefit-sharing in the international river basins.

Table 2: Benefit-sharing in the International River Basins

River basin	Countries involved in cooperation	Area of cooperation	Benefits Obtained	Types of Benefits obtained
Senegal River basin	Mali, Mauritania, Guinea, Senegal	Energy production, food security and water security, economic development	Hydropower, irrigation facility, flood control, supply of drinking water, soothing of political tension	Type-2 Type-3 Type-4
Columbia River basin	Canada, the US	Energy production, flood management	Hydropower, flood control, economic compensation	Type-2 Type-4
Orange-Senqu River basin	Lesotho, South Africa	Energy production, water security, economic development	Hydropower, water royalty, water supply, cluster development	Type-2
Mekong River basin	China, Myanmar, Thailand, Lao PDR, Cambodia, Vietnam	Energy production, food security, navigation, economic development	Hydropower, navigation, economic gains	Type-2 Type-3 Type-4
Nile River basin	10 countries	Energy production, food security, water security, environment	Information exchange, irrigation and drainage facility, climate change adaptation and mitigation	Type-1 Type-2 Type-4

Source: Prepared by the author.

5. Results and Analysis

5.1. Emerging Challenges in the Ganges River Basin: Need for a Benefit-sharing Approach

Some of the major concerns for both Bangladesh and India is to provide their growing population access to sufficient water for drinking, adequate water for irrigation, affordable clean energy supply and protection from natural disasters like flood and drought (Earle et al. 2015). When it comes to the Ganges river basin, it is of paramount importance to ensure those facilities as the Ganges basin is sustaining one of the largest and densest global population with prevalent poverty. The riparian countries had a bitter experience in the past to devise a framework for sharing the water of the Ganges river. It took almost 45 years for Bangladesh and India to sign a long-term water-sharing treaty on the Ganges river. The agreement, signed in 1996, was based on the physical sharing of the Ganges water for the dry period. Now, the availability of water in the Ganges during the dry period is decreasing (Hosterman et al. 2012; Mukherjee et al. 2018). Since the water is pivotal to any physical water-sharing agreement, any adverse impact on its availability will make it difficult for the riparian states to negotiate on its sharing and produce a positive-sum outcome. The quantum of water in the basin has already fallen far short of the requirement of the riparian countries, which is also under the threat of climate change. Besides, both countries still have some divergent views on the joint management of the Ganges river, and those unresolved issues might cause a stumbling block in the future water negotiation process if it is solely based on physical water sharing.

The following section will shed light on some of the emerging challenges that will make the water negotiation in the Ganges basin extremely difficult if it is still only based on the physical sharing of water. This presentation will provide the rationale on why both countries will need to step beyond their traditional mode of cooperation and redirect their focus on sharing of benefits rather than sharing of water.

5.1.1. The Growing Gap between the Soaring Demand and Inadequate Water Supply in the Ganges Basin

The demand for water in the Ganges basin is increasing concurrent with population growth, whereas the availability of water is decreasing at an alarming rate. Especially in India, according to the country's population census of 2011, the per capita water availability was 1,545 cubic metre in a year (Government of India 2019). It has been predicted that the availability of per capita water will be dipped down to 1,486 cubic metres per year in 2021, 1,465 cubic metres in 2025, and 1,235 cubic metres in 2050 (The Hindu BusinessLine 2019). According to the "Water Stress Index", if per capita water per year in a country goes below 1,700 cubic metres, the country is considered to be in a water stress situation. And if it goes below 1,000 cubic metres, the country is said to be a water-scarce country (White 2012). That means India is currently in a water-stressed situation. With the current trend, the country is going to face a severe challenge to meet its water demand in the future. This souring demand and the decline of per capita water availability is going to stress the country's available water resources that will ultimately intensify the competition for water among the stakeholders, even between India's own provincial states.

Though the water availability situation in other riparian countries of the Ganges basin is not as bad as India, they are also experiencing the increasing demand for water in their respective countries. Especially in Bangladesh, water scarcity in the dry season is prevalent, hampering people's life and livelihood. Inland navigation and businesses based on water transportation is taking a massive toll due to inadequate water supply in the Ganges and its distributaries. In addition, the ecological health of the

Sundarbans is also threatened because of the drying out of some of the rivers that were dependent on the headwater of the Ganges for their water flow.

Therefore, there is a high possibility that every stakeholder involved in the Ganges basin, be it the provincial states of India or the Ganges riparian countries, will take a very conservative position when they engage in a water negotiation to ensure as much water as possible for its own citizens. In such a scenario, the traditional water negotiation process focusing on physical sharing of water might produce a zero-sum outcome as this will not allow the negotiating parties to make any concession or compromise on their own demands; the opportunity that benefit-sharing approach can provide.

5.1.2. The Issue of Climate Change and the Availability of Water

The uneven distribution of water resources and its Spatio-temporal variability is already a major concern in the Ganges basin. As mentioned in section four, the Ganges receives 80 per cent of its annual flow during the four months of the monsoon period. Therefore, the mismatch between water demand and the seasonal supply of water in the river is a common phenomenon. This problem is going to be deteriorated due to the adverse impact of climate change. All informants, both from Bangladesh and India, have expressed their deep concern regarding the possible implications of climate change in the Ganges basin.[4]

The water flow in the Ganges river largely depends on the precipitation from the monsoon rain coming from the Southwest and the run-off from the melting ice and snow of the Himalayan glaciers (Hosterman et al. 2012). A stable climatic condition is needed to run the entire system smoothly. Any change in the evaporation and temperature will thus adversely affect the precipitation and ice-melting pattern, hence raise the variability of the water flow in the river (Swain 2018). Climate change in the Ganges basin is expected to increase the average annual temperature (Bhutiyani and Pawar 2009; Jain and Singh 2020; Nepal and Shrestra 2015). In addition to that, change of precipitation, ranging from 10 to 25 per cent, are also predicted to occur annually (Kapuri and Modak 2019). These climatic changes will increase the quantum of water in the river during the wet season, due to snowmelt and glacial retreat, for a short period of time. But, in the long run, this will have a detrimental impact due to long-term reduction in the run-off of water. That means, less water will be available in the basin during the lean period.

Lack of water during the dry period is one of the prime areas of contention between Bangladesh and India. Less availability of water means increasing competition between the countries to secure access to scarce water resources. This situation will make any physical water-sharing negotiation extremely difficult to succeed and produce a positive-sum outcome.

5.1.3. The Internal Political Dynamics of India and the Growing Conflict between its Provincial States

India's domestic political dynamics is now becoming a major concern for its central government to involve in transboundary water negotiation with its neighbours. Internal conflict among different provincial states in India centring around water is increasing day by day. Various Indian states are now having conflicting demands over their shared water resources which also have a transboundary connotation. Pandey (2018) have argued that the intrastate river disputes among the provincial government are now outweighing the interstate river disputes in India. The discontent between the state government of Bihar and the West Bengal on the issue of Farakka barrage is one such example in this regard. In Bihar, which protested the Ganges water-sharing treaty when it was signed in 1996, there is a growing discontent against the present mode of Gange's water management. The Bihar state government has repeatedly blamed the Farakka barrage for several flooding events in its territory and demanded its decommissioning (NDTV 2017). But for West Bengal, Farakka barrage is considered as

[4] Author's personal interview with the informants.

a lifeline for its Kolkata port. Without water diversion at the Farakka, the Kolkata port will face severe navigability problem due to siltation, especially in the dry season. Nowadays, the central government always remains under pressure from both Bihar and West Bengal state government regarding the management of the Ganges.

Besides, according to the Indian constitution, water is under the jurisdiction of state governments where the Indian central government has a limited role to play (Ministry of Jal Shakti n.d.). There is a visible transformation in India's political governance where the country is transforming from a strong unitary state that has subsidiary federal features into a federal state with subsidiary unitary features (K.C. Wheare, cited in Pandey 2014). The state governments are exercising more authority over the issues under their jurisdiction (Pandey 2014; Swain 2018). For that reason, the central government now has to make compromises with the basin states regarding the transboundary water issues. The diminishing authority of the central government was vivid in 2011 when it failed to ink the Teesta agreement with Bangladesh due to the opposition from one of its provincial state governments. The West Bengal government rejected the terms of that agreement on the ground that it will hamper West Bengal's own water demand for agricultural production (Pandey 2018).

So, the increasing authority of the provincial state on water-issues are now evident in India. Nowadays, the central government has to settle the discontent between its own provincial states first, before going to resolve problems with its neighbours. And it seems like without adequate incentives; it would be highly unlikely that the states governments will make any concessions to their water-related demands and allow the central government to reach an agreement with other riparian states.

5.2. Potential Areas of Benefit-sharing in the Ganges Basin

Identification of the basket of benefits is crucial when it comes to transboundary water cooperation under a benefit-sharing arrangement. Basket of benefits facilitates a positive-sum outcome in a water negotiation by giving the riparian states multiple options to negotiate and allowing them to make trade-off among different benefits. Therefore, it is important to identify the potential areas that can generate a wide range of benefits for cooperation. This section presents some of the potential areas in water resource management in the Ganges basin where Bangladesh and India can negotiate benefit sharing in order to enhance cooperation. This section is developed based on the finding of the thematic analysis of the primary data collected for the study.

5.2.1. Inland Navigation and Water Transit

The inland navigation through the network of rivers has always been one of the cheaper modes of transportation in both Bangladesh and India, which have been in operation since time immemorial (Bhuiyan and Hossain 2006). There had been historical evidence recorded by Megasthenes, a Greek historian and Indian ethnographer, that from the fourth century BC, the Ganges river system is being used for navigation (Nagabhatla and Jain 2013). Since then, water transportation based on the Ganges and its tributaries and distributaries flourished. Especially during the 19th century, the British colonial rulers in the subcontinent extensively used inland navigation routes for trade and commerce, which was in full swing until the division of British India in 1947.

Since then, inland water transit between Bangladesh and India has been neglected for a long time, which is still in the nascent stage (CUTS International 2017; Sinha 2016). Bangladesh has seen a drastic shrink of its inland waterways in the last couple of decades that was almost 24,000 km in total (Hasan et al. 2018). The country lost nearly 15,600 km of the navigational route, which also includes 685 km of Gange's dependent waterways. Barely 5,968 km of waterways are now navigable by motorised vessels, only during the monsoon period. The route further shrinks to 3,865 km during the dry period due to the low flow in the river (Bhuiyan and Hossain 2006; Hasan et al. 2018; Hassan 2019). In the case of India, it has almost 14,500 km of inland waterways at present (IWAI 2016). But, the full potential of inland

water transportation has still not been realised. The movement of cargo through inland water transportation in India is approximately 20 million tons, in contrast to over 1.5 billion tons by road, rail and pipeline (Nagabhatla & Jain 2013).

Being one of the cleaners and cost-effective mode of transportation, especially for freight and logistic, inland navigation and water transit has enormous potential for facilitating cooperation by sharing multiple benefits derived from a shared river basin. A well-developed and integrated waterway, as part of multimodal transport connectivity, can provide an incentive to the riparian countries by offering various benefits that can ensure better water management and further the cooperation. In case of the Ganges basin, a transboundary navigational route can offer Nepal, the land-locked country of the basin, an immense opportunity to increase its international commerce and trade by gaining direct access to the seaports through the river system of Bangladesh and India that will allow the country to gain economic benefits. Nepal mostly depends on road transportation for its international trade, which is ten times more costly compared to water transportation (Ahmad 2004; Upreti 2006). Therefore, the economic benefit of getting involved in a water transit cooperation in the Ganges basin is huge for Nepal, which, in turn, can unlock multiple benefits to both countries.

In the case of Bangladesh India transboundary water cooperation, the inland water transit can also play a huge role. There is already a bilateral protocol for India to use the waterways of Bangladesh for water transit (Biwta.portal.gov.bd. n.d.). However, the scope of the protocol is still limited, which has a vast potential to expand. Both countries can collaborate in developing and maintaining water infrastructure in the Ganges basin to strengthen water transit facilities. India has already taken an initiative to develop it's National Waterway 1 (NH-1, The Ganges waterway) under 'Jal Marg Vikas' project. The country can jointly work with Bangladesh to connect its National Waterway 2 (NH-2, The Brahmaputra waterway) with its NH-1 under the Inland Water Transit and Trade Protocol[5] between the two countries. Informant D from Bangladesh also believes that Bangladesh should accept any proposal from India to connect its NW1 and NW2.[6] This will give India the must-needed access to its land-locked north-eastern provinces cost-effectively and safely and enjoy economic benefits. Besides, a large container ship can carry up to 90 containers, which is equivalent to 90 truckloads of goods (Saum & Ahmad 2019). So, India can also reduce transportation time by carrying a huge amount of goods at a time in a congestion-free manner. In return, Bangladesh will not only get economic benefits in the form of transit fees and duties but also can enjoy the enhanced water supply in the river. To secure its own benefit of plying large vessels through the rivers of Bangladesh, India would be interested in providing sufficient water in the rivers to ensure its navigability. Informant E from Bangladesh also believes "this will not only increase the flow of the river but also add economic value to the Ganges basin."[7]

Indian water transit will allow both Bangladesh and India to conserve the environment by reducing carbon emission. Inland water transit can also be helpful for climate change adaptation and mitigation. In this regard, the statement of Informant G from India reads like, "when we are thinking of inland water transportation, we are also thinking of climate change mitigation because it reduces transport emission. We are also thinking of climate change adaptation, as there will be a higher availability of water in the dry months because of the augmentation of the flow".[8] In addition, during the time of natural disasters, inland water transit will help to transport food grains and relief materials when other modes of transportation will not in a position to use. Moreover, inland navigation and transit is a non-consumptive form of water utilisation, thus is less problematic to negotiate compared to consumptive use of water, like irrigation. And, in the long run, inland navigation and water transit can play a crucial role in consolidating the regional cooperation in the whole Ganges basin by involving other riparian states in the water transit route.

[5] The protocol route is Rajshahi-Godagari-Dhulian; Dhulian-Godagari-Rajshahi.
[6] Author's personal interview with Informant D from Bangladesh.
[7] Author's personal interview with Informant E from Bangladesh.
[8] Author's personal interview with Informant G from India.

5.2.2. Multipurpose Storage Dam Projects

The Ganges basin is endowed with a vast amount of water resources. Unfortunately, as mentioned earlier, water becomes abundant during the monsoon when the basin receives 80 per cent of its water supply and causes flooding in the downstream. During the lean period, the basin faces water scarcity. None of the riparian states in the Ganges basin has been able to properly utilise the monsoon flow that ultimately ends up in the Bay of Bengal. Multipurpose storage projects in the upstream can be a potential area of cooperation that will provide multiple benefits to the riparian states. By storing excess monsoon water and redistribute it during the lean period, multipurpose storage projects will not only allow the riparian countries to utilise the monsoon flow but also help to augment the dry-season low flow in the river. The Ganges Strategic Basin Assessment (GSBA 2014), conducted by the World Bank, also highlights the high potential of multipurpose storage dams in the upstream and confirms that it can substantially augment the dry season water flow in the Ganges.

When it comes to the development of multipurpose storage dams in the Ganges basin, the involvement of Nepal in the cooperative framework becomes crucial. Informants from both Bangladesh and India have acknowledged the crucial role of Nepal in this regard. According to Informant G from India, "in the broader framework of cooperation, especially in term of water augmentation, the cooperation of Nepal is crucial."[9] The terrain of the central and northern areas of Nepal offers suitable places for the building of such facilities. The country has already identified twenty-eight potential sites where dams could be built. Among those, nine of them are classified as large, with a total storage capacity of 110 billion cubic meters (Biswas 2017; Rasul 2015). Construction of storage dams in Nepal would offer several benefits to downstream countries, let alone generating its own benefits. Well evaluated and well managed dams can help to augment the Ganges river flow during the dry season by one-third to three-times of the amount, depending on the month of the lean period (Sinha 2016). According to another study (GSBA 2014), storing and redistributing wet-season water flow will double the low flows in the Ganges during the months when the river will experience the lowest flow. The increased flow during the dry season will allow both Bangladesh and India to continue their inland water transportation unhindered, make more water available for drinking and irrigation, preserve the ecological flow of the river and stimulate the ecosystem and biodiversity of Sundarbans. In return, Nepal can enjoy economic benefit from market-based water transfer and producing hydroelectricity, which it can sell to Bangladesh and India.

One of the co-benefits of multipurpose storage dams is the generation of hydroelectricity, which can be the driving force for Nepal to get involved in the benefit-sharing mechanism in the Ganges basin. The GSBA (2014) report has confirmed the previous claims of Nepal's economically feasible hydropower potential, which is believed to be more than 40,000 MW in the headwaters of the Ganges (Aquastat n.d.; Rasul 2015; Sinha 2016). Only less than three per cent of the total potential (1,127 MW) has been materialised till now, whereas, Switzerland, Sweden and Japan have materialised 87 per cent, 73 per cent and 68 per cent of their hydropower potential respectively (Biswas 2017; IHA 2020). The net economic value of this potential hydropower is estimated approximately five billion annually, which is 17 per cent of Nepal's total GDP (which was US$29.01 billion in 2019) (GSBA 2014; Tradingeconomics.com 2020). Therefore, the economic significance of the hydropower generation is huge for Nepal. Besides, per capita, electricity consumption in Nepal is still very low, which is 146.468 kWh per person per year (in 2014) compared to the world average of 3,133 kWh per person per year (in 2014) (World Bank 2020). Therefore, the additional electricity, produced from hydropower will not only help Nepal to meet its internal consumption but also help other riparian countries in the basin to meet their own. Moreover, electricity trade through regional grid connectivity also has immense potential for regional economic integration.

In the case of the wet season water utilisation through storage dam projects, India can also play a crucial role. The country has already developed 39 hydroelectric projects in upstream of the Ganges basin

[9] Author's personal interview with Informant G from India.

distributed in its nine provincial states (Department of Hydro and Renewable Energy n.d.). Besides, a number of new projects have also been proposed. If all the ongoing and proposed hydroelectric dams are constructed, the Ganga basin will have the highest dam density in the Himalayan region (Jain and Singh 2020). If properly planned and jointly developed, these hydropower projects hold immense potential for storing a large amount of monsoon water, along with generating hydropower. Informant D from Bangladesh also believes water storage facility can be built in some of the Indian states in the upstream of Ganges basin.[10] This can enable benefit-sharing with Bangladesh and enhance cooperation by securing multiple benefits in the socio-economic field. According to Informant D from Bangladesh, "I believe increasing water supply is the ultimate solution to the water-related problems between Bangladesh and India."[11]

Recently, the government of Bangladesh has decided to move forward with the "Ganges-Padma Barrage Project" with the objective of optimum utilisation of the Ganges water (The Daily Star 2018). It is expected that the project will offer multiple benefits to various sectors, like navigation, flood management, agriculture, river-bank erosion, salinity intrusion etc. This project can be an area of cooperation which might open new opportunities for both Bangladesh and India and provide a platform to work jointly under a benefit-sharing framework.

5.2.3. Joint Management of Sundarbans

Sundarbans, the world largest single block mangrove forest, is located at the downstream of the Ganges delta and spread across Bangladesh and India. It is about 10,000 square kilometre, among which, 6,017 square kilometre is in Bangladesh, and the remaining 3,983 square kilometre is inside India (Rahman and Navera 2018). Sundarbans offers a wide range of benefits by supporting a broad array of flora and fauna. It provides essential ecosystem services to nearly five million people, living within the Indian part of Sundarbans and approximately 10 million people, living within the impact zone of the Bangladeshi part. So, life and livelihood of nearly 15 million people are directly dependent on the Sundarbans (BISRCI n.d.). The forest works as a buffer zone from the devastating impact of cyclonic storm surge and flooding from the Bay of Bengal. Besides, the "Sundarbans Reserved Forest" is a UNESCO world heritage site and a "RAMSAR" site, protection of which is stressed by various international conventions in which Bangladesh and India are both members.

The deterioration of ecological integrity of Sundarbans is a huge concern for both Bangladesh and India. Various environmental and anthropogenic stress have already affected the rich biological diversity of the mangrove forest, which is clearly visible through the changing pattern of forest's species composition (Nishat and Chowdhury 2018). The decline of biodiversity and the ecological health is directly connected with the reduction of dry season freshwater flow in the Ganges river, especially in its distributaries like Gorai, Mathabhanga, Kobadak, etc. (Hoque et al. 2006; Karim 2004; Nishat and Chowdhury 2018; Rahman and Navera 2018). The situation has been further degenerated due to the adverse effects of global climate change and sea-level rise. There are predictions that climate change and sea-level rise can drastically alter the current composition of freshwater mangrove by replacing it with saline water mangrove, thus destroy the ecological balance of the forest and its economic potentials (Nishat and Chowdhury 2018).

The joint management of Sundarbans would offer huge scope for Bangladesh and India to conserve the ecological health of the forest, thus nurture its numerous benefits. Both counties have already recognised the importance of the joint management of Sundarbans and signed an MoU in 2011. Unfortunately, there has been minimal progress in this regard. A cooperative framework based on benefit-sharing will allow both Bangladesh and India to increase their understanding of the conservation of the forest ecosystem. Water augmentation in the Ganges river can be a potential measure to restore the ecological balance of the Sundarbans by increasing the dry-season water flow in the Ganges

[10] Author's personal interview with Informant D from Bangladesh.
[11] Ibid.

tributaries. This will help to reduce the salinity intrusion in the forest. Increased water flow in the downstream of the Ganges will also enable India to enhance water supply inside its part of Sundarbans. Informants from both Bangladesh and India have highlighted the possibility of water transfer. According to Informant A from Bangladesh, "technically, it is possible to transfer fresh water from the Ganges to the Indian part of Sundarbans through the Ichamoti river of Bangladesh."[12] Besides, both Bangladesh and India are party to CBD and RAMSAR convention. Joint management of the forest will help both countries to take holistic measures to conserve the Sundarbans' fragile ecosystem, which will enable them to meet their obligations to those international environmental conventions. Moreover, the exchange of data and model generation under a joint cooperative framework to govern Sundarbans will allow both countries to manage disasters like flood and cyclones in the Ganges basin more efficiently, a tangible benefit both countries will be inclined to achieve. The scope of joint management could further be broadened by supporting both Bangladesh and India in initiating a high degree of climate mitigation and adaptation strategies and watershed management in the area of the Sundarbans. This will facilitate a win-win outcome in the transboundary water cooperation between Bangladesh and India in the Ganges basin.

5.3. Facilitating Benefit-sharing in the Ganges River Basin

Promoting benefit-sharing in the Ganges basin will require a change in the status quo of current transboundary water management set up between Bangladesh and India. There is a need to revisit the policy outlook of both countries to develop a conducive environment that will facilitate benefit-sharing. Besides, the current institutional setup for water management will also need to be strengthened in order to support the benefit-sharing cooperative arrangements.

5.3.1. Shift in the Policy Outlook

5.3.1.1. Exchange of Information and Joint Assessment

Successful implementation of benefit-sharing requires access to a wide range of hydro-meteorological, technical and water-project related data in order to identify the full breadth of potential benefits. Bangladesh and India need to increase the exchange of data and information between them in order to build a conduce environment for benefit-sharing. All informant from both Bangladesh and India have stress importance on this issue. Unfortunately, the current scope of data exchange between these two countries is limited. India only shares some hydro-meteorological data that help Bangladesh in some aspects of disaster management like flood warning and forecasting. But, still, maximum data related to the Ganges basin is being classified by the Indian government under its hydro-meteorological data dissemination policy (Government of India 2018). Though, someone can request for having access to the classified data; yet, it's a very arduous undertaking where getting permission is not always guaranteed. Besides, India hardly shares any information about its water-related projects in the upstream of the Ganges basin, which is severely affecting the flow of the river. Highlighting the importance of information sharing, Informant B from Bangladesh raises the question, "if someone does not share information, how will it be possible to build cooperation?"[13] Therefore, there should be a comprehensive protocol of information exchange between Bangladesh and India that will allow both countries to share information and cooperate with each other.

In addition to information exchange, it is also crucial to enhance the number of joint assessments between Bangladesh and India. There are previous instances of joint assessment in the Ganges basin, like Bangladesh–Nepal Joint Study, conducted in 1989, in which, the joint team of Bangladesh and Nepal collaborated to identify the potential storage reservoir sites in Nepal for water augmentation. Joint assessments help to build trust and give credibility to the findings, thus provide incentives to the riparian states for cooperation under benefit-sharing arrangements. Besides, joint assessments are really

[12] Author's personal interview with Informant A from Bangladesh.
[13] Author's personal interview with Informant B from Bangladesh.

important for the development of any water infrastructure in the river basin. In this regard, the suggestion of Informant C from Bangladesh reads, "we need to conduct joint studies in case of building any physical infrastructure in the river basin. The joint studies will work as a building block for future river basin organisation."[14]

To improve data sharing and facilitate joint assessment, it is important to establish a network of institutions with concrete information sharing protocol. Besides, both Bangladesh and India have to make sure that the exchange of information will not only be confined within the state apparatus, rather academia, research organisations and people who are interested in working on the Ganges basin will have access to that. In case of joint assessment, the hydrodynamics of the entire river basin need to be taken into consideration in order to generate predictive hydrological and climate modelling that will come handy in identifying a wide range of options for benefit-sharing.

5.3.1.2. Harmonising National Water Policy and Embracing Basin-wide development

National water policies, which mainly focus on domestic water discourses, have an important bearing to transboundary water cooperation (Hensengenth et al. 2012). A basin-wide perspective is required in the national water policies to enable an effective benefit-sharing involving all the riparian states of a river. Recognition of transboundary water issues in the national water policies will allow the riparian countries to take actions that would be beneficial to the whole basin. The national water policy of both Bangladesh and India do recognise a basin-wide perspective of water resource management, accepting the entire basin as a unit of development. However, article 13 of the Indian Water Policy (Government of India 2012) has prioritised the bilateral negotiation approach while dealing with international agreements in a shared river basin. India's such preference to negotiate water issues bilaterally could work as a stumbling block in facilitating benefit-sharing in the Ganges basin. The detailed discussion in section 5.2 has already demonstrated the potential role of Nepal in promoting benefit-sharing. Therefore, it is crucial to have a multilateral perspective on national water policies. Besides, Informant G from India suggests that "each country's national water policy should have a certain degree of complementarity. The basin actors should sit amongst themselves and discuss the complementarities of water policies amongst themselves."[15] That means, along with national priorities, there needs to be some degree of complementarities in order to maximise mutual benefit. Moreover, benefit-sharing is based on the principle of making optimum trade-off among different benefits related to various sectors of water resource management. Hence, both countries need to embrace the concept of Integrated Water Resource Management (IWRM) in their respective national policies and implement it accordingly.

5.3.1.3. Provision for Third-Party Involvement

The involvement of the third-party has played a crucial role in water negotiations and benefit-sharing arrangements in different international river basins like Senegal, Mekong, Indus etc. In the case of the Ganges basin, there is a growing need for third-party involvement in order to facilitate cooperation and reduce disagreement between the riparian states. Their presence could be instrumental due to their ability to make large investments in joint water projects that the riparian countries could undertake for benefit-sharing. Besides, they bring technical competence and advance technology, which can help in realising benefit-sharing potentials in the basin. Moreover, as discussed in section 5.1, water negotiation in the Ganges basin will become more troublesome in the future due to various reasons. According to Informant H from India, "sometimes, bilateral negotiation is perceived as a zero-sum game. That debate goes away with the involvement of a third-party."[16] Hence, a third-party can work as a neutral mediator to any disagreement or conflictual situation that might arise during benefit-sharing negotiation and can help to produce a positive-sum outcome. They can also contribute as a part of a dispute-settlement mechanism for benefit-sharing arrangements.

[14] Author's personal interview with Informant C from Bangladesh.
[15] Author's personal interview with the Informant G from India.
[16] Author's personal interview with Informant H from India.

5.3.1.4. Promoting Track-II and Track-III Diplomacy

Benefit-sharing is a complicated endeavour that involves a wide range of stakeholder and multifaceted issues. Therefore, regular dialogue and exchange of views always remain a priority in any benefit-sharing arrangement. Hence, in addition to state-level diplomacy (track-I), it is important to promote track-II and track-III diplomacy in order to increase the regular exchange of dialogue. Track-II and track-III diplomacy will help to bring the intellectuals, water experts and academia from both Bangladesh and India to work closely through the regular arrangement of informal meetings and discussions. These informal meetings and dialogues will not only help to identify the basket of benefits in the Ganges basin but also find a feasible way to establish a cooperative arrangement to materialise those benefits.

In addition, track-II and track-III diplomacy also highlights the potential role of civil society in the benefit-sharing arrangement. The NGOs and social activists work at the grass-root level and have a strong connection with the local population. Therefore, their input in potential benefit-sharing mechanism is vital. Besides, civil society can influence public attitudes toward the use of water in a shared basin and can mobilise public pressure on their respective governments for a better outcome. So, both Bangladesh and India need to promote the involvement of civil society in the water negotiation process and take into account their valuable feedback.

5.3.1.5. Concrete Conflict Resolution Mechanism

Benefit-sharing often occurs in a contested environment, involves stakeholders with divergent views and interest. The outcome of a benefit-sharing arrangement might sometimes lead to controversy and conflict among the riparian states. Besides, the bilateral water relation between Bangladesh and India centring around the Ganges issue had a long history of conflict and disagreement, in which both countries have opposing views on several issues. Therefore, both countries need to devise a conflict resolution mechanism while negotiating on benefit-sharing. A provision of conflict resolution was incorporated in the 1977 Ganges water-sharing agreement, which was dropped from the current Ganges water-sharing treaty signed in 1996. Any future agreement under benefit-sharing arrangement should have an explicit and deliberate conflict-resolution framework in order to resolve any dispute or disagreement amicably and ensure smooth functioning of the cooperation framework.

5.3.2. Development of Institutional Arrangements

5.3.2.1. Strengthening of Joint Institutions

Investment in joint water infrastructure projects works as an important driver to facilitate benefit-sharing in a shared basin. These sort of investments and their collective management allow the riparian states to obtain multiple benefits in the field of socio-economic, environmental and other sectors, thus help to build trust and create space for further cooperation.

The success of collaborative development largely depends on the strength of the joint institutions or river-basin organisations. A strong institutional with a clear mandate is a prerequisite to shares the benefits and cost in an equitable manner. In the case of the Ganges basin, Bangladesh and India lack a strong basin-wide institution that can facilitate benefit-sharing and look after the join management initiatives. Though, there is a water commission, known as the Joint River Commission (JRC), to oversees cross-border water issues between Bangladesh and India for all 54 common rivers; yet, the institution lacks proper jurisdiction when it comes to transboundary water management and works within the narrow framework of a political agenda. According to Informant B from Bangladesh, “currently, the authority of the JRC is only limited to providing proposals. Without the consent of

political authority, they cannot even discuss any issue."[17] Besides, in most of the time, the JRC could not work collectively, as one part of it is located in Bangladesh and another part is in India, which is mainly run by the Ministry of Water Resources, River Development and Ganges Rejuvenation of India (Uddin and Sultana 2017).

Therefore, successfully implement benefit-sharing in the Ganges basin will require a robust joint institution that can work on a basin-wide level. To take such responsibility, the scope of the JRC needs to be increased with adequate capacity and jurisdiction. Though some of the informants have suggested for the development of a new river basin organisation particularly for the Ganges basin, the majority of them have argued for utilising the existing institutional structure of JRC. According to the Informant I from India, "there is no point of having a separate commission. Whatever institutional structure we have is enough for Ganges basin."[18]

To strengthen the JRC, it is important to create more layers under the commission with a concrete mandate to look after the activities in the Ganges basin. Informant C from Bangladesh suggests establishing different technical committees under JRC to visualise different benefit-sharing scenarios from technical perspectives.[19] The recommendation of the Informant G from India reads like "the scope of the JRC needs to be broadened by ensuring wider participation of state and non-state actors under the layers of JRC."[20] The commission also needs to concentrate on developing a robust mechanism of collecting hydro-meteorological and scientific data by creating a data inventory of its own and closely collaborating with meteorological institutions in both Bangladesh and India. It needs to be understood that benefit-sharing cooperation is a step-by-step process that starts with regular interactions among the contracting parties. Hence, all informants stress the importance of the regular meeting of JRC as per the JRC statute.

Involvement of Nepal is another crucial issue when it comes to benefit-sharing at the basin-wide level. Nepal holds immense potential to facilitate benefit-sharing in the Ganges basin. Therefore, Nepal's participation in the institutional arrangements of benefit-sharing is something to think about. JRC is currently focusing the bilateral water issues only between Bangladesh and India; but, in the future, the scope of the JRC needs to be extended at the basin-wide level by incorporating Nepal. According to Informant E from Bangladesh, "JRC should be multilateral in nature. India always promotes bilateral mechanism. But the commission should be multilateral. Any institution in the Ganges should include at least Bangladesh, India and Nepal."[21]

The success of a benefit-sharing arrangement needs to be evaluated based on the generation of various benefits and their equitable distribution among the riparian states. Therefore, there is a need to establish a monitoring and evaluation system under the JRC for periodic review and assessment of benefit-sharing arrangement in a neutral way. This will work as a learning tool for the riparian states by identifying the emerging and unanticipated concerns and evaluating the shortcoming that will also facilitate consensus-building, an important prerequisite of benefit-sharing.

5.3.2.2. Utilising Regional and Sub-regional Cooperative Mechanism

In addition to JRC, Bangladesh and India need to exploit other regional or sub-regional cooperation arrangements that can foster transboundary water cooperation. Bangladesh Bhutan India Nepal (BBIN) sub-regional initiative can be a viable option in this regard which has placed joint water management as one of its agendas. Informant A from Bangladesh believes "BBIN can be a good platform to cooperate in the Ganges basin as it involves the three riparian states."[22] Informants from India also stress

[17] Author's personal interview with Informant B from Bangladesh.
[18] Author's personal interview with Informant I from India.
[19] Author's personal interview with Informant C from Bangladesh.
[20] Author's personal interview with Informant G from India.
[21] Author's personal interview with Informant E from Bangladesh.
[22] Authors personal interview with the Informant A from Bangladesh.

importance of exploiting the platform of BBIN to pursue benefit-sharing in the Ganges basin. The advantage of using BBIN platform is that Nepal is also a party to this sub-regional cooperation. BBIN can promote benefit-sharing by not only allowing the riparian states to facilitate water connectivity but also support their drive for exploiting the hydropower potential of the basin and subsequently helping energy trade by establishing regional grid connectivity. In such a way, BBIN platform will allow the riparian states of the Ganges to secure a wide of benefits from the basin.

6. Discussion

The physical sharing of water still dominates the water cooperation in the Ganges river between Bangladesh and India, which is now considered as an obsolete approach to transboundary water management by many scholars. The current Ganges Water Sharing Treaty is going to expire in 2026, and there is a growing concern that any future water negotiation based on physical sharing of water might not produce a fruitful result. The study is developed on the argument that Bangladesh and India need a shift of focus in their current mode of transboundary water management from physical sharing of water to sharing of benefits derived from the water in order to foster transboundary water cooperation in the Ganges river basin. The main objectives of the study were to discuss the necessity of the benefit-sharing in the Ganges river basin; identify the potential sectors of benefit-sharing; and how to facilitate benefit-sharing between Bangladesh and India in the Ganges river basin.

The first research question of the study focuses on the necessity of benefit-sharing in the Ganges river basin. The results demonstrate that the water negotiation in the Ganges basin would become much more complicated in the future, primarily due to the growing gap between the demand and the availability of water. The water situation will deteriorate even further due to the adverse impact of climate change. So, it is apparent from the findings that the water resources of the Ganges basin will be under severe stress in the future. This will further intensify the competition for water among the riparian states. Besides, the changing nature of India's domestic politics and the growing internal conflict between its provincial states will weaken the Indian central government's authority to manage transboundary water resources jointly. Therefore, in the future, Bangladesh and India would find it extremely difficult to elicit a positive-sum outcome from any water negotiation in Ganges river if they still focus on the quantitative aspect of water, availability of which is not guaranteed.

The second research question seeks to identify the potential areas of benefit-sharing in the Ganges basin. The findings of the study suggest that inland navigation and water transit, multipurpose storage dam projects and joint management of the Sundarbans can be the potential areas for benefit-sharing in the Ganges basin. Collaboration and coordinated action in those areas will allow the riparian states to unlock additional benefits that will work as an incentive for further cooperation.

The final research question was set to explore the possible options to facilitate benefit-sharing between Bangladesh and India in the Ganges river basin. The bilateral water cooperation framework between these two countries in the Ganges basin is still dominated by unilateral actions, which is not allowing the riparian states to enjoy multiple benefits from cooperation. Maintaining the status quo will not enable Bangladesh and India to introduce the benefit-sharing in the basin. The findings of the study stress the importance of shifting the policy outlook and developing institutional arrangements that will allow both countries to introduce and facilitate benefit sharing in the Ganges river basin and equitably share benefits.

It is important to discuss how transboundary water management based on benefits-sharing in the Ganges basin can help to realise multiple benefits from the Ganges basin, which, in turn, will foster further cooperation. With the help of the analytical framework, the following discussion will demonstrate how different types of benefits gained from the benefit-sharing arrangement will work as a motivating factor in fostering transboundary water cooperation between Bangladesh and India.

6.1. Benefit-sharing as a Motivating Factor in Transboundary Water Cooperation

6.1.1. Type-1 Benefits: Benefits to the River

Type-1 benefits mainly derive from the better management of the river and its surrounding that ultimately proving benefits to the river itself. Many of the environmental and ecological benefits generated through the improved ecosystem health of the river support other benefits, including type-2, type-3 and type-4 benefits. Unfortunately, the 1996 Ganges water-sharing treaty, which is the only official framework for cooperation between Bangladesh and India on the Ganges river, does not have any provision for the preservation of the river ecosystem or its ecological flow. The growing demand for water and its unsustainable use, unilateral construction of water infrastructure and the adverse impact of climate change are severely impacting the environmental balance of the river and its water quality. If viewed in isolation, there may appear fewer incentive for the protection of the river's health provided that the water negotiation is only based on the volumetric allocation of water. But the reality is any deterioration of the river's health ultimately affect adversely all potential benefits that can be obtained from the river.

Cooperation based on benefit-sharing can substantially improve the ecological health of the river. From the findings of the study, it is already evident that Bangladesh and India need a change in their policy perspectives and institutional arrangement in order to facilitate benefit-sharing. By increasing the exchange of information and joint assessment, both countries will be able to reduce negative externalities of their unilateral actions on the Ganges river. Besides, strengthening the joint institutional framework will allow both countries to improve and enhance the regular monitoring and assessment of their initiative. This will help to curb any adverse impact of the project on the river. Moreover, inland water transport and transit and preservation of the Sundarbans, two potential areas for benefit-sharing identified in the study, largely depend on the augmentation of the river water flow during the dry season. Increased water flow, a co-benefit of those initiatives, will be helpful to restore the ecosystem balance of the Ganges basin by maintaining ecological flow, flushing out the pollutants, and preventing salinity intrusion. Conversely, the improved ecological health of the river will help to support all other benefits that can be obtained from the basin. In such a way, benefit-sharing can provide an incentive to both Bangladesh and India to maintain the ecological integrity of the Ganges, thus facilitate in realising the type-1 benefits.

6.1.2. Type-2 Benefits: Benefits from the River

Type-2 benefit focuses on the economic productivity of the rivers. Efficient collaboration and joint management in a river basin can unlock huge potential for riparian states to derive a wide range of economic benefits from the river. The economic gains obtain from a shared basin work as the main motivating factor for cooperation.

The potential areas identified in the study for sharing benefits can offer a wide range of economic benefits. Inland water transport and transit will not only unlock vast economic benefits for Bangladesh and India but also provide an incentive to Nepal to get involve in a benefit-sharing arrangement. Environmental benefits of inland transport can also be a motivating factor for riparian states for cooperation. Multipurpose storage dams, another crucial area for benefit sharing, can play a vital role in augmenting the dry season water flow in the Ganges river. This will help to fully realise the economic benefits of inland water transportation along with supporting the conservation measures of the Sundarbans. Hydropower generation, one of the co-benefits of multipurpose storage dams, also has immense economic potential for the whole Ganges region, especially for Nepal. However, this sort of constructions would require a substantial investment which is not possible for a country like Nepal to bear by its own. Therefore, joint investment from all riparian countries can develop a benefit-sharing

arrangement from which all of them can have a positive outcome by enjoying multiple economic benefits. The joint management of Sundarbans can also help to preserve the ecosystem services of the forest, thus provide economic benefit to 15 million people, both from Bangladesh and India, who are dependent on it. Besides, the potential financial gain from the disaster protection provided by the Sundarbans can catalyse both countries to come under a cooperative arrangement for the preservation of the Sundarbans.

The literature review conducted on the international river basins also demonstrates the importance of economic benefit in cooperative arrangements. In different international river basins, economic gains have been accrued from benefit-sharing, which could not otherwise be achieved through unilateral actions. In the case of the LHWP in the Orange-Senqu River, South Africa and Lesotho have been involved in a benefit-sharing agreement that allows the former country to meet its growing need of water by providing the latter one with economic gains. Due to joint collaborative actions, South Africa have to bear least-cost compared to other alternatives. In return, Lesotho receives substantial water royalties, along with in-kind hydropower benefit. In the Columbia river basin, Canada and the US come together to maximise the economic opportunities from the river by altering the upstream dam design in Canada. This collaboration manages to increase the aggregate net benefits by providing flood protection and additional hydropower generation opportunity to the US, whereas Canada has been economically compensated. The same sort of cooperative scenario was found in the Senegal river basin, where potential economic benefits motivated the riparian states to jointly owned water infrastructure. The joint projects help to realise hydropower and irrigation potential that none of the riparian states could achieve individually, given the substantial financial requirements. Economic benefits work as a driver for cooperation even in the Mekong and Nile river basin. These examples bolster the claim that potential economic gains, both monetary and non-monetary, can provide an incentive to the riparian states in reaching a collaborative arrangement and foster cooperation.

6.1.3. Type-3 Benefits: Benefits because of the River

Type-3 benefit mainly focuses on the reduction of cost associated with non-cooperation and disputes among the riparian states. Water cooperation can reduce the tension among the co-riparians, which is often present in a transboundary river basin.

Unfortunately, the cost of non-cooperation is exceptionally high in the Ganges river basin. At present, there is no basin-wide perspective of development, which is hurting the opportunity to obtain numerous benefits. Political tension centring around the sharing of Ganges water is also hindering the potential for cooperation in the basin. But the findings of the study shows that taking a basin-wide benefit-sharing perspective and joint investment in the areas like inland transport and transit, multipurpose storage projects and hydropower generation can bring all the riparian countries under a cooperative framework to maximise economic benefits. The collaboration will not only help to generate economic benefits but also co-ownership of joint infrastructure will build trust among the riparian states and give a sense of belongingness. This will help to appease any tense relation that might arise centring around the utilisation of Gange's resources among the riparians. Thus, benefit-sharing can contribute as an important factor in reducing tension and conflicting views among the stakeholder for the shake of economic gains and foster cooperation.

The Senegal river basin is a glaring example where basin-wide water cooperation helped to ameliorate the tension between the riparian states. Mauritania and Senegal worked out their differences and refrained from involving in an armed conflict for the sake of their mutual interest in jointly owned dams. The involvement of China in the GMS programme can also be seen as an instance of reducing tension among the riparians states due to the incentive of potential benefit from cooperation arrangements.

6.1.4. Type-4 Benefits: Benefits beyond the River

Type-4 benefits focus on the benefits beyond the river basin. Collaboration in a shared basin can work as a motivating factor for broader cooperation in a basin-wide scale that can generate benefits even beyond the river basin. Joint investment in large water infrastructure, collective management of assets and joint institutions for management represent much bigger cooperation effort that provides the much-needed thrust for further economic integration among the riparian states which is perceived as a win-win situation for all.

In the Ganges basin, inland water transit and multipurpose storage dam projects highlight the necessity of Nepal's involvement in the cooperative management that will produce a positive-sum outcome to all riparian states. Inland water transit will help to create a network of transit routes in the Ganges basin that will facilitate communication, trade and commerce in the entire region. The multipurpose storage dam projects have the potential to generate hydroelectricity, which can be distributed regionally through regional grid connectivity. These benefit-sharing initiatives have the potential to work as a catalyst for further cooperation through regional economic integration in the Ganges basin.

Instances of type-4 benefit can be found in the case of Senegal and the Mekong basin. The economic gains achieved from electricity, irrigation, water supply and reduced political tension due to joint ownership of infrastructure allow the riparian states in the Senegal river basin to bring substantial benefits that go beyond the river and improve the living condition of people in the whole basin. In the case of the Mekong river basin, riparian countries manage to gain significant economic benefits from the river through cooperative arrangements. That ultimately allow the riparian states to stabilise their mutual relations despite the presence of divergent views and pursue cooperation beyond the river basin.

To sum up, the discussion above demonstrates that multiple benefits available in the Ganges basin have the potential to work as a motivating factor to facilitate cooperation between Bangladesh and India. If we see around the world, cooperation was possible in the international shared basin like the Mekong, Orange-Senqu, Columbia, Senegal, Nile, etc. because the riparian states saw the vast potential of benefits in jointly managing their shared resources under a benefit-sharing arrangement. The potential benefits available in the basin motivated the riparian countries to formulate a cooperative framework in order to create value and maximise benefits. Benefit-sharing arrangements thus have the potential to bring riparian states under a collaborative framework to foster cooperation. Therefore, Bangladesh and India need to employ benefit-sharing to promote transboundary water cooperation in the Ganges basin.

6.2. Challenges of the Benefit-sharing Approach

Benefit-sharing does have the potential to transform a zero-sum outcome in a water negotiation to a positive-sum result and generate a win-win solution for all. However, the approach is not a silver bullet to all transboundary water cooperation related issues. Water negotiations under a benefit-sharing arrangement can face multifaceted challenges like – procrastination in the negotiation process, ignorance of environmental concerns, limited participation of local stakeholders in the benefit-sharing process, etc.

As mentioned earlier, benefit-sharing is a complex endeavour that deals with various issues and concerns and involves a wide range of stakeholder and multiple interest groups. The development context, socioeconomic conditions, strong political will and public support is needed to reach a benefit-sharing agreement. Besides, the riparian countries have to establish an equitable division of cost and benefits for cooperation. Therefore, negotiations under a benefit-sharing arrangement take time. For example, in the case of LHWP, the initial groundwork for the project began in the 1950s, whereas the first two phases of the project completed in 1998 and 2002, respectively. In the Columbia River, the initial investigation of the potential for upstream storage dams in Canada began in 1944. It took almost 23 years to complete the storage dam under the treaty. One of the main reasons for the protracted

negotiation process is the identification of potential basket of benefits and establishing an effective cost-benefit sharing mechanism that would be accepted as equitable for all. Besides, the negotiation process largely depends on the political environment and mutual relationship between the riparian states that can procrastinate the whole process.

Overemphasising economic gains can be a severe concern to benefit-sharing approach. There is no denying that potential economic benefits play a crucial role in mobilising the riparian states to get involved in a benefit-sharing arrangement. In most of the cases, economic benefits are derived from the development of large water infrastructures like multipurpose storage dams, hydropower projects, feeder canals, barrages, etc., on the rivers. Without proper Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) of the whole project, these large water infrastructures could have a severe negative impact on the health of the river, surrounding environment and locality. Especially, the large multipurpose storage dams and hydropower projects are associated with large scale inundation of land and displacement. So, one of the biggest challenges of the benefit-sharing arrangement is the proper evaluation of the environmental and societal concerns of the potential projects and make efficient trade-offs between the economic gains and environmental concerns so that the projects do not become harmful for the local population and produce counter-productive results.

Another major challenge of benefit-sharing arrangement is the involvement of the local stakeholders in the negotiation process and distribution of benefits among them. Most of the time, local people are the ones who are directly affected by the benefit-sharing projects. Therefore, ensuring their resettlement, rehabilitation, and appropriate compensation in a satisfactory manner always remains a major challenge for the riparian countries.

6.3. Limitations of the Findings and Future Research Opportunity

One of the limitations of the study is that it has not taken into consideration the political reality of the riparian states while discussing the benefit-sharing potentials. The introduction of benefit-sharing is highly dependent on the political context of the riparian states. The political leadership is the ultimate authority in taking any decisions on moving forward with the benefit-sharing policies. Besides, the fair and equitable distribution of benefits also depends on the political will of the riparian states. Therefore, without understanding the political environment of the riparian states and their mutual relation, it isn't easy to have a clear picture of benefit-sharing potential in a shared river basin. Due to the limited scope of the study, the political aspect of benefit-sharing has not been considered in this research work, which can be considered as a significant limitation of the findings.

Besides, the findings of the study have limited generalisability. Bangladesh and India share 54 common rivers. Though most of the shared rivers are the part of the GBM basin, they do have some distinctive features. Therefore, it would be difficult to generalise the findings of a single case study on a specific river basin to all the shared rivers between Bangladesh and India.

Regarding the future research opportunity of the study, the findings can work as a reference point for future studies that will focus on benefit-sharing in the Ganges basin. Future studies could explore the political reality of benefit-sharing. There is also ample scope to explore different practical ways of quantifying potential benefits, which is very important to get a clear picture of the total cost-benefit calculus. Besides, it would be interesting to research how Bangladesh and India might start developing a benefit-sharing mechanism staged over time.

7. Conclusion

The Ganges issue remains one of the crucial areas in the bilateral relation between Bangladesh and India. Both countries are sharing the water of the Ganges river according to the Ganges Water Sharing Treaty, signed in 1996. The treaty only focuses on the physical sharing of water that undermines the riparian states ability to enjoy multiple benefits available in the Ganges basin. The present study aims to explore the future opportunities of benefit-sharing in the Ganges river basin that can promote water cooperation between Bangladesh and India. The study also looks into the possible ways benefit-sharing can be facilitated in the Ganges river basin.

The study finds that the water resources in the Ganges basin will come under tremendous stress from the soaring water demand and inadequate water supply that will force the riparian states to take a very conservation stance in sharing of Ganges water. The decline of water supply during the dry season due to unilateral actions in the upstream and the adverse impact of climate change will make the situation further worse. In addition to that, India's domestic politics and its interstate conflict will limit the central government's ability to ink any future agreement with the riparian states without the approval of state governments. In such a situation, the study argues that furthering transboundary cooperation would require a shift from physical sharing of water to sharing of benefits that will outweigh any unilateral action and provide the much-needed incentive to the riparian countries to come under a cooperative arrangement for maximizing their mutual gain.

The study identifies inland navigation and water transit, multipurpose storage dam projects and joint management of Sundarbans as the potential areas for benefit-sharing in the Ganges basin. Cooperation in those areas under the benefit-sharing arrangement will enable the riparian states to enjoy four types of benefits, i.e., benefits to the river, benefits from the river, benefits due to the reduced cost because of the river and benefits beyond the river. Concentrating on sharing benefits and ensuring their equitable distribution will not only allow Bangladesh and India to facilitate transboundary water cooperation among themselves but also provide the opportunity for closer regional integration by involving Nepal in the cooperation arrangement.

The study suggests a shift in policy perspectives and institutional arrangements to realise the benefit-sharing potential in the Ganges basin and facilitate it. In addition to the regular exchange of information and joint assessment, the study highlights the need for basin-wide perspectives in national policies of the respective governments. It also stresses the importance of strengthening of JRC and utilisation of the sub-regional platforms to operationalise the benefit-sharing arrangement in order to promote transboundary water cooperation.

The analysis of the findings illustrates that benefit-sharing in the Ganges basin can provide enough incentive to the riparian states to collaborate with each other for generating a positive-sum outcome. The benefit-sharing arrangement will enable them to optimize the trade-off among present and future benefits and make the transboundary water cooperation a win-win outcome for all.

In conclusion, it can be said that all riparian countries in the Ganges basin have a stake in the economic development and socio-political stability of their neighbourhood. Jointly harnessed and properly planned, water resources in the Ganges basin could be a crucial entry point for collaborative development that can also ease mutual tension. Limited cooperation and unilateral actions have already hindered the utilisation of multiple benefits from the Ganges basin. Moving from water-sharing to benefit-sharing in a basin-wide scale will facilitate the water cooperation among the riparian states. This will not only improve the ecological health of the river and its surrounding ecosystem but also unlock multiple benefits that will motivate the riparian states for further cooperation.

Acknowledgements

I would like to take the opportunity to register my sincere thanks and heartfelt gratitude to my supervisor Ashok Swain, PhD, for his scholarly guidance, sagacious insights and unwavering support throughout the research work. I am also extremely indebted to my subject reviewer Lara B. Fowler, JD, and examiner Claudia Teutschbein, PhD, for their insightful comments and comprehensive feedback, which has helped me a lot to keep my research on track and enrich my thesis report. I am sincerely grateful to the Department of Earth Science, Uppsala University, for giving me the opportunity to conduct this research work.

A special acknowledgement is due to the MSD Programme Directors: Magdalena Kuchler, PhD and Karin Gerhardt, PhD; Director for Studies Mikael Hook, PhD; and Thesis Course Director Malgorzata Blicharska, PhD, for their guidance and support, without which this accomplishment would not have been possible. I am profoundly thankful to all my course coordinators and lecturers of the MSD Programme for their instruction and supervision, which has equipped me with the required knowledge and skills to complete the degree. In this regard, the Study adviser Ms Amanda Johnson and Course administrator Ms Jenny Thor also deserve special thanks and appreciation for their unswerving administrative support throughout the academic programme.

My wholehearted gratitude goes to all informants, both from Bangladesh and India, for their kind consent for the interviews, their precious time and valuable insights to develop this study. The critical comments and constructive feedback from my thesis opponent Mr Jaya Lal Neupane and the participants from the thesis presentation remained invaluable to give the research work a final shape.

I am also grateful to the Bangladesh Institute of International and Strategic Studies (BIISS) for allowing me to pursue the MSD Programme at Uppsala University. Further credits are due to my colleagues at BIISS for their support and motivation.

Last but not least, I am immensely grateful and highly indebted to my mother Dr U. F. Shahnaz Begum, my wife Tasnim Ahmed, my friends, family members and classmates for their prayers, never-ending care and assistance, without which I won't be able to come this far. I am highly indebted to them for inspiring me in all my academic endeavours and being there every moment for giving me the strength in pursuing my cherished dreams.

October 2020 Sajid Karim

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Appendix A

Questionnaire for Interview

Transboundary Water Cooperation between Bangladesh and India

- How will you evaluate the current state of transboundary water cooperation between Bangladesh and India?
- How will you evaluate the role of the concerned institutions in fostering transboundary water cooperation between Bangladesh and India?

Ganges Water Sharing Treaty

- How will you evaluate the successes and failures of the Ganges Water Sharing Treaty signed in 1996?
- What lessons have we learned so far from the Ganges Water Sharing Treaty?
- Considering the present treaty is coming to an end in less than six years, how would you envision the negotiation process for the new treaty to going forward?
- What would ideally be included in the future Ganges treaty?

Potential Benefit-sharing in the Ganges Basin

- Which are the potential areas in the water resource management in the Ganges basin where benefit sharing can be introduced?
- Apart from physical water allocation, what other benefits might be included in the new treaty that can be accrued from the Ganges basin?

Facilitating benefit sharing in the Ganges basin

- What kind of institutional and policy structure do we need to facilitate benefit-sharing and enhance cooperation between Bangladesh and India in the Ganges basin?
- What are the challenges in operationalising benefit sharing in the Ganges river basin?
- Do you think the involvement of the third party is vital in transboundary water cooperation between Bangladesh and India in the Ganges basin?
- How important is it to incorporate Nepal in the negotiation process for benefit sharing in the Ganges basin?
- In establishing a River Basin Organisation in the Ganges basin, what committees or structures are needed to establish and harmonised with the national institutions of riparian states?

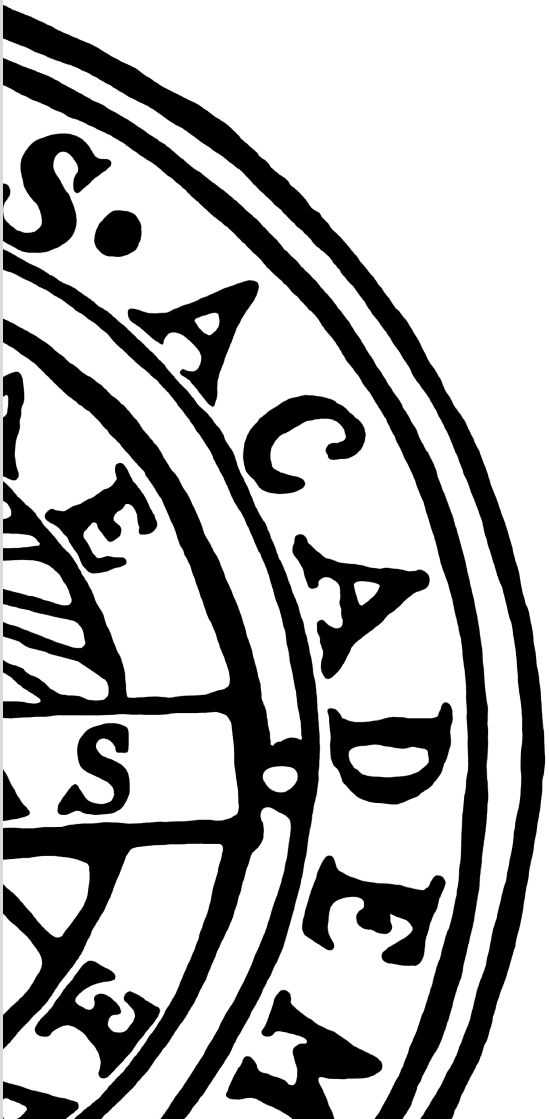
General Questions

- With the predicted change in the hydrological regime due to climate change and human activities in the Ganges basin, how can the future agreements be made more robust and climate adaptive?

Appendix B

List of Interviewees

Name	Designation	Affiliation
Dr Ainun Nishat	Professor Emeritus	BRAC University, Bangladesh
Dr Rezaur Rahman	Professor	Bangladesh University of Engineering and Technology (BUET)
Md Mahmudur Rahman	Member	Joint River Commission, Bangladesh
Dr Malik Fida A. Khan	Executive Director	Centre for Environmental and Geographic Information Services (CEGIS), Bangladesh
Dr Smruti S. Pattanaik	Research Fellow	Manohar Parrikar Institute for Defense Studies and Analyses (IDSA), India
Dr Uttam Kumar Sinha	Research Fellow	Manohar Parrikar Institute for Defense Studies and Analyses (IDSA), India
Dr Punam Pandey	Postdoctoral Fellow	Institute for Reconciliation and Social Justice, University of the Free State, South Africa
Mr Sheikh Rokon	General Secretary	Riverine People, Bangladesh
Dr Md Nazrul Islam	Professor	Department of Law, University of Dhaka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