

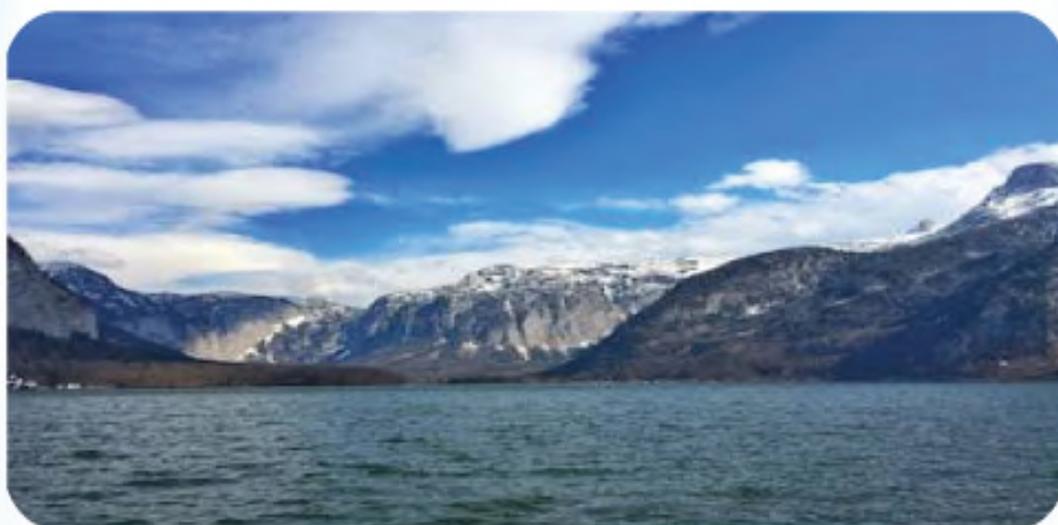
REPORT



International Conference on Himalaya Water: Highland-Lowland Interactions

Spectra Convention Centre, Gulshan 1, Dhaka.

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Final Draft

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PREFCAE

Today all the nations of South Asia face water crises in one form or another due to a range of factors—population rise, growing urbanisation, inefficient water use, bad water management and lack of governance, among others. The unfolding water crises pose serious threat to sustainable development, agriculture and industries, poverty reduction and ecosystem. Climate change, ‘the most systematic threat to humankind’, has exacerbated the brewing water crises like never before..

Water is a commons and managing and governing commons has always been a challenge at any scale—be it local or regional. A participatory robust institutional architecture for water governance is needed to manage and govern the water resources in a systematic and efficient way. Many of the important water bodies in South Asia are transboundary and thus their basins spread in more than one country. Integrated basin management would not be a reality without regional cooperation at the South Asia level. Most of the water treaties in South Asia are bilateral in nature, which form the core of South Asian political ecology of water governance. Be it upper or lower riparian, nations in the region are apparently not content with the existing treaties. For example, India, an upper riparian nation does not seem to be happy with the Indus Water Treaty with Pakistan, a lower riparian in this case. Between Bangladesh, a low riparian nation and India, Teesta river issue still remains unresolved, with Bangladesh asking for an increase in water share. People in Nepal, an upper riparian, think water treaties with India produces environmental injustices to the riverine people of Koshi river.

Along with this kind of political ecology of the region, the issue of sovereignty in South Asia is a very sensitive topic. South Asia represents a typical case of the Westphalian concept of sovereignty, where each nation has exclusive sovereignty over its territory and the natural resources including water. No nation would like to be seen as compromising its sovereignty. However in reality, in the face of globalisation and trade integration, each nation is bargaining its sovereignty with the other nations and regional and international actors. These two factors—the existing South Asian political ecology and the power politics played out in the name of sovereignty—both hinder and open up opportunities for regional cooperation at the same time. Some may think that the regional cooperation compromises on the sovereignty of a nation-state. However, the notion of sovereignty can be broadened to accommodate and facilitate the idea of cooperation. Cooperation is not about imposing suzerainty of one nation on another.

With promotion of water cooperation in the region as its aim, in this three-day conference water experts from Pakistan, China, Nepal, India, Bhutan, Myanmar and Bangladesh and the representatives of various regional and international agencies such as ICIMOD and IUCN convened in Dhaka to discuss the ways of regional water cooperation and deliberate over potential solutions to the imminent water and climate change problems. This report is a direct outcome of the conference and is expected to generate and enrich discussions on the water issues of the region.

EXECUTIVE SUMMARY

Hindu Kush Himalaya (HKH) region is the largest storehouse of fresh water in the world. However, with rise in temperature, region is under threat. If the temperature goes above 1.5 degrees Celsius, 1/3 of the HKH will be lost. Climate change is giving new meanings and interpretations to existing issues. 1o C rise in temperature in Tropical Regions would have the same impacts as 6o C increase in Polar Regions. Although the rate of melting glaciers may be debatable, the trend of melting is evidently beyond what is expected to occur naturally.

Disturbing the natural hydrograph will threaten a range of ecosystems and species dwelling in the co- and lower-riparian countries. Bangladesh, a lower riparian country in the HKH region, has the fastest growth rate in Asia, yet the most vulnerable to unprecedented challenges like climate change and migration. These challenges also have political consequences leading to political instability and strife. Therefore, nature-based solutions need to be adopted for achieving a sustainable future. It is important to note that nature itself can provide 37% of the mitigation needed by 2030 to remain within the 2oC pathway, mangroves can reduce annual flooding for more than 18 million people globally, agriculture production could be increased by 20% with greener water management practices, and urban green spaces increase property values by 5 to 15 percent.

Since natural systems do not act according to national borders, the approach for managing these systems also needs to go beyond borders. In order to do that, regional engagements through the conferences like this are necessary to achieve peace, prosperity, security and protection of population and resources of each country. Common ecological entry points for sharing water resources need to be identified and exchange of scientific and political knowledge be promoted to influence national policy decisions for better governance outcome.

Of late, erratic and uneven rainfall has led to reduction in dry season flow of rivers in the HK region. For example, Nepal contributes 70% of water flow during dry seasons and 40% annual flow of the Ganges. Evidently, Nepal's topography can afford better storage of water, this will enable storage dams for flood control of the lower regions, lean season augmented flow and drinking water for food security as both drinking water and food are major problems of India and Bangladesh. Furthermore, more storage also means increased depth which will make navigation more fluent. Storage projects in Nepal can also solve the Farakka Barrage problem of Bangladesh.

In addition to reduced water flow due to climate change, another problems that the rivers in the HKH region face is sedimentation. River sedimentation is probably the major water quality problem of the region. The main sources of sediment in Himalayan rivers are glacial deposits, landslides and intensively cultivated hill slopes. Each year the Ganges, Jamuna and Meghna rivers of Bangladesh transport more than one billion tonne of sediment from their catchments in India, China, Nepal and Bhutan to this delta region. This calls for cooperation between the highland and lowland countries.

Climate change has also led to changed dynamics in the river basins, necessitating climate proofing of the existing transboundary water treaties. One such treaty is Indus Water Treaty. Climate Proofing in its conceptual sense is to incorporate climate change related clauses and provisions in a water agreement with a view to ensure its sustainability. Repealing a treaty is not a solution as entering into a treaty takes huge amount of time. Bangladesh shares 54 transboundary rivers with India, but only one treaty exists for one river. Considering the time making of one treaty took, to create the remaining 53 treaties will easily take centuries.

The mountain systems is one of the many ways that South Asia as region is connected. Water plays a central role in transboundary connectedness. Its true potential is still not fully harnessed. For example, in Bangladesh, the navigation route is 60% cheaper than railway or highway, but it has not received enough attention of the policy makers. With the tremendous hydroelectric potential, the future electricity of South Asia is likely to be hydro-generated, if it is developed properly. Steps like these will pave the way for a sustainable and prosperous South Asia which is home to 23% of the world population.

CONCEPT NOTE

Water Scenario in HKH region

Water crisis is looming large over the countries in the Himalayan region. The unfolding water crisis is likely to get worse in the coming years, aided by the man-made drivers such as climate change. The per capita water availability has drastically gone down, thus compromising on the developmental needs, especially, of the poverty-stricken population. Rapid rate of urbanization (often unplanned), ever-growing population and fast-paced industrialization in the Himalayan region stress upon the already depleting natural resources including water. In the face of competitive sectoral demands for water, administering the equitable distribution of water resources for different sectors and needs and ensuring gender friendly access to water resources could be even more challenging for the existing water governance structures. A very vast population in this region depends on water bodies such as rivers for their livelihood and survival. Augmenting water resources, rejuvenating water bodies and strengthening water governance institutions will be key to the development of the region, human security and achieving Sustainable Development Goals, especially Goal 6.

Highland-Lowland Interactions

A recent publication of a volume on “The Hindu Kush Himalayan Assessment: Mountains, Climate Change, Sustainability and People” published by ICIMOD-HIMAP (Springer 2019) has not only synthesized many key information but also highlighted the key interactions between the highland and the lowlands. Mountains occupy 22% of world’s land surface area and home to world’s 13% population. About 915 million people live in the mountainous regions, less than 150 million people live about 2500 meter above sea level and only 20-30 million people live above 3000 meter above sea level. But the water from the mountains serves the several billions of people in the lower altitudes and plain lands. Thus highland-lowland interactions remain a dominant parameter that need to be considered in global sustainable development and decision making. Increasing climate change is going to affect these interactions.

Opportunities and Challenges in Water Cooperation with HKH Region

Hydro-politics as a subset of regional geopolitics often ferments competition among the countries and war hysteria in media which undercuts the prospects of cooperation. In the geopolitical tug of war, it is no denying that countries may incline to use water as a weapon. Establishment of effective trans-boundary water governance structures and constant dialogues to achieve trade-offs between upstream and downstream water uses may preclude such scenario. It is important for countries to understand that cooperation on water issues leads to a win-win situation.

The intentions of countries with regard to governing water resources are stated in their national policy documents. National water policy of a country is driven by domestic calculation. Very often the national policy of a country finds itself incompatible with those of its neighboring countries, as each of them tries to stick to their domestic priorities. Bringing in regional perspective and integrating regional concerns in the national water policies of the countries may usher in a new chapter of cooperation in the Himalayan region, benefiting all the countries in development and poverty reduction.

More than anything else, management of floods requires regional cooperation, as the 10 big rivers in the Himalayan region are trans-boundary in nature. Flood management is possible through real-time data sharing, community participation and local response system.

Communication and experience sharing among the cross-border communities will speed up the information transmission processes and strengthen the preparedness of the communities in the wake of floods. Data sharing will help establish an effective flood warning system.

Contamination of water by the chemical and biological factors has deteriorated the water quality in the region. In addition to the pollution and waste flowing into the water bodies, presence of salinity, total dissolved solids, arsenic, bacteria, siltation etc. in water bodies accentuate the looming water crisis. Water pollution and water-borne diseases lead to hazardous health problems. Waste management and environment-friendly development processes can help prevent such situation from getting worse. River rejuvenation is the need of the hour. In the region, rivers are dying, leading to destruction of environment, ecological habitats and livelihood opportunities. Timely intervention can save such rivers and their dependents. Learning's from the experiences of the European countries in river rejuvenation could be useful.

Objectives of the conference

This conference is going to consider and discuss the roles of served interactive systems such as hydrology, geology, population dynamics, culture and social challenges, biodiversity, economics, lifestyle and climate change are going to be very important in the near future of the Himalayan area and the lowlands around the mountains in Asia particularly South Asia.

This conference aims at advancing discussions on the above themes from regional perspective to stimulate actions on part of the stakeholders. This conference will also serve as a platform for promoting regional dialogue and multi-stakeholders partnership on water issues for effective water resources management and conflict mitigation.

Organization and content of the conference

The first two days of the conference will be highly interactive exchange of ideas on mountains and water systems, climate change impacts, social interactions and sustainable development futures. The last day will be a field visit to visualize the interactions between water, human beings and ecosystems.

PROGRAMME

Day 1: Saturday, 16 November 2019

Inaugural Session: (9.30 am-11.10 am)

08.30-09.30	Conference Registration
Chair:	Dr. Atiq Rahman, Executive Director of Bangladesh Centre for Advanced Studies (BCAS)
Chief Guest	Dr. Md. Enamur Rahman, MP, Honable State Minister, Ministry of Disaster Management and Relief (MoDMR), Peoples Republic of Bangladesh
09.30-09.40 am	Welcome Address and objectives of the conference by: Mr. Volker Lennart Plän, Resident Representative, Hanns Seidel Foundation, New Delhi, India
09.40-10.20 am	Keynote Presentation : “Overview of Water Resource and River Management in Himalaya” By: Dr. Ainun Nishat, Professor Emeritus, BRAC University
10.20-10.30 am	Address by Special Guest: His Excellency Mr. Peter Fahrenholtz, Ambassador of the Federal Republic of Germany to Bangladesh
10.30-10.40 am	Address by Special Guest: Mr. Md. Shahidul Haque, Senior Secretary, Ministry of Foreign Affairs, Peoples Republic of Bangladesh
10.40-11.00 am	Address by Chief Guest: Dr. Md. Enamur Rahman, MP, Honable State Minister, Ministry of Disaster Management and Relief (MoDMR), Peoples Republic of Bangladesh
11. 00-11.10 am	Address by Chair
11. 10-11.45 am	Tea/Coffee and Networking

Technical Session 01: Water and Himalaya (11.45 am -1.00 pm)

Chair: Mr. Volker Lennart Plän , Resident Representative, Hanns Seidel Foundation, New Delhi, India	
11.45 am -12.00 am	<i>Presentation 1:</i> “Hindu Kush - Himalayas Assessment and Highland-Lowland interactions” By: Dr. Md. Abu Syed, Fellow of Bangladesh Centre for Advanced Studies (BCAS)

12.00 am -12.15 pm	<i>Presentation 2</i> : “Sharing Water for Shared Ecosystems: Himalayan Opportunities” By: Professor Dr. Mohammad Rezaur Rahman, Institute of Water and Flood Management (IWFM), BUET
12.15 pm -12.30 pm	<i>Presentation 3</i> : “Assessment of Water Resources Carrying Capacity in South Asia” By: Dr. JIA Shaofeng, Institute of Geographic Sciences and Natural Resource Research, Chinese Academy of Science, Beijing, China
12.30 pm-1.00 pm	Open discussions
1.00 pm-2.00 pm	Lunch

Technical Session 02: Integrated Water Resources Management (2.00 pm-3.15 pm)

Chair: Mr. Tshering Dorji, Chief, Admin/HR Division, Royal Society for Protection on Nature (RSPN), Thimphu, Bhutan	
2.00 pm – 2.15 pm	<i>Presentation 4</i> : “Integrated Management of Ganga River Basin” By: Dr. Ratna Sansar Shrestha, Chairman, Nepal Hydro & Electric Limited
2.15 pm – 2.30 pm	<i>Presentation 5</i> : “Water Security of Pakistan: Role of Higher Education Institutions” By: Mr. Muhammad Shahid Panhwar, Monitoring & Evaluation Specialist, US-Pakistan Centre for Advanced Studies in Water, Mehran University of Engineering and Technology, Jamshoro, Sindh, Pakistan.
2.30 pm – 2.45 pm	<i>Presentation 6</i> : “Linkages between Himalayan and Coastal Sedimentation” By: Dr. Umme Kulsum Navera, Professor, Department of Water Resources Engineering, BUET
2.45 pm – 3.15 pm	Open discussions
3.15 pm – 3.30 pm	Tea/Coffee

Technical Session 03: Assessment of Water Resources (3.30 pm - 4.45 pm)

Chair: Mr. Ashwin B Pandya, Secretary General, International Commission on Irrigation and Drainage, New Delhi, India	
3.30 pm-3.45 pm	<i>Presentation 7: “Flood Forecasting Using Latest Technology on Highland-Lowland”</i> By: Professor Dr. Monowar Hossain, Executive Director, Institute of Water Modeling (IWM)
3.45 pm-4.00 pm	<i>Presentation 8: “Water Scenario in Bhutan”</i> By: Mr. Tshering Dorji, Chief, Admin/HR Division, Royal Society for Protection on Nature (RSPN), Thimphu, Bhutan
4.00 pm-4.15 pm	<i>Presentation 9: “Telescoping Indus Waters Treaty through the Lens of Climate Change”</i> By: Mr. Fiaz Hussain Shah, Director General, National Institute for Disaster Management, Pakistan
4.15 pm-4.45 pm	Open discussions

Technical Session 04: River Basin Management (4.45 pm – 6.00 pm)

Chair: Dr. Atiq Rahman, Executive Director of Bangladesh Centre for Advanced Studies (BCAS)	
4.45 pm – 5.00 pm	<i>Presentation 10: “Himalayan Water and Opportunities for South Asian Deltas: A Non-conventional Approach”</i> By: Dr. Khondaker Azharul Haq, Chairperson, Global Water Partnership (GWP)
5.00 pm-5.15 pm	<i>Presentation 11: Gender Aspects in Water Security: Himalayan-Coastal Interactions</i> By: Professor Dr. Mahbuba Nasreen, Director, Institute of Disaster Management and Vulnerability Studies (IDMVS), University of Dhaka
5.15 pm – 5.30 pm	<i>Presentation 12: “Conservation and Development in South Asia and Mountain”</i> By: Mr. Raquibul Amin, Country Representative, International Union for Conservation of Nature (IUCN)
5.30 pm – 5.40 pm	<i>Presentation 13: “Challenges of Managing Large River Basins”</i>

	By: Mr. Ashwin B Pandya, Secretary General, International Commission on Irrigation and Drainage, New Delhi, India
5.40 pm – 6.15 pm	Open discussions
7.30 pm	Conference Dinner @ Sajna Restaurant, House # 14, Road # 1, Block # H, Banani, Dhaka 1213

Day 2: Sunday, 17 November 2019

Technical Session 05: Societies and Vulnerabilities (10.00 am –11.15 am)

Chair: Dr. Umme Kulsum Navera, Professor, Department of Water Resources Engineering, BUET	
10.00 am -10.15 am	<i>Presentation 14:</i> “Societal Divers of Vulnerability and Gender perspectives in Water in Himalayan System” By: Dr. Dwijen Mallick, Fellow, BCAS
10.15 am – 10.30 am	<i>Presentation 15:</i> "Trans boundary politics in the Kosi river basin" By: Dr. Srinivas Chokkakula, MoJS Research Chair – Water Conflicts and Governance Centre for Policy Research, New Delhi
10.30 am – 10.45 am	<i>Presentation 16:</i> “Water based Sustainable Tourism” By: Mr. Md. Mokhlesur Rahman, Adjunct Faculty, Department of Tourism and Hospitality Management, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj.
10.45 am – 11.15 am	Open discussions
11.15 am – 11.30 am	Tea/Coffee

Technical Session 06: Harmonizing National Environment Policies (11.30-12.45 pm)

Chair: Dr. Srinivas Chokkakula, MoJS Research Chair – Water Conflicts and Governance Centre for Policy Research, New Delhi	
11.30 am -11.45 am	<i>Presentation 17:</i> Harmonizing National Environment Policies By: Mr. Md. Taufiqul Islam, Director (Technical), Water Resources Planning Organization (WARPO), Dhaka
11.45 am – 12.00 pm	<i>Presentation 18:</i> “Need for Master Plan of Chittagong Hill Tracts

	(CHT) for Implementation of Bangladesh Delta Plan 2100: Vision to Action” By: Mr. Malik Fida A Khan, Executive Director, Centre for Environmental and Geographic Information Services (CEGIS)
12.15 pm – 12.30 pm	<i>Presentation 19: “India’s “New” Water Policy: Moving Beyond Lofty Statement”</i> By: Dr. Uttam Kumar Sinha, Senior Fellow, Nehru Memorial Museum and Library (NMML), New Delhi
12.30 pm – 12.45 pm	Open discussions
12.45 pm – 2.00 pm	Lunch

Technical Session 07: Highland-Lowland Interactions (2.00 pm-3.30 pm)

Chair: Dr. JIA Shaofeng, Institute of Geographic Sciences and Natural Resource Research, Chinese Academy of Science, Beijing, China	
2.00 pm – 2.15 pm	<i>Presentation 20: “Food, Water and Energy Nexus in the Himalaya-Hindu Kush Region with Highland-Lowland Interaction”</i> By: Dr. Golam Rasul, Chief Economist, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal
2.15 pm – 2.30 pm	<i>Presentation 21: “From the Mountains to the Plains: Changing Paradigms of Governance and management”</i> By: Ms. Simi Sadaf Kamal, Head of Programs, Pakistan Poverty Alleviation Fund
2.30 pm – 2.45 pm	<i>Presentation 22: “Water Management: Trans-boundary Water Conflict in South Asia”</i> By: Dr. Nilufa Islam, Vice-President, Bangladesh Water Partnership
2.45 pm – 3.00 pm	<i>Presentation 23: “Ayeyarwady Integrated River Basin Management”</i> <i>By: Mr. Aung Kyaw Phyo, Directorate of Water Resources and Improvement of River Systems, Yangon, Myanmar</i>
3.00 pm – 3.40 pm	Open discussions

3.40 pm – 3.50 pm	Conference evaluation survey by the participants
3.50 pm – 4.00 pm	Tea/Coffee

Concluding Session (4.00 pm-5.30 pm)

Chair:	Dr. Atiq Rahman
Chief Guest	Dr. Shamsul Alam, Senior Secretary and Member, General Economic Division, Planning Commission, Ministry of Planning, Peoples Republic of Bangladesh
4.00 pm – 4.10 pm	Brief Summary of the Conference: Mr. Volker Lennart Plän, Resident Representative, Hanns Seidel Foundation, New Delhi, India
4.10 pm – 4.20 pm	Address by Special Guest: Bangladesh Representative
4.20 pm – 4.30 pm	Address by Special Guest: Bhutan Representative
4.30 pm – 4.40 pm	Address by Special Guest: China Representative
4.40 pm – 4.50 pm	Address by Special Guest: India Representative
4.50 pm – 5.00 pm	Address by Special Guest: Myanmar Representative
5.00 pm - 5.10 pm	Address by Special Guest: Nepal Representative
5.10 pm - 5.20 pm	Address by Special Guest: Pakistan Representative
5.20 pm - 5.25 pm	Briefing for Day 3 programme details (field trip)
5.25 pm	Vote of Thanks & Concluding Remarks by Chair

Day 03: Monday, 18 November 2019

Field visit for international participants @ Harirampur upazila of Manikganj district to perceive the massive river erosion impacts of mighty Padma River.

About Harirampur Upazila

Harirampur Upazila is belongs to Manikganj district in Bangladesh. Harirampur upazil is a flood plain that has been formed by alluvium of the Padma river and their distributaries. The mighty river has subjected the Upazila to severe bank. The Upazila comprises a total of 246 sq. km including an area of 4052 ha of river (BBS, 2011). The river has been flowing from north-west to the south-east demarcating the south and south-west

boundary of the Upazila. The river course shifting along the left bank at the Upazila was very rapid.

About Padma River

The erosion intensity of Padma river is very high which is second erosion prone river in Bangladesh. Padma river is a braided characteristics which is vulnerable, because channel variation is very active. That is why, it is very difficult to control the flow concentration and predict the channel changes. Sometimes erosion occurs one place and sometimes other place. The Padma is a very large sand-bed river

The most erodible place of Padma river is Harirampur area of Manikganj district. Due to severe erosion, bank line was shifting towards the Harirampur upazilla, which migrated in the curved anabranches as morphological change. Secondary current effects as well as lateral bed slope effect exist in curved reach which increases sediment transportation towards the inner direction. For that reason, erosion takes place and the bank area is washed away drastically.



CONFERENCE PROCEEDINGS

DAY 01: Saturday, 16 November 2019

Inaugural Session:

Welcome Addresses

Dr. Atiq Rahman, Executive Director, Bangladesh Centre for Advanced Studies (BCAS) chaired the Inaugural Session of the conference. He commenced the conference by highlighting the magnitude of impacts of climate change on the South Asian region. He stated that climate change is giving new meanings and interpretations to existing issues. 1° C rise in temperature in Tropical Regions would have the same impacts as 6° C increase in Polar Regions.



Underlining the importance of having regional conferences such as this, Dr Rahman said that South Asian scholars, as well as global scholars, have been studying and reporting on these mountain interactions. However, more scientific researches need to be conducted to create adequate literature. The Himalayan and Hindu Kush snow is melting faster like never before, increasing the flow of water. Yet, causing a shortage of water. Dr. Atiq Rahman expressed his concern on this issue by mentioning the need for being sensitive to this reality as it affects various important economic sectors. He emphasized on another reality, that people and communities are also being affected through ecological interactions like the declining floral and faunal diversity in ecosystems.

Dr. Rahman concluded his speech by mentioning that the mountain systems is one of the many ways that South Asia is connected. Even though China and Myanmar are not part of this region, they are important for the interactions on this matter. With the tremendous hydroelectric potential, the future electricity of South Asia will be hydro-generated. South Asia is also closely connected through the Food-Energy-Water Nexus. These issues are complicated but complementary. However, sustainable solutions to these issues are also emerging; such as Nature-based Solutions, he added.

After the address by Dr. Atiq Rahman, Mr. Volker Lennart Plän, Resident Representative of Hanns Seidel Foundation India, delivered his welcome speech. At the beginning of his speech he shared how impressed he was by the South Asian representation from all the countries at the conference. He then said how lives are interconnected across these national boundaries. Among many other factors, a major cross-boundary connection is through water.

Water is indeed a blessing, but it brings along some challenges too. To cope with these challenges, existing data needs to be translated to information that will be usable to people and politics. Mr. Plän reassured that the rising awareness, backed by legitimate data will transform into action since the public will then demand the governments to act. He gave example of how EU elections are now decided over environmental politics. Since natural systems do not act according to national borders, our approach for managing these systems also need to go beyond borders. In order to do that, regional engagements like this conference are necessary. Exchange of scientific and political knowledge will then influence national policy decisions. Similarly, trans-boundary water policies would be more applicable and useful. This can be adopted through harmonized national politics. Not only that, exchange of knowledge will also drive innovation in technology to tackle these challenges and harness the potential opportunities.



After Mr. Plän's welcome speech, the Chair Dr Rahman requested the Chief Guest His Excellency, Mr. Peter Fahrenholtz, Ambassador of the Federal Republic of Germany to Bangladesh to address the South Asian delegates at the conference. He began with acknowledging that currently Bangladesh has the fastest growth rate in Asia, yet the most vulnerable to unprecedented challenges like climate change and migration. These challenges also have political consequences. He also emphasized on the significance of regional approach to acquire peace, prosperity, security and protection of population and resources of each country. His Excellency hoped that the conference would initiate a platform for such action through productive discussions and constructive exchange of knowledge.



Keynote Presentation

Dr. Ainun Nishat, Professor Emeritus, BRAC University, presented the keynote paper on “Overview of Water Resource and River Management in Himalaya” in the Inaugural Session. His presentation outlined the Integrated Water Resource Management (IWRM) process in trans-Himalayan regions. At the beginning of his presentation, he listed out some major issues to be discussed for Trans-boundary Water Resource Management (TBWRM). Among them, he mentioned that management of surface water, flood management, erosion control in Border Rivers, and hydro-power generation and distribution are being discussed between India and Bangladesh. On the one hand discussions on management of navigation;

ecosystem, watershed and forest management; and the impact of climate change and climate variability have been recently initiated; on the other, vital issues such as management of fisheries, management of water quality issues, salinity in the coastal belt; industrial water supply, domestic water supply and sanitation, and management of ground water are not being discussed enough by the two countries.



Afterwards, he discussed the key elements for effective management of trans-boundary water resources, which includes basin-wise planning and management; ensuring minimum ‘environmental flow’; effective management of control structures; and institutional arrangements for management. Dr. Nishat then clarified how this approach can be established effectively. He explained that for diplomacy to play an effective role, political will is necessary since all discussions on environmental, social and technical issues will go in vain without it. In turn, appropriate institutional mechanisms, economic and financial interests, along with transparent and accountable systems are required to be in place for ensuring political willingness in pursuing these issues in international policy negotiations.

Through his presentation, he also set a tone for discussions throughout the conference by laying out issues on technical, environmental, social and legal considerations for management of transboundary water resources management. He also talked about “The Wind of Change” that is evidently emergent in political approaches. Dr. Ainun Nishat further suggests ways to augment convergence of different agendas for cooperation.

In conclusion, he mentioned that institutional frameworks/mechanisms for basin management of common rivers needs to be established; seasonal and temporal variation in availability of water will be a critical factor in future as demand will increase. Inter-ministerial coordination is lacking in co-riparian countries. It needs to be urgently fixed. He reiterated that the directions to approach future planning has to come from political level and political masters must be in-charge and technical-diplomatic-legal units will assist them. A fresh look into the whole problem may lead to opening of new routes for collaborative program.

Technical Session 01: Water and Himalaya

Presentation 01: Highland – Lowland Interaction in the HKH Region by Dr. Abu Syed

In his presentation on “Highland – Lowland Interaction in the HKH Region”, **Dr. Abu Syed**, Fellow, BCAS, introduced the Hindu Kush Himalayan context of water sharing. Although the rate of melting glaciers may be debatable, he said that the trend of melting is evidently beyond what is expected to occur naturally.



Acknowledging that the rate of melting cannot be predicted accurately, he pointed out that any disruption to the water supply upstream will inevitably present challenges to the millions of people living downstream. Given the high density of populations in the plains, the water related challenges are getting aggravated; for example, flood magnitude may double.

Dr. Abu Syed pointed out six urgent actions for the Hindu Kush Himalaya (HKH):

1. Cooperate at all levels across the HKH region for sustainable and mutual benefits.
2. Recognize and prioritize the uniqueness of the HKH mountain people.
3. Take concerted climate action at all levels to keep global warming to 1.5°C by 2100.
4. Take accelerated actions to achieve the SDGs and 9 Mountain Priorities.
5. Enhance ecosystem resilience; halt biodiversity loss and land degradation.
6. Regional data and information sharing and science and knowledge cooperation.

Presentation 02: Sharing Water for Shared Ecosystems: Himalayan Opportunities by Professor Dr. Mohammad Rezaur Rahman

Dr. Mohammad Rezaur Rahman from the Institute of Water and Flood Management (IWFM) at BUET presented about the immense bounties of Himalayan basin. Some of the largest rivers in the world such as Indus, Ganges and Brahmaputra are sustained by the Himalayas which in turn sustain a high rates of population, a large part of which is in poverty. Dr. Rezaur Rahman elaborated on the fact that ecosystem connections are beyond national borders by showing examples of the Sundarbans, Gangetic dolphins and Tanguar Haor. He reasoned impoundment and diversion of water resources will have impacts on these shared resources. Disturbing the natural hydrograph will threaten a range of ecosystems and species dwelling in the co-riparian countries.



However, he concluded that it is possible to find out common ecological entry points for sharing water resources to ensure protection of common resources. Besides, there are legal obligations in protecting these common resources. Existing initiatives may be strengthened to enhance sustainable development of the region.

Presentation 03: Assessment of Water Resources Carrying Capacity in South Asia by Dr. Jia Shaofeng

Dr. Jia Shaofeng from Institute of Geographic Sciences and Natural Resource Research at Chinese Academy of Science in Beijing, China delivered the last presentation of the session. He started off by asking the question, “How much population can our



water resources sustain?" Then he introduced the concept of Water Resources Carrying Capacity (WRCC), followed by the concept of optimization model. He then defined Water Resources Carrying Index, which is the ratio of population and WRCC.

Despite being only 3% of global landmass, South Asia holds 14% of croplands and 23% of the world population. Thus, taking up the largest shares of global irrigation for decades. Dr. Jia then shared some data on water resources and uses. He showed the global high-resolution runoff map that has been produced using big geo-data and machine learning approach and has been tested by comparing with currently available runoff data. He also shared about the model that he used to determine the Exploitable Water Resources in each South Asian country. Followed by that, he shared his method and datasets used to identify sector disaggregated use of water. Deep Learning based on a multi-layer feed-forward artificial neural network has been trained with stochastic gradient descent using back-propagation. Three major sectors were considered to assess water use in South Asian countries. In all countries, the agricultural water use is dominant, except in Maldives.

Then he shared results of the Water Resources Carrying Capacity Assessment (WRCCA) in these countries. The lowest WRCC per km² is in Bhutan and part of Pakistan, while Chandigarh marks the highest WRCC of 4,857 population per km². Towards the end of the presentation, Dr. Jia Shaofeng shed light on some of the pressing challenges and future prospects of managing water resources in South Asia.

Technical Session 02: Integrated Water Resources Management

Mr. Tshering Dorji, Chief, Admin/HR Division, Royal Society for Protection on Nature (RSPN), Thimphu, Bhutan was the Chair of this session and introduced the participants.

Presentation 04: Integrated Management of Ganga River Basin – Nepali Perspective by Dr. Ratna Sansar Shrestha

Dr. Ratna Sansar Shrestha, Chairman, Nepal Hydro & Electric Limited emphasized the contribution and ability of Nepal towards reducing water crisis in parts of Asia. He stated that Nepal has the highest per capita water availability of 7,366 m³ which is relatively rich among countries of the Ganga basin. Due to temporal phenomenon 80% of all rainfall occurs during 4 months of monsoon (June-September) and the remaining 8 months of the year remain generally semi-arid. He articulated that electricity can be derived from various sources but there is no alternative to fresh water for drinking or irrigation, therefore, water-food-energy nexus may be reconsidered, as survival without electricity is possible but not without water.



Speaking about positive externalities of storage of water, Dr. Shrestha explained that Nepal contributes 70% of water flow during dry seasons and 40% annual flow of the Ganges. Evidently, Nepal's topography can afford better storage of water, this will enable storage dams for flood control of the lower regions, lean season augmented flow and drinking water for food security as both drinking water and food are major problems of India and Bangladesh. Furthermore, more storage also means increased depth which will make navigation more fluent. Storage projects in Nepal can also solve the Farakka Barrage problem of Bangladesh.

Dr. Shrestha also explained the negative externalities and long-term opportunity costs of storage dams in Nepal, emphasizing that dams are not unmitigated blessings. Once a storage dam is built low-riparian countries benefit from it but high-riparian countries cannot use that water for drinking or irrigation. Nepal being an upper riparian, such scenario will further deprive Nepal's land based agro-products and ecosystem services. Storage dams will cause inundation and involuntary displacement, creating a double lack of land, once for the conversion and again for new land to accommodate displaced population. Therefore, Nepal, Bangladesh and India need to collaborate to build a string of reservoir projects in Nepal on her major rivers, but as Nepal lies in the seismic zone, precautions have to be taken to minimize environmental degradation. He concluded that lessons could be learned from Columbia Treaty, and Lesotho Highlands Water Projects. As mentioned in Lesotho, per 18 m³/s flow, USD 25/year is paid, in that regard, Nepal supplies 1200 m³/s so it should be paid around USD 1666/year.

Presentation 05: Harmonization of National Policies in Water Sector by Mr. Md. Taufiqul Islam

Mr. Md. Taufiqul Islam, Director (Technical), Water Resources Planning Organization (WARPO), mentioned the availability of prior policy directives exist among national water sector policies. He mentioned that centralized harmonization is influenced by globalization and market force where the main alternative is competition. South Asia is the least economically integrated, consisting of a lot of non-tariff barriers. He mentioned that there are four types of harmonization; i) Harmonization of specific rules and regulations prescribing how certain activities should be performed – e.g. Standard of effluent discharge into common watercourses can be made more similar in different countries, or different jurisdictions of the same country, ii) More general governmental policy objectives – e.g. concerning the ambient water quality standards to be maintained – can be harmonized, iii) A third type of harmonization concerns certain general principles that are to be followed in policymaking (i.e. polluter pays principle), and iv) Harmonization of structures and procedures, often as a means of reinforcing other types of harmonization.



Speaking about harmonizing national policies in water sector, Mr. Islam identified where prior policy directives are available citing the National Water Policy of 1999. He articulated that all four types of harmonization concerns are available, but type 4 is most complicated as it requires institutional framework and deals with different stakeholders. He mentioned that Industrial Water Use Policy should be formulated in line with Environment Conservation Rules of 1997 and National Environment Policy 2018. Water quality index has to be developed for ambient water quality, and for general principles Zero discharge approach, enforcement of polluters pay principle and ensuring total cost recovery need to be looked into. Lastly, to encourage fourth level of harmonization circular economy approach can be taken.

Mr. Islam also emphasized on where prior policy directives are not available specially for groundwater sustainability. In terms of specific rules, standardization of groundwater assessment procedure and criteria for sustainable yield are not visible, additionally, aquifer mapping and conjunctive use of water are not present in government policy objectives. Furthermore, adoption of DPSIR (drivers, pressures, state, impact and response) framework for groundwater sustainability assessment are not present in policy making. Establishment of central authority for coordination, monitoring, and enforcement of policy provisions for groundwater sustainability has to be reinforced into institutional framework, as we do not have central groundwater board like India. In conclusion, Mr. Islam mentioned that market forces and business models are creating competition and efficiency in process optimization, and platform economy and supply chain traceability are creating shared responsibility. Altogether, this paves the path for Zero Discharge of Hazardous Chemicals (ZDHC) and water stewardship.

Presentation 06: Linkages between Himalayan and Coastal Sedimentation by Dr. Umme Kulsum Navera

Dr. Umme Kulsum Navera, Professor, Department of Water Resources Engineering, BUET, mentioned that sediments form due to chemical, mechanical and organic weathering. Sediments can occur from different sources; soil erosion, shore erosion, slope sliding, channel degradation and catchment deterioration and when transported by streams is called alluvium, and when transported by wind and glacier are called loess and till respectively. She articulated that surveys of coarse sediments in six Himalayan River Basins have generated a unique database which showed that significant differences exist in the size and shape of the particles between basins but the dominant control in all basins was rainfall. The main sources of sediment in Himalayan rivers are glacial deposits, landslides and intensively cultivated hill slopes. However, little qualitative or quantitative information is available on these sediments released from these sources. These sources produce immense volumes of material and river



sedimentation is probably the major water quality problem of the region.

She said that as the rivers reach the Ganges plain the slope is comparatively less, hence velocity is comparatively low which allows the sediment to settle down, and with increased rainfall the sediment size, sorting, roundness and skewness increases. Dr. Navera mentioned that most of the large deltas in the world are suffering from sediment starvation, the Bengal delta is prograding at a substantially high rate. The progradation expedites the shifting process of delta building estuaries as well as their associated distributaries, which play an important role in the eco-system of the delta by influencing the salinity, sediment and also the flooding pattern. She pointed out that each year the Ganges, Jamuna and Meghna rivers of Bangladesh transport more than one billion tonnes of sediment from their catchments in India, China, Nepal and Bhutan to this delta region.

The scenario in Bangladesh, she mentioned, is that although accretion is the dominant process, several thousands of people in the densely populated tidal plains become landless and homeless every year due to erosion. High sediment input from upstream and high tidal energy and Meghna Estuary itself is very dynamic in nature and characterized by erosion and accretion on the scale of several thousand hectares of land per year. Therefore, sediment management, based on a sound knowledge of the processes of sediment dispersal in the estuary and along the coasts are the effects of large events in the recent past, could be instrumental in combating sea level rise. Ms. Navera mentioned that after 1970s studies on Land Reclamation Project (LRP), Meghna Estuary Studies (MES) and Estuary Development Programme (EDP) carried out by Bangladesh Water Development Board (BWDB) have greatly increased knowledge and understanding of the physical processes of sediment transport, erosion and accretion, and now we have the Bangladesh Delta Plan 2100 to look forward to.

Open Discussions of Technical Session 02

One of the participants asked the question on lack of availability of data on groundwater and how it can be better monitored by WARPO, Mr. Islam answered by saying that BWDB have their own data although data on deep aquifer levels is lackluster, but WARPO is filling that gap. He mentioned that using GRACE Tellus technology for groundwater and Surface Water Ocean Topography (SWOT) technologies can be efficiently used to monitor the water sources and changes.

An interesting question posed by Dr. Atiq Rahman was, “Can there be a zero-waste human being?”, to which Mr. Islam responded that waste is what we make it, nothing is a waste if we can use it for further industrial processes citing the example of industrial symbiosis. The problem, he stated, is not waste, but rather the useless by-products of manufacturing one product. If this can be reduced, so will waste.

A very fruitful discussion occurred when participants presented their take on sedimentation flows. Participants mentioned that if construction with huge bulldozers takes place in upper

riparian countries, the lower riparian people will be faced with un-anticipated sedimentation. Land-slide induced dams create huge sediments but are less understood. Bangladesh consists of 139 policies which encompass sediment dynamics. They also mentioned how flood embankments change sediment patterns. It was also stated how sediments of Bangladesh are slippery and that we have bigger rivers, so land acquisition would be hard.

Ms. Navera added that sedimentation patterns also affect our livelihoods, therefore, total fluvial process have to be monitored. We have to create Ganga Power, Brahmaputra Power just like Mekong Power. Therefore, we need to integrate techno-economic information and scientific intent into policies. Hydro-diplomacy is not only to be left to diplomats, and source-to-sea approach has to be the over-arching framework, additionally, sedimentology has to be seen as an important area of study.

Technical Session 03: Assessment of Water Resources

Presentation 07: Flood Forecasting Using Latest Technology on Highland-Lowland by Professor Dr. Monowar Hossain

Professor Dr. Monowar Hossain is the Executive Director of Institute of Water Modeling (IWM), Bangladesh. He presented on flood forecasting in Bangladesh, which is the lowest riparian country in the Hindu Kush Himalaya basin. The geographical location of the country causes it to be the most vulnerable to water related disasters. During the time of floods, Bangladesh has excessive water whereas, there is a shortage of water during dry seasons.



A quarter of the population of Bangladesh suffers from water related stresses. Flood forecasting is therefore very important for the people of this densely populated country. A model was developed for reliable forecasts of floods using high quality data. Bangladesh uses the MIKE system to forecast floods. Input data includes evaporation, temperature, etc. Weather research can also forecast rate of inundation in coastal zones, using hydrological model.

Presentation 08: Water Scenario in Bhutan by Mr. Tshering Dorji

Mr. Tshering Dorji, Chief, Admin/HR Division, Royal Society for Protection on Nature (RSPN), Thimphu, Bhutan first presented an introduction of his country, Bhutan. This included the country profile, geographical features like the four major river systems. Then he moved on to talk about the threats that the county encounters, especially in the face of



climate change. Following that, he discussed some of the ways to mitigate those threats to build resilience to disasters and climate change. A major part of that was through ensuring sustainable forests and mitigating GLOF (glacial lake outburst flood). Some of the legal and institutional frameworks that are in place to achieve those things were then highlighted by Mr. Dorji.

However, a definite challenge that remains is the lack of accessibility of water, despite being highly available. To counter this challenge, a pilot project on Hydraulic Ram (Hydrum) was initiated. Installation of this technology has made water more accessible.

Presentation 09: Telescoping Indus Waters Treaty through the Lens of Climate Change by Mr. Fiaz Hussain Shah

Mr. Fiaz Hussain Shah, Director General, National Institute for Disaster Management, Pakistan presented to establish the need to have a more practical water sharing treaty that will account for climate change. He began by providing a geographical profile of the Indus River Basin (IRB), followed by its legal profile, and finally the institutional profile. He proceeded the presentation by discussing the major threats/risks to the Earth and Water systems. Then he talked about the possible impacts of climate change on water resources of Pakistan.



Finally, he spoke about the need for climate proofing the Indus Water Treaty (IWT). Climate Proofing in its conceptual sense is to incorporate climate change related clauses and provisions in a water agreement with a view to ensure its sustainability. Not only that, the treaty has been signed in 1960 and several technological and educational advancements in the field of hydrology, water resource management, trans-boundary watercourse management, conflict resolution have taken place ever since. Mr. Shah has illustrated a theoretical/conceptual framework, along with an applicability sequence and plausible modalities for climate proofing the IWT. He concluded with an analysis of the challenges and opportunities to it.

Technical Session 04: River Basin Management

Presentation 10: Himalayan Waters and Opportunities for South Asian Deltas: A Non-conventional Approach for Cooperation by Dr. Khondaker Azharul Haq

Dr. Khondaker Azharul Haq, Chairperson, Global Water Partnership (GWP) opened with the fact that South Asian countries are not being able to reap optimum benefit off of the South Asian Delta, mainly due to lack of political will coupled with the issue of sharing these transboundary rivers. He reiterated the benefits of water such as food security, ecosystems etc, as well as what water induced disasters the region faces, e.g. flood, salinity intrusion, cyclones and so on. “Water is the lifeline of culture, economy and poetry”, Dr. Haq exclaimed, stating an example of the Indus Water Treaty (IWT) that was signed in 1960 and sustained two Indo-Pakistani Wars. He later discussed the multiple treaties that exist between India, Nepal and Bhutan, and that each treaty needs to be dissimilar as river connections between countries are different. He stated that Bangladesh shares 54 transboundary rivers with India, but only one treaty exists for one river. Considering the time making of one treaty took, to create the remaining 53 treaties will easily take centuries. He said today the water treaty between India and Bhutan is one of the best treaties in the region and is working well.



Furthermore, Dr. Haq explained the major areas of cooperation for improving delta management. In flood control, sharing real time data for forecasting floods, and intervention through infrastructure development like control and regulating structures in the upper riparian countries are major areas that need cooperation. He explained that due to the opportunity of getting early warning, death by flood has decreased, but this needs improvement. In terms of prevention of river bank erosion, a study found that one person relocated five times in their lifetime due to such erosion, and that most migrants in Dhaka come as a result of losing their assets in river bank erosion. Therefore, river training, construction of infrastructures in appropriate location of the riparian countries, and proportionate joint investment by riparian countries may be explored. In Bangladesh, the navigation route is 60% cheaper than railway or highway, but still it has not received enough attention, however, this can be sustained through capital dredging of main rivers, prevention of shifting of the main channel of the rivers in the dry season through river training, and ensuring year round adequate draft in the major rivers and their tributaries. Dr. Haq mentioned that every year 1.5 to 2 billion tonnes of silt comes in Bangladesh, saying that “we are so obsessed with water, that we do not realize the potential of sedimentation, this amount of sedimentation can create a whole new Bangladesh if guided properly”. Speaking about arsenic contamination and salinity intrusion in groundwater, he mentioned that Dhaka is 8 meters above sea level and still has to go 80 meters below surface to reach groundwater, this was only about 2 meters only a few years back. In conclusion, if one kilogram of rice needs 4000 liters of water, then it is not affordable, we should decrease our consumption and go for conservation.

Presentation 11: Waterlogging and intersectionality nexus in Himalayan region by Dr. Mahbuba Nasreen

Dr. Mahbuba Nasreen, Director and Professor, Institute of Disaster Management and Vulnerability Studies (IDMVS), University of Dhaka, mentioned that water is essential for existence of different species and integral part of our economy, society & ecology on internal dynamics & external networks. The increased frequencies, intensities, extent & magnitude of disasters are inextricably linked with climate change resulting extended vulnerabilities of people & biodiversity. Although Bangladesh is climate ideal for water resources (from rainfall, river flow and ground water) as the receiving end of the Ganges-Brahmaputra basin agriculture, forestry, fisheries, & ecosystem of Bangladesh are dependent on flow of water through transboundary rivers. The grounded theory on coping with disaster underlines; although women are severe sufferers, they play a leading role in facing water challenges, as women are key in household water management. The very nature of unequal power dynamics around gender & intersectionality has to be elaborated in highland-lowland domain.



Dr. Nasreen referred to case studies related to waterlogging and stated that people in southwest region of Bangladesh have to stay water logged for longer periods, the gradual effects of waterlogging events added more risks on local communities, ecosystem & livelihood of people. Women, children, persons with disabilities, elderly & other marginal communities become more vulnerable due to differential impacts driven by socio-cultural identities. Key challenges for children in this regard are; health and treatment facilities, status of nutrition, and shelter, education and recreation facilities, the same remains for women and people with disabilities. Therefore, such facilities need to be paid more attention. Effective, efficient & equitable management of water resources in the region depends on concerted efforts. Cross regional, intersectional people need to be equally involved in consultation process; management & implementation of water related services. In conclusion, the socio-cultural pattern needs to be understood along with the economic-political and scientific information for sustainable management.

Presentation 12: Conservation and Development in Asia: Challenges and Opportunities by Mr. Raquibul Amin

Mr. Raquibul Amin, Country Representative, International Union for Conservation of Nature (IUCN), elaborated on the biodiversity and



ecosystem values of Asia, stating that it is one of the most biologically diverse regions on earth having eight of the world's 36 biodiversity hotspots, new species are being discovered all the time -over 1,000 new species were found in the Greater Mekong Sub-region alone between 1997 and 2008. In Asia, the Ganges-Brahmaputra-Meghna (GBM) river basin support one of the most productive agriculture systems, Yangtze is one of the longest rivers on earth, whilst the Mekong supports the world's most productive fisheries. Asia accounts for 40% of the global GDP being a key driver in global economy where Asia is expected to emerge as the World's Economic Centre of Gravity by 2050. He discussed that Asia is also facing a lot of pressure and threats; over half (60%) of the global population and over 70% of the world's poor people are in Asia, where the GBM river basin is the most populated in the world. This is mainly due to very rapid development and urbanization, often based on unsustainable natural resource exploitation (including massive illegal wildlife trade), leading to large-scale degradation and loss of habitat and many different taxonomic groups. IUCN Red List can illustrate the impact of these pressures on the species of Asia; for example, nearly 40% of the world's Critically Endangered large mammals are found in Asia.

Climate change is our greatest threat, Mr. Amin emphasized; recent disasters are triggered by climate change accounting for annual economic loss of \$675 billion, five of the ten most affected countries are in Asia and over 300 million people (70% of which are in Asia) will fall below the elevation of average annual coastal flood according to the estimate of sea level rise in 2050. Therefore, Mr. Amin pointed out that we have to reframe nature's relationship with climate change to one as an ally, not simply a vulnerability, and seek "Nature-based Solutions" for effective sustainable solutions. Nature itself can provide 37% of the mitigation needed by 2030 to remain within the 2°C pathway, mangroves can reduce annual flooding for more than 18 million people globally, agriculture production could be increased by 20% with greener water management practices, and urban green spaces increase property values by 5 to 15 percent. Blue Carbon inclusion is integral to Nationally Determined Contributions (NDCs) where 29 countries have included mitigation, and 59 countries have included adaptation in their NDCs.

Mr. Amin mentioned how benefit sharing is more important than say, water sharing. IUCN has been building river dialogues (such as Meghna profile and benefit sharing opportunities between Bangladesh and India) that build confidence of stakeholders to increase interrelations and interaction. Due to the success of the 14 years 'Mangrove for Future' project, 'Himalayas for Future' will be undertaken from 2019-2030, which will deal with resilience, and 'Scaling Up Mountain Ecosystem-based Adaptation in Bhutan' will focus on policy, financing, and demonstration of ecosystem-based national adaptation framework. He stated that various species are integral part of understanding ecosystems, for example, IUCN has monitored 44 birds with video satellite and have found how each time they stop at wetlands, this shows the importance wetland ecosystems in our world. He concluded by stating that many people have been, are and will be migrating, just as Rohingya in Bangladesh, and this has destroyed the habitat of Asian Elephants, 15% of which are at dire risk, but as India has proposed Elephant population as migratory species, there will be, if agreed, new avenues for cooperation.

Presentation 13: Challenges of Managing Large River Basins by Mr. Ashwin B Pandya

Mr. Ashwin B Pandya, Secretary General, International Commission on Irrigation and Drainage, New Delhi, India, highlighted that large river management is actually large basin management and stressed that natural processes need a more in-depth understanding to properly formulate management pathways. He stated that rivers are the final concentration area of the entire basin runoff, and involves all processes such as evapotranspiration, ground water recharge, stream network, sedimentation, water needs and demands. These processes have to be focused on to ease the challenges of management. The main challenges of managing large basins are identifying water



allocation amongst competing communities and use priorities - determination of equitability, other sources availability, opportunities for alternative growth options, navigation, business and historical developments. It also concerns, developmental opportunities at various zones of the basin and priorities like hydropower, agriculture, urban and industrial usages, also environmental processes and constraints need to be better understood along with the essence of international politics and treaties.

Regarding the management of monsoon fed basins, he cited an example of how Ganga River divides the skewed rainfall distribution thereby affecting irrigation and usable water. Water requirement is rainfall dependent, therefore, rainfall should be better monitored, he said. An examination of the basin network reveal that Ganga does not get supplemented by the tributaries till its confluence with Yamuna at Allahabad. With the heavy dependence on the river flows for agriculture, and in absence of adequate storage in the head reaches, the lean season flows below the diversion structures upto Narora dwindle considerably. This takes a heavy toll on the river water quality due to untreated effluents coupled with lack of fresh water. Mr. Pandya stressed that with the growing concern of climate change, water shortage will be inevitable, therefore storage of water is of utmost importance. Storage can only happen where it is capable of submerging minimum amount of land per cubic meter of stored water. Such situations only occur at the foothill regions. Ganga and Brahmaputra have the most water availability and live storage, where Brahmaputra also has the highest per capita water availability. An equivalent basin in terms of tail end yield like Ganga comes poor second at 6094 cum/Ha versus 27633 of Brahmaputra. In conclusion, Mr. Pandya emphasized that proactive dialogues and dynamic experiment-based models, technologies and simulations have to be adopted with continuous upgrades and nurture, asserting that, “No dialogues will work unless water storage is ensured”.

Open Discussion of Technical Session 04

The discussions paved the way for a more philosophical outlook on river basin management, participants mostly agreed on a paradigm shift that the future of our sovereignty shall not be divided by geographical borders rather a hydrological and economic border is sought. When the discussions headed towards treaties and previous track record of international cooperation, it was mentioned that confrontations occur because we look at things sensationally rather than in an enabling outlook, it should be seen as symbiosis in economic development rather than water sharing. In conclusion, social science and natural sciences are similar and should be utilized interchangeably for effective water management.

Technical Session 05: Societies and Vulnerabilities

Presentation 14: Social Drivers of Vulnerability in Himalayan River Systems by Dr. Dwijen Mallick

The session started with a presentation on social aspect of Himalayan river. **Dr. Dwijen Mallick**, Director, BCAS presented his work on Social drivers of vulnerability in Himalayan river System. The study was conducted on four Asian river basins namely Indus, Upper Ganges, Gandaki and Teesta using Hi-Aware research supported by International Development Research Centre (IDRC) Canada, and vulnerability was assessed. Physical impacts of climate change on water and drivers of such impacts were identified and the most vulnerable communities were recognized. The river basins were mostly affected due to three systems- high mountain, mid-hills and downstream. The methodology was mainly developed using matrix, which was concerned of three sections- socio-economic drivers, climate stresses, and level of vulnerability and adaptation needs. There were six major climate stresses, followed by multiple micro climate stresses. Flood, flash flood, river bank erosion, cold waves, and drought are the leading climate stresses, along with temperature rise and erratic rainfall. The socio-economic row was concerned with Population Structure, Poverty, Patterns of Livelihoods; Water & Food Security which further stated that social exclusion and caste discrimination were the major drivers. It was proven through research that marginalized communities were more vulnerable to the impacts of climate change, as their accessibility to water and other resources were lesser compared to other socio-economic groups. The research further suggested that disaster risk management in lower Teesta region should be integrated with regional development plans and initiatives. Moreover, better governance across river basin to allocate resources efficiently is required to stop locals from using autonomous adaptation methods.



Presentation 15: Trans-boundary Politics in the Kosi River Basin by Dr. Srinivas Chokkakula

Dr. Srinivas Chokkakula, Professorial Chair of Water Conflicts and Governance, Center for Policy Research (CRP) in his presentation was concerned with the regional, national, and state level politics in Kosi river basin. Dr. Sriniva tried to find out the role and impact of ‘p’ in transboundary governance, rationality, and policy implications. In his study on Kosi river basin , ‘p’ denoted multiscale politics for transboundary governance of Kosi. In addition, his

study urged for disaggregation and finding out the root cause of larger politics to ensure better transboundary governance. In 1960, Kosi project was initiated to act as a flood protection system between Nepal and India. Other than flood protection, system the project was also concerned with irrigation benefits. However, due to unstable political system in both countries, the project drastically failed and in 2014; 94 people died due to flood events. The thirty-five-year treaty's expenditure was stated but maintenance cost was not well distributed which resulted in such losses. Primary reason was the 'P' between Nepal and India, but the problem intensified when 'p' took over. Kosi became stagnant due to lack of financial resources allocated in maintenance. This problem was highlighted in evaluation report and Nepal's dysfunctionality was considered as the major reason behind the transboundary collapse. This transboundary collapse affected both Nepal and India but India being a lower riparian compared to Nepal suffered most. This study not only highlighted the loopholes persisting in the entire project but also suggested a national community management and policy implication to revisit KOSI treaty and create a section for flood risk management.



Presentation 16: Water Based Sustainable Tourism by Mr. Mokhlesur Rahman

Mr. Mokhlesur Rahman, Adjunct Faculty Department of Tourism and Hospitality, Bangabandhu Sheikh Mujibur Rahman Science & Technology University (BSMRSTU) mentioned water-based tourism is often affected by natural disaster and barely receive attention. Dr. Mokhlesur brought this arena into attention and promoted sustainable water-based tourism in his presentation. According to census, 50% of the tourist are interested in water-based tourism and tourism industry is the third largest industry in the world. This research also highlighted that by 2020 1.16 million tourists will prefer wetland-based tourism and



Bangladesh being a low riparian can benefit a lot from wetland tourism. Moreover, tourism can work as a sustainable development tool in all aspect as it brings in economic benefit which adds up to the GDP and protects biodiversity too. Bangladesh being a downstream country is bearing the highest amount of pollution, though its contribution is less than half of its neighbours. Inclusion of social, economic, and environmental parameters to ensure sustainability was the main idea of the sustainable tourism. In addition, awareness campaigns to protect both environment and cultural diversity should be incorporated. Further, to eradicate transboundary pollution affecting the Bangladesh's tourism industry, regional treaties can be initiated.

Open Discussion of Technical Session 05

A question answer session was conducted at the end of session 5. Audience wanted to know whether Bangladesh have any law to limit transboundary pollution or any plan to initiate such law. In reply, Dr. Mokhlesur said, Bangladesh do have policies drafted on tourism but weak implementation and monitoring has led to environmental degradation. Regarding the Kosi river agreement a representative from Nepal wanted to know the implication of Kosi barrage and if there's any plan to revisit it. Dr. Srinivas stated that the implication should be such that it integrate both national and state level government.

Technical Session 06: Harmonizing National Environmental Policies

Presentation 18: Need for Master Plan of Chittagong Hill Tracts (CHT) for implementing of Bangladesh Delta Plan 2100: Vision to Action by Mr. Malik Fida A Khan

Mr. Malik Fida A Khan, Executive Director, CEGIS, Member, National River Conservation, Commission, Bangladesh stated that Bangladesh is one of the pioneering countries to develop 100-year visionary plan. Bangladesh Delta Plan 2100 is envisioned as a long-term holistic plan that takes the water resource management, climate change and environmental challenges for supporting sustainable development of the country. It is founded on sixth and seventh five-year plan and vision 2041 which seeks to eliminate extreme poverty by 2030 and being a prosperous country beyond 2041. The plan identified 6 hotspots and Chittagong Hill Tracts (CHT) as one of six hotspots for development and suggested strategies accordingly. Key defining issues for selecting CHT are flooding, drainage congestion, cyclone, erosion, sedimentation, landslides, fresh water supply and sanitation, loss of livelihood and food production, loss of biodiversity, poor sanitation practices etc. The Bangladesh Delta plan identifies key strategies and sub-strategies to manage water resources in CHT. They are a) protection of economic zones and towns from flood and storm surge b) ensure water security and sustainable sanitation c) ensure integrated river management d) maintain Ecological Balance and Values (assets) at CHT e) increase institutional capacity for integrated water resources management f) develop multi-purpose resources management system for sustainable growth.



Mr. Fida expressed that the country has not developed any action plan to implement the BDP 2100. However, the country has identified potential areas for development i.e. land use, agricultural practice, livelihood options, water supply and sanitation, reviving off springs, policy and institutional arrangements. The strategies will be followed in accordance with short term, medium term and long-term period. Dr. Fida referred that the plan has adopted 3

principles from ICIMOD to achieve sustainable development in CHT and they are: 1) Utilizing/conserving the existing rich natural resources (such as springs/chora, forest etc.); 2) retaining the cultural practices; and 3) strengthening their existing indigenous practices (agriculture, water supply etc.). Focus areas for agricultural development are: adaptation of diversified crops and plants, livestock Development program in homesteads, gradual adaptation to a sustainable and climate smart alternative to shifting cultivation for example, as Contour cultivation, adaptation of cultivation systems, provision of Effective Irrigation Facilities, policy on provision of incentives to farmers and local people. Livelihood development will be focused on the following: promote non-farm activities through capacity development and incentives, Production of Biomass briquettes as alternative to coal, charcoal and wood and an alternative livelihood, strengthening Vocational and Social Skills, networks among the youth and women, accelerating animal husbandry, developing a Master Plan of tourism development & engagement of local communities. Water supply and sanitation activities will focus on the following: Identification of alternate options for water harvest: Rainwater Harvest, Identify the Sources of Safe Bottled Drinking Water, Adaptation of environmentally friendly sanitary facility.

He finally stated that CHT needs special attention for inclusive development due to its extensive natural resources and cultural diversity. He emphasized the importance of integrating ethnic communities into mainstream development while retaining their specific ethnic & cultural identity. He exclaimed that community based watershed management should be emphasized and it requires cooperation at all levels of stakeholders. He stated that best practices from other countries such as Nepal and Bhutan can be contextualized for such implementation.

Presentation 19: India’s “New” Water Policy: Moving Beyond Lofty Statement by Dr. Uttam Kumar Sinha

Dr. Uttam Kumar Sinha, Senior Fellow, Nehru Memorial Museum and Library (NMML), New Delhi mentioned about the two very important words “realism” and “dogma” which he believes defines the water policies in national and regional level. He said the joint management of rivers is a useful tool for settling transboundary river issues. He gave a historical snapshot of the joint river management issue. Recently India has made a new water policy regarding joint management to study the Indus Basin. The idea of joint river management is not a new world. However states should carefully handle issues relating the joint river management for peaceful relationship with the neighboring countries.



He mentioned that one of the first principle of water policies is that the policies are the means that should lead to greater end. These water policies should be designed in a way that become an end for good life. Policy makers are not concerned in making effective policies that will contribute towards welfare of the people. Whereas technicians are concerned with technical issues related to water which does not fulfill the overall need of the people. Countries should have clear understanding of water policies specially countries with transboundary river basins. Dr. Sinha stated that the second principle of water policy is that it should engage a large stakeholder participation. The history of water policies in India is not very old and is evolving. Now policy makers in India are more aware of water policies and they try to incorporate past experiences into new water policies.

While constructing new water policies, policy makers should consider how the new water policy would be. He mentioned national water policies should be bold and not lofty focusing on certain achievability. Policies should have definite time frame with specific goals. Water policies should be more assertive and have clear objectives. Countries should have more research before drafting water policies that will contribute to smart water policies supported with data, logically defined, clear and achievable objectives.

Open Discussion of Technical Session 06

During the discussion session one of the participants asked to the speaker from Bangladesh that why Bangladesh has adopted a long-term plan like Delta 2100. Dr. Fida replied that being a flood plain and climate vulnerable country Bangladesh is faced with numerous natural calamities. The country has 25 and 30 years plans but considering the impacts of climate change the country need long term plans to have a stable growth and sustained development.

Dr. Sinha stated that the central government and the state government of India need to have agreement on national policies regarding water issues. Participants suggested that all the Asian countries should have a mindset while formulating and implementing policies and have continuous interactions. He said that the countries should take river basin management and regional approach and instead of sub-regional or country-based approach while managing rivers as transboundary water issues are very critical. Countries should take into consideration about the upstream and downstream relations while making their policies. Dr. Sinha mentioned that currently India is moving towards a demand side approach to demand side approach. Being a middle riparian country Indian policy is different from other countries. Formation of any policy goes through a very critical long-term scrutiny before being proposed as a policy.

Dr. Fida remarked that there is no alternative and avoidance of dialogue between countries regarding water issues whether bilateral or multilateral. Being a downstream country Bangladesh has both advantages and disadvantages. The country should formulate its policies considering not only the economic benefit but also the environmental sustainability he stated. Policies should be crafted in a way to be applicable in all forms of government.

Dr. Srinivas Chokkakula, MoJS Research Chair- Water Conflicts and Governance Centre for Policy Research, New Delhi Chaired this session. He stated that water governance is a critical issue and water management is a tragedy of the commons. For effective water strategy we need to influence the state leaders with good intentions and need intervention from the political government. Policies need to be supported by action plans and implementation strategies with specific strategies.

Technical Session 07: Highland-Lowland Interactions

Presentation 20: High-land low-land interaction by Dr. Golam Rasul

Dr. Golam Rasul, Chief Economist at International Centre for Integrated Mountain Development (ICIMOD) stated the importance of the ten-river system geographically connected to eight countries of Hindu Kush Himalayan Region (KH). He stated that ICIMOD's core area of work is focused on the high land low land cooperation, and explained how low land Indo-Bangla serves as the food basket. Dr. Rasul further stated that if high and low land cooperation takes place, both the territories will be potentially benefited. However, with diverse and enriched ecosystem of HKH is highly vulnerable to climate change and natural disasters. He also stated that contribution of seasonal glacier melt, snow melt, runoff from HKH can serve for irrigation for the whole world. Unfortunately, the lowest share reaches the Farraka, and in dry seasons people receives only 10% of water for irrigation. With rising temperature water stress increases both in India and Pakistan which has direct impacts on food basket. In accordance with Paris Agreement if the temperature goes above 1.5, 1/3 of the HKH will be lost. Therefore, Bangladesh whose rainfall is decreasing day by day will suffer even more if temperature further rises, as source of irrigation water will be reduced. He suggested to store rainwater and use it for irrigation purpose. Also, policy implementation is required in order to limit transboundary pollution.



Presentation 22: Water Management: Trans-boundary Water Conflict in South Asia by Dr. Nilufa Islam

Dr. Nilufa Islam, Vice-President, Bangladesh Water Partnership stated that with a population of 1.5 billion, South Asia is a home to half of the world's poor; approximately half a billion of people lives in this region on less than a dollar per day. The Hindu Kush-Himalayan region (HKH), the largest storehouse of fresh water in the world is in South



Asia. Its mountains are the source of major river systems; the Indus, the Ganges and the Brahmaputra arise from Himalayan glaciers. Water resources in South Asian region mostly come from Indus basin, Ganges basin, Brahmaputra basin, and Meghna basin. Though the water sources seem to be enough for the population of south Asian countries, due to exponential population growth resource scarcity stands to be a problem in recent times. Bangladesh too which is a riverine country is facing water scarcity in dry seasons and consecutive flood events in wet season. Climate change along with resource scarcity and improper distribution of resources have intensified the problems even more. Moreover, transboundary river basin sharing, lack of good governance, low water productivity, mistrust issues all added up to the existing problem.

Presentation 23: Ayeyarwady Integrated River Basin Management in Myanmar by Mr. Anug Kyaw Phyo

Mr. Anug Kyaw Phyo, Director of Water Resources and Improvement of river system Yangon, Myanmar presented his work on Ayeyarwady river. According to Mr. Phyo there are many rivers in Myanmar, but Ayeyarwady river is the biggest one and covers 61% of Myanmar's total area. Myanmar government received US\$100 million credit from World Bank for a project in Ayeyarwady river, named as Ayeyarwady Integrated River Basin Management Project (AIRBM). AIRBM aimed to develop tools needed for management of



water resources and implement integrated river basin management in Ayeyarwady basin. The project was concerned of three components- water resource management, hydro-meteorological observation, and navigation enhancement. Mr. Phyo further discussed about these components and stated his recommendation to combat future challenges. According to him, government should do environmental impact assessment (EIA) and invite diverse group of experts to ensure environmental sustainability and soundness.

Open Discussion of Technical Session 07

To conclude the session, an open discussion was held. The participants made suggestions for China with regard to multilateral water treaties with South Asian countries. China has not been so far very forthcoming for a multilateral engagement on the rivers that flow from China down up to Bangladesh. However, Bangladesh along with India can sanction a regional treaty with china to reduce transboundary water pollution. Dr. Rasul added that South Asian countries need new sets of ideas, as this is not a win-lose situation anymore; transboundary pollution eventually affect everyone. To eradicate such problems more integrated measures are required.

Concluding Session

Dr. Atiq Rahman, Executive Director, Bangladesh Centre for Advanced Studies (BCAS) chaired the concluding session and conveyed his resourceful thoughts. He stated rivers belong to themselves and the society with all its inclusivity belongs to themselves as well. So, we need to care for them for our own need otherwise we will bring disastrous conditions for ourselves. The river has the right to flow and we are taking that right away from them. We the small group of people trying to control the flow of river which is against the nature and if we cannot manage it properly this will bring sufferings for all of us. Therefore, we need joint management of overall river basin and joint research to support these activities that he stated.



Mr. Volker Lennart Plän, Resident Representative, Hanns Seidel Foundation, New Delhi, India stated that the joint management of transboundary rivers is a crucial task and the organizers are delighted to bring likeminded people under one umbrella. He mentioned that political harmony is an extremely important issue in joint water management. He suggested that the diplomats need to streamline the focus on data sharing. For the organizers the conference is a crucial one because the discussions from the conference will give ideas for fruitful actions regarding joint river management. He elaborated that every year this kind of conferences should be organized to exchange views for better river management which will instigate research or transboundary issues. This network can be strengthened and used for future collaborations.



Dr. Nilufa Islam, Vice President of Bangladesh Water Partnership (BWP) Bangladesh stated that through this conference she learnt about the water policies of China and Myanmar. She mentioned that to strengthen joint management of river we need bigger platform which will bring up the sufferings of the people.



Mr. Tshering Dorji, the country Chief, Administration and Human Resource Division at Royal Society for Protection of nature (RSPN) applauded the initiation of such kind of conference to enhance regional cooperation, insights, guidance and enhanced capacity building among countries. Though geographical boundaries are a sensitive issue, policies makers should take the ecological boundaries into consideration. He added that while formulating policies all should consider common causes and solutions and think about a broader perspective and this kind of platform has given the opportunity to that cause.



Dr. JIA Shaofeng, Institute of Geographic Sciences and Natural Resource Research, Chinese Academy of Science, Beijing, China stated that this conference has given the participants a platform to share and display their ideas with regional countries about water issues. This will also strengthen the regional cooperation.



Dr. Srinivas Chokkakula, MoJS Research Chair- Water Conflicts and Governance Centre for Policy Research, New Delhi noted that there is a great deal of synergy across the south Asian region and emphasis on environmental issues and management. He added that there are opportunities for better cooperation and interconnectivity among the high land and low land countries. Watershed countries with same river catchment should come to a common platform considering the overall ecosystem of river basin. Politicians and leaders should come under one umbrella of common solutions and contribute to make sound policies for human welfare. He stated that conferences like this at South Asia level can also play fruitful role in this.



Mr. Aung Kyaw Phyo, Directorate of Water Resources and Improvement of River Systems, Yangon, Myanmar expressed that like Myanmar, the south Asian counties have similar disasters occurrences, so they almost need similar kind of solutions as what we have in Myanmar with special attention which requires common platform for knowledge sharing and



these kinds of conference have great significance to that purpose.

Dr. Ratna Sansar Shrestha, fellow Institute of Chartered Accountants of Nepal appreciated the organizers for organizing such kind of event which has become very fruitful as it has contributed to strengthen cooperation among the participating countries. To overcome common challenges, the countries of this region should consider the broader picture and take actions considering the overall river basin. He suggested that India, Nepal and Bangladesh can jointly construct dams in Nepal to reduce the water stress and jointly manage water problems which will simultaneously benefit all the countries.



Brigadier Fiaz Huaasin Shah, Director General, National Institute for Disaster Management, Pakistan expressed his gratitude to the Hanns foundation for inviting him for the third time and he showed optimistic attitude towards the outcomes of the conference. He recalled that once a buzzword, 'bilateral' is now being replaced by 'multilateral' and we should give it a try in South Asia also. He recommended that to avail the advantages of joint river management countries should initiate joint research on the river basin that may contribute to problem solving of common issues.



Dr. Md. Abu Syed, Fellow of Bangladesh Centre for Advanced Studies (BCAS) noted that this kind of conference should be continued for knowledge sharing and enhanced regional cooperation. Countries need to come forward to plan joint research and multilateral river management approaches.



Dr. Shamsul Alam, Senior Secretary and Member, General Economic Division, Planning Commission, Ministry of Planning, Peoples Republic of Bangladesh expressed his gratitude for arranging such conference. He noted that temperature change is not a hoax anymore and because of climate change and other issues the water is getting polluted more and more. Rainfall pattern has changes tremendously and countries are facing numerous challenges over and over again. He expressed with optimism that the government of Bangladesh is taking proactive measures and the government is already has



taken a 100-year plan “Delta Plan 2100” to analyze the long-term changes and take necessary actions to tackled the impacts of climate change. Bangladesh is a lower riparian country and 95 % of the catchment of most of the rivers are out of the geographical boundary of Bangladesh so the emphasis should be given on to basin wise management of rivers rather than a countrywide approach. River is a public resource and needed to be managed by public authorities that should be supported with cooperation of all the stakeholders from all the sectors. Focus of all the countries should be to ensure water security for sustainable growth which is hindered by political discrepancy among the regional countries. Here researchers and the development sector can play a crucial role in diluting and solving the research gap and help contribute solving regional difference to improve regional cooperation for joint river management.

The Conference ended with a group photo and was followed by a field visit next day.



Post-Conference Conversation with the speakers of the Conference

Post-2019 Dhaka Conference on 'Highland-Lowland Interactions' in the Himalayas, HSS-BCAS engaged some of the conference delegates in conversation on key issues that the Hindu Kush Himalayan (HKH) region as a whole faces. Following are the excerpts of the conversation:

Dear delegates, it was a great pleasure to have you participated in the 2019 Dhaka conference. Your presentations were wonderful and thought-provoking. Further, this conversation solicits your responses and perspectives on some supplementary questions that are before us with regard to the water issues in the Himalayas and know your perspectives. Let us begin with this question first:

How best can regional governance of water resources help regional cooperation?

Dr Uttam Kumar Sinha (India): Regional governance of water resources can be an impetus to regional cooperation and integration. It can be an engine to economic growth and trade and provide peace and stability in the region. Rivers have to move beyond its volumetric definition and sharing formula to areas of mutual benefits in which the riparian actors have equal negotiating power.

Brig. Fiaz Shah (Pakistan): Presently, the trans-boundary agreements do not provide sufficient space for effective regional governance. Even if the space is provided by the protocol, true implementation in letter and spirit does not exist. Yes, in all those agreements where space for regional governance exists, it should be religiously implemented and where it doesn't, required space should be created to usher an era of regional cooperation.

Dr Abu Syed (Bangladesh): Regional cooperation through shared (by basin sharing countries) research on water resources particularly availability, demand, supply and seasonality will generate evidences. So that regional governments, policy makers and academician/researchers will have evidence as to where, how and why to cooperate and collaborate especially in the two specific areas:

One is in the area of transboundary water management. As water resources frequently cross country borders, water resource management often needs to be transboundary as well. Transboundary water management can be achieved through joint and shared application of technical tools to specific water-related questions and challenges to improve water-specific outcomes in watercourses that are transboundary. This may be monitoring specific hydrological or environmental parameters as a basis for implementing water quality measures (such as availability, demand, supply and seasonality, better wastewater treatment along a shared river) in order improve water quality outcomes across legal jurisdictions. The Rhine may be a good example.

And the other area where the scientific evidences will help is water cooperation. The benefits can be derived by managing transboundary water resources cooperatively rather than unilaterally for riparian communities and states. For example, integrated and cooperative management of a dam cascade on a transboundary river can provide greater hydropower

generation or flood control benefits as seen through the details of the Colombia River Treaty between the United States and Canada.

Mr Jia Shaofeng (China): The will to cooperation and the awareness of mutual benefit is very important for cooperation. A good regional water governance must prove to be good for regional cooperation.

Khondaker Azharul Haq (Bangladesh): See, water is one of the two (the other is energy) major and common denominators and principal prime mover of the economies of the HKH region. Water ensures food security, livelihood and improved quality of life for the population majority of whom live in the rural areas and depend directly or indirectly on agriculture for their basic survival as well. The region is also extensively hydraulically conducted both by surface water and ground water. Any intervention by any country in the development and use of water adversely impacts the other—more specifically the countries located in the down streams. In addition to quantity, quality of water is also becoming a major governance issue as water is increasingly polluted by domestic and industrial effluents and agro-chemicals. For an inclusive balanced development of the region good water governance is a prerequisite and for the reasons cited above it cannot be done without effective regional cooperation.

Mr Ratna Sansar Shrestha (Nepal): We have to understand that water is life and it must be harnessed by focusing on water for drinking and irrigation purposes; energy generation being secondary. Water resources of the HKH region cannot be harnessed to the optimum level without regional cooperation amongst upper riparian and lower riparian nations.

Dr Nilufa (Bangladesh): Let me add here how Bangladesh approaches the transboundary water resources management. The new perspective of the present government of Bangladesh looks not only at the water resources alone but also the sharing of benefits in terms of financial cost and benefits. The sharing of cost and benefits could be a package cost—benefit as regard to hydro-power, irrigation, flood control as well environment protection. Therefore, regional water governance is now looked as integrated with cooperation on mutual economic cost and benefit-based development. There is a great deal of mistrust as regard to cost and benefit sharing in such cooperation which is required to be understood and addressed from the perspective of water sharing, equity and justice.

Do you think that addressing water and climate change issues in the HKH region need a regional outlook? What are the best ways to address governance deficit in the region for water and climate change?

Brig. Fiaz Shah (Pakistan): Yes, there is a requirement of regional outlook on so many accounts. Climate change is a global phenomenon; it is impacting each walk of life. Water is one of the most sensitive sectors to climate change. Water consequently is affecting many other related economic and development sectors. A regional outlook, for HKH region will ensure protection of the catchment area and monitoring of glacial fluctuations, river inflows, climatic conditions including temperature, precipitation and humidity. With regional outlook, neighbouring countries shall be able to share data, conduct joint research and where possible

resort to integrated water resource and watershed management. All these interventions will be able to address the governance deficit in the region, both for water and climate change.

Khondaker Azharul Haq (Bangladesh): It is absolutely necessary to address governance deficit in the region for water and climate change. The hydrology, environment and ecology are interconnected and it is extremely difficult to separate them country-wise. It should also need to be recognized that in the region the geographical (political) borders were superimposed on the hydrological borders (Basins) which in most cases were arbitrary. Therefore, separate governance systems shall have to be developed for hydrologic regions and geographical regions. The deficits in understanding the two separate systems has to be overcome from their own requirements and perspectives. At the same time it has to be understood that climate change impacts will also not recognize any borders. The borderless technological interventions have already begun but are limited to the space. We now need this concept to be transmitted to the ground and try to adapt. The other deficit which is probably more difficult to address is the inadequate "political will" of the regional leaders who refuse to accept the reality and necessity of solving a regional problem regionally.

Dr Uttam Kumar Sinha (India): Climate impact on water has now a proven link. This evidence-driven link will have an impact on food and energy. These are the fundamentals of economic growth and well-being in the region. Governance deficit has to be overcome by enhancing cross-border, sub-regional and regional economic cooperation across South Asian countries—such cooperation that are multi-level, multi-sectoral and multi-stakeholder.

Dr Abu Syed (Bangladesh): The regional sciences (comparison of water stress, availability, demand, supply and seasonality) among HKH countries are important to draw attention of policy makers. Mostly, governments are sitting on their own data and sources. However, this should change and they should develop a regional holistic approach and understanding. As I mentioned earlier once there are science-based evidences, government will have better understanding of issues and on what and how to collaborate with the neighbouring countries. Climate change and/or water can be a window for cooperation and collaboration. All governments have to recognize and appreciate needs and priorities of the people of the neighbouring countries. A sustainable institutional mechanism needs to be established in the region which can facilitate dialogue on water and climate and share information and knowledge.

Mr Jia Shaofeng (China): Yes. Water and climate issues are of regional scale, must be treated in regional scale. There are four ways to address governance deficit in the region. First, capacity building including monitoring and data collection. Second, coordination between deferent administration departments for integrated management of water and climate change. Third, pricing system of full cost recovery to avoid resources waste and promote high efficiency. And the fourth, formal water resources allocation agreement and its enforcement is very important.

Dr Nilufa (Bangladesh): There is a wide variation of resources availability and demand throughout the region. People located in different areas would be affected distinctively due to

water use and its changes consequent upon climate change in future. Therefore, water governance as regard to climate and water deficit is to be addressed at sub-regional scale and translated into regions interfacing the HKH.

Mr Ratna Sansar Shrestha (Nepal): In nutshell, a mechanism must be developed to recompense for negative externalities and to share positive externalities, without which optimum harnessing of water resources would not be possible.

South Asia stretches between Himalayan & Hindu Kush Mountain range in the north and the Bay of Bengal & Arabian Sea in the South. How can we best address highland-lowland interactions in a rapidly emerging world of climate change impacts?

Dr Abu Syed (Bangladesh): The upstream and downstream areas are intricately linked to each other in many ways. The downstream which receives water from the HKH mountain systems are highly dense in population with challenges from climate extremes resulting into floods, flash floods, sedimentation, erosion and eventually displacement of millions of people. These require immediate action from all quarters to sustain environments and ecosystem services of mountain and improve livelihoods in the region. The governments need to cooperate at all levels across the HKH. They need to act together to enhance ecosystem resilience.

Mr Jia Shaofeng (China): The cooperation between the highland and lowland is very important. The high land region should pay high attention to soil and water conservation to create better environment for flood prevention and water utilization in the lowland region. The highland region may also provide water resources storage and electricity for lowland region. For these, the lowland region may pay some service fee or compensation.

Mr Ratna Sansar Shrestha (Nepal): Storage dams (in the highland) can generate lean season augmented flow (in the lowland) and such regulated flow of water around the year will mitigate impacts of climate change to a large extent.

Brig. Fiaz Shah (Pakistan): HKH region houses ten major river basins. The leading ones are; Indus, Brahmaputra, Ganges River Basins. Only Indus River falls in Arabian Sea whereas other rivers fall in Bay of Bengal. India is a common upper riparian to Indus, Brahmaputra and Ganges Rivers. India should play a positive, constructive role of an upper riparian and ensure that no such intervention is undertaken by India which shall cause harm and damage to lower riparians. For this purpose, monitoring and data sharing mechanism should be made more effective and a culture of joint research should be encouraged for initiating regional cooperation.

Dr Nilufa (Bangladesh): Highland-lowland interaction in terms of data exchange should be attempted first on priority basis. Glacial melt in the Himalayas that effects post monsoon flows of Ganges and Brahmaputra is an important information and data that would help the lowland areas to plan for their water governess. There is a wide gap in the understanding of changing climate in this part of the world and unless we have a more certainty about the

issues and more importantly socioeconomic interaction and integration does not improve, a meaningful interaction between highland-lowland at this stage could hardly be a priority.

Dr Uttam Kumar Sinha (India): The climate impact on the snow, water, ice and permafrost in the highland has direct correlations with the lowlands. A mountain forum as an institutional mechanism that includes the mountain states of India along with the transboundary mountains states has to be created. Emphasis on technical solutions along with local knowledge and advocacy in diplomatic and political circles is required.

Khondaker Azharul Haq (Bangladesh): Geography of South Asia can probably be considered a 'mini world' which represents nearly all types of climate scenarios/terrains of the world. This includes high snow-covered mountains on the north, flood plains in the middle, extremely climate change coastal zones in the south. The entire area also offers a large practical laboratory where mitigation/adaptation research can be conducted at relatively low cost. A commission may be formed with representatives from the countries to formulate a prioritized comprehensive regional research agenda led by international institutes like ICMOD, IWMI, ICRISAT, ICDDRB etc. If needed subgroups can be constituted in different vulnerable areas of the region. It should also be recognized that research needs for different geographical terrain will be different. Considering that the climate change impacts will not recognize any geographical boundaries, research projects shall have to be designed following 'Basin' type approach. Also, highlands of the regions will have significant impacts on the environment of the low land, thus special attention needs to be paid on highland lowland interaction particularly due to climate change.

Water is heavily affected by Climate Change. How can cooperation in South Asia help in addressing social, environmental and economic issues simultaneously and swiftly?

Khondaker Azharul Haq (Bangladesh): Climate change will probably have the most serious impacts on water and there will be significant change in temporal and spatial distribution. On the other hand there could be some windfall benefits if such impacts ensure more uniform distribution of rainfall. Only an effective regional program on water management through IWRM can ensure positive outcome. Some attempts have been made through establishment of joint river commissions. But results have not been very encouraging. I think the entry point for larger climate change impact studies should be through the water sector as some governance modalities are already in place and also water ensures food, livelihood and nutrition security. Also it is related to flood, drought and salinity intrusion. Therefore, it is imperative that regional efforts be initiated immediately to ward-off the imminent danger that non-action or slower action will lead the region into.

Brig. Fiaz Shah (Pakistan): Global warming is the driver for climate change phenomena. Rise in temperature is melting HKH glaciers. Precipitation patterns are changing. Weather systems have become erratic. Availability of water has become uncertain. The magnitude, intensity, duration and frequency of water availability across the year has become unpredictable which has created uncertainties in planning for social, environmental, developmental and economic interventions. All these constraints emerging from climate

change can be addressed if culture of joint and integrated management is introduced in the region for bringing all the stakeholders on-board. Proactive and joint policy making by the stakeholders will pave way for regional cooperation and addressing the concerns simultaneously and swiftly.

Dr Uttam Kumar Sinha (India): Cooperation on inland waterways transport is an effective means to address social-economic issues and equally safeguarding environmental concerns. It will require upstream and downstream participation in mutually assured benefits as well as protecting environmental flows. The sustainability of the region's economic future and the management of its natural resources are heavily dependent on its ability, and willingness, to co-operate across national boundaries.

Mr Ratna Sansar Shrestha (Nepal): Climate change impacts water flow in terms of change in rainfall pattern; excessive rain in dry season and little to no rain in wet season. Storage dams can mitigate huge variation in hydrological cycle by regulating flow in lower riparian areas.

Dr Nilufa (Bangladesh): I would like to suggest the few steps than need to be followed up to deal with the impacts of climate change: 1) Strictly adhere to the principle of environmental protection in the most affected hot-spots by industrialization; 2) provide clean drinking water to poor and vulnerable everywhere and 3) make available water for agriculture in the most poor and disadvantaged area.

Mr Jia Shaofeng (China): The water-climate interaction is a very complex topic to say in the first place. Cooperation has huge potential to address many issues simultaneously and swiftly. In one word, cooperation is much better than non-cooperation.

In which of the following areas, multi- or bilateral cooperation in the HKH region would have the most significant effect? Why?

a. Energy poverty

b. Data Sharing

c. River-basin and water ecosystem management

d. Droughts

e. Flooding

Mr Jia Shaofeng (China): Cooperation is very useful and necessary in the HKH region. Hydropower cooperation may provide good chance to reduce hydro poverty. Data sharing is very helpful for flood prevention and water resources management. It's necessary to take the basin as an unit for integrated resource and ecological management. Basin level water resources regulation is useful for anti-drought.

Dr Abu Syed (Bangladesh): Multi- or bilateral cooperation river-basin and water ecosystem management in the HKH region would have significant effect. Ecosystem and climate change

issues are manifested through water resources availability and access. These also have serious links to regional transboundary implications and response/s and solution/s as well. Once it is done effectively, data sharing must be embedded into it. These would also address the problems of droughts and flooding.

Mr Ratna Sansar Shrestha (Nepal): Regional cooperation is *sine qua non* to mitigate droughts and flood.

Dr Uttam Kumar Sinha (India): I think multi- or bilateral cooperation in the HKH region would have the most significant effect in the area of flood.

Khondaker Azharul Haq (Bangladesh): In my opinion "River basin and water ecosystem management" will have a significant effect. Because this approach is expected to include all other mentioned areas of poverty, data sharing, droughts and floods. It can be mentioned here that multilateral cooperation among Nepal, India and Bangladesh, through real time data sharing has significantly reduced deaths and property damage from floods. Similarly, early warning systems in place has also played a big role in saving lives and property.

Brig. Fiaz Shah (Pakistan): As far as Indus River Basin is concerned, four out of five areas mentioned above can be bilaterally worked upon. Between Pakistan and India, under present geo-political environment, it may not be possible to undertake joint venture for energy poverty alleviation. However, lot of scope exists for working together with respect to data sharing, river basin and water ecosystem management, drought and flood management. Indus Water Treaty covers elaborately all mechanisms related to data sharing which need to be implemented in true letter and spirit. Although, there are no such provisions in Indus Water Treaty which should encourage river basin, water ecosystem management or for that matter drought management and flood remediation. To that end, a separate protocol should be added to Indus Water Treaty where all these aspects should be elaborately covered for bilateral cooperation between Pakistan and India.

Dr Nilufa (Bangladesh): There is a growing demand for energy for improved livelihood and development throughout the region. Again, drought and flooding are likely to worsen with climate differently under different scenario of socioeconomic situations. Depending on those the poor and disadvantaged section of the society would be affected disproportionately with changing climate. Drought and flooding are therefore still the priorities. Improving energy situation is required for overall impetus to improving livelihood of the population depending on the nature of economic development. Ecosystem is also going to face deterioration with economic development unless they are addressed in increasing manner. Data exchange among the stakeholder is of course key for bringing awareness and making plans for any meaningful advancement.

Dear all, thank you so much for taking out your valuable time and responding to the above questions.

About Hanns Seidel Foundation (HSF)

The Hanns Seidel Foundation, founded in 1967, is a German political foundation, implementing political and developmental cooperation “in the service of democracy, peace and development”. The Foundation is working for more than 40 years in the field of development cooperation and is currently undertaking 80 projects in more than 55 countries worldwide.

About Bangladesh Centre for Advanced Studies (BCAS)

Bangladesh Centre for Advanced Studies is an independent, non-profit, non-government, policy, research and implementation institute working on Sustainable Development (SD) at local, national, regional and global levels. Established in 1986 it has grown to become a leading research institute in the non-government sector in Bangladesh and South Asia.