

**Hydro politics of Yarlung Tsangpo River: Conflict and Cooperation  
between India and China**

**Doctor of Philosophy**

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Date: 20/07/2018

**DECLARATION**

I declare that the thesis entitled "Hydro politics of Yarlung Tsangpo River: Conflict and Cooperation between India and China" submitted by me for the award of the degree of **Doctor of Philosophy** of Jawaharlal Nehru University is my own work. The thesis has not been submitted for any other degree of this University or any other university.

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We recommend that this thesis be placed before the examiners for evaluation.

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## **Abbreviation**

ARWR: Actual renewable water Resources

SNWTP:-South-North water transfer project

BCM:- Billion cubic meter

ELM :-Expert level mechanism

TAR:-Tibetan autonomous region

ILC:-International law commission

ILA:-International law association

SADC;-Southern African Development Community

WCED:-World commission on environment and development

ERP:-Eastern route project

MRP:-Middle route project.

WRP:-western route project.

SNWD:-south north water diversion.

TGD:-Three gorges dam.

UNWC:-UN watercourses convention.

ICIMOD:-International centre for Integrated mountain development.

IWRM: Integrated water resource management.

ICJ: International court of justice.

IBWC: International boundary and water commission

ICPR : International commission for the protection

IWRM:-Integrated Water Resource Management

MOU:-Memorandum of understanding

BBI:-Bangladesh, Bhutan, India, Nepal

CWC:-Central Water Commission, Government of India

JGE:-Joint Group of Experts

MOWR:-Ministry of Water Resources, Government of India

MOEA:-Ministry of External Affairs

NEC:-National Environment Commission, Royal Government of Bhutan

PAC:-Project Advisory Committee

SAARC:-South Asian Association for Regional Cooperation

MW:-Mega Watt

SAFTA:-South Asian Free Trade Area

NEC:-National Environment Commission, Royal Government of Bhutan

JRC:-Joint Water Commission

ZOPA:-Zone of Possible Agreement

RSPN:-Royal Society for Protection of Nature

SAWI:-South Asian Water Initiative

ZOPEC:-Zone of Possible Effective Cooperation

UNFCCC:-United Nations Framework Convention on Climate Change

E4L:-Ecosystem for Life

DHPS:-Department of Hydropower and Power Systems, Royal Government of Bhutan

CSO:- Civil Society Organisation

BIMSTEC:-Bay of Bengal Initiative for Multi-Sectorial Technical and Economic Cooperation

IUCN:-International Convention for Conservation of Nature

MCM:-Million Cubic Meter

GBM:-Ganga, Brahmaputra, Meghna (Rivers)

DGPC:-Druk Green Power Cooperation

WWF:-World Wide Fund for Nature

## Chapter One

### Introduction

The term 'Hydro-politics' was introduced in 1979 by John Waterbury in his book, "*Hydro-politics of the Nile Valley*" which analysed how availability of water resources would impact water politics, a resource fundamental to all life forms and human development (Waterbury 1979). Hydro-politics in YarlungTsangpo has emerged as key issue between China and South Asian countries (particularly, India and Bangladesh). Arun P. Elhance has argued that hydro-politics is the "systematic study of conflict and cooperation between states over water resources that transcend international borders" (Elhance 1999). The case of shared water bodies with their international and transnational characteristics plays an important role in the analysis of conflict and cooperation between countries. Water bodies transcend political borders, making river riparian states interdependent on each other. Riparian states are linked by the hydrology of an international river basin, and as a consequence share a complex network of interdependencies related to environment, economy, politics and security (Dinar 2013). Elhance locates the potential for interstate conflict and opportunities of cooperation within these interdependencies (Elhance 1999). Clean water is a basic necessity for human health and a vital resource for economic growth, food production, navigation and other critical issues, therefore fresh water resources form a key issue of all development programs.

China built a hydropower project on YarlungTsangporiver to meet the downstream water demand and supply. This hydropower project plays an important role in the diplomatic relations of India and China. Both China and India are major powers in Asia, competing for water resources and their utilization. Many Chinese scholars and hydropower lobbyists have commented on Chinese water diversion projects. Commenting on the construction of the hydro-electric project in an interview in the *Guardian*, Zhang Boting, deputy general secretary of the China Society for Hydropower Engineering, said that the dam on YarlungTsangporiver which would save 200m tonnes of carbon each year would have global benefits. He further said, "We should not waste the opportunity of the biggest carbon emission reduction project. For the sake of the entire world, all the water resources that can be developed should be developed" (Chinese Engineers propose world's biggest hydro-electric project in Tibet, *The Guardian*, May 24, 2010). China depends on the concentration of water hub of the Tibetan plateau for its concentrated agriculture in the north eastern arid region, which has been growing more than other sectors. China focuses on reducing the northern arid problem

through two most important measures. First, it has focused on the construction of dams on YarlungTsangpo river basin. Second measure is the transfer of Tibetan water through the projected big south-north water transfer project which would fill the gap of Northern Chinese arid region.

Trans boundary water resources determine the relations between upper riparian and lower riparian countries. YarlungTsangpo is a trans-boundary river originating in the Tibetan region. Trans-boundary River is a river that flows through at least two or more political boundaries, within a nation and international boundary. "There are 261 international rivers, covering almost one half of the total land surface of the globe and untold numbers of shared aquifers. Water has been a cause of political tensions between Arabs and Israelis, Indians and Bangladeshis, Americans and Mexicans, and all ten riparian states of the Nile River. Water is the only scarce resource for which there is no substitute, over which there is poorly developed international law and the need for which is overwhelming, constant and immediately" (Wolf 1998).

The Tibetan plateau, also called the Roof of the World is the highest and largest plateau in the world, covering 2.5 million sq. km area and having an average altitude of 4000 meters above sea level. The YarlungTsangpo River basin is one of the largest river basins in the world. YarlungTsangpo, originating in the glaciers of Mt. Kailash in Tibet is known as the 'Brahmaputra Himalaya Range River' in India. The average discharge of the river is 20,000 m<sup>3</sup> /s. "This mighty river drains an area of 651,335 km<sup>2</sup> connecting China (50.5 %), India (33.6 %), Bangladesh (8.1 %) and Bhutan (7.8 %)" (Immerzeel, 2008). "The Indian part of the basin is shared by Arunachal Pradesh (41.9 %), Assam (36.3 %), Meghalaya (6.1 %), Nagaland (5.6 %), Sikkim (3.8 %) and West Bengal (6.3 %)" (Goswami). About 47% of the population of the world is dependent on the fresh water originating from the Tibetan area. The YarlungTsangpo river system is situated between latitudes 20 degrees north and 32 degrees north and longitudes 80 degree east and 96.30 degrees east. While in India, the river is known as Brahmaputra river, in the Tibetan region, from where it flows, it is known as Tsangpo River. The YarlungTsangpo river basin covers the regions of Tibet, China, India and Bangladesh and the river has a long route through the arid and plane region of Southern Tibet.

China is a major growing economic power, and has built dams on many rivers in the Chinese region to use hydropower. "China's domestic dam industry is unparalleled at the international

level in a number of projects, financial investment, and impacts on the environment and society. Almost half of the world's 45,000 large dams have been built or are under construction in China. Additionally, loss of land and environmental degradation caused by dam projects has imposed significant costs on the Chinese rural population. Jing stated that 10.2 million people living in rural environments had been displaced by hydropower projects by the 1990s. More alarmingly, in his 2007 work report to the National People's Congress, Premier Wen Jiabao reported that 23 million people have been displaced by dam projects. China's most recent five-year plan (2011–2015) has proposed an increase in the number of domestic dam projects by 50% to contribute 130–140 GW to the country's energy supply"(Beck 2012).

Citing technical difficulties, the government of China has postponed the diversion plan of YarlungTsangpo's waters to the arid north region. The long discussed plan is part of the proposed Western route of the massive South-to-North Chinese diversion project, construction on which has not begun yet. Chinese officials and analysts say that the difficult terrain and technical problems have made the diversion plan very unlikely. However, four hydropower projects would now be built on the middle reaches of the Brahmaputra under the energy plan, each located a few kilometres from the other. Under the 12<sup>th</sup> five year plan, (2011-2015) China approved the construction of 3 dams, Dagu, Jiacha and Jiexu on the middle reaches of YarlungTsangpo river. The plan said that the government "will push forward vigorously the hydropower base construction" on the middle reaches of the YarlungTsangpo. The government under this plan commenced the generation of 120 million kilowatt of conventional hydropower (China gives go ahead for three new Brahmaputra dams, The Hindu, January 30, 2013). The first dam called Dagu is located at less than 18km upstream of Zangmu dam with a capacity of 640 MW. Another dam called Jiacha dam with a capacity of 320 MW would be built downstream of Zangmu. Jiexu, the third dam (560 MW) would be built 11 km upstream of Zangmu. Further, China constructed the Zangmu dam on the same river which is already generating and bringing power to Northern and Western areas of China.

China has witness high rates of industrialisation, urbanization and economic growth. As a consequence, there is high demand for water as it is one of the key factors of Chinese development. However, China faces huge water scarcity. It therefore attempts to fulfil the demands of water supply for its agriculture by diverting the flow of Tibetan water resources.

The on-going South-to-North Water Diversion Project diverting Tibetan waters particularly of the YarlungTsangpo is one such project.

Tibetan plateau fresh water resources are integral to many south Asian countries. According to the report published by Institute of Defence Studies and Analysis in 2010, India and China would need per capita water availability of 1700-2100 cubic meters by 2025. Therefore, water security is becoming a major source of conflict in 21<sup>st</sup> century Asia. It is estimated that one out of five people do not have access to fresh water. China and India are neighbouring countries and share long boundaries. These two countries have a major dispute related to the sharing of the water of YarlungTsangpo river basin. The dams built by China on the upper reaches of YarlungTsangpo river basin have obstructed, diverted and reduced the flow of water to the downstream states of India and Bangladesh, which are situated in the lower region of Brahmaputra, thus having series of negative implications for the two. Both India and China are emerging powers not only in Asia but are also contenders in international power politics. India as a downstream state depends on the upper stream states for the flow of water resources. The diversion has therefore severely impacted its water resources, affecting its ecology, biodiversity and human life. The dams have had a dangerous impact on Indo-Burma biodiversity hotspots including Kaziranga National Park and Manas National Park, which are situated on the lower reaches of the river basin as well as on the livelihoods of people living in catchment areas of the same.

The Yarlung water resources are an issue for all riparian states sharing these resources and the diversion project would affect the sustainability of the environment, food security, health, social and economic progress of these states. Being a transboundary river, it is an imperative that all riparian states cooperate with each other on sharing the water resource. Concerns and objections have been growing strong against Chinese projects that have little concern for downstream states and have violated the rights of these countries. Downstream countries have strongly raised the diversion question with the Chinese government. The diversion of this water resource has led to the displacement of people, increased salinity, and declined the water quality in the regions in India and Bangladesh. Addressing this dispute requires building institutional frameworks that would assist in maintaining the flow of water in all riparian states. In his book, 'Water: Asia's New Battleground, Chellaney (2011) mentions that China is increasingly directing its focus on water reserves of Tibetan plateau to fulfil water demands of intensive farming. India as a developing country with high population requires more water for its development programs necessary for ensuring its sustainable and

inclusive growth. While all riparian states must have equal water distribution, the river water flow to downstream states depends on upstream states and their cooperation. India has signed various treaties with its neighbouring states regarding water distribution. However, the dispute is acute in the case of India and China as they do not share an institutional framework to manage the water distribution of Brahmaputra river basin. For instance, India does not have any treaty with China with regard to rivers in the North East Indian region that would direct both to share water according to non-navigation uses of internal waters law. As a result, compared to China, India has been facing an acute crisis of fresh water supply in many of its states.

Water is a fundamental resource for human life without which life is not possible. Human settlements and the development of civilisation have emerged and flourished on the banks of rivers and have been integrally dependent on river basins. It is for this reason that they are called cradle of human civilisation. For instance, Indus and Nile rivers have witnessed the development of world's biggest civilizations. In India, cities have grown and flourished on banks of rivers. To mention a few examples, Kolkata on the bank of river Hugli, Allahabad on the banks of river Ganga have been able to provide a home for millions due to the presence of the rivers. While, the YarlungTsangpo is not a home to big cities, large populations of China, Bangladesh and India are dependent on it. The river enables survival of these densely populated countries. Further, YarlungTsangpo is of strategic importance to the three south Asian countries through which it passes. In order to understand the debate of Brahmaputra river clearly, focus is specifically kept on India and China.

China and India are two major emerging powers to reckon with in the current global situation, with China being the second largest economic power after USA and India having a high growth rate. Each of these countries attempts to utilise and control water resources according to its national interests. However, water resources are scarce as is evident in the estimates of the World Bank according to which China possesses only 6.2% of the world's total fresh water resources to cater to 21% of the world's total population. Increasing population and high economic growth rate has increased usage of water resources. Increasing industrialization and urbanization have further put pressure on the already scarce water resources. Water shortage is magnified by the dropping aquifer levels, disappearing lakes, and polluted rivers. In addition to such pressures, the misuse and mismanagement together have intensified the problem of water shortage (Nair Yogesh, 2011).

Water security hence has become a major challenge not just in 21<sup>st</sup> century Asia but across the world..India and China, two highly populated countries are currently facing this challenge.International scholars have warned about the impending water crisis and the challenge of water security in Asia. World Bank vice president, Ismail Serageldin, warned in 1995 that “many of the wars of this (twentieth) century were about oil, but the wars of the next century will be about water” (IDSA task force report 2010: 2). On a similar note in 1998, the UNESCO director-general Federico Mayor said, “As (water) becomes increasingly rare, it becomes coveted, capable of unleashing conflicts. More than petrol and land, it is over water that the bitter conflict of the near future may be fought” (Chellaney 2011).Scholars are predicting that the water crisis and the vicious national competition over water resources would be a source of violent political conflicts in future.The UN Secretary General, Kofi Annan addressed the potential in water resources for future conflict on World Water Day on 2002. He said, “If the entire world’s people work together, a secure and sustainable water future can be ours” (UN Secretary General Kofi Annan, World Water Day 2002).

Hence, the Brahmaputra river basin has been a central issue in the relations between Asian countries. This is so because the two major powers of Asia located next to Brahmaputra river basin are competing with each other for water resources that are essential to fulfil the process of high growth and development.Originating from the Mansarover Lake of the Himalayan Mountain, YarlungTsangpo is the world’s highest altitude river with a length of almost 2900km.It covers an area ofapproximately 651,335 km<sup>2</sup>.About 50.5% area of the river flows in China 33.6% within India, 8.1% in Bangladesh and the remaining 7.8% in Bhutan (Immerzeel, 2008, 23).The capacity of Brahmaputra is exceeded only by 5 rivers across the world and only the Yellow river in mainland China carries more silt (This cannot be watered down, Brahma Chellaney, Hindustan times, November 28, 2015). Brahmaputra is called Laohitya in Sanskrit.According to Hindu mythology, Brahmaputra means ‘son of Brahma’(May 21, 2013,[www.indianetzone.com](http://www.indianetzone.com)). Within India, about 41.9% of the river flows in Arunachal Pradesh, 36.3% in Assam, 6.1% in Meghalaya, 5.6% in Nagaland, 3.8% in Sikkim and 6.3% in West Bengal (Dulal C Goswami, ND, 2).

As argued earlier, Brahmaputra river with its vast volume of cross border flows, flowing from China to other countries, is the most important river in Asia. It is estimated that the Brahmaputrariver’s annual trans-boundary runoff volume nearly equals the aggregate volume of the cross border flows of all the other rivers flowing from Tibet to India(Chellaney, 2011:143).In the Tibetan region, the river flows for hundreds of miles before entering into



Arunachal Pradesh in India. It is this Trans-Boundary nature of the river that is making it a centre of dispute and conflict in the Asian region.

### **Tibet: Introduction**

Tibet is an autonomous region of China. It shares its fresh water glaciers with all other South and South East Asian countries. "The People's Republic of China has is divided into 23 provinces and five autonomous regions and four municipalities directly under the Central Government, and two special administrative regions. As one of the five autonomous regions, the Tibet Autonomous Region is established mainly by the Tibetan race. The Tibet Autonomous Region is located in the south-western border area of the People's Republic of China, and the south-western part of the Qinghai-Tibet Plateau. Lying at 78°25'- 99°06'E and 26°44'- 36°32'N, it abuts the Xinjiang Uygur Autonomous Region in the north, Qinghai Province in the northeast, Sichuan Province in the east, and Yunnan Province in the southeast. It also has a 4,000 km border with the neighbouring countries of Myanmar, India, Bhutan and Sikkim as well as Kashmir in the south and west"(Facts, July3, 2013, <http://www.china.org.cn/english/tibet>).

The Tibetan plateau, covering 2.5 million sq. km and having a height of 4000 metres above sea level is the highest and largest plateau in the world. Scholars have referred to the plateau with various names such as the 'The Third Pole', 'Water Tower of Asia', and 'Roof of the World'. The Tibetan plateau is the source of the largest South Asian river as well as a number of other rivers and is the 3<sup>rd</sup> most glaciated region in the world after Arctic region and Antarctica, having more than 46,000 glaciers covering over 105,000 sq km of area. Hence it is also known as the fresh water hub of Asia. While it is surrounded by Kunlun range in the North, Himalayas in the South, the Hindu Kush and Pamir ranges surround the plateau in the West. Over 34 glacial lakes are situated in the northern slopes of Himalayas. The plateau was also home to the largest ice mass outside the polar regions- the Hindu Kush Ice sheet. However increasing climate change has been witnessing glacier retreat and melting in the region(<http://tew.org/archived/2010/climatechangereport.pdf>) the impacts of climate change, May 15, 2013).

"The Chinese water resources ministry estimates that the Tibetan autonomous region has 448.2 billion cubic meters of water volume, the ministry further estimates that the Tibetan autonomous region has the possible generate 1,800 billion kWh of electricity making it second only to Sichuan province. China's territorial location of Tibet, it is a significant matter

the current and future water issues with India, which is lower riparian state” (IDSA, 2010, p 48).

The Tibet Environmental Watch in its report in 2010 stated, “These snow peaks and glaciers facilitate Tibet to be the source of four major rivers that meets much of Asia’s water demand, for instance as much as 70% of the summer flow in the Ganges and 50- 60% of the flow in other major rivers and the Driчу (Yangtze River) river basin accounts for 40% of China’s freshwater resources, more than 70% of China’s rice production, 50% of its grain production, more than 70% of fishery production, and 40% of China’s GDP” (<http://tew.org/archived/2010/climatechangereport.pdf>The impacts of climate change, May 15, 2013).

Further, the report studied in detail the desert regions that are receiving water from the Tibetan Plateau. It said, “The Plateau provides Asia’s fresh water resource from the deserts of Pakistan and India to the rice paddies of southern Vietnam, from the great Tonlesap lake of Cambodia to the North China plain. With the major Asian rivers originating from its plateau, the total river basin area is estimated above 5,477,700 km<sup>2</sup>. That is 3% of the land surface of our planet. Beyond the populations residing in the watersheds of these rivers are the additional hundreds of millions or billions who depend on monsoon rains drawn inland by the Tibetan Plateau. According to World Wildlife Fund for Nature (WWF), the Tibetan Plateau Steppe—one of the largest land-based wilderness areas left in the world—has the most pristine mountain grassland in Eurasia” (The impacts of climate change, May 15, 2013 <http://tew.org/archived/2010/climatechangereport.pdf>)

Map 1: Tibetan Plateau



Source:[http://www.google.co.in/search?gs\\_rn=17&gs\\_ri=psab&pq=tibet+plateau&cp](http://www.google.co.in/search?gs_rn=17&gs_ri=psab&pq=tibet+plateau&cp)

### **Primary River Basins of Tibetan Plateau:**

The Tibetan plateau is the source of most of the rivers of South and South East Asian countries such as China, India, Bangladesh, Nepal, Bhutan, Pakistan, Thailand, Myanmar, Laos, Cambodia, and Vietnam. Hence is a life line of the populations of these countries as over 90% of their fresh water needs are met by this region. “Tibetan plateau originates ten most important rivers in Asia such as the Yarlung Tsangpo (Brahmaputra), the Sengye Khabab (Indus), the langchen Khabab (Karnali), the Dirchu (Yangtze), Zachu (Mekong), Machu (Huang Ho, Yellow river), Gyalmo Nyulchu (Salween), Lodrak Sharchu (Manas), and Phung Chu/Bhumchu (Arun)” (Shakya 2009: 12).

Rivers flowing from this region have provided fresh water to millions of people in Asian countries through which it flows, specifically the lower riparian countries. While these rivers depend on the South West Monsoon for replenishing for a small period, it is the Tibetan glaciers that maintain their flow of the fresh water in these countries in the absence of monsoons. Hence, Brahmaputra river basin and her tributaries play a very important role in maintaining the flow of water in South Asian region

In addition, the rapidly growing Asian powers, India and China depend extensively on the fresh water of Tibet plateau which is increasingly putting strains on this rapidly depleting resource. This is because both these countries have the largest populations in the world which automatically increases their water needs, and as a result it is estimated that over 47% of total world population is dependent on the Tibetan plateau. Further as emerging economic hubs, rapid industrialization is taking place in these countries which brings with it high demands for water in the new urban areas as well as pollution and misuse resulting from overuse. Therefore, it is important to ensure sustainable use of this life source and conserve it for future generations. This poses a huge crisis for the Tibetan plateau in the current times (Immerzeel et al 2008: 52). Below is the map of the major Tibetan river system:

Map 2: Tibetan river system



Source: <http://www.google.co.in/search?q=tibetan+rivers+map&safe>

### Yarlung Tsangpo River Basin:

An international drainage basin is defined in Article 2 of the Helsinki rules as “the geographical area determined by the watershed limits of the system of waters, including surface water and underground waters, following into a common terminus (Helsinki Rules, International Law Association, 1996, Article II). Below is the Map of the YarlungTsangpo/Brahmaputra river basin)

Map 3: Brahmaputra/YarlungTsangpo river basin



Source: <http://www.google.co.in/search?q=yarlung+tsangpo+river+map&safe>

The following table shows the status of Brahmaputra and other rivers originating in the Tibetan region.

Table 1. The volume of river waters flowing out of the Tibetan plateau to countries other than China

River System	Direct Destination	Mean Annual Runoff Volume Out (km <sup>3</sup> )

Brahmaputra (YarlungTsangpo) and tributaries	India	165,400
Rivers of southwestern and western Tibet	India	181,620
Rivers from southern Tibet	Nepal	12,000
Salween (GyalmoNgulchu, or Nu)	Burma (Myanmar)	68,740
Mekong	Laos and Burma	73,630
Tibetan rivers flowing out from western Yunnan	Burma	31,290

(Source: Chellaney (2011) 143)

#### **Increasing Chinese Water Demand:**

The increasing water demand will be the most significant water challenge for China in the coming years according to Tsering (2002). The economic development that China covets about itself has not matched the requirement for water as surface water in China. The amount of surface water in China is one-quarter of the global average and is distributed in an uneven manner. Water crisis in China lies are on groundwater availability and distribution. A substantial level water this version programme was designed to orient water towards the drought region in the North – away from the south and west.of the country(Tsering, 2002). One of the most basic water problems in China is the lack of accessibility of surface water. In terms of population to land ratio, the north and the northwest, which has a population of about 380 million people or around 30 percent of the national population, has over half of the country’s arable land but it has only seven percent of its surface water. Its per capita resources are roughly 20-25 percent of the average for China as a whole, and five to six percent of global standard. The north China plain has only 10-15 percent of the per capita supply for the country as a whole, or less than four percent of the global average. Northern waters also carry far more sediment than the southern ones and even more industrial pollutants per cubic meter. On top of that the north China plain has high seasonal fluctuations in water supply. Thus, China’s dams, though used mainly for hydropower, are also used for storing water for the dry parts in China (Dhirendra K Vajpayi 2012, 142).

The water consumption in China will increase by one percent annually as estimated by The Chinese Ministry of Water Resources. Its water resources are diminishing and making it more and more arid by the way of time. In 2009, over-all freshwater reserves plunged to 2.42 trillion cubic meters, 353 billion cubic meters less than in 2000, which represent a 13 percent decline (Dhirendra K vajpayi et al 2012, 142). The total reserve of water resources in China is about 2800 billion cubic metres (m<sup>3</sup>) and positions sixth in the world. However, in terms of per capita accessibility, it has only 2700 m<sup>3</sup> far less than the world average for the country's dense population and vast territory and rank 121<sup>st</sup> in the world (Nair Yogesh, 2011, 141-42). To add to this lopsided distribution of water in China, problem has been compounded as South China has 36.5 percent of the total territory but holds only 80.9 percent of the country's water resources. The northern and north-western region amounts to 63.5 percent of the entire area, but has only 19.1 percent of the country's total water resources (Nair Yogesh, 2011 141-142, Claws Journal 1 Summer 2011). The skewed water scenario in China has compelled Chinese state to prepare her for future challenges. To meet the demand-supply mismatch of water, China is interested to divert Tibetan water resources for her purposes. China has projected big south-north water transfer project diverting Tibetan waters particular on the YarlungTsangpo (Brahmaputra River). The expected diverts of water by China affects India and Bangladesh. Through these dams, China generates electricity on Brahmaputra basin and maintains its hydro-hegemony in Asia. Apart from that diverted water is used for strategic interest in Western Chinese development program. In addition to that Northern region of China is one of the most densely populated areas of China and also in the world, as capital Beijing and other major Chinese cities are located in this region. The soil of this region is vibrant, and it is problematic to grow agriculture in water scarcity. Colossal water uses for agriculture sectors is becoming the significant tension rather than other purposes water demands. Another major problem of water is consumption in the industry sector and the urban population which is growing fast. In the current economic milieu, China is the largest industrial water consumer with 120 billion cubic meters a year. China's coalmining, processing and electric generating industries account for a fifth the of the national water consumption. By 2020, China's growing dependence on coal for primary energy is projected to grow by an additional billion metric tons annually, representing a 30 per cent increase. This will create extra issues for the managerial authorities. While the dry northern provinces like Gansu, Ningxia, Shaanxi, Shanxi, Xinjiang and Inner Mongolia see a large concentration of coal reserves the southern regions have the water needed to develop these reserves. The line on the west is the only one of the three routes of the South-North Water Transfer Project

(SNWTP) (Nanshui Beidiao Gongcheng), the dry Yellow River would directly receive water which would sustain the energy rich region. In Northern and western provinces, it gives the unproven western transfer scheme more momentum for approval. However, SNWTP will ease the imbalance between supply and demand of water resources in the Northern China Plain (Jesper Svensson, 2012, pp 7-8).

Challaney (2011) rightly puts China as the world's most 'dammed' nation today. The utilisation of water in China is very high due to its growing industrialisation, high economic growth and growth of urbanisation. Hence, water is one of the critical factors for the development of China. All these factors corroborate the fact that China has enormous water scarcity. And water security is going to be a significant problem in the 21<sup>st</sup> century in Asia as China is turning to trans-boundary rivers for its utilisation. To augment its capacity and manage future challenges, China is focusing on large-scale water works like the south to north water diversion project. It is must for China to execute these projects to match the expected rate of economic development. In this backdrop, China plans to divert the Yarlung Tsangpo river which will have a significant bearing on the Brahmaputra water leading to a water crisis in North Eastern part of India (Nair 2011). Through means of dams, China will control the Himalayan advances of the principal rivers of India and South-East Asia that deliver wherewithal to the agriculture and energy of these immense territories which can lead to future water conflicts. Although, attention has been paid to the problem of "peak oil" however geopolitical implications of water shortage has rarely been recognised. It is a fact that the alternative energy option of oil is available but there is no substitute of water which is at the base of very sustenance of human life itself. The Chinese state is able to gauge the magnitude of problems of water scarcity and has vigorously continued to maintain its claim over disputed territories with its neighbour, be it India, Russia or Vietnam to meet its future requirements (Water Wars: Rivalry over Water Resources). China constructed the Zangmu Dam on the Brahmaputra River and it will bring power to Northern and Western China. It is designed as a "run of the river" dam and many proposals have been planned by the Chinese government. As water plays the critical role in India and China's diplomatic relations; it will have severe consequences as the dam is directly affecting the water share of India.

#### **Diversion of Yarlung Tsangpo (Brahmaputra River):**

The great south to north water diversion project was visualised by Mao Zedong when he reportedly said in 1952; 'the south has a lot of water, the north little, it is okay to lend a little



water.” Mao’s grand ideas to take water from China’s flood-prone south to arid north” (Chellaney 2011: 60). Mao’s statement was being considered by the Chinese government since the beginning of the southern north diversion project. It was not recognised by Ministry of Water Resources till December 1979 (James E. Nickum).

The diversion project, involves diverting water from the south to the north along three routes. The central and middle routes, which have no impact on India, will divert water from the Yangtze River to Beijing and Tianjin in the north. The western course, from the Brahmaputra, is the most ambitious and is of enormous consequence for India and Bangladesh. It includes building a dam on the ‘great bend’ of the Brahmaputra — the place where the river does a u-turn of sorts and commences its passage east to India (India, China and water security, The Hindu, November 20, 2009). One could say that for the Chinese dam builder’s the Brahmaputra is a magnet as this river’s cross-border annual discharge of 165.4 billion cubic metres is more than the combined trans-boundary water amount of the other water bodies flowing to Southeast Asia from China. Mega dams like the Mekong are to be expected as China begins to build dams on the Brahmaputra, (This cannot be watered down, Brahmachellaney, Hindustan times November 28, 2015).

### **South-North Water Diverion (SNWD) Project:**

Diversion of South to North water project is of utmost importance to balance the development in China and harness the potential of the Northern region. There are three rivers in China which are part of the south to north diversion project which are Yellow River, Huaihe and Haihe river basins. These river basins are facing the problem between water supply and water demands. The main problem of water scarcity exists due to the lack of management of water resources for this region (Pei Yuansheng, et al.).

The water transfer project from the southern part of China to the northern part of China is proposed to resolve the demand-supply mismatch. Three routes of water transfer: western, middle and eastern routes are planned in this considerable water diversion project linking the Yangtze, Yellow, Huai and Hai Rivers through these three transfer routes. This is expected that the water resource shortage in the middle and northern part of China will be reduced and the alleviation of the severe flood threats in the southern part of China can be reduced. China diverts water from upper, middle and lower reaches of the southern region to the northern region and northwestern part of China. China aims to acquire the target of 45 billion m<sup>3</sup> of water volume by the year 2050 by way of rerouting. Eastern route is 15 billion m<sup>3</sup>, middle

path 13 billion m<sup>3</sup> and western routes 17 billion m<sup>3</sup>. Through these diversions, China wants to improve its water shortage (Lianxiang Wang and Lintao Chen, 2004, 3).

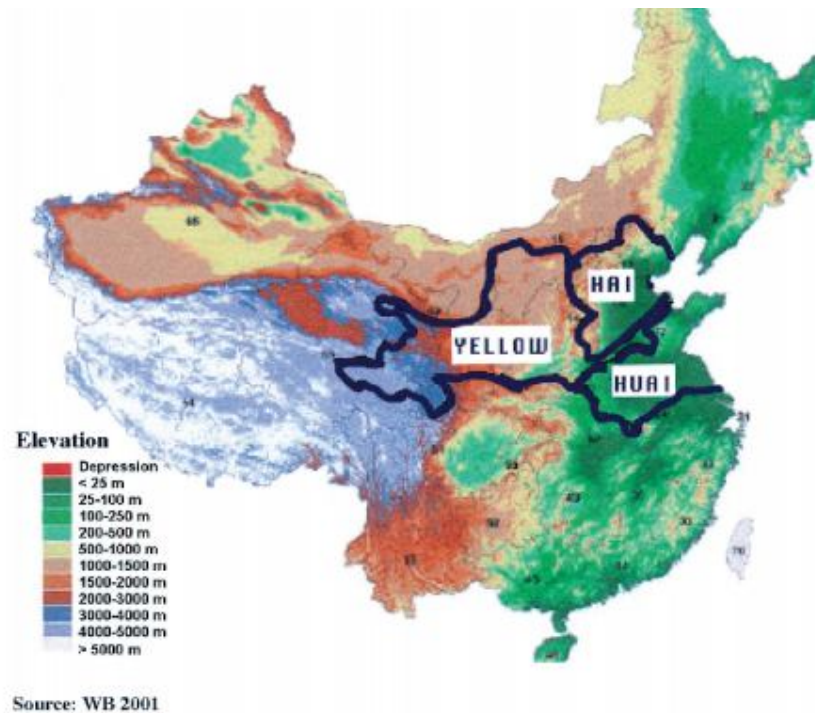


Figure: 1 Yellow, Hai, and Huai River map (Source: Jeremy Berkoff)

### Primary Concerns:

China controls over Brahmaputra water resources and uses it for her utilization without consulting any of the downstream states (India and Bangladesh). China has built the dam on the Brahmaputra river basin which has affected the livelihood and ecology of downstream people. The concern of downstream countries especially India centres on the fact that the downstream countries suffer from water shortage if a dam is built by upper riparian countries to divert the flow to their benefit without having a proper sharing arrangement. The kind of unilateral diversion which China is resorting to, without adequate consultation, negotiation and sharing arrangements may lead to a long-term dispute among nations and has potential to create environmental hazard such as desertification” (Ahmad 2003: 180). The fact remains that Brahmaputra water resource is a tactical resource in the Asian region for social and economic development. It has the prime importance for energy generation, human security, and environmental sustainability food productions not only in China but in the whole region.

### **China's diversion policy of Yarlung Tsangpo (Brahmaputra River):**

The upcoming mega-hydro engineering projects by China on the transnational river Brahmaputra is becoming a matter of threat not only to the internal security of India but also Bangladesh.

China has been aggressively kept constructing more and more dams on such international waters alike that of Brahmaputra the barriers that China has been creating on Brahmaputra are indeed huge having greater transboundary implication, which has given rise to many geopolitical risks in other co-riparian countries, with India and Bangladesh being majorly affected.

Brahmaputra serves as a lifeline to millions of people in India, especially in the state of Assam, irrespective of their different occupations. Brahmaputra carries a tremendous socio-economic impact on the lives of people living in India. It helps the agrarian society in cultivation by irrigation and supplying essential nutrients to their fields. It also serves to be the means of transport for men and material. Livelihoods of majority rely directly or indirectly on the river Brahmaputra as some are fishermen, daily labourers and also boatmen. Apart from these positive impacts on the lives of many, it also has widespread negative implications in various ways. Brahmaputra has earned notoriety for the dangerous hazards of annual flood and erosion that create mayhem every year. It also shatters the fragile agro-economic base of the region and damages the banks in the valley. Then, thousands of acres of cultivable lands are nowhere to be found, and deposition of tons of sand on arable land thus making it less fertile and unusable to the farmers. This often makes the farmers landless and becomes the reason for their migration to other parts of the country in search of the substitute source of maintenance. The Brahmaputra causes frequent violent floods causing property damages, destruction of community houses and infrastructure and loss of human and animal life as well. Due to its overexploitation, mining, and increasing construction of hydro-engineering projects, it has turned out to be a cause of untenable socio, economic, cultural and environmental development. Though specific measures are taken for its management, many adverse impacts remain unaddressed and are unsatisfactory. To reduce these negative impacts and devastating effects, sustainable measures should be taken up by all the relevant stakeholders including not only by the government but also the industrial houses, affected communities, NGOs and civil society. Therefore, what is required is a holistic multi-stakeholder, based approach to mitigation.

China justifies its diversion policy of Brahmaputra (200billion cubic .mts.) claiming that:

1.) A partial deflection of Brahmaputra would help control flood damage in downstream states like India and Bangladesh and would not have any adverse impact on them.

2) The diversion would prevent the freshwater from flowing into the ocean and going waste. However, contradictory to the Chinese claim, the ground reality reflects the serious damage that the diversion project has done to the river basin of Brahmaputra.

### **Implications on Yarlung Tsangpoof China's Diversion Policy:**

- Variations in the overall pattern of rainfall on the Tibetan Plateau.
- The diversion of water would change Brahmaputra's annual flooding cycle, which would then result in loss of nutrient profile suitable for agricultural activities for both India and Bangladesh.
- This will also result in blocking of silt and nutrient rich sediment of the river in its upstream side. This would result in fluvial imbalance in the upstream and loss of nutrients in agricultural and fishing activities in the downstream.
- Reduction in the quality of water.
- Flooding of side plains in the upstream.
- In the downstream side, it would result in drought situation.
- Irrigation caused salinity will increase salt level in the upper-middle basin as a result of widespread farming.
- It may result in decreased in agricultural production level in downstream region.
- It would also result in extreme weather conditions in the downstream region.
- Drying of other smaller streams in North-east region of India and some parts of Bangladesh.
- It may escalate poverty in deltaic plains of Bangladesh.
- Widespread Ecological damage. .
- Increased damaging impact on wetlands of the Sunderban forests.
- Over use of groundwater resources will result in decreased ground water level and it also will affect aquifer system present in the region.
- Other environmental problems including contamination of coastal areas with saline water loss of land fertility, arsenic contamination and water pollution.

Recently, it was reported that China is building a dam on a tributary of the YarlungZangpo , also known as Brahmaputra Tibet. It is one of the most expensive hydel projects and it turns out to be the part of this diversion policy and it would create problems India for the various reasons like,

- a.)It would result in consolidation of Chinese claim over territory of the Arunachal Pradesh.
- b.)It would be challenging as it not based on any bilateral or multilateral treaties.
- c.)There is a fear of reduced flow of water in India.
- d.)This project could result into a political weapon.
- e.)It would result innorthward change in the route of the river YarlungZangpo.
- f.)It would result in great casualty in terms of either flooding of some parts or reduction in the flow of water.So, the implications of this policy are going to be devastating for both the countries i.e. India and Bangladesh.
- g.)Hugh loss of lives and money was reported in 2001 as one of the constructed dam collapsed.

### **Projects under the Diversion Policy of Yarlung Tsangpo (Brahmaputra River):**

#### **The Lalho project:**

“This project is on the Xiabuqu river in Xigaze (close to Sikkim) is underway at an investment of \$ 740 million .Xigaze is a few hours from the junction of Bhutan and Sikkim. It is also the city from where China intends to extend its railway towards Nepal.China’s first Dam on the upper reaches of Brahmaputra was built at Zangmu in 2010. Three more dams at Dagu, Jiacha,andJeixu (small-scale projects ) are under construction.

In 2015, China inaugurated the Zam hydropower station , the highest dam built on Brahmaputra river . The Xiabuqu river (195km) tributary of YarlungZangpo near region called Xigaze, also known as Shigaste was blocked for Lalhohydel project which was

launched in June 2014 , which is scheduled to be completed in 2019” (Economic Times & The Times of India, October 5, 2016).The river’s mean discharge is 25.8 cubic metres per second (cumecs), less than 0.15% of the Brahmaputra’s mean discharge when it enters India.The reservoir was designed to store upto 295 cumecs which will irrigate 30,000Ha and will result in controlling floods and also the generation of power.

### **Challenges and Possible Implications for India:**

It is of great importance for a big country like India to have water security for its population. Equally important is to sustain economy through industrial development and urbanization. “Union Ministry of Water Resources of the Government of India estimates the country water requirement to be around 1093 BCM (billion cubic meter) for the year 2025 and 1447 BCM for the year 2050 (IDSA, 2010). India is about 17% world’s population but it has less than 4 % of water resources and on the top of it country is dependent on foreign-originating river for about a third of its surface water. Water shortages will exact rising economic and social cost in the country as India’s population and water will continue to grow” (Christopher 2013, 10).

The demand and supply of water resources affects downstream as result of this project. It would lead to depletion of water resources in India and Bangladesh and consequently, it will pose a threat to biodiversity of the regions in both the countries. India and Bangladesh are using trans-boundary water resources from Tibetan plateau. But China is exploiting water of this River which evident from unparalleled building of so many numbers of dams on Brahmaputra river basin for its electricity requirement and agricultural purpose from these dams. Also China is aiming to divert water from these area towards the Great Bend area of this river. This has been done by connecting water from the Brahmaputra River to Yellow River which is known as Great Bend Diversion of Brahmaputra River which will result in widespread negative effects on different spheres like economic growth, societal progress, food security, ecological profile public health in downstream region.

“In addition to that Brahmaputra dams will change the life of the Indo-Burma biodiversity hotspots which are few of the 34 biodiversity hotspots in the world. There is a serious potential threat to Kaziranga National Park, the Manas National Park and Sundarban delta. It is imminent fear that the species which are dependent on the Brahmaputra River will be depleted once its water is diverted. It will have serious ecological and strategic repercussion in the region leaving aside the livelihood and agriculture concern. Diversion issue will be creating the problem for two economic powers in the Asian region, India and China. Now

China is economic hub and India is also growing as an economic power in the world. Both countries are facing water scarcity problem; water diversion of Brahmaputra will play the important role in interstate relationship in coming years. In addition to that, balance of power is important for regional security, if China and India will not make a better relationship with each other then regional security of Asian region will be negatively impacted. An institutional gap of the Brahmaputra is a major issue between India and China. ” (Christopher 2013, 10)

### **Hydro-Management of YarlungTsangpo (Brahmaputra) River Basin:**

It is important to highlight the gap in the institutional mechanism on water sharing of the Brahmaputra River. PreechaRengsomboonsuk, Minister of Natural Resources & Environment of Thailand, stressed on the importance of international river basin and said, “Good governance is required for establishment of strategies on sustainable management of international river basin” (November 2, 2012, The Hindu). The reason for the growing concern over the international river basin can be traced to the fact that China overuses the water of Brahmaputra River which has affected the livelihoods and ecologies of both downstream countries, India and Bangladesh. Dense population in this region has further intensified the scarcity of water, forcing populations to migrate to other destinations and as a result, causing conflicts. Strategic importance of dams over Brahmaputra is reflected in how the hydrological infrastructures such as dams are used as “defensive and offensive weapons during wars (Vajpayi et al 2012, 13). Dams regulate water but they are also used to deny water to downstream countries and create a situation of conflict. In 2010, China’s actions on the river basin renewed the dispute between China and India on Brahmaputra’s water (Vajpayi et al 2012, 13-14). The river headwaters in Tibet, controlled by China, provide water to Arunachal Pradesh which is claimed by China. In order to assert its control over Arunachal Pradesh, China tried to block an Asian Development Bank loan to India’s projected dam in Arunachal Pradesh in 2010, sparking tension in region. Since these tensions arose, both countries have intensified military presence in the region (Vajpayi et al 2012, 13-14). The absence of institution relating to trans-boundary water resources management of Brahmaputra water make it tough for integrated water management of the Brahmaputra river basin of riparian countries. As there is a lack of coordination among countries those who are on the banks of the Brahmaputra river basin, hence they face the danger of possible consequence of the expansion plan of this river. There are multiple problems in front of these riparian countries due to which such expansion of the Brahmaputra River would become a challenge. Some of

those problems are: the absence of any regional treaty among India, China and Bangladesh regarding the water sharing on Brahmaputra; geographical location of these countries where they are situated very densely along with the vast population etc. If the data regarding the flood water and its raising level can be provided to the states like North East India and Bangladesh which are vulnerable to the flood, then the issue can be solved in an efficient way. To do so, there is an urgent need of a regional water management body which can be coordinated by different countries.

In the absence of any institutional body which can provide authentic data regarding the flood, the situation in Bangladesh becomes more tensed. China, which is in much suitable position in providing useful data to those downstream states, denies the access of water related information. By not signing the 1997 UN Convention on the Law of the Non-Navigational Uses of International Waterways, China makes its stand very clear where it expresses its unwillingness in passing any information related to Brahmaputra. Such rigid position causes the adverse repercussions over the other countries situated on the lower side of the river where various damming work that are being done by China are hardly known.

However, there has been a few steps taken by China, India and Bangladesh where hydropower cooperation can be seen but despite of those small steps the required outcome couldn't achieved due to the absence of the institutional framework. Signing of a memorandum of understanding (MoU) between India and China in 2013 regarding providing the data of Tsangpo River is one example where both the countries seem to be coming closer to have cooperation in the hydro-field. But, as there isn't a proper legitimate institutionalised body between both the countries hence the problem remains unresolved.

The other important factor in this domain is Climate change. The world is facing the existential threat from the problem of climate change. Especially those countries which are located on the banks, they are in major threat because of the climate change issue and its major repercussions. This study focuses upon the issues faced by those countries which share rivers, lakes or other water bodies. In such situation, sharing and management of water becomes a major need for these countries. The possibility of international cooperation among the water sharing countries is the focus of this work.



### **Indo-China Management of Yarlung Tsangpo (Brahmaputra River):**

Among all the natural resources, water is the most valuable and in demand resource. This is especially important in contemporary times where various other political, economic and strategic considerations too inform the politics between two nations which have shared riverine resources. Often such sharing of water resources is deeply linked to economic and industrial progress of the two nations which makes such negotiations even more contentious.

It is for this reason that the looming threat of water scarcity affects modern nations in a major way and poses numerous health, economic and political challenges. As fresh water resources are depleting nations are compelled to look for newer ways to acquire water and to manage these resources. It is this need for water for several important reasons that has led to inevitable conflict and cooperation over trans-national water resources. Water scarcity leads to increased dependency of nations on transnational flows.

Water is also connected with the issue of national security as its management done by one country can be seen as a security threat by the other one. China's act of diversion of its various rivers has been generated the suspicion in the minds of various countries. Growing water stress across the world, especially in population rich East and South Asia, and geo-political considerations are making China engage in this hydro politics. In addition, China's ambition to emerge as a leading global economic and political power, lead it to use the water resources under its control to establish supremacy over South Asia, especially India.

China has been continuously putting its efforts to get control of the water resources of Tibetan region as well as the other adjoining areas. Its approach of controlling the region of Arunachal Pradesh and nearby is also backed by the same motive. These are plentiful water resources which will make the country controlling them as not only a regional but a major global player. In this way, China's tactic of controlling the water resources has actually been supporting its economic and military power and provides them an extra advantage.

The reason behind not signing any kind of river treaty is very clear where China is avoiding any legal binding towards providing the water related information to the other countries. By signing a water sharing agreement China does not wish to bind itself to a commitment which would make it answerable in case of a dispute. Rather it wishes to retain an unhindered control over water resources which mostly originate in its territory but are a valuable resource for many countries downstream. It wishes to retain a geo-political autonomy.

China's closeness with Pakistan and its access to the Pakistan Occupied Kashmir have already creates major security threat for India. Addition to that the trans-boundary flow of the Brahmaputra River creates another concern for India. Not only India, but there are other countries as well with whom China is facing water disputes including Russia, Burma, North Korea and Kazakhstan. Yet, China not only avoids any kind of water treaty with the affecting countries but it also manages to get hydropower projects in those countries.

The flow of water can facilitates a country to gain its certain strategic goals and this is the reason why India looks this river management issue seriously. In case of India, China has adopted comparatively an aggressive method to handle the issue of water where it is working for several huge hydropower projects in Tibet.

On the other hand, India and Pakistan have put in place institutional mechanisms for dispute resolution on water sharing through various treaties related to water diversion. Contrary to this, India and China have no such bilateral arrangements related to the water conflict.

By eschewing the multilateral path, China in effect keeps alive all its disputes with neighbouring countries over water resources. It is able to do this with relative impunity because of its geographical advantage, as most riparian resources originate on its territory, its economic and military might.

As far as solving this bilateral issue is concerned, most of the China's steps looks symbolic in nature and less solution seeking in nature. Even in late 2006 when former Chinese President Hu Jintao visited New Delhi and agreed for a joint expert level mechanism regarding the interstate river waters, it appears as if China is serious regarding solving this issue. However, China's further response in his issue proved its hollowness towards this issue. While India had to accept China as the legitimate party in the water dispute due to having control over Tibet, China remained reluctant towards the bilateral or multilateral solutions for these issues. Since Tibet comes under upper riparian state hence according to the Customary International Law, China gets the first right over the available water resources.

China has an upper hand in claiming Brahmaputra waters and justifying its diversion policies due to the non-existence of a coherent water sharing treaty between India and China. In addition, the principles of customary International water laws that remain in force bolsters China's claims.

In such a scenario, India can do very little to challenge Chinese dominance by way of deploying water as a political tool. To have an equitable utilization and enforce an obligation of not causing substantial injury to co-riparian states, The HELSENKI RULES on the Uses of Waters of International Rivers were framed in 1966. While India became a signatory to the HELSENKI RULES in 1973, China did not. These rules reflect the principles to those enshrined in Customary International Water Laws, even though they fall short of legal force.

India's subordinate position vis-à-vis China is a consequence of the blunders of Nehru and Vajpayee governments and their respective foreign policies. The reason is located in India's recognition of Tibetan Autonomous Region (TAR) as part of the Republic of China and subsequently, in effect, the leveraging upper hand of China on transboundary waters of Brahmaputra.

India's foreign policy has thus not been successful in concretely addressing and evolving an effective management and dispute resolution mechanism. The lack of such a mechanism leads to conflicts between countries with respect to water sharing, especially those that border China.

#### **The Indo-China Management of Yarlung Tsangpo (Brahmaputra River) Progress:**

In 2018, Chinese Foreign Ministry announced that it has now agreed to share the data concerning Brahmaputra River with India, which it had withheld in 2017, after the Doklam military standoff in the eastern part of India. Beijing is bound by bilateral agreements to share the River data with India, but withheld this exercise from 2017, after both armies had a 73 day face off at Doklam. While Beijing cited renovation of data sharing stations as the reason for not sharing, experts argue that it was a form of 'water war' by China sparked by Doklam issue. The announcement in 2018 followed India-China talks over the trans-border rivers in the 11<sup>th</sup> edition of India-China Expert Level Mechanism Meet (ELM). (Economic Times 28<sup>th</sup> March 2018).

Water is undoubtedly Asia's new warzone. Trans-boundary water resources and subterranean water resources are a bone of contention in diplomatic relations between Asian countries—China, India, Nepal, Pakistan, Bangladesh, Bhutan, Vietnam, Burma, Cambodia, Laos and Thailand. With the annexure of Tibet, Asia's 'Water-Tower', China enjoys exclusive leverage over its downstream territories. The Tibetan Plateau supports the highest density of natural water resources, thus it has a significant hydrological importance. Since riparian

rivers are the lifeline of any regions and it plays an influential role in the socio-economic and political spheres of life in any regions. So its geopolitical and strategic importance automatically gets augmented. Due to highly intensive agriculture, increasing industrialization and growing urbanization in north China, there is great demand of water supply in that part. So China wants to use the abundant water resources available in the Tibetan plateau, from where Brahmaputra River is originating.

In a concluding note we can say that Hydropolitics on Yalung Tsangpo(Brahmaputra) River Basin has great importance for India and Bangladesh. Since, Fresh Water resources is a key issue of all development programs, clean water is essential to human health, economic growth and a range of other critical issues from food production to navigation. China and India contain world largest population and these countries are growing as an economic hub, these countries people has increased per capita income level, living standard and the increasing urbanization is the most important challenging issue. Further, water pollution due to industrialization and increase the demand of fresh water of a new society who is living in urban areas. There is challenge to harness the Tibetan plateau's fresh water resource in a sustainable way.To improve their bilateral relations, both the countries have agreed to continue with river data sharing and co-operation of hydrological information. In the case of India, hydrological data is helpful in predicting and preparing in advance for the floods in north-east states. China is trying to build dam on Brahmaputra River, it will divert the large quantity of water toward north China and it will create a shortage of water in India which will hamper the socio-economic development of the country and it will also affect the biodiversity and ecology, environmental sustainability, food security and public health in downstream states. Further, India and China do not have any such kind of institution e.g treaty to manage the Brahmaputra river basin to sustain human civilization in this region. In such a situation, it should be a great challenge for both country and this issue should be solved in such a way that none of both countries should suffer from the water shortage.

## Chapter two

### **Theoretical Perspective: Conflict and Cooperation: India and China over Yarlung Tsangpo River**

History and relations between India and China if explored tells us that unfortunately, there had never been any such instance of China treating as an equal state. In the contemporary world also China is considered to be the foci of attention in international politics. Traditionally also Chinese were convicted to the belief that they were most civilized state and thus they have always looked down upon India and all other states and cultures subservient to themselves. Though not co-operation, but also conflict has not previously occurred between India and China because of the buffer state of Tibet. But international trade has the potential for conflict between India and China, as competitors since last decade. China is neither democratically run nor has enough transparent institutors. It is tightly controlled by communist party, which determines its political and economic system. The problem with China is largely the delicate balance that it tries to maintain by being a participant in a capitalist free trade world and simultaneously dealing with its communist domestic policy. China's nuclear program is far superior to India, also China has not left a stone unturned in belittling and decrying India's economic progress. Finally while China's growth has accelerated at an enviable pace, it has come at the expensive price of degrading environment. While the cities of Hong Kong glitter with economic wealth, they are no more than ugly concrete jungles. The three Gorges Dam and other major hydro engineering projects transboundary rivers are examples of Chinese placing development over environment and also causing threat to the downstream co-riparian states. This shows signs of conflict between two countries especially India and China. These theories of conflict and cooperation can be better understood with the theoretical perspective of Game theory of international politics.

#### **Theoretical Perspective: Application of Game Theory in the context of Sino-India relationship with respect to the Yarlung Tsangpo(Brahmaputra) river:**

Game theory is the mathematical model used in the International Relations for exploring the strategic interaction among nations.. It revolves around the security dilemma which suggests that if some states increase their security, it automatically thereby results in decreased security of other states and letting others feel insecure.

It's a tool for analysing the various forms of conflict and cooperation seen among nations. Game theory has been readily used to examine water allocation among international basin riparian states of transboundary waters. Game theory may help us understand scope and potential for cooperation regarding transnational waters of Yarlung Tsangpo (Brahmaputra) river. Game theorists assume that the players are rational and logical. They are two branches of game theory.

### **Game theory**

Although the use of Game Theory in examination of transnational river disputes among the upstream and downstream countries is not unusual, however, it has been under use quite frequently in recent times. The theory applies in cases when actors or agents act independently. These actors could be an individual, a group, firm or a combination of these. The concept of the theory provides a language to formulate, structure, analyze and understanding strategic scenarios (Turocy, 2001). It has been very useful in the explaining water allocation among international basin riparian states, lately, pollution and water quality aspects of transboundary water sharing have become increasingly important. It may help in understanding potential for cooperation Yarlung Tsangpo river basin riparian's.

Two necessary elements of the Game theory are one the 'modelling part' and second the 'solution part'. Such models of conflicts and cooperation provide strategic behavioural patterns, and the resulting to the payoffs are determined according to certain solution concepts. There are two branches of Game theory. The first is the non-cooperative game theory and second is the cooperative game theory. The main distinction between the two is that non-cooperative theory models situations where players see only their own strategic objectives and thus binding agreements among the players are not possible, while cooperative game theory actually is based mainly on agreements to cooperative gains (solution concepts) (Dinar 2007).

Nash recounts that "cooperation game theory refers to coalitions of two or more players acting together with a specific common purpose in mind. Since rationality and intelligence are two fundamental assumptions in game theory, any cooperation between players must take into account the objective of maximising their own individual payoffs"(Narahari, 2012). Cooperative frameworks develop the management for international water resources. Cooperative Game Theory applied on water resources.

Water related conflicts involve usually a small number of stakeholders (players) that are inter-related to each other. Therefore, there is greater scope for strategic behaviour among players in water related conflicts. The level of externalities associated with water utilisation is a big incentive for cooperation (Dinar 2007).

China is a typical example of an upstream riparian state, being situated on the source of Yarlung Tsangpo River, also called Brahmaputra in India originates in Tibetan part of China and passes through India and Bangladesh. China while exploiting all its benefits very ably transfers the damages to the lower riparian states (Menniken 2007). Game Theory, if applied, will suggest that China's geographical advantage also lends it political, military and economic precedence over its downstream counterpart states. For instance, India is totally on the mercy of China as far as water of Yarlung Tsangpo is concerned. Here the dominating factor is China. One of the major issue of contention between these countries is building of Zangmu and three other project over Yarlung Tsangpo River. Zangmu is a "run of the river" hydel generation dam on the Brahmaputra (known in China Yarlung Tsangpo). It fears that the dam would reduce the flow of waters from the Brahmaputra (Vajpeyi 2012). Here apply to cooperative game approach which would try to solve the two Asian big power problems to water conflict between them. Cooperative game methods on water and environment resources are used to find how cooperating parties shall fairly and efficiently share the incremental benefits of cooperation (Madani et al 2013).

The application of Game theory in the issue of international river water dispute has been occasional and irregular. Roger (1969) applied the Game Theory approach to the disputed Ganges-Brahmaputra basin that involved different uses of the water by India and Pakistan (now Bangladesh). The result suggests a range of strategic for cooperation between two riparian nations (Dinar, 2007). Cooperative game theory approaches applied to water sharing between the United States of America and Canada in the Columbia basin, among Nepal, India and Bangladesh in the Ganges-Brahmaputra basin, and among Ethiopia, Sudan, and Egypt in the Nile basin (Dinar 2007). An –depth analysis conducted for the Ganga-Brahmaputra basin case, where a joint solution improves each nation's welfare more than any noncooperative solution (Roger, 1993).

Graph model could be a suitable conflict resolution model for representative water resources game ingrained with complex socio-political aspects. It has been used in resolution of Nile

river conflict. A graph model for each decision making has vertices representing. It is various states and arcs representing their different strategies. The conflict moves from state to state via this transition based on decision making preference. This allows for systematic examination of permissible moved and counter and countermoves by the decision making until a terminal point is at which equilibrium occurs. A decision support system based on graph model for conflict as a game and finding is equilibria (Madani et al 2013). Graph model will be work on Yarlung Tsangpo River effectively to share the water between India and China.

Three basic elements are required in the Game Theory approach for conflict resolution, viz., the players, their options and their preferences for the possible outcome of the game. In this case of Yarlung Tsangpo River there are three players - China, India and Bangladesh. All three of them would like to have water of Yarlung Tsangpo river available for their usage as possible preference. The respective geographic position of these countries with respect to Yarlung Tsangpo is - China's position, the upper riparian state and India being in the middle and Bangladesh's position as lower most riparian state. Their options may not be the same. The players' preferences of the game's outcome vary according to their position in the power/economic hierarchy of the region, the options available to the other players, their water resources current development level, and their physical location in the Nile river basin (Madani et al 2013). This kind of reflection to see on Yarlung Tsangpo river basin, China and India both are developing countries who really want to Yarlung Tsangpo's water for their utilization. And their physical location is different, China is upper riparian state and India is lower riparian state.

Yarlung Tsangpo River, being one of the biggest and voluminous perennial river of world plays a key role in allupstream and downstream state's water resources. When China diverted water of this river than downstream countries is fear about to maintain the flow of this river basin in the lower riparian region. Present time China is fully focused on Yarlung Tsangpo river basin water resources. China is making the dams on Yarlung Tsangpo upper, middle and lower riparian. It is diverting the natural way of Brahmaputra River. Around 625 million people are depending on Brahmaputra river basin area. This is most populated areas in the world. Around 80 percent people depend on this river for their agriculture, fisheries, economic activity, etc.



## **Water Resources Scarcity Approach**

There is a general belief in the academia that conflicts over transboundary resources are primarily functions of resource supply or demand. If the resource is scarce relative to demand for those resource nations are more likely to conflict. Water is a natural resource. The transboundary water scarcity is popularly associated with interstate conflict. Homer-Dixon has argued that “violent conflict between upstream riparian is likely only when the downstream state fears that the upstream state will use water as form of leverage and believes it has the military power to ratify the situation. Therefore the situation is most dangerous when (a) the downstream country is highly dependent on the water for its national well-being, (b) the upstream is threaten to restrict substantially the river’s flow downstream and (c) the downstream country believes it is militarily stronger than the upstream country” (Homer-Dixon 1999). Wildlife biologist, Firoz Ahmed, said on the proposed dam sites are ecological hotspots; “A dam kills the rivers and its ecosystem over a period of time. Putting at risk all flora, fauna as well as human being. Wildlife species like the river dolphins, elephants and tigers will be affected.” Fish and other species in the rivers are also likely to be drastically impact by the flow regime, which will artificially change the river flow in line with electricity generation needs (Rehman 2014). So need to conserve these species in the region.

The Dublin Statement reiterates that scarcity and misuse of water may lead to a serious and ever increasing threat to sustainable development and protection of the environment. “Tibetan plateau and the Brahmaputra should be developed for their ecological rather than economic value. We should seek a route to development that draws on that ecological value, reducing environment harm and the problems that result from it. The Tibetan plateau is home to the source of many of Asia’s rivers and mountain ranges. The state of its natural environment directly affects the ecological balance and security of china and South Asia, and even the world. Its worsening environment is a major factor in the degradation of the ecologies of the Brahmaputra and the other rivers and the interference from human development will only add insult to injury. If this continues, the glaciers and snowlines of the Himalayas will recede depriving the rivers of a source of water and the plateau’s waterways will be cut off or even dry up and the land become desert” (Yong 2014). The south-north water transfer project is particular controversial. China has discussed the rerouting of water from the Brahmaputra northwards of the

Yangtze River. This proposal has been described by some Indian experts as a declaration of 'water war' on the lower riparian states of India and Bangladesh.

The issue water security has been predicted to be a major crisis in the 21 century in Asia. The situation is so grave that one in every five persons does not have access to fresh water. Its problem not only India but also China has (Jesper 2012). Tibetan researcher Tashi Tsering (2002) describe that China is more focus on Yarlung Tsangpo for hydropower. He mentions here Water will be threat to China's economic growth. Its crisis not only surface but also ground water. China water crisis has grown. China water resources will be extraordinary, potentially, threatening economic development and social stability. China has planned a big project of a national strategy to divert from rivers in south and west to drought stricken northern areas.

China has been actively indulged in the building dams in large numbers, in fact, they have been time and again continuously accused of causing large scale environmental damage and as a result forcing people to migrate in neighbouring downstream countries. Building dams on such large scale has caused shortfall of availability Yarlung Tsangpo water in the downstream states; disruption of natural flooding cycles; the holding back of nutrient-rich sediment; and changes to riparian, marine, and fishery ecology and economy. In future years, climate change may well exacerbate these effects, particularly in glacier-fed rivers like Brahmaputra (Christopher, 2013). Chellaney (2011) raised the securitization of water and environmental issue, current scenario Asia is emerging powerful. It has growth rate very high, so they want to capture to more water, Asia has trans-boundary river system, many country share the water each other, for example India-china share the Yarlung Tsangpo river (Brahmaputra river). It points out upstream states to downstream states which is share the water. Fresh water scarcities raise the internal and external security to economic growth, social progress, environment sustainability, food security, public health and inter- riparian relations. Asia is going to become the global power, so it has so many challenges which are most important water security.

China's ever growing industrialization and urbanization is causing increased demand of fresh water, with ever depleting water availability for individuals. China's northern area is a huge industry and largest population another place in China. They are really consuming huge capacity of water resources. Northern household water consumption is rising quickly. In Chinese northern region is a limited water resource. The Chinese government

is driving the water resources from the southern region in the northern region for water demands. The agriculture sector is also rising in China; it is also wants to huge water demands and supply. This is the most important threat to the Chinese water supply sector. China is diverting the Yarlung Tsangpo river water for this sector through Yellow River. There is seeing here that China is diverting the Brahmaputra water for her own utilization. Chinese hydropower project on Brahmaputra is the effect of downstream water resources demands and supply. India and Bangladesh have been taking the water from Tibetan plateau transounadary water resources. China is exploiting water of Brahmaputra River; it is unparalleled to build the many dams on Brahmaputra river basin which will bad impact on downstream livelihoods. China focuses on the Brahmaputra River for fillip the gap of electricity generation and farming from Brahmaputra River's dams.

### **The Institutional and the International Water Law Approach**

Institutions are defined as organisations founded for a particular reason founded on a set of formal rules having originated from an established custom, law or relationship in a society or community (Jesper 2013). IDS (discussion paper 372) discuss about the natural resources management literature, institutions are considered to be key in sustainable livelihood adaptation and natural resources management, and an understanding of institutions is now seen as central to successful policies in this area. Institutions are sets of working rules that are used to determine who is eligible to make decisions in some arena, and what actions are allowed or constrained. Further the rules describe what procedures must be followed, what information must or must not be provided and what payoffs will be assigned to affected individuals (Ostrom 1990). Keohan talk about the logic of institutionalise theory with its focus on the information role of institutions appears solid. In case of which countries share the common water their territory on a certain institution umbrella, they can use the water of that institution laws and rules.

Obe (2005) while talking about Helsinki rules for international water law defines an international drainage basin as a geographical area extending over two or more states determined by the watershed limits of the system of waters, including surface and underground waters following into common terminus. It on the use of international rivers rules, equitable utilisation of the waters of an international drainage basins, pollution, navigation, and procedures for the prevention and settlement of disputes. It describes equitable and efficient water allocation among competing users at the river basin.

Convention of non navigation international watercourses law is significance for the management of transboundary water resources. Article 5 is very important to understand the law. “It has contained in Part II, reflects the principle that is widely regarded as the cornerstone of the Convention, and indeed the law in the field: equitable and reasonable utilization and participation. It requires that a State sharing an international watercourse with other States utilize the watercourse, in its territory, in a manner that is equitable and reasonable vis-à-vis the other States sharing it, in order to ensure that their utilization of an international watercourse is equitable and reasonable, States are to take into account all relevant factors and circumstances” (McCaffrey, 2008)

India has signed Ganga and Mahakali agreements and river convention with Bangladesh and Nepal respectively (Chimini 2005). Over Brahmaputra river basin, Chinese stand has been unclear and a little suspicious as they are not ready to share the hydrological data with the downstream countries like India and Bangladesh. China did not sign the 1997 UN Convention on the Law of the Non-Navigational Uses of International Waterways. When China started the damming on the Mekong river basin, it did not give the information of the downstream countries about her work. In the same thing apply by China; when China started work on the Brahmaputra river basin in November 2010 without any concern about it with downstream states (India and Bangladesh) (Jha, 2011). In case of Yarlung Tsangpo river basin downstream states did not have any treaty with China. Rahaman (2009) analysis water is strongly linked with the overall development framework of the Brahmaputra basin. However, the absence of integrated management of Brahmaputra water resources and lack of coordination among the riparian states constitutes an ongoing threat to future development plan within the basin. It is essential to develop an integrated water resources management approach involving all riparian to foster regional development and overcome the prospect of severe water conflict along the Brahmaputra.

A lack of water-sharing mechanism or any water treaty between India and China makes the resolution of a potential problem, highly complex. For instance, India and Pakistan have recently quibbled over water issue but since their issues are within the framework of the Indus water treaty the countries have institutionalised mechanism like the Indus water commission third party arbitration and neutral expert intervention to help mitigate any problems. China and India do not have a similar arrangement. As a result, being the upper riparian, China has more leverage on the issue. India feels that it would be at China's

mercy during the dry season, and for protection from floods during the rainy season (Vajpeyi et al 2012). India has water sharing with neighbour Pakistan, Nepal and Bangladesh, Bhutan, and China. India has water treaties with Pakistan, Bangladesh, Nepal, but India does not have any water treaty with China.

The upper riparian state always enjoys a certain advantage in the fabrication of hydraulic facts and may force their topographical strength into concluding any arrangement. But clearly in the case of Yarlung Tsangpo, India is weaker position and bargain with China over a likely water treaty will put Indian negotiators in technical context that for latter at least entirely lacks historical precedence. Put differently the Indian side will need to develop a new language game which above also provides a novel architecture for discussion that are based on an entirely different set of hydraulic concepts and categories” (D’Suza 2012). Preecha Rengsomboonsuk, Thailand Minister of Natural Resources & Environment (November 2, 2012, The Hindu), said, Good governance is required for establishment of strategies on sustainable management of international river basin. . Anton Earlesays clearly how vital it is to cooperate effectively over the management shared waters to unlock their contribution to regional sustainable development. The Ten Nile riparian countries adopted integrated water resources management as a lead theme for the Nile basin to develop a mutual platform for the development of a shared vision on the common use of water resources and the benefits of the Nile (Nile initiative, 2000). As well as if India, Bangladesh and China will make the certain institution which shares the Yarlung Tsangpo’s water resources for their national purposes.

The present research strives to provide suitable mechanism for sharing Yarlung Tsangpo ’s river water effectively. There should be a legal institutional framework on transboundary river between upstream and downstream countries which will solve the water resources related problem for these countries. China, India will make an institutional framework on Yarlung Tsangpo River. This will reduce the problem of sharing of Yarlung Tsangpo water among those countries. Nile and Mekong riparian have an institutional framework for using water resources. So it will be possible on Yarlung Tsangpo. There is a good thing for using of Yarlung Tsangpo water’s resources.

### **The UN Watercourses Convention on sharing the transboundary water resources:**

Some of the scholars (McCaffery 2007, Obe 2005, Rahaman 2009, and Chimini 2005, Salman 2007), refer to International Watercourses Law for advocating fair share in the usage of international river water among countries sharing a common river water resource. Such an international law, the UN Watercourses Convention, was adopted by the United Nations General Assembly on 21 May 1997. It has successfully set up laws and principles for the management and protection of international watercourses. It has also set certain rules for cooperation and laid down basic standards to be exercised by the concerned parties. It endeavours for the sustainable use of such resources.

One of the most important features this law is that it advocates for an equitable and reasonable use of integrated water resources and peaceful resolution of such issues. This law came from their minds from interstate water disputes in the western part of the USA of initial stage around the 20<sup>th</sup> century. Another example of this law has taken to originate from riparian rights developed in Wales and England which contain a rule of rational use of water. This kind of thinking has taken riparian rights into the original settlers in the United States of America. United States of America central court have given the decision with water disputes exposed that the rule of equitable sharing out to be the deciding aspect in most cases. There is understand point about this law, it is easier uses to domestic cases like less than one country which is ruled by one government, and same law and order in the whole country, it is really tough for applying transboundary water resources in international level which contain many countries. The main problem is the view of reasonable and equitable use of the waters of Transboundary Rivers is broadly adopted by many countries have many views for this kind of thinking. They can be different view to not agree or agree with utilization of water. After that main problem of this is how to convince of every country which share the transboundary water resources for their own utilization (Beaumont 2000: 478). Many countries share the water of same river basin water and they have some problem with each other to maintain the flow of the river basin.

Water is an essential natural resource bestowed by the nature. International environmental law has given the ideas of international water law which grow up in twenty centuries. 1972 Stockholm Declaration statements is the basis of the

international environmental law and it has gained the some features of the 1992 Rio Declaration about it. Statement of Principle 21 of the Stockholm Declaration 1972 is the main base of several international environment law conventions (Beaumont, 2000: 478-79). (See below the principle 21)

### **Principle 21**

“States, as per the Charter of the United Nations and the principles enshrined in several international law, enjoy the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction” (Beaumont, 2000: 478-79).

Helsinki rules on International Watercourses lays down the definition of international drainage basin as a geographical area which cover the two or more countries share the water which called it transboundary water resources, as well as underground and surface water flowing into common territory which also part of transboundary water resources. International Rivers are free for their navigation, equitable utilization of the waters of international drainage basins, and pollution free navigation each country which shares the water for it. There is describing efficient and equitable water distribution among competing users in the river basin by it. Two main principles were formulated by the law of Non-navigational uses of international watercourses are first one is the principle of equitable and second is the principle of non-significant harm. The anxious relationship between these two principles and the try to settle them very much in facts in the draft of the International Law of Commission leading to the 1997 convention (Obe, 2005: 31).

UN Watercourses Convention is a significant piece of law for the management of transboundary water resources. Article 5 is very important to understand the law. “It has contained in Part II, reflects the principle that is widely regarded as the cornerstone of the Convention, and indeed the law in the field: equitable and reasonable utilisation and participation. It requires that a State sharing an international watercourse with other States utilise the watercourse, in its territory, in a manner that is equitable and reasonable vis-à-vis the other States sharing it, in order to ensure that their utilisation of an international watercourse is equitable and

reasonable, States are to take into account all relevant factors and circumstances” (McCaffrey, 2008: 2). Article 6, is Factoring relevant to the equitable and reasonable utilisation, Article 7 lays down the obligation on parties not to cause significant harm; Article 8 puts the general obligation to cooperate,; Article 9 advocates for regular exchange of concerned data; Article 10 describes the relationship between different kinds of uses. The present paper studies three article out of all in detail as they lay out important rules and principles for transboundary water resources management (United Nations report: Supplement No. 49 (A/51/49), 2005).

### **Article 5**

“Equitable and reasonable utilization and participation”.

States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.

This article further states that the states through which transboundary river is passing through shall utilise, develop and protect that water body in equitable and sustainable manner. Such states will participate in such a manner it will enjoy the right to utilise the river water as well as be responsible to cooperate in the protection and development thereof, as provided in the present Convention” (United Nations report: Supplement No. 49 (A/51/49), 2005).

### Article 9

“Regular exchange of data and information”

In continuation to article 8, the States through which transboundary river is passing shall regularly exchange the available data and information related to the watercourse, specifically data like hydrological, meteorological, hydrogeological and ecological nature and related to the water quality as well as related forecasts.



In such a case where one watercourse State seeks data or such other information from another watercourse State which are unavailable, the later state shall employ its best efforts to comply with the request but may condition its compliance upon payment by the requesting State of the reasonable costs of collecting and, where appropriate, processing such data or information.

All the states through which the transboundary river passes shall endeavour to collect, appropriate and process the data in a manner that further assists the state to which such information has to be shared with, in utilising the river water more efficiently (United Nations report: Supplement No. 49 (A/51/49), 2005).

#### Article 10

“Relationship between different kinds of usages”

In the absence of agreement or custom to the contrary, no use of an international watercourse enjoys inherent priority over other uses.

“In the event of a conflict between uses of an international watercourse, it shall be resolved with reference to articles 5 to 7, with special regard being given to the requirements of vital human needs”(United Nations report: Supplement No. 49 (A/51/49), 2005).

This piece of law is very crucial. It may be revealed by the very fact that the Convention had significant influence. Within the very four months after it was chartered, the International Court of Justice referred and quoted from its provisions in its judgment in the Gabčíkovo-Nagymaros Project case (I.C.J. Reports 1997, paragraph 85). The Convention is widely viewed as a codification of customary international law because of its crucial provisions with respect to at least three obligations it embodies, namely equitable and reasonable utilization, prevention of significant harm, and prior notification of planned measures. These and other provisions of the Convention have influenced the negotiation of treaties concerning international watercourses, as can readily be seen from even a cursory review of recent agreements, for example, the Revised Protocol on Shared Watercourses of the Southern African Development Community (SADC) of 7 August 2000” (McCaffrey, 2008: 3).

The UN Watercourse Convention has given the most important thing for our society for the development of equitable utilisation of transboundary water resources. It is potential for protection of conflict between the states which would be going to war due to lack of sharing transboundary water resources. It has played the important role in these kinds of conflict situations. This time growing the water scarcity problem in whole World, no one escape this problem, and the hope that the convention would be affected for the sharing of transboundary water resources ( McCaffrey, 2008 4). In case of China no clear accepted international law on shared waters, and when on such was attempted, China was only among the three countries that voted no to favour of the convention on the law of the non navigation uses of international watercourses in the UN General Assembly in 1997 (IDSA, 2010: 49). The Brahmaputra river basin such an affected lack of the convention on the law of the non navigation uses of international watercourses acceptance in Asia's region.

### **Sustainable optimization of available water resources**

There had been several agreements regarding transnational river basin but not necessarily to incorporate water sharing. Some agreements aim to promote joint development of basins of co-riparian, whereas some are related to maintain the water quality. For example: 1969, La Plata Basin treaty involving Argentina, Paraguay, Brazil, Bolivia, and Uruguay.

Some agreements of river basin are part of biodiversity conservation projects. For example 2003 conservation on sustainable management of Tanyanika signed by it's co-riparian. While others are for navigation for example: Rhine and Danube agreement in Europe. It is seen that there are very less number of agreements on water sharing and the most significant reason behind it being the lack of mechanism to mitigate, and lack of institutional framework to manage conflicts and analyze profits amongst the co-riparian nations. This ultimately paves way to increasing conflicts and discontent between nations. To ensure peaceful water future so both India and China and Bangladesh as far as river Brahmaputra is concerned, these nations need to regulate framework and binding agreements to have peaceful water future. Alike other resources such as minerals, petrol and oil, water also serves to be one such potential resource to become tool for counter terrorism in future for water- centered wars.

As per UN data its is surveyed that water competition and geo-political risks involved have increased since 1990s. Strengthening international norms, rules and cooperative institutional

mechanisms can help to manage equitable sharing of transnational waters. These norms and rules also help in quantifying the hydraulic parameters of the transboundary flow.

I.) Customary (unwritten) International laws: (Chellany , 2014)

i.) \*The principle of absolute territorial sovereignty (the upstream state rules) versus the principles of absolute territorial integrity (the downstream river states' interests are shielded) in a river basin. Under the first principle , an upper riparian state enjoys the right to invoke absolute territorial sovereignty over transboundary watercourses on its own side of territory translating into unlimited right to use such watercourses as much as it wishes for its own developmental need, irrespective of the impacts of such policy on a co-riparian state. The maximalist principle of absolute territorial sovereignty, which extends to all natural resources within a country's borders has been borrowed from the now- discredited "Harmon doctrine" in the United States and appears to guide Chinese and Turkish riparian conduct today. The plain fact is that the principles of absolute territorial sovereignty and absolute territorial integrity are in flexible and antithetical to each other and to the present –day imperative for collaborative inter riparian relationships. No new water treaty is likely to materialize without the parties seeking some middle grounds between these diametrically opposed principles.

ii.) \*A balance between the principle of fair and reasonable utilization and the doctrine of not causing any major damage. This balance of rights and obligations, to be achieved on the basis of fairness and give and take, has been laid down to help promote harmonious relations between co-basin states. Although an upper riparian has the first right to exploit basin resources, all riparians have the same right to equitable and Reasonable utilization. The right of any state, however, comes with the obligation not cause significant harm to another party over a shared resources. However, customary international law lacks clarity on how to strike a balance between the right of " equitable" and " reasonable " utilization ( which itself is not clearly spelled out ) and the corresponding obligation not to cause palpable harm. The key unresolved issue is what is primary –the right to utilize shared water resources, or the obligation not to cause considerable damage.

iii.) The principle of prior appropriation. A priority right falls on the the first usewater requirements takes precedence over the entitlement of a “junior appropriator” to draw resources from a waterway. This (called the “senior appropriator “).A priority right thus can full on the downstream state if it the first user of river waters. The right of the “ senior appropriator” to meet its water requirements takes precedence over the entitlement of a “ junior appropriator” to draw resources from a waterway.

The central element in prior appropriation is the diversion of water from a watercourse for “developmental” applications, such as for irrigation, industrial or mining purposes, power generation and municipal supply. The definition of beneficial application of water has expanded since the 1990s to include environmental protection uses.

iv.)The law of riparian rights. This doctrine confers proprierty water rights to the owner of land contiguous to a river. After all, the term ‘riparian’ comes from the latin word meaning “ the bank of a stream”, with the riparian landowner in customary law being the one whose continous ownership title extends beyond a river bank .The of riparian rights permits an upper riparian to secure “reasonable “ water share , yet it does not define that term .Whereas the doctrine of prior appropriation allows an appropriator to remove the water from its source and put it to beneficial use at another location , including through interbasin transfer , the law of riparian rights tends to impose a geographical limitation .

v.)The law of reason .This nascent, still-evolving principle seeks to link modern water norms and rules with ecosystem values, rather than merely with human demand and competition .Water rights water rights. Within some nations or sub national regions water rights have evolved in such a way that they have become analogous to property rights. Water rights thus can be exercised, mortgaged, or transferred irrespective of the land on which the water originates or wherever it is planned to be used. National or state-level legislation in some countries, by decoupling water to be traded on an open market.

## II.) United Nations Watercourses Convention:

It was designed to serve as the global water law passed by United Nations General Assembly .The rules in the UN convention reflect customary International law and codifies many principles of the Customary water law.UN convention also provides a detailed dispute settlement provisions which states that if the concerned parties fail to mutually resolve its

conflict , they may “jointly seek good offices of , or request mediation or conciliation by , a third party or make use , as appropriate , of any joint water-course institutions that may have been established by them or agree to submit the dispute to arbitration or to the International court of Justice.”The UN convention has some strong rules to avert diversion and over exploitation of shared water resources and to avoid water wars.

The UN convention gives some key principles to guide the nations to share its water courses.

Article 5&6: “Equitable and reasonable utilization.”

Article 7: “The obligation not to cause significant harm” to another party over a shared waterway

Article 29: “International water courses and related installations , facilities , and other work shall enjoy the protection accorded by the principles and rules of international law applicable in international and non-international armed conflict and shall not be used in violation of those principles and rules .”

The UN convention also identifies following 7 issues in order for equitable and reasonable utilization: (Chellany 2014 ).

- 1.) Geographical, hydrological , climatic , ecological , hydrographic , and other factors of natural character ;
- 2.) The socio-economic needs of the respective states through which the waterway passes.
- 3.) Number of people dependent on the waterway in each co-riparian river basin state .
- 4.) The impact of utilization of shared waters on another water course state;
- 5.) Existing patterns of utilization;
- 6.) The conservation, protection, development and economic use of water resources, as well as the costs of measures undertaken for these purposes and;
- 7.) Any comparable alternatives to an existing or planned use.

III). Helsinki Rules: Helsinki Rules of 1966 adopted by non-governmental International law association (ILA) were complemented in 1986 by ILA-approved ground water Rules creating norms for transnational river basin with surface or subsurface waters .

Helsinki Rules were first International effort to frame standard to govern International or transboundary waters . Though Helsinki did not have any binding effect , yet it mirrored the principles of customary International Law.

Helsinki Rules shaped many provisions of UN convention , not only this , but it laid down a framework for dispute settlement with a mechanism along with a provision of creating a joint commission of inquiry by submitting these disputes to some tribunals or International Court of Justice .

Helsinki Rules were further modified in 1970s and 1980s by International Law Commission ILC which was formed by United Nations . ILC is made up of 34 International lawyers thus representing major International legal system.

#### IV) Berlin Rules :

It was ILA, who in 2004 drafted “Berlin Rules “ thus giving more scope and broadening the Helsinki rules . These Berlin Rules comprise of 73 articles which are contentious as even before International water Law came into force , these rules seek to apply the customary laws to both national and International waters . Berlin rules also fills the lacunae of UN conventions to address environmental concerns and also for aquatic environment concerns. Berlin Rules also forces every riparian states duty to share its water equitable and reasonably with causing no harm to other basin states or co-riparian .

Berlin Rules provide a forward thinking approach to mitigate violent water wars in modern days of water scarcity and meeting demands of highly populous nations.

#### V.)ICJ:

The ICJ, International Court of Justice, popularly known as ‘The World Court’ is the principle organ of UN which issues advisory opinion on important legal nature between nations. ICJ however lacks any practical mechanism to enforce its jurisdictions.

India is so many treaties with her neighbouring countries such as Pakistan, Nepal and Bangladesh; it has the Ganga and Mahakali agreements with Bangladesh and Nepal (Chimini, 2005). Many upstream countries do not respect of equitable utilization with downstream countries, it is a violation of the law of non-navigation uses of the international watercourses. In case of Brahmaputra river basin downstream states did not have any treaty with China according the law of non-navigation uses of the international watercourses.

According to Molgosia Fitzmaurice and Gerhard Laoibl the watercourse crisis is one among the most significant problems the world is currently facing some of which are water scarcity, its steady depletion and the ever increasing pollutants in fresh water reserves etc.. They have strongly indicated towards limited fresh water supply and its vulnerability as a limited natural resource, stock of which highly dependent upon the socio-economic. They listed four major issues as far as fresh water is concerned. (Subedi, 2005: 78):

- (a) Scarcity of water as there is limited supply
- (b) Unequal distribution of water among nations
- (c) The issue of water quality and related health hazards
- (d) Unrestricted building of dams and reservoirs

With fast economic growth every state would try to secure fresh water supply. So is true in the case of fast growing nations India and China which are world's two most populated countries, world's half population reside in these two countries. Water is scarce and in short supply in many countries across the world such as Middle East, North Africa, Central Asia and Sub Saharan Africa including North China. Even where water is available, its accessibility seems to be a great cause of concern specially in developing countries(Chellaney, 2011: 4).

### **The Institutional Approach:**

Few scholars (Keohan 1995, Chellaney 2011, Rahaman 2009, Ostrom 1990 and Jesper) favour institutional approach, essential to the management of water resources because the institution has certain rules and regulation which distribute the resources. "Transboundary water resources management is the management of

surface and subsurface water in a qualitative and quantitative and environment sense of a multi-disciplinary and perspectives” (Jaspers, 2002: 79). Institutional approach is important to develop of transboundary water resources management. Frank G.B. Jesper describes that “Institutions are organizations or establishments founded for a specific purpose base on a set of working rules originating from an established custom, law or a relationship in a society or community” (Jaspers, 2002).

IDS (discussion paper 372) discuss about the natural resource management literature, institutions are considered to be key in sustainable livelihood adaptation and natural resources management, and an understanding of institutions is now seen as central to successful policies in this area. Ostrom describes that “Institutions are sets of working rules that are used to determine who is eligible to make decisions in some arena, and what actions are allowed or constrained, further the rules describe what procedures must be followed, what information must or must not be provided and what payoffs will be assigned to affected individuals” (Ostrom, 1990: 7). Kohnan talk about the logic of institutionalize theory with its focus on the information role of institutions appears solid. In case of which countries share the common water their territory on a certain institutional umbrella, they can use the water of that institution law and rules. India and China both are sharing the Tibetan plateau water of Brahmaputra River. They do not have any kind of institution which can go ahead.

Nile riparian which contains ten countries adopted transboundary water resources management, it has example of sharing the water as a mutual benefit platform which is respect each other countries flow and supply of water resources (Nile Initiative, 2000). As well as if India, Bangladesh and China will make the certain institution which shares the Transboundary water resources for their national purposes. India and China both are economically competitive in the Asian region; they are emerging power in the world. Defiantly they will secure the water for their national purposes from Tibetan plateau water. There should be an institution mechanism of Brahmaputra River (Yarlung Tsangpo) between the two big countries.



## **The Sustainable Development Approach to Transboundary Water Resources Management:**

Sustainable development theory is very essential in the contemporary world. Theory of sustainable development came from the ideas the 1987 report of the World Commission on Environment and Development generally known about that (WCED, 1987). Brundtland Commission has given the sustainable development theory. The Brundtland Commission report has given the ideas of Our Common Future: From One Earth to One World. It has given the new ideas of the world to secure the resources for our future generation, everyone exploited the natural resources, this commission has given the view for next generation whose are not part of your enjoyment this time, it has protected their rights whose did not born yet.

The World Summit on Sustainable Development defined ‘integrated water resources management’ as a process which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystem, and emphasized that water should be managed in a basin-wide context under the principles of good governance and public participations” (WSSD, 2002). Sustainable management is very important for water resources because water is the main component of livelihood.

Brundtland report defines “sustainable development” as a process of constructive change by bringing harmony between environment, resource exploitation, investment, technological and institutional changes to enhance the current and the future potential of human needs (Corina maria en, et al, ND: 1). It takes into consideration the growing world population, its limited natural resources, and appeals that the world that it should respect these natural resources as most of them are not renewal, and over exploitation of which is a matter of concern for the existence of our future generations. According to Preecha Rengsomboonsuk, Minister of Natural Resources & Environment, Thailand, good governance is imperative for the establishment of strategies on sustainable management of international river basin (Mekong River, November 2, 2012, The Hindu).

The goal of sustainable development has been continuously facing challenges from ever depleting water resource and misuse of the available stock as observed by The Dublin statements. It is also a threat of environment protection. Water is a key component of natural resources, if upstream states divert the river water for their own interest and build the many dams which diverted the water either side because of short flow water of the downstream states, it shows that they do not respect to the downstream states' water rights. There is call it violation of downstream state's water rights. China has made the Zangmu dam and construction other dams on the Brahmaputra River in Tibetan plateau for diverting the water south to the northern Chinese region.

According to Tashi Tsering, water scarcity will pose great challenge to China's ever growin economy, the reason being not only the decreasing surface water but also fast depleting ground water. Chinese water crisis has widened; It is going to face the challenge of water scarcity causing a hindrance in its economic development and imbalance in social harmony. China, being aware of the upcoming challenge, has prepared a national project intending to divert its rivers in the south and west to drought suffering northern areas (Tashi Tsering, 2002). As per Anton Earle "clearly how vital it is to cooperate effectively over the management shared waters to unlock their contribution to regional sustainable development" (Anton Earle, 2010).

Transboundary water resources have been a great matter of concern in international politics. In 1995, Ismail Serageldin, Ex-vice President, the World Bank in 1995 cautioned the world about the increasing number international water dispute cases which may possibly be the cause of another war. The beginning of 21<sup>st</sup> century has been already marred with a number of conflicts resurfacing over international for water resources. Particular Asia of which, China, India, Pakistan and Bangladesh are most populated states, and share the common Tibetan water resources under control of China, will be a matter of concern for the whole world, Chellaney reiterated the same in his book (Water Asia's New Battleground, 2011) pointing out towards the new battle lines being drawn in Asia international water courses. He emphasized the danger of great water conflict. Of utmost importance is the river basin in common with a China and India, the Brahmaputra / Yarlung Tsangpo which is has a significant value for downstream countries like India and Bangladesh

as they have been variedly associated with this river be it economic, cultural, or social. The Brahmaputra brings prosperity to these riparian countries.

China's hegemony over trans-boundary water resources is a well known fact. China refuses to treat its co-riparian states as equal. This lack of cooperation from China's end may well lead to a conflict between these states, especially India and China. To better comprehend the abstract of conflict and cooperation, we can adopt the Game theory.

The epicenter of the Game Theory is the Security Dilemma. This implies that the increase in security by a state results into the decrease in security and increase in anxiety of the other state. The theory is applicable only when both states are independent of each other. Being a mathematical model, it provides us with a scientific language to devise and analyze the diplomatic scenarios. A cooperative framework of the theory develops the blueprint for management of Transboundary water resources. It also helps in formulating a strategic behavior among key stake holders in a water-related conflict. The Game theory involves the stake holders, their stand and their preferences in its framework to resolve the conflict.

Also widely used is the Water Resource Scarcity approach. It's is majorly focused on water supply and demand. According to this, if the supply falls short of demand, it may lead to a water conflict. China's extensive damming activity on Yarlung Tsangpo River is leading to water scarcity in the downstream state. This might be a precursor to a violent conflict between China and its co-riparians, also leading to bitter diplomatic ties. Thus, keeping the supply and demand proportionate can avert hydro-conflicts.

Water conflicts have globally been avoided through a well-planned institutional approach. Several teams-nation treaties have been signed and many organisations have been founded with the aim of resolving transboundary water conflicts. An institutional gap is one of the major reasons for a water conflict. An institution guarantees a just cooperation between the co-riparians. China is on the edge of triggering a water conflict since it is reluctant to fill any institutional gap. It refused to sign the 1977 UN Convention on the Law of the Non-navigational Uses of International Waterways, and also it hasn't sign any treaty with downstream states.

This lack of water sharing mechanism between India and China puts the two countries in a vulnerable situation where a violent conflict is very much possible. Therefore, a legal framework is the need of the hour to resolve the water sharing issue on the Yarlung Tsangpo River.

### **Chapter Three**

#### **China's interest on Yarlung Tsangpo River**

Water resource from Tibetan rivers is a bone of contention between India and China. In similar fashion, it is one of the influential tenets of diplomatic relations between other South Asian Countries. The main reason for the tussle between these countries is due to less availability in present and water shortage in the future. Due to strategic position, China is in the commanding position over the water resources of Tibetan rivers. Tibetan rivers is the lifeline of Northern and North- Eastern part of India and other South Asian countries like Bangladesh, Pakistan, and Nepal.

Due to fast growing urbanisation and industrialization, the requirement of water is exponentially high in China. As we aware that water resources from river provide livelihood to millions of people in the 20<sup>th</sup> and fast growing 21<sup>st</sup> century (apart from the drinking water). Water is one of the major components in the fast growing Chinese development. Nowadays, due to over exploitation of water resources, China is facing huge water crunch. Tibetan fresh water resources, which are originates from Tibetan plateau are not only essential for China but also other South Asian countries. As per IDSA report, by 2025 India and China will be required 1700 and 2100 cubic meters per capita (IDSA, 2010).

South-western and Northern part of China are facing the severe water crisis. Due to scarcity of water, many health problems are reported on the regular basis. In similar fashion, many social welfare programs are affected due to water crisis in many parts of China. In the case of Northern region, water crisis in the worst position. In the comparison between other developed western countries and northern region of China the water availability per capita is very less. That's why China wants to store and divert Tibetan water in the sake of the utilization of own people. In the continuity of this policy, Chinese government built Zangmu dam on Brahmaputra River for the purpose of power supply to Western and Northern part of China. This dam is constructed as a "run of the river". Due to construction of dam and diversion of water resources, it would be a burning issue in the future.

Water of Tibetan rivers plays an important role between India and China diplomatic relations. China and India, both are the most powerful countries in the South- Asian region. In order to fulfil the desire of and requirement of own people both the countries want to capture more water of Tibetan rivers. They are competing in the world to capture the water for their utilization. Many Chinese scholars had pointed out the plan

of Chinese dam projects. The deputy general secretary of the China Society for Hydropower Engineering, Zhang Boting told the *Guardian* that “a massive dam of the great bend of the Yarlung Tsangpo research had been carried out on the project, but no plan has been drawn up. But documents on the website of a government agency suggest a 38 gigawatt hydropower plant is under consideration that would be more than half of the Three Gorges dam, with a capacity nearly half as large as the UK's national grid. This dam could save 200m tonnes of carbon each year. China could not waste the opportunity of the biggest carbon emission reduction project. That CO<sub>2</sub> saving would be over a third of the UK's entire emissions” (Chinese Engineer, The Guardian, May 24, 2010)

The water is not just requiring for energy sector, it is also essential for China's concentrated agriculture, which demands more water. The demand for more water is also strengthened by the growing of other sector of north-eastern arid region of China, which is depended on Tibetan rivers. In order to solve the northern arid problem, China focuses on two points. First is making dam on the Brahmaputra River. Second is making big south-north water transfer project to transfer the Tibetan water in order to fulfil the water demand in the Northern Chinese arid region. For this purpose, China built the dam called Zangmu Dam on the Brahmaputra. Since 2010 this dam has been working and it has 510 MW capacities. China did not stop here, she moves further and started to build three other important hydropower dam on Brahmaputra, which is situated on the mainstream of the middle reaches; first dam is called Dagu and it is situated on 18 Km upstream of Zangmu and it has 640 MW capacities. Another dam will be constructed at Jiacha and it has 320 MW capacities. This dam is situated on the middle reaches of the Brahmaputra, which is downstream of Zangmu. A third dam called Jiexu, which is situated on 11 Km upstream of Zangmu. The capacity of this dam is currently not in public domain. These three dams will be constructed through the Chinese 12<sup>th</sup> five year plan (2011-15) (Three new dams, The Hindu, April 5, 2013).

**China's water mega project on Tibetan river basins:**

China's annexation of Tibet was not morally correct, but, on the other hand, it is very fruitful for China. Prior to this, Tibetan river is moved to downstream states of India, Nepal, Bangladesh, Pakistan, Bhutan, Vietnam, Burma, Cambodia, Laos and Thailand. That's why by and large the water flow to above mentioned countries under the direct control of China. Henceforth, China started stopping water for electricity, mining, irrigation and other cash-cowing activities. Since water can't be imported from other countries, so, China focused to strengthen water infrastructure. After overutilization of depleting Yellow River by China, the Chinese policy makers shifted their plan toward other rivers in order to fulfil their vicious desire.

The Chinese immoral decision to build mega dams and other projects on International Rivers has been turned water into the new battleground of Asia. A Chinese analyst pointed out, "China's water-supply crisis has taken on an international dimension, not only in respect of other countries affected by the pollution in China, but also in disputes over water resources." In 1991, China launched fifty-one projects for the infrastructure development in its western region. These projects also include massive hydro- power projects and irrigation projects. That time China also planned to divert Tibetan rivers through dam to the dried northern region. These new projects and old projects are severely destroyed the eco-system of Tibetan rivers. Stream-bank erosion and distortion of natural eco-system causing depletion of aquatic life, and simultaneously it has also been affecting the livelihood problem for the people of neighbouring countries (Chellaney 2011). Chinese annexation of Tibet not just resulted into the losing of geographical, political, and national identity of Tibetan people. Simultaneously, Tibet also lost the identity of Asian freshwater powerhouse. If former event did not happen, then thing will remain in order. Since the communist regime, China's water demand has been raised day by day. The Chinese authority has focused the third phase of the Great South-North Water Transfer Project on Tibetan rivers. For this project the water is being irresponsibly used for environmentally insensible irrigation, mega hydro-power manufacturing, rising needs of urban settlement and water contamination. As a result, the downstream of these rivers in south and south-east Asian countries is directly and indirectly affected in the form of quality and quantity both.

Currently, China built dam on every major river which is originated from the Tibet. Through dam China controls the water of Salween, the Mekong, the Brahmaputra, the Yellow, the Yangtze, the Sutlej, the Indus, the Karnali, and the Shweli. Even, China does not want leave small rivers like Arun and the Subansiri untouched. Near the Tibet-Nepal frontier, China has

plan to built five dam on Arun. In the continuity of making the dam project, the China has planned to make series of dams on the Salween, the Mekong, and the Brahmaputra (Chellaney 2011) and China already built the major dam on the Indus close to India- China border, and another one on the Karnal. Since, these dams are near to the international borders and rivers, that's why they are a key factor of conflict.

Surprisingly, China now concentrated to built dams in ethnically dominated areas. This new plan to make dam in ethnic community has resulted in displacement of ethnic community and these would create big trouble in order to survival of these ethnic community. Currently, the construction of dam is primarily concentrated in ethnic province of Yunnan and Tibet autonomous region. Since the Tibet region is considered by Chinese authority as a resource storehouse, thus maximum dams were constructed in the Tibetan region. "In fact, before the countries in the lower Mekong basin could realize the implications, China quietly went ahead and completed the 1,500-megawatt Manwan Dam on the Mekong in 1996 with little publicity. Manwan is located 100 kilometers south of Dali in Yunnan. More dams on the Mekong followed in quick succession: the 1,350-megawatt Dachaoshan, located in the Dachaoshan Gorge; the 750-megawatt Gongguoqiao; and the 1,750-megawatt Jinghong, near Jinghong city about 300 kilometers north of Chiang Rai, Thailand all completed in the first decade of the twenty-first century" (Chellaney 2011).

The upper Mekong also boasts the giant 4,200-megawatt Xiaowan and the 5,850-megawatt Nuozhadu. This dam building spree is proceeding unabated despite constant protest from the downstream territories. This intense, irresponsible damming activity has had serious implications on the river's ecology, including the drastic decrease of water quantity of the lower Mekong River, which has been registered 51 year low in 2010, hinting towards severe drought. China's interest over the Tibet's water resources can be read in term of her plan to build the world's largest dam and hydropower project on the Brahmaputra River at Metog (just before the India's line of control). "The dam, by impounding water on a gargantuan scale, will generate, according to the state-run Hydro China Corporation, 38 gigawatts of power, or more than twice the capacity of the Three Gorges Dam, which came with a price tag of \$30 billion." In one of its statements, Hydro-China accepted its responsibility for "conducting the hydropower planning for the upper reaches" of the Mekong, the Salween, the Jinsha, and the Yellow and the middle reaches of the Brahmaputra-activities that focus on the Tibetan Plateau. "Such is the proposed scale of the Motuo Dam, as it is officially called, that the project will by itself produce the equivalent of three-quarters of the total capacity



Australia had in 2010 to generate electricity from all energy sources.” A series of six major dams has also been proposed in the upper-middle reaches of the Brahmaputra, the first being at Zangmu--beginning in 2009. These dams joins the long list of dams on Brahmaputra and its tributaries along with more than a dozen smaller dams, including at Yamdrok Tso, Nyingtri-Payi, Pangduo and Drikong.

The iconic Motuo Dam—a project run by China's state-run hydropower industry and for this industry, leaders of china have strongly lobbied in order to capture the sizable amount of the Brahmaputra waters. The purpose of this project is to work around the Great Bend, at the Great Bend the river makes a sharp turn just before the point where River enters to India. This Bend is famous for strongest concentration of river energy on the Earth, the project is designed in order to gain maximum hydro-power and control over the water. Apart from the Motuo, a list of planned dams, which is released by Hydro-China Corporation in 2010 also listed Daduqai (site of a large dam) — close to the disputed border with India— which will produce huge amount of electrical power through the river's powerful 2,000-meter water-fall. Another plan of project is published by the State Grid Corporation of China in 2010, the country's main builder and operator of power grids, suggests that China is all set to combine the Great Bend area to China's national grid, implying the development of hydro-energy infrastructure there.

Up till now, China's river damming activities on the Tibetan rivers will produce energy and also divert water of these rivers for irrigation and mining. The proposed new projects, however, have bigger hydro-engineering aspirations, including inter basin transfers. The new dams are humungous, even by the global standards. Thus, China plans to use water as a political weapon. China tries to built inter- basin and inter-river water diversion projects, by making Tibetan Plateau at the center. Riding on the back of its economic stability, China is desperate to establish its hydropower hegemony. China was to increase its water supply for own needs trough multi-billion-dollar water diversion projects. While other resources are a part of trade deals, for water, China turns its head towards the Tibetan Plateau's international rivers. This might trigger a water-war between China and its co-riparian states.

Also, such large scale damming activity would significantly affect the natural flow of rivers. The variable flows make it hard for the downstream territories to predict the assured flow, and will spoiling the relations with co-riparians. For instance, the mega projects on the

Mekong River have infuriated downstream states of Vietnam, Cambodia, Laos, and Thailand. China's unwillingness to share resources with India can also antagonize the latter; the more river resources are exploited by China, the less water availability will be for India leads to potentially harness. In its rush to exploit resources, China is putting at stake the sensitive areas of their natural forests. For example, the reservoir of the Motuo Dam will be much larger than the Three Gorges reservoir, the length of this reservoir is more than 630 kilometers and the average width of this reservoir is approximately 1.3 kilometers. This reservoir vanished 1,300 archaeological sites and shattered the beautiful picturesque of the limestone mountain of the Qutang, Wu, and Xiling gorges (the "Three Gorges"). But Motuo situated in the area of the Tibet's greatest natural site and "the largest and best preserved virgin forests in China" (Chellaney 2011).

China's hydro-engineering projects also damage the hydrology of river, and will cause the danger for the fluvial ecosystems. The fire in China's belly for water and energy has had serious consequences on the ecosystem. It has significantly depleted and contaminated the rivers and the subterranean water resources, putting the burden on nature due to unbridled withdrawals and lax antipollution controls. Next on China's black radar seems to be the ecological viability of river systems linked to southern and south-eastern Asia. Various data sets suggest that the intensified damming activity is causing a large scale deforestation and population displacement beside causing a fluctuation in flow of water and thus causing flood in downstream territories. "For example, a breach in an upstream dam in Tibet in mid-2000 not only triggered flooding in the north-eastern Indian state of Arunachal Pradesh but also led to Indian and Chinese border troops being put on the alert. The breach raised the level of the Brahmaputra by more than 30 meters and caused serious flood would damage the downstream, leaving at least 26 residents dead and 35,000 homeless in Arunachal Pradesh and stoking an Indian furor." Initially, the Chinese government was reluctant about the dam bust and kept it veiled from the media. But later it admitted the dam, identifying the location as Yiong, beyond Mount Namcha Barwa, and claiming that it was a 60-meter-high "natural dam" that gave way—a claim that was received skeptically by those downstream (Chellaney 2011).

Continuous floods in 2000, 2001, and 2005 in another Indian Himalayan state of Himachal Pradesh kept China on the back foot and it couldn't articulate a plausible explanation. The floods in that state, located North of New Delhi prompted one Indian newsmagazine to coin the phrase Made-in-China Hoods. Satellite images reaffirmed that the floods, which caused

more than 100 deaths, were due to excess water release from China through the Sutlej basin hydro works without any forewarning to India.

Plausibly, Chinese hydro-infrastructure on international rivers on the Tibetan Plateau affects their flow in the co-riparian states. Even though Thailand, Laos, India and other states have demanded for greater transparency, Beijing remains tight-lipped on information about its water projects. As a result, India has had to rely on its technical intelligence capability to detect new Chinese dam projects. China has only shown flexibility in sharing flood related hydrological data during the monsoon season. It has agreed to supply such hydrological information to the lower Mekong basin states and India. But the deal is 'quid pro quo' and China demands a fee in exchange for the data (Chellaney 2011).

In 2005, after Himachal Pradesh flood, Chinese authority agreed to provide hydrological data to Indian counterpart in the case with the abnormal rise or fall water level of the Sutlej River, which has been quietly dammed by China. Also, after the streak of flash floods in Arunachal Pradesh, China signed a MoU with Indian counterpart to share flood-season data of the Brahmaputra and two of its tributaries—the Parlung Tsangpo and the Lohit— in June 2008. Through the MoU, India can improve its flood forecasting and timely warning on the plains of Assam. Since 2002, China had already been sharing hydrological information with India on the Brahmaputra but not about the two tributaries (Chellaney 2011). India now needs to persuade China to include in the spectrum of the memorandum all rivers flowing from Tibet and also provide regular hydrological data not just related to flooding but also about low-average precipitation at the river source so that downstream users can be forewarned to a potential drought.

Since the watershed is enormous, India and other riparian states need to fulfill the institutional gap with China for better cooperation. The new larger-scale Chinese hydro-engineering projects on the Tibetan land poses serious long-term diplomatic, economic, and environmental implications which can be hard to be ignored by the downstream countries and other actors and institution which are keenly interested in Asian peace and stability.

#### **South to North water transfer project:**

South to North water transfer project is the most important water transfer project for the Northern arid region of China. This project is covering the three rivers of China as a

part of south to north diversion project, which are Yellow River, Huaihe and Haihe River and these rivers flow through the most important economic region of China. The economic activity of this region contain one third of the total GDP of China. The period during 1990 to 1997, China has witnessed the fast growing grain production, which was occurred due to these rivers. The basin of these rivers constitutes almost 79% grain of China. The river basins of these rivers cover 7.2% of total area covered by Chinese river basin. And, the per capita water availability of this river is 465 meter cube that is lower than the international standard. Due to less water availability and higher demand of water in this region, the Chinese authority shifts their attention towards Tibetan Rivers. The main reason behind the lack of water availability is socio-economic development programs and it is strengthened by the bad management of water resources and mindless use of river basin in this region (Pei Yuansheng, et al 2009).

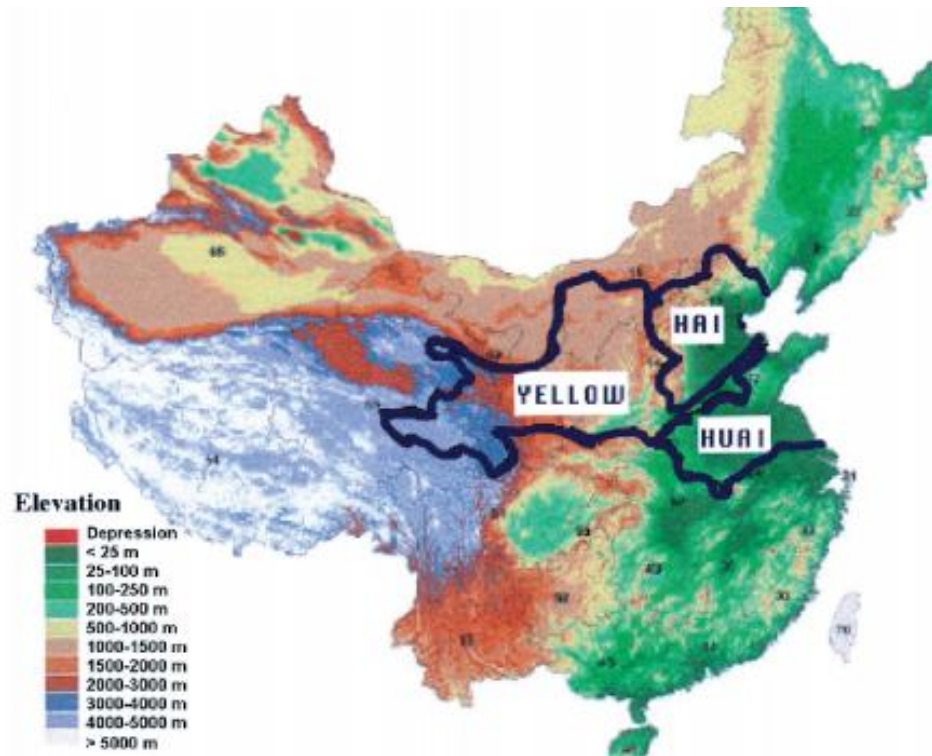
In the connection of Chinese south-north water diversion project, the new developed project will shift 44.8 billion cubic meters water per year to the Yellow river basin from the Yangtze River to Yellow River for the northern arid region of China. Due to this project million of people will be displaced from one region to other region. “The great south to north water diversion project was visualized by Mao when he reportedly said in 1952; ‘the south has a lot of water, the north has little, it is okay to lend a little water’” (Chellaney 2011: 60). The idea of transfer of water from south to north was basically Mao’s vision and successive Chinese Government has been working on this vision. The above mentioned statement of Mao was considered by the Chinese authority as a driving force of the southern north diversion project. Although, the Chinese Government and Ministry of water Resources did not started work on this plan till 1979-80 (James E. Nickum). We are aware about the fact that if the any country has sufficient amount of fresh water then that country will exploit and China is not an exception. Due to immoral exploitation of water resources, China becomes one of the most economically powerful country.

The river water transfer plan from the southern to the northern region of China is divided into three routes; this project will link the Yellow, Yangtze, Hai and Hui Rivers through these three routes for the sake of water transfer project. This project has two purposes: first is to fulfil the water demand in the middle and north region. And, second is that the reduction of flood possibility in southern region. It has three water diversion routes. The western route of this project is first and the Middle route of this

project is second and third is an Eastern route of this project. China diverts water from upper, middle and lower reaches of the southern part to the northern and north-western region of China. Up to 2050, China aims to reroute the total water volume of 45 billion cubic meter. For this aim, Eastern route will share 15 billion cubic meter, middle route will share 13 billion cubic meter and western routes will share 17 billion cubic meter. Through this project China wants to tackle water scarcity (Wang and Chen, 2004: 3)

(See below Yellow, Hai, and Huai river map)

Map 4: Three rivers



Source: WB 2001

**Source: Jeremy Berkoff**

There are three water diversion of this project.

- Eastern Route project (ERP).
- Middle Route project (MRP) or central route project(see below figure).
- Western Route project (WRP).

This water diversion from upper, Middle, and lower reaches of South to North and North-West of china. (See below a map of the Chinese water diversion project)

Map 5: Western, Central and Eastern route project

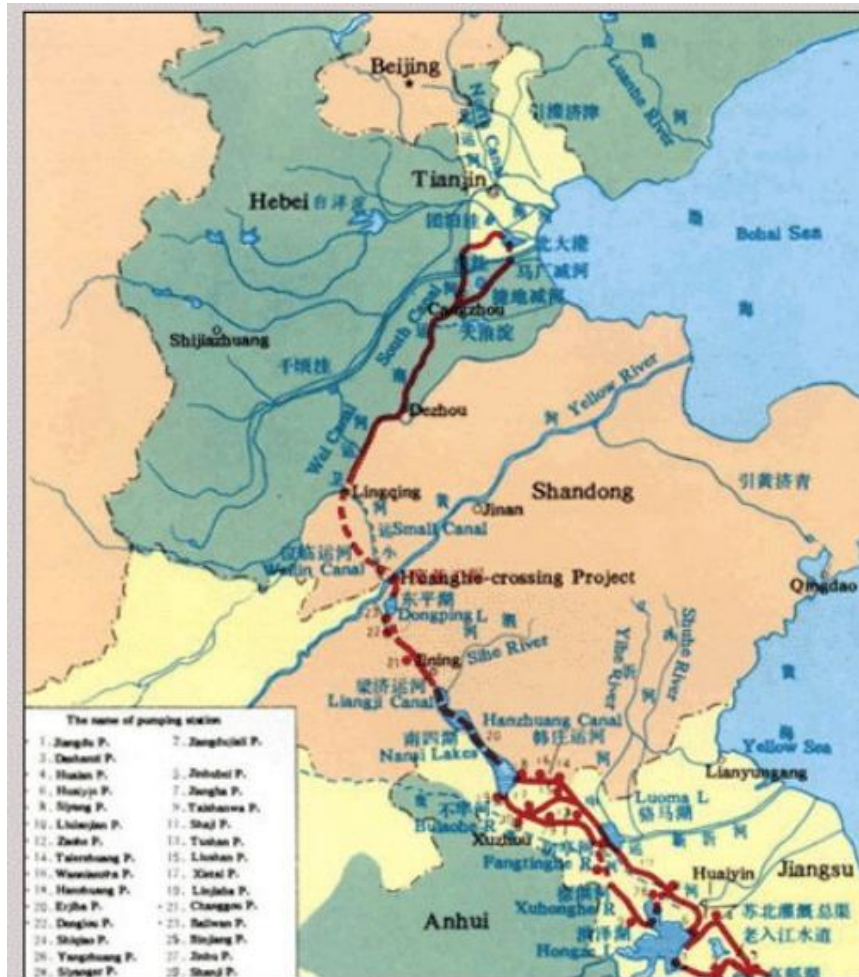


Source:<http://cis.uchicago.edu/outreach/summerinstitute/2010/documents/sti2010-okeefe-water-diversion-china>.

### **Eastern Route Project:**

The eastern route of this project shifts water from the Yangtze about 100 km from Nanjing and 250 km from the sea. The eastern route project inaugurated in 1961, it is based on the Jingdu Pump Station (400 cubic meter per second, one of the largest in the world) primarily for the irrigation purpose in Jiangsu. The capacity of this power station and other stations will enhance to 600 cubic meter per second by 2010, 1000 cubic meter per second by 2020 and finally to 1400 cubic meter per second. This route (1150 km) connects the rivers, lakes, canals (mostly exist to the Shandong border) and reservoir. In the process of water transfer programme, the water will be uplifted to 65 m through twelve pump stations to the Yellow River, and also water will cross through many tunnels. After the transfer of water to Yellow river the significant amount of

water can reach to Tianjin. The second stage will cost US\$3000M and from the amount of US\$600–800M will cost for an emergency Tianjin project (US Embassy, 2001; WWF, 2001). And other Accessory costs like, pollution control will cost US\$4000M and this cost is essential and cannot be ignored. This project will shift 3% of annual water flow of Yangtse River (975 cubic kilo meter) and simultaneously this project will have insignificant impact on the lower reach of Yangtse River (Jeremy Berkoff, 2003, p 5). (See below a map of the Eastern route project) Map 6: Eastern Route



Source: <http://www.cawra.com/PDFtext/SouthToNorthWaterTransfer>.

**Benefit of the eastern route of this project:**

- to provide Water supply to industry, irrigation and navigation for Jiangsu, Anhui, Shandong, Anhui, Tianjin and Hebei.
- To support the navigation capacity to Grand Canal.

To provide water for the grain production and cultivation to the western Shandong and Northern Tiangsu.

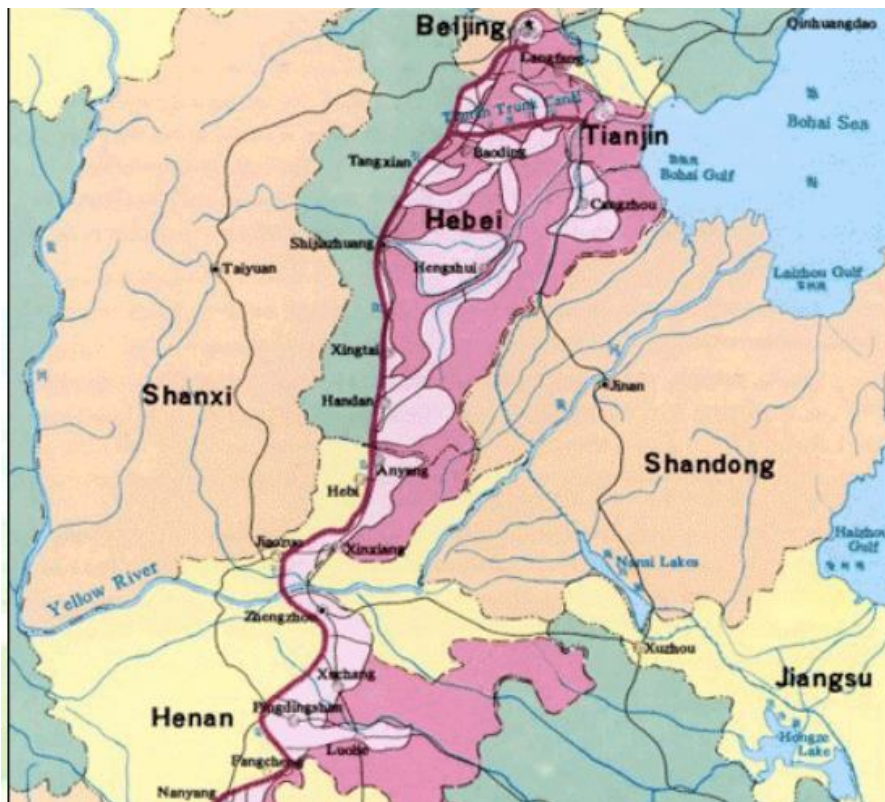
- Will be useful for the economic development in around Bahai Sea area and also eastern Huang-Huai-Hai plain (Wang et al 2004: 76).

### **Middle Route Project:**

The Middle Route of this project begins from the Danjiangkou reservoir on the Han River, a major left-bank tributary of the Yangtse River. In 1974, this dam was built with the height of 162 m, on the other the dam was designed in such a way that the height could raised up to 176.6 m. After the increase of the height, it will enhance the capacity from 17.5 cubic kilo meter to 29.1 cubic kilo meter. In the connection of this project, the canal also built through the Huai River and Xiaolangdi Dam built through Yellow River. The water transfer project is also connected to Beijing along the foot of the Taihang Mountains. The canal's total length is 1230 km, and it has branch in Tianjin, which has total length of 142 km. The development of Canal project will displace the 50,000 people. These channels are built in the context of preservation of water quality and command the full flow of the river. In the context of water transfer and conservation project, China built more than a thousand structures, it includes a 7.2 km tunnel through the Yellow River. The first stage will divert 9–13 cubic kilo meter per year or 25–35% of total flow of Han River in Danjiangkou, through the height increasement process of dam will control the flood and water control will beneficial for the lower territory of Han River and Wuhan City. The cost of the first stage will be around US\$7000M, with a US\$3000M cost for the accessory. A second stage could increase diversions to 20 cubic kilo meter, but is only feasible with compensating transfers from the Yangtse to the lower Han (Jeremerhoff 2003: 5). (See below a map of the middle route project)

Map 7: Middle route





Source: <http://www.cawra.com/PDFtext/SouthToNorthWaterTransfer>.

**China gets to benefit from middle route project:**

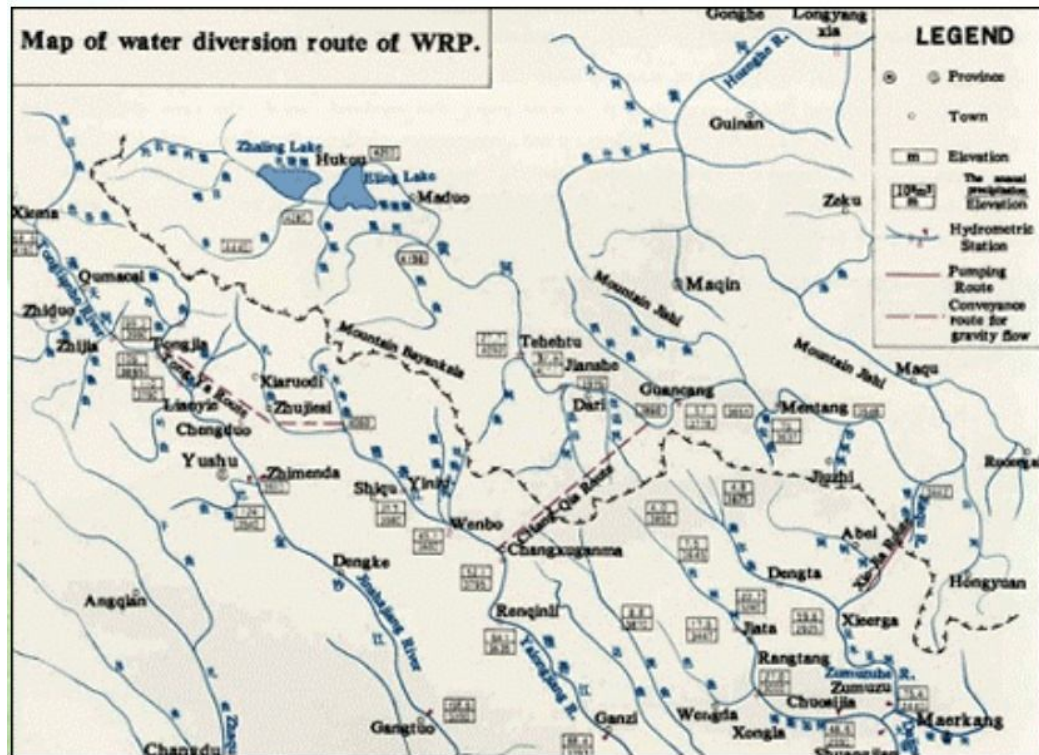
- “Mitigate the water crisis in Beijing, Tianjin-Hebei and Henan.
- Increase the ability of food control in the middle lower Hangjiang” (Ruan, B, Wang et al, 2004).

**Western route project:**

The Western route is more ambitious than the former routes. This route will be designed in such a way that it could be connected to three tributaries of the Yangzi River (a) the Tongtian, (b) Yalong and (c) Dadu rivers. These rivers originate from the Qinghai-Tibet plateau, where nearly one-third of China's water resources are coming from these regions, and flow around 500km through the Bayankala Mountain, this mountain has elevations of 10,000 to 16,000 feet above sea level. This mountain helps in order to provide water to the Yellow River, and indirectly this mountain is able to provide water for the irrigation of millions of hectares in the western region of China, in addition it helps to provide the water for the urban settlement, industry, and energy sector in the region.

(Carla Freeman). The project area will be able to cover six provinces Gansu, Ningxia, Shanxi, Qinghai, Inner Mongolia, and Shaanxi (Jeremerhoff, 2003). (See below a map of the Western route project)

Map 8: Western route



Source: <http://www.cawra.com/PDFtext/SouthToNorthWaterTransfer>.

**China gets to benefit from a western route project:**

- “Increase the irrigated area and supply domestic and industrial water in the western region
- Promoting the economic development of the North-West Loess Plateau” (Wang et al 2004: 7).

China’s south-north diversion project will provide the water to the Chinese arid region such as north-eastern and north-western region which are facing many problems due to the shortage of water.

Yellow, Huaihe, and Haihe rivers are flowing through the most important Chinese, and these rivers are the driving force for the national economic development program.

Chinese sustainable socioeconomic development is more affected due to water scarcity in the northern Chinese region. Yellow river, Huaihe River, and Haihe river basins are gaining the water from the Changjiang river basin which is connecting a good network to good geographical areas, it will be gaining the water resources for over a long period of time (Yuansheng 2009: 5). But, this will not possible for a long period of time, Tibetan water resources. Most important thing is here is that, to cut down the misuse of water resources in all areas which is totally wasted the water generally.

### **The Great South-North Water Diversion Project (SNWD)**

Due to ascending water scarcity in Northern plains, China is resolute about the Great South-North Water Transfer Project, the biggest hydraulic project ever designed in the world. The South-North Water Transfer Project not only includes damming rivers and diverting river waters for energy, irrigation, and mineral resource extraction, but also inter-basin and inter-river transfer ventures. The water-transfer plans in the third phase—focused on the Tibetan Plateau—involve international rivers, and upon completion, it will arm China with significant advantage over the downstream states—an advantage it can exercise to keep any downstream state on good behaviour.

The Tibetan Plateau is a water tower—often referred to as the ‘Third Pole’—owing to the unmatched height from which the water falls at unprecedented speed. Thus, China is devouring this hydro-potential to quench its thirst for energy. To meet the fast-rising demand in its east, Yunnan has been turned into the "powershed" of Guangdong. Even the megadams on the upper reaches of the Mekong and Salween are an attempt for the same. But China is also seeking to divert waters from the Tibetan Plateau to its arid and semiarid areas. To justify their plans and support, official and Communist Party institutions in Beijing have started publishing supporting material. A state backed book titled, ‘Tibet's Waters Will Save China’, has supported inter-basin and inter-river water transfer projects in Tibet and championed the northward rerouting of Brahmaputra waters. Some 10,000 copies of this book, written by former officers of the People’s Liberation Army (PLA), Li Ling, were bought by the China and its agencies for circulation to officials (Chellaney 2011).

The 2005 book seemed to bear the PLA's imprimatur. The book includes stale suggestions like going beyond the northward diversion of the waters of the Yangtze's Tibetan tributaries

and rerouting the Brahmaputra waters to the Yellow River. Such ideas have been endorsed by the PLA since at least the 1980s. The book's publication and wide distribution in military and civilian circles suggests that the PLA and civil hydrologists and engineers would soon collaborate in planning the rerouting of Tibetan river waters to China proper.

The PLA's blasting and tunneling skills would prove to be vital in rerouting, since it involves boring many channels and tunnels through mountain ranges. The challenges of building tunnels in one of the world's roughest environments are enormous. Li's own 1,239-kilometer inter-basin diversion proposal called for 56 kilometers of tunneling through six mountain ranges. Such a route would cross five rivers, collecting their waters with the help of dams, before entering the Yellow River at the tri-junction of three Chinese provinces—Qinghai, Sichuan, and Gansu, each of which incorporates Tibetan regions (Chellaney 2011).

The Great South-North Water Transfer Project was originally conceived in August 1958 after the launch of the 'Great Leap Forward' in politburo meeting of the Chinese Communist Party. The Great Leap Forward was a catastrophic charge toward forced collectivization initiated by Mao Zedong that eventually led to mass starvation and millions of deaths. The politburo meeting, under Mao's influence, passed the so-called Directive on Hydraulic Works (Guanyu Shuili Gongzuo De Zhishi), coining the phrase "south-to-north water diversion" (nanshui bei-diao). In a first work began on a giant reservoir at Danjiangkou, on the Haijiang River in Hubei Province as per Mao's order. The Danjiangkou Reservoir, however, could not be completed until the "Cultural Revolution"—another disastrous initiative of Mao that started in 1966—was at its height.

The grand water diversion projects were shifted to back burners during the decade-long Cultural Revolution. The focus shifted on modest dams, barrages, and irrigation canals during this era. The south-north transfer plans revived in late 1980s after persistent efforts by hydro-engineer-turned-premier Li Peng. The project was then included in the country's five-year and ten-year plans by the National People's Congress in 1991. A year later, work on the Three Gorges Dam was also resumed. But the project had to wait until 2002 for approval by state council.

Since the south holds four-fifth of China's water resources, The South-North Water Diversion (SNWD) project can rectify the northern water vows. Housing one-fifth of global population—which is projected to grow exponentially—the inter-basin and inter-river water transfer projects are a way to address the demands of its increasingly water-stressed economy.

But Beijing is ignorant to the environmental damage which would be caused by the large scale diversion, or the potential impact of climate change on the longterm availability of the water resources it is eyeing on the Tibetan Plateau.

The northward diversion is an ambitious project which has been openly backed by a string of Chinese Leaders. It should not be forgotten that the northward diversion of the waters from the Tibetan Plateau is an idea enthusiastically backed by a succession of Chinese leaders, including Hu Jintao, a hydrologist who made his name through a brutal martial-law crackdown in Tibet in 1989. The Tibetans' feelings of subjugation and loss have been deepened by the "Go West" Han migration campaign, to annex Tibetan farmland and monastic life. They have been pushed to the margins of society, and their culture is used as a cash cow for Han economy. Tibetan representatives have no stake in China's hydro-projects, even though the projects have an impact on local Tibetan communities and the natural environment.

The SNWD Project initially sanctioned \$5.86 billion in credit from state-run Chinese banks. Another \$7 billion was invested by the federal government for several subsidiary projects under this mega project. "By 2008, according to the director of the SNWD Project office, Zhang Jiayao, the available investment for the eastern and central routes had swelled to the equivalent of \$37 billion." A total budget of \$62 billion has been sanctioned by the State Council for the SNWD Project, but the actual cost is likely to be much higher.

The mega project includes water diversion routes connecting the Yangtze River, the Huai River, the Yellow River, and the Hai River to help the water-scarce northern regions, such as Shandong Province and the municipalities of Tianjin and Beijing. The project will facilitate three new waterways that will run along the east, center, and southwest of China. The first phase of SNWD involves a huge capital of at least \$15 billion and the relocation of more than 440,000 residents, the maximum from Henan and Hubei provinces. Work on the western route will commence once the work on the Central route is wrapped up. Parts of the eastern and central routes have already been completed, though some of it is being hit by some roadblocks. The eastern and central routes are precursors to the western route and involve China's domestic rivers only. Thus, it is free from any international implication.

The project of eastern route has a tunnel burrowed beneath the Yellow River, which will derive 14.8 billion cubic meters of water annually from the Yangtze in Jiangsu Province right up to Tianjin in the north. It will also expand the 1,600-kilometer imperial Grand Canal into

the world's longest aqueduct. The Grand Canal was built during the Sui Dynasty—which lasted from AD 589 to 618—to ferry rice northward from the fertile southeast; it runs from Hangzhou to Beijing. The eastern route would also link the Shandong Peninsula with the Yangtze. After the state council approval in 2002, work on the eastern route began instantly. It is 1,156-kilometer long and with less than 9 kilometers of tunneling from the outlet of Dongping Lake to the inlet of the Weilin Canal, it's the simplest of the three.

Work on the 1,421-kilometer-long central route began in late 2003. It intends to relieve pressure on the resources of the Yellow River by annually diverting up to 14 billion cubic meters of water northward from the Yangtze basin. “The nearby city of Tianjin also will draw water from a trunk line. The route's gravity-fed flow is designed to pass through tunnels in the Funiu and Taihang mountains on its way to Beijing's Yuyuantan Lake. But its most complex part involves burrowing tunnels under the Yellow at Gubaizui.”

The central route is brimmed with engineering challenges, cost overruns, pollution, and the burden of resetting large numbers of displaced rural residents. It is already several years behind schedule. A protest by local farmers against relocation also came as a roadblock in the project. The Mao-era Danjiangkou Reservoir which is being enlarged at a cost of \$365 million to serve as the point of origin of the central route also staked some 350,000 residents who were relocated from near Hubei Province's. A 15 meter increase in the height improved the capacity—17.45 billion cubic meters—of the reservoir by 11.6 billion cubic meters. This created an incline to transport water northwards,

Popular protests are unlikely to stall the conduit's completion. The Chinese state machinery is well-versed in tackling protests and relocating population. “After all, by the time the Danjiangkou Reservoir had filled in 1974, the area around what became Asia's largest human-made lake already stood depopulated. The forced resettlement for the SNWD Project is China's biggest since displacing a record number of local residents to build the Three Gorges Dam. Many of those displaced by the enlargement of the Danjiangkou Dam are being resettled in the adjacent but crowded province of Henan, China's most-populous region, which has nearly 100 million people.”

With revised deadline of 2014, the Chinese authorities are desperate to complete the central route's first and largest phase and the entire eastern route by 2013. Upon completion, the two

routes would be annually supplying almost 29 billion cubic meters of water to the north. "This transfer capacity would be three times greater than America's diversion of 9.3 billion cubic meters of water from the lower Colorado River to California, Arizona, and New Mexico."

The western route is the largest part of the SNWD project. Bulk of the water will be diverted through it. It will divert water from Tibetan plateau to the Han heartland. An engineering complication, it involves heavy construction at an altitude of 4000 to 5000 meter above the sea level. The transfer from Brahmaputra to the Yellow River constitutes the most important and ambitious part of the multi-billion western route.

The western route will engage the waters of four major Tibetan plateau rivers, the Salween, the Mekong, the Brahmaputra, and the Iinsha. One challenging plan in the larger western route involves building a series of canals and tunnels along a 1,215-kilometer route bisecting the eastern Tibetan Plateau to connect the higher reaches of the Yangtze with the upper catchment of the Yellow. The western route involves tunnelling through the earthquake-prone Bayankala Mountains.

The western route will dig the roof of the world but China seems to be ignorant. Having already dammed the Mekong, the Salween, the Brahmaputra, and other rivers on the Tibetan Plateau, China seems to be least concerned about the ecological implications. All it cares about is to the exploitation of south-western waters. The big question is when China will go from building dams on these rivers to generate electricity for its eastern regions to constructing tunnels and channels to send waters from the Tibetan Plateau northward as part of the western route. This Diversion seems to begin as soon as the central route is wrapped up, likely by 2014. The western route, too, will be fully operation by 2050 according to official sources.

Even after the SNWD project, the water vows of the northern plains don't seem to end. It boasts 64% of China's cultivated land and is in dearth need of freshwater. Besides affecting the ecosystems of the rivers targeted for water diversion, the project is likely to spur sediment build up, erratic flow speeds, contamination, and other problems in the new human-made waterways. Despite Premier Wen Jiabao's 2006 assurance to the National People's Congress that the government would emphasize "the prevention and treatment of pollution at the sources and along the routes of the South-North Water Diversion Project," water contamination already has emerged as a problem in the eastern route, with the director of the

SNWD Project office admitting that authorities have "still a long way to go" to transform "the eastern route into a clean-water corridor." Water treatment will put more economic burden over state council.

Only thing certain with diversion is river depletion and contamination. For instance, Yangtze, because of the Three Gorges Dam, has become so polluted that it has been identified as the single largest source of the pollution of the Pacific Ocean. According to reports, 3 Million cubic meters of water in the new canals channelling the "blue gold" to the north are likely to be lost annually to evaporation. Instead of dealing with the unsustainable agricultural and industrial practices in the Northern provinces by enforcing water productivity and efficiency standards and promoting conservation, Chinese planners are intent on manipulating the natural flows of the rivers in the south to meet the unquenchable water needs of the north. However, they need to recognize that the Tibetan Plateau and its ecosystems, including the great rivers that arise there, are part of the ecological heritage of Asia and other regions in the Northern Hemisphere.

#### **China's River Damming Policy:**

China is a world most majestic growing economic power, thus it is essential and necessary for the China to use the hydro- power and for that the China has to build the dam on many rivers in Tibetan and other region of China. Beck pointed out "China's domestic dam industry is unparalleled at the international level in a number of projects, financial investment, and impacts on the environment and society. Almost half of the world's 45,000 large dams have been built or are under construction in China. Additionally, loss of land and environmental degradation caused by dam projects has imposed significant costs on the Chinese rural population. Jing stated that 10.2 million people living in rural environments had been displaced by hydropower projects by the 1990s. More alarmingly, in his 2007 work report to the National People's Congress, Premier Wen Jiabao reported that 23 million people have been displaced by dam projects. China's most recent five-year plan (2011–2015) has proposed an increase in the number of domestic dam projects by 50% to contribute 130–140 GW to the country's energy supply" (Beck 2012: 6).

Moving Further, Beck highlights: "The TGD (Three Gorges Dam) on the Yangtze (Chiang Jiang) River is the world's largest hydropower plant. This was proposed for energy generation, flood control, and to increase trade routes to Western China, the



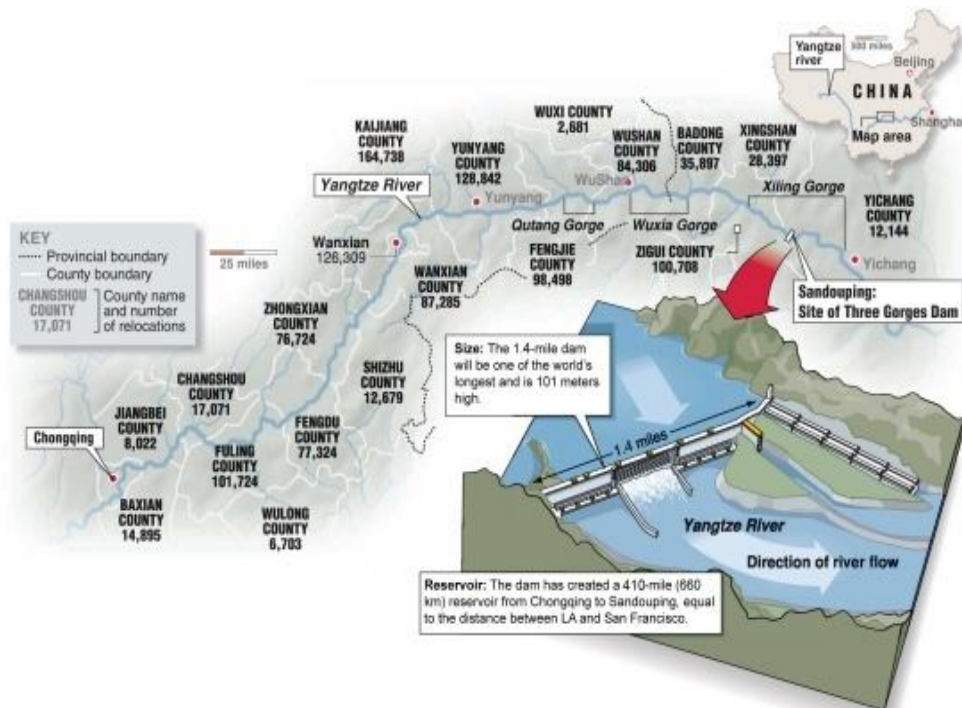
Three Gorges Dam became fully operational in 2008, generating an electric potential of 18,200 MW” (Beck 2012: 8).

In the similar fashion, Gleick pointed out the about the dam, “The Three Gorges Dam is nearly 200 meters high, has a volume of 40 million cubic meters, and has created a reservoir 600-kilometer long with a total storage capacity approaching 40 billion cubic meters. Maximum storage of water behind the dam is expected to occur sometime in 2008. The 14 generators in the north side of the dam have already been installed and they reached full capacity (9,800 MW) on October 18, 2006 after the water level in the reservoir had been raised to 156 meters. Installation of seven generators in the south side of the dam was completed by the end of 2007 and bringing the total power capacity to 14,800 MW and surpassing the generating capacity of the Itaipu Dam (14,000 MW) in Brazil” (Gleick 2008-09 140).

Moving further, Gleick highlights: “At its completion, sometime after 2010, the project is expected to have a total installed hydroelectric capacity exceeding 22,000 MW. This power capacity is higher than originally proposed because of an expansion initiated in 2002. In 2007, the turbines generated around 62 billion kWh of electricity – about two-thirds of the maximum level expected from the completed project. Other benefits of the project claimed by project designers include 140 The World’s Water 2008–2009 flood protection on the historically dangerous Yangtze River and improvements to river navigation for thousands of kilometers” (Gleick 2008-09 140).

(See below the Yangtze River basin)

Map 9: Yangtze River



Source: <http://www.internationalrivers.org>

### In order to tackle the water problem, **China diverts of Brahmaputra River:**

China has a majestic water scarcity crisis and it will be worse in future; thus, China wants to divert the Tibetan river from South to North. In the continuity of this plan, the Yarlung Tsangpo/Brahmaputra river diversion plan is also the part of south to north interlinking river project. This river diversion plan of China is a long term plan in order to flow Yellow river, which is badly facing the shortage of water availability in present time (Rashid, ND: 3). On the one hand, China will be facing the huge water crisis and on the other hand, it has the pressure to fulfil the power demand and simultaneously, it has pressure by international agency to reduce carbon emission. Although, China is currently focusing on hydro power project, and for that it requires building dams (Husain 2012: 4). Like other Countries, China does not want to dependent on electricity, which is made trough Coal. In order to this, China made the Zangmu dam on the Brahmaputra River. And this dam started working since 2010, it has 510 MW capacity. The construction of this dam on Brahmaputra is based on the proposal of Gao Kai and Li ling. They wrote the framework of grand plan of the Tsangpo

diversion in their book called *Xizang Zhi Shui Jiu Zhongguo* (Save China through Water from Tibet).

In addition, the Chinese government make the framework of future plan of the energy sector for 2011-2015. They also provide the blueprint of 54 hydro power stations, which has 120 GW capacity. And all these hydro power stations will be build on the upper reaches of Salween, Driчу (Yangtse) and Zachu (Mekong). In this process, China is ignoring the geological, hydrological and biodiversity risk. The blue print of making the dam also includes the restart of previous dam projects on the River Salween; it is stopped due to certain environmental objections. China is planning to create 1.2 TW (1200 GW) power capacity through water by 2030 and simultaneously, 277 GW power capacity through coal by 2015. Interestingly, the coal reserves (majority) in China are in dry regions, like Shanxi and Inner Mongolia. Simultaneously, Coal mining requires lot of water. The Managing and securing the river water in Tibet is the toughest task for the Chinese policy makers and simultaneously it is essential and necessary for the Chinese development policy. The states situated near the downstream of Tibetan Plateau originating Rivers would establish a regional forum in order to create policies that could effectively safeguard to access and quality of water, in the era of fast melting glacier melt. (To Dam or Not to Damn, June 8, 2013, tibet-edd.blogspot.in).

### **China Twelfth Five-Years Plans to Built the Hydro-Power Project on The Yarlung Tsangpo (Brahmaputra)River Basin.**

Like India, China has also five year plan in order to fasten the national development policy. During the period of Chinese twelfth five year plan create the non fossil fuel energy which can reduce the carbon dioxide emission. "In the 12th Five-Year Plan adopted by the Chinese government in March 2011 devotes considerable attention to energy and climate change and establishes a new set of targets and policies for 2011-2015. While some of the targets are largely in line with the status quo, other aspects of the plan represent more dramatic moves to reduce fossil energy consumption, promote low-carbon energy sources, and restructure China's economic development. Another goal is to "gradually establish a carbon trading market." main targets include: 16 percent reduction in energy strength (energy consumption per unit of GDP) and

increasing non-fossil energy to 11.4 percent of total energy use; and 17 percent reduction in carbon intensity (carbon emissions per unit of GDP)” (Lewis 2011: 1).

Lewis moves further: “includes a target to increase non-fossil energy sources (including hydro, nuclear and renewable energy) to 11.4 percent of total energy use (up from 8.3 percent in 2010). While not formally enshrined in the 12th FYP, one more recent notable announcement is a cap on total energy consumption of 4 billion tons of coal equivalent in 2015. To get together meet the cap on energy consumption, annual energy growth would need to slow to an average of 4.24 percent per year, from 5.9 percent between 2009 and 2010 years. The government is also trying to slow GDP growth rates, targeting 7 percent per year – far below recent growth rates. Lower GDP growth rates make it even more challenging for China to meet energy and carbon strength targets, since energy and carbon need to grow more slowly than GDP for the country to achieve declining energy and carbon” (Lewis 2011: 1).

#### **The Three New Chinese Dams on the Yarlung Tsangpo (Brahmaputra) River:**

As per Article China built dams: “China strategic interested diversion of on the Brahmaputra river basin is important river basins in Tibetan region which will be fill the gap Chinese electricity and irrigation problem in the southern Chinese region. China is building three more dams on the Brahmaputra river basin in Tibet. Chinese government allows building the three new dams on the Brahmaputra river basin such as Dagu, Jiacha and Jiexu. China makes the Pondo Water Control Project is located on the Lhasa River, a tributary of the trans-boundary Brahmaputra River. There is massive size has led to it being called “Tibet’s Three Gorges Dam.” Construction on the project began in 2008. It includes a reservoir that will irrigate 43,520 hectares of farmland and a hydropower plant that generates 599 million kilowatt hours of electricity a year. It has cost an estimated \$728 million USD. The three new dams have been approved by the State Council, or Cabinet, under a new energy development plan for 2015” (China built dams, The Hindu, January 30, 2013).

China begins to build these three major hydropower dam on the middle reaches of the Brahmaputra River. The government plan, “will push forward vigorously the hydropower base construction” on the mainstream of middle reaches of the Yarlung

Tsangpo river. The government is decided to construct of the capacity of 120 million kilowatt of hydropower, during the period of the twelfth Five Year plan period (2011-15) (Dams across Brahmaputra, The Hindu, February 2, 2013).

The article moves further and argues: “the government has shelved a long-discussed plan to divert the Yarlung Tsangpo’s waters to the arid north, citing technical difficulties. The plan is part of the proposed Western route of the massive South-to-North Chinese diversion project, on which construction is yet to begin. Chinese officials exposed and analysts say a diversion plan is very unlikely, considering the difficult terrain and technical problems. Though, with the three new approvals under the energy plan, four hydropower projects will now be built — all located within a few dozen kilometers of each other — on the mainstream of the middle reaches of the Brahmaputra” (Dams across Brahmaputra, The Hindu, February 2, 2013).

The dam is called Dagu, which is built on upstream of Zangmu and it has length less than 18 km. It has 640 MW capacity. Another 320 MW capacity of the dam will be built at Jiacha, which is built on the middle reaches of the Brahmaputra at Zangmu. A third dam called Jiexu, which is built on the 11 km upstream of Zangmu. The capacity of this dam still not confirmed. These three dams built under the Chinese 12<sup>th</sup> five year plan (2011-2015). As Chellaney assement: “China, the world’s most ‘dammed’ nation today” (Chellaney 2011: 61). Now, China has more dams in comparison to any other dam in the world. (See below the map of three new dams on the Brahmaputra River Basin)



Source: the Hindu April 5, 2013, New Delhi

The government of China has published about her greedy interest of the diversion of the Brahmaputra River to Northern part of China. India has also the right of water of Brahmaputra. But, China did not want to share the water of Brahmaputra River. In order to deny maximum water to India, China is planning to build four new dam projects on the river in the region of Tibet. China is working on this project on the majestically fast and ignores the international pressure. In the context of India's intention, Himanshu Thakkar highlights: "Government of India also wants to build the dams on the Brahmaputra river basin in Indian Territory in Arunachal Pradesh for her strategic interest which will help of Indian energy supply and other kinds of water demands in the north eastern Indian region. While China has started more work on Brahmaputra river to divert the water to help south north water diversion project. As well Indian intention on Brahmaputra River is good for Indian states, if India will do" (Himanshu Thakkar 2013).

China's vicious intension to built dam on Brahmaputra River will create the problem of livelihood and water crisis for the people of India and Bangladesh. This will create a new era of dispute between China and other South Asian countries. China does not

work as per international treaty that could help China and other South Asian countries. Due to non acceptance of The UN Convention on the Law of the Non-Navigational Uses of International Watercourses by India and on the other hand, China is not a member of this convention, otherwise the situation could be better. In context of the benefit for India, it could be necessary to pressurize China for a water sharing treaty with India and other South Asian Countries.

On the issue of environmental concerns, Himanshu Thakkar rightly pointed out: “In current scenario every country should focus on climate change issue, it is a more sensitive issue for the whole world. At present, climate change becomes a topic of discussion, there is some rule followed by some countries to protect the environment. Everyone has been making for their own development project; these kinds of project are impacting the environment to ignore climate change impact on worldwide. In Asian region many hydropower projects are working on, it is planned by many Asian governments which want to accelerate their economic growth. These kinds of things are help for their manufacturing project such as townships, roads, tunnelling, blasting, mining, manure dumping. Making dams and reservoirs are diverting the water from the main river basin; it will affect such terrestrial biodiversity, the glaciers, aquatic and communities, forests, water availability and water supply, these kinds of things will become more dangerous during climate change time” (Himanshu Thakkar 2013).

The Chinese policy for the more construction of the dam on the Brahmaputra/Yarlung Tsangpo is becoming a hot topic among many environmentalists. The Chinese policy in the context of the construction of dam could affect the South Asian Countries, because the economy of these countries is based on river. And, the constructions of dams on the Brahmaputra will create social, economical and environmental chaos among these South Asian Countries. This issue would become a bone of contention in the context of political and diplomatic issue between India, China and Bangladesh. As Gleick rightly pointed out the Chinese argument and counter argument in the context of the construction of the dams: “One of the strongest and most consistent arguments made by project proponents has been that the electricity produced by the dam would otherwise be produced by dirty Chinese coal burning power plants, with their serious environmental impacts. One of the strongest and most consistent arguments made by

project opponents has been the huge scale of the environmental and social transformations of the watershed of the Yarlung Tsangpo/Brahmaputra river basin both upstream and downstream of the dam itself. These major questions are addressed here” (Gleick 2008-09: 141).

**Ecological Issue:**

As per Asian Development report, “river sediment is a major threat that could undo all the positive effects the dam is supposed to get bring. Sediment builds up from the natural flow of the river will slowly cause the water level in the reservoir to rise - potentially flooding low-lying parts of the river basin area. Rising water levels could eventually transform the Dam into a massive waterfall. Millions of the people who live downstream states of the dam like India and Bangladesh would be endangered by overflow and destroy the region. The dam plays the role like war and disaster” (The Asian Development Bank and Dams fourth part: Dam impact and Effectiveness ND: 65).

The report moves further and argue, “Dams building have to change part of the river ecosystems and loss biodiversity, in the upstream and downstream region states. The unscheduled releases or discharges of water from dam’s reservoir result in sudden changes in water climate disrupting seasonal migration patterns of fish and wildlife and destroying plant life in the region. The blocking of dams of the silt rich in nutrients is depriving fishes, and also not finding its way downstream for agriculture in the river basin. All these modifications and blocking during and after construction of dams, affect the resources available for land and riverine based productive activities, such as agriculture and fisheries and other purposes” (The Asian Development Bank and Dams fourth part: Dam impact and Effectiveness ND: 65).

The construction of three new dams on the Brahmaputra River has bad environmental impacts. It will severely damage the population of endangered species in this area, water quality and quantity, and could be increase the amount of possible earthquakes and landslide in the area. Brahmaputra River is the home of some endangered species like dolphin and other kind of species, and due to construction of dam on the river Brahmaputra will cause the drastic reduction of these endangered species. And that’s why it could have majestic negative impacts on the ecological balance.



**Societal Issues:**

The Asian Development Bank report has rightly pointed out that the construction of Dam would have the negative impact on the indigenous population: “indigenous people and distorted the riparian ecosystems of upstream and downstream thus affecting the resources available for land-and-riverine-based productive and economic activities where affected people depend their traditional livelihoods like agricultural production, fishing, livestock grazing, fuel wood gathering and collection of forest products” (The Asian Development Bank and Dams fourth part: Dam impact and Effectiveness ND: 59).

The Report moves further, “there are about 40-80 million people who have been forcibly expelled or displaced from their homes to make way for dams. The impacts of dam-building have been particularly disturbing in Asian, African and Latin American region. Large dams in India and China could have displaced between 26-58 million people between 1950 and 1990. The construction of the world’s largest dam, the Three Gorges Dam in China, the level of displacement has increased substantially” (The Asian Development Bank and Dams fourth part: Dam impact and Effectiveness ND: 59).

Moving further, “most of the physical displacements due to dam-building is involuntary and engage coercion and force, and in a few cases even caused the lives of people. A million people have lost their lands, livelihoods and access to natural resources. The timing of these social impacts varies, depending on the close causes. In the case of loss of home and livelihood due to the build of a Dam, the social impacts are immediate in the region. The implications for downstream livelihoods, however, are palpable only after the completion of the dam. The scale and extent of impacts will vary depending on location, size and other dam characteristics such as submerged area and population density in the river basin region. In many cases in densely populated tropics large dams will lead to both physical and livelihood displacement. The damming of the upper reaches of the Yarlung / Brahmaputra River affecting the livelihood like fisheries and agriculture of the downstream people in India and Bangladesh” (The Asian Development Bank and Dams fourth part: Dam impact and Effectiveness ND: 60)

Moving further, “the impacts of Yarlung/Brahmaputra dam-building not only spilt the riverine ecosystems, but also physically displaced and deprived indigenous people from the river systems where they depend on their traditional livelihoods. On a deeper insight, their physical displacement from the river system also alters their cultural way of life. Indigenous people are victims whose have no lands-no titles-no compensation resettlement practices” (The Asian Development Bank and Dams fourth part: Dam impact and Effectiveness ND: 60).

**Political Issue:**

India and Bangladesh may face worse and more water crisis due to Chinese policy of diversion of Tibetan water diversion by china. Apart from that, there is a speculation among Indian think tank that the China has a plan to build the dam on the Yarlung Tsangpo. This proposal based on Gao Kai and Li ling, who wrote a grand project of the Tsangpo diversion in their book called Xizang Zhi Shui Jiu Zhongguo (Save China through Water from Tibet). If we closely analyze the location of dams, there are valid reasons to believe the speculation of water diversion would be carried out in near future. Although, such a massive project will also have undesirable social and environmental impact in Tibet as well as regions of downstream states.

In the context of political issue, Harun Ur Rashid pointed out: “The Brahmaputra / Tsangpo River has always been considered as the source of fresh water for both India and Bangladesh and it divides into hundreds of channels in Bangladesh to form a vast delta which flows into the Bay of Bengal. Now India has awakened up of its rights when China wants to divert waters from the Tsangpo / Brahmaputra River. China is reportedly doing the same thing with India as India did with its trans-boundary rivers in relation to Bangladesh. Furthermore several Chinese projects in west-central Tibet have a bearing on river-water flows into India but China refuses to share information with India. The same tactics India adopted with Bangladesh are likely now biting India China does not find it necessary to consult, discuss and sit down with India in the proposed diversion of waters from the Tibetan Plateau. There cannot be one rule for India and China and another in India and Bangladesh” (Harun ur Rashid 2009: 1). Now, it is a fact that most of the speculation regarding China’s plans to exploit the water resources of Tibetan rivers is implemented. That’s why, this is the right time for

the government of India and Bangladesh to pressurize the China to stop such mindless projects.

If India and Bangladesh fail to stop the damming of Brahmaputra/Yarlung Tsangpo river water by the China that will be more effect in India and Bangladesh livelihood. So they go into negotiation with the Chinese government of right solution which will not be an effect of downstream livelihood, it is good for regional stability.

Indian scholar and international studies analyst Dr. Brahma Chellaney, has been quoted that the upcoming war between India and China due to sharing trans-boundary water resources. While water issue could emerge as a major threat to Sino-India relations given rapidly rising demand, competing water usages and threats from climate change, the 'water wars' narrative has been overblown (Zhang Hongzhou, 2015).

The Grand Western Water Diversion Plan:

The Grand Western Water Diversion plan is a brain child of the Chinese water expert-Guo Kai. This plan includes the diversion of water from the six rivers in south-western region of China, including the Brahmaputra River, which also flows into India, after Tibet- to divert the water scar areas of northern region of China. We all aware the fact that if the water of Brahmputra is diverted, the water levels of the Brahmaputra will drop naturally, and create water crisis in the North- eastern part of India. At the very first glance, it seems that India's worry is very must justified. Due to China's severe water crisis, China is strongly motivated to divert water of international river for own purpose. On the basis of China's previous record, we can assume that China could do anything for her gain. "it is a serious mistake to believe that the Chinese government would implement the plan given the following reasons: Firstly, despite the fact that China is a one-party state, competing interests prevail among different social groups and even between different government entities; hence the opinion of a few scholars and even retired officials cannot represent the policy preference of the government. Apart from strong criticism from the mainstream scholarly community, on several occasions, the Chinese government has clearly stated that China has no plans to divert water from the Brahmaputra River to the Yellow River. In addition, China claimed that it would not do anything that would harm the interests of the lower riparian states including India. Secondly, many outsiders wrongly perceive the Grand Western Water Diversion Plan as the western line of China's South-North water diversion Project which intends to link the headwaters of the Yangtze and Yellow rivers across the high-altitude Qinghai-Tibetan

Plateau. While both the eastern line and central line of the South-North Diversion project were completed, the western line remains largely conceptual. Considering its grand scale and potential ecological, social and environmental impacts many experts feel that the western line may ultimately prove impossible to build. Thirdly, Chinese scholars and even government officials have become more aware of the futility of water diversion projects to meet China's water shortages. As stated by China's former minister of water resource, Wang Shucheng, solutions lie in the development of a water-sustaining society; water diversion projects are not only costly but also aggravate current ecological and relocation problems. Furthermore, with declining costs of water recycling and desalination technologies, the western route could turn out to be economically unattractive, not to mention the massive Grand Western Water Diversion Plan. Lastly, given the potential negative impact of the Grand Western Water Diversion Plan on China's relations with its lower riparian neighbours, particularly India, it is even more unlikely that the Chinese government will seriously consider the Grand Western Water Diversion Plan. This is especially the case under Chinese President Xi Jinping's New Foreign Policy Doctrine of bringing amity, security and common prosperity to its neighbourhood".

Zhang Hongzhou puts forward the counter view in the support of China and he argues, the --- misperception of the Sino-India water dispute is China's uncooperative attitude towards trans-boundary rivers issues, arguably reflected in China's passive role in international water governance and its reluctance to cooperate with downstream countries. Indeed, China's engagement with the global water governance regime is very limited. China voted against the adoption of the 1997 UN Watercourses Convention (UNWC) and it is unlikely that China will sign up for the convention in the near future. Besides, at the regional level, China also appears to be quite uncooperative in terms of trans-boundary river management. For years, China has been criticised for being absent from the Mekong River Commission and turning down binding water agreements with India. Although it is true that China needs to cooperate more with neighbouring countries on the trans-boundary river issues, it is unfair to label China as the uncooperative water hegemony". Moving further, Zhang Hongzhou argues: "Firstly, for many years, data and information related to water, land and other critical resources which have been considered state secrets, have not been made open even to the domestic audience, not to mention foreign countries. Nonetheless, what should be noted is that these areas are gradually opening up. China has become more willing and open to share hydrological data with neighbouring countries including India. Precondition for closer

relations Secondly, China's vote against UNWC is not without its reasons: (a) 1997 UNWC's emphasis on responsibility at the expense of the interests of upper riparian states; (b) conflict between mandatory involvement of third party in dispute settlement and China's long tradition on bilateral approach to dispute settlement; (c) national sovereignty and national security concerns. Thirdly, contrary to common belief, China is party to some 50 treaties governing or related to its shared water resources, though most of the treaties are not water sharing agreements. Fourthly, according to Professor Patricia Wouters, a study which compares China's trans-boundary water treaty practices with approaches adopted under the UNWC shows that China in fact embraces the fundamental cornerstone principles of UNWC—the overarching duty to cooperate, the norms of equal and reasonable use and due diligence obligation not to cause significant trans-boundary harms—despite the treaties' vague content. Besides, China's aversion to a UNWC's third party compulsory dispute settlement is linked to culture and tradition. However, what is clear is that both UNWC and fundamental principles of Chinese foreign policy—Five Principles of Peaceful Co-existence—stress peaceful resolution of international disputes. If history can serve as a guide, based on China approaches to trans-boundary water disputes management with Russia and Kazakhstan, a warming bilateral relationship is the precondition to closer cooperation on the water issues between China and India” (Zhang Hongzhou, 2015).

### **Potential Factors for Water Intervention**

The problem of massive water shortages could force both India and China to "securitize" the water sources and that could lead to tension among both the countries. The idea of diversion of the water of Brahmaputra river was first mentioned in the International Conference of Global Infrastructure Fund in Anchorage, Alaska, in 1986. And Li bring this issue in the public domain after the publication of his seminal the book called “Tibet's waters will save China” (Li, 2005). In the lieu of this, the people's daily in 2003 informed the masses about the study of the feasibility of the diversion of the Brahmaputra River (Hughes, 2013). In the justification of the Chinese policy, Adamas pointed out: “China is not secure in water, meaning thereby uneven distribution of waters within its territory. For having a massive South North water diversion project, China had made an aggressive attempt by diverting the water of the river that has caused the deterioration of the harmonious relation since 1962. The unbelievable growth of Chinese population and growing urbanization has aggravated the greatest concerns of the country. The requirement of water in urban areas is

projected to increase by between 65-100% over the next 20 years. China's hydro projects and water requirements are bringing the country into conflict with its neighbours. There are already rising conflicts between the water demands of agriculture, energy and cities" (Addams et al., 2009). As per available data, China has only 7% of world's fresh water, which has to meet the needs of 22% world's people. Beside this, the water resources of China are not equally distributed. Due to the economic development plan, the ground level and water resources is severely gross levels of water contaminated ([http://news.qq.com/a/20130821/001282\\_all.htm](http://news.qq.com/a/20130821/001282_all.htm)).

As per Walker and Young: "the decreased water flow and the environmental impact together have impacted the irrigation practices and local livelihoods further compounding the intensity of the problem. The continuing melting of Himalayan glacier as a result of climate change, drying up the Brahmaputra river have palpable impact upon human health, water availability and rise in water-borne diseases. Mudslides caused by glacier avalanches are also on the rise. The greatest hazard of all comes from seismic activity. Climate change has brought about main environmental problems on the Tibetan Plateau and in the river basins: snow lines creeping higher, accelerating glacier melt (on average 200 to 500 meters retreat over the past 20 years) and widespread desertification and degradation that have turned vast swathes of the river basin into sandy dunes" (Walker et al., 2014 and Yong, 2010). Ma Jun, author of the renowned book on China's Water scarcity has explained: "In some regions, the environmental capacity is very low, and the groundwater is now quite depleted. We have either to change our livelihoods, or make space for natural restoration to happen. We have to recognize that in certain parts of our earth, existence is fragile" (Jun, 2004 and Christina, 2010). Due to the industrial and agricultural waste and untreated sewage, the ground water is unusable. As per CIA: "the Brahmaputra flows through some of the most heavily disputed and unstable areas in South Asia. China and India currently dispute 83,000 K.M within the basin. Alluvial or "Char" land that is exposed as a river shifts often leads to dispute, as the land is highly valued for agriculture" (CIA, 1998 and IBRU, 1999). According , "both China and India are water-stressed economies. The spread of irrigated farming and water intensive industries have led to severe struggle for more water. Both are in the era of perennial water scarcity. A large population, water shortages, ineffective water sharing and rising demands of middle class call for a stable source of water supply between two nations. Melting glaciers badly affect rivers originating in the Tibetan Plateau which leads to tension. In order to overcome hydrological unevenness, projects like the "South to North water diversion" was first proposed by chairman Mao in 1952 to reduce water shortages in the cities like Beijing

&Tianjin. Later on faced with acute water shortage, China proposed for water diversion projects namely- the South-North Water Diversion Project and the Great Western Route Diversion Project. There are two components behind the planning of Yarlung projects. (i) to generate hydro Power (ii) to reroute the Brahmaputra's water to the dry yellow river in the North Western provinces of Xinjiang and Gansu. Tibet is the second largest province of China after Xinjiang. The existing water resources in Tibet are estimated to be 40,000 times higher than in China" (<http://www.tibet.net/en/pdf/diirpub/environment/4/chap-2.pdf>). Tibet is the source of most of north- eastern Indian rivers. It is the world's largest fresh water resources after the polar glaciers (Chellaney, 2009). "The Tibetan Plateau is the principal Asian watershed and source of ten major rivers. Four of the world ten rivers the Brahmaputra, Indus, Yangtze and Mekong have their head water on Tibetan Plateau. China's intensive farming requires water. Now China is emphasizing upon massive inter-basin and inter river water transfer projects. China wants to re-route Brahmaputra water northward before the river enters India. The Brahmaputra is also the source of freshwater for China. The increased demand of fresh water has prompted the construction of dams and barrages by way of artificial structures" (Rashid, 2013). Moving further, "China foremost desire is to reduce its reliance on fossil fuels. To meet future demand for energy, China strives for doubling its electricity generating capacity from 960 gigawatts in 2010 to 1,900 GW in 2020. Huge hydroelectricity projects for energy & water diversion schemes for food sufficiency are strategic to China's growth path" (Sinha, 2012). Moving further, "the high dependence on coal has also given the dubious distinction of being world's top emitter of green house gases. This factor demanded to think again on the "Scientific Development Concept" for a balanced and sustainable development. China's new energy policy then emphasized upon hydro and nuclear power. The extraction of Tibet's untapped natural resources are supposed to fuel the economic engines of eastern China which will make backward Tibet forward, ensuring economic integration and stability. Increasing hydropower resources facilitates China to reduce the income gap between China's eastern provinces and its western regions. Selling electricity to its neighbours promotes cross border integration, which benefits the western China development programme". Beside this, Tibet resourceful for the attainment of the energy, most important reserves of uranium, borax, chromite, lithium, copper, zinc, iron etc., are found in the Tibet Autonomous Region (TAR).

The management, development and exploitation of water resources has become a crucial factor for the national development of a country. This importance is not only relevant to the internal factors of the country but also has external implications. The most important motive

for China to pursue and implement projects on management of water resources, aggressively, is the urgent need in certain parts of the country for this incomparable resource. The water crisis present in the western and northern parts of China is a major precondition for its assertive stance. For a country like China, one of the major powers in the world and yet developing, hindrances to development becomes a point of contention and hence its aggressive and steadfast stance. From this point flows its clash with other riparian countries in South Asia. The issues of river diversion leading to widespread environmental impacts, reluctance or even refusal to water sharing with lower riparian countries, stem from China's need to fulfil its requirement to provide water to semi arid areas within the country. This steadfast attitude has been viewed as the need by China to maintain its commanding position in the South Asian and Southeast Asian region. The insistent and continuous dam building on China's part, which has gotten more and more ambitious, has also brought the country to the verge of armed clashes with other countries. The social impact comes in the form of displacement of indigenous population in the areas where the dams are being built, and from whom China has also attracted dislike.

Thus, in advancing its own interests, China has succeeded in presenting itself as a hostile power towards the other countries in the region. While it's cooperative attitude has been visible with countries with which it shares warmer bilateral relations, China should be more forthcoming and cooperative in discussing bilateral issues such as water sharing in order to shed its assertive stance.



## Chapter Four

### **Diversion of Yarlung Tsangpo River impact on India**

A lot of India's water requirements are met by rivers which originate from Tibet. One of the major river basins shared by India and China is that of the Brahmaputra River while Indus and Sutlej are the other major ones.

Being neighbouring countries of Asia, India and China share a vast physical boundary. Since the river originates in Tibet, China has built many dams on the initial stretch of the river. This has created long-standing issues between the two countries. Since India is one of the downstream states, these dams create major water crisis for India. India and China both being really big emerging economies, this situation creates a strenuous relationship between them. Being strong competitors on global and Asian level, this is of great significance for both of them. Not just India, but this trouble extends to many other downstream countries like Sri Lanka as well.

To get a complete and holistic understanding of Brahmaputra's hydro-politics it is important not just to know Brahmaputra's biophysical characteristics and the changes in its stream-flow but also its social, historical, political and economic background.

#### **Yarlung Tsangpo's (Brahmaputra) Physical Geography:**

The Brahmaputra river has its origin point at an elevation of 5150 m among the glaciers that lie to the east of Mansarovar Lake. This river then flows downward and reaches the Himalayas close to Namcha Barwa at 7755m and then crosses Arunachal Pradesh through Dihang gorge. This river also known as "Tsangpo" in Tibet is brought down to 135m above sea level at Sadiya.

Flowing to the west in Assam till Dhubri (28m), the Brahmaputra takes a clear southward turn as it penetrates Bangladesh. Since Brahmaputra's catchment area is rich in rainfall, it has multiple tributaries along both its banks in Assam valley. As all the tributaries are of considerable size, Brahmaputra receives a huge amount of water and sediment from them. There is a lot of instability in the regime of the river caused by the constant silt movement. This is also the cause for the creating of sandy shoals and the regular sifting of its many channels. The channels get highly braided during rainy season as the river changes course

from one bank to the other and there is a strong turbulence with huge haul of silt over a width of 10 kms.

This magnificent river is also highly ill-famed for major erosion of river banks as well as regular flooding. The floods are such a nuisance as they affect, on average, about 1 lakh hectares of land annually. With the highest annual discharge of more than 65 Lakh cumecs (Pandu, close to Guwahati) and its low being 4210 cumecs, this river also contains Asia's biggest river island of Majuli which is bounded in the north by district of Lakhimpur and in the south by the district of Jorhat. Tributaries like Tist, manas, Subansari and Raidak are drawn to the right bank of the river while ones like Kappili, Dhansiri and Kalang are drawn to its left bank after crossing Pasighat (Majid Hussain 2012).

### **Shifting Courses of the River Yarlung Tsangpo (Brahmaputra) and Alternations Made to its Course of Flow:**

Before joining the Padma (Ganga) river to create a new stream known as Jamuna in two districts of Bangladesh by the name of Jamalpur and Rangpur, the Brahmaputra river was discharging its water into a river called Meghna as it flowed through Mymensingh (appx. 250 yrs ago). This was a major change of course for the river and is mostly associated with the 3000 cm rise in the forests of Madhopur between 1720-1830 AD. A thin channel of this river still flows along the original course and is called by the same name. Geologists claim that during the initial days, the huge river of Myanmar called the Irrawaddy river was carrying huge amounts of water through China but later the Tsangpo River was captured by a small stream flowing on the Himalaya's southern slopes, thereby contributing the evolution of today's river Brahmaputra.

Another example of this kind of river capture is of a tributary of Brahmaputra called Kapili. The above mentioned river, Meghna, in old times originated from the ranges between Manipur and Meghalaya, called Brail ranges and flowed downward to contribute its waters in the eastern section of Bay of Bengal. The northern course of this river was captured by Kapili by head water erosion, thus helping the formation of one of the popular rivers called Jamuna of Assam. The proof of this occurrence can be seen in the valley of Lumding-half long pass.

The rivers can shift their courses due to various reasons like twisting paths of rivers, Malda gap getting downwarped, floods straightening the courses of rivers uplifting of area like Barind and Potwar Plateau among many others. Another cause of impact on the drainage system of Brahmaputra is the high seismicity of the area which expands the susceptibility to erosion as well as landslides. With PRC Tibet getting about 40 percent, India getting about 34 % and Bangladesh and Bhutan with around eight percent, Brahmaputra's basin is divided among these four countries.

### **Socio-Economic Importance of Yarlung Tsangpon (Brahmaputra) basin:**

Being such a huge river Brahmaputra has enormous advantages from hydropower projects to fertility of land. This river's water is the thread that holds the entire's regions agriculture and economy together. With almost 40 crore people depending on this river for their livelihood, the Agro-ecological practices of different communities differ substantially in various parts of the river's basin which also causes many changes in people's livelihood profile. To balance out the strange temper of this river in different seasons, people do not completely depend on agricultural practices but also partake in the control and use of water which is crucial to livelihoods all over the region. Not only this, the river's basin has suffered a social stratification as well with categories like gender, caste and class playing the main points of division.

### **Political Context:**

In an attempt to slowly better its political and economical relationship with many South Asian Countries, China has launched a new economic policy by the name 'One belt One Road policy' which targets to link Asia, Africa and Europe with China by land sea routes (Velare and Van der putton, 2005). At the present moment, the smaller countries like Bhutan and Bangladesh are relatively dependent on India, especially politically because of their weaker diplomatic ties with other nations while China has unstable border contentions with both India and Bhutan which definitely affect the diversion of Brahmaputra by China. Looking at the Hydropolitical situation of Brahmaputra, it is quit obvious that the upstream nations have a one up on the downstream nations in terms of not just the quantity and quality of the river but also its geomorphology. The international relations of this region especially the political aspect has a long history and is still unfolding.

The area from where most of the Asian rivers originate falls under Tibetan Autonomous Region whose water resources are mostly utilised by China. One of the major rivers of this region is Brahmaputra river whose basin covers vast areas in India and Bangladesh. And not just the water resources, China has some other political aspirations to expand her power around the Indian territory which is reflected in China's South Asian String of pearls Strategy. The Gyadar port in Pakistan, Chittagong in Bangladesh and the Humantota port in Sri Lanka are some of the major examples. Being the neighbouring country, it is of tantamount importance to India to balance the power in South Asia. But as long as these developments are not to counter India but rather for the development of the region, it is not arguable. This Policy of China can be compared to the Portugal policy of Blue water in the British period.

Therefore, looking at this wider aspect of the Brahmaputra river, we gain a better insight into the nature of the hydro-politics surrounding this river. The changing course of the river and many modifications done to the river by engineering projects reflect the extent of collaboration collectively undertaken among co-riparian states. It also helps us understand the political-economical ties between the co-riparian states and also highlights the areas of possible and existing conflicts.

The difficulty of managing the water resources does not end with nation level problems but extends to the Indian states as well. The following table shoes the division of Brahmaputra basin in percentage between different states and their respective drainage area (Mhanta et al. 2012).

States	Drainage Area
Arunachal Pradesh	41.88%
Assam	36.33%
Meghalaya	6.10%
Nagaland	5.57%
Sikkim	3.75%
West Bengal	6.47%

The flow of Brahmaputra varies over the year according to the seasons; especially between June to September, which is the monsoon season, and between October to May, which is the lean season. While sometimes the flow of Brahmaputra arises from the Glacial melts of the autonomous region of Tibet but for the major part the maximum flow is created within India by the rich rains, Thus, this variation is of huge significance. The natural changes in the course of Brahmaputra aside, the present set of modifications done to the river (mostly the man-made hydropower dams) have severe impact on the geo-morphology as well as the ecosystem of the rivers. Most of these projects on Brahmaputra are constructed by and in India, Bhutan and China.(Hague Institute of global justice report 2017)

### **Yarlung Tsangpo (Brahmaputra) in India: A Brief History**

The Brahmaputra has played a crucial role in the history of not only Assam but also Arunachal Pradesh. Brahmaputra is not just a physical entity but much more than that. It was on the banks of this river that the great Ahom rule was developed by Ashoka and the great dynasty Varma. It was on the holy feet of Brahmaputra that developed the great Kutchari Chutiya. It is this river that hails ensuing in the court of Bhaskar Varman. It was this river whose outline the Mughals' invading forces followed (Arun kumar dutta 2012).

Brahmaputra river played a crucial economic role for the British imperialists by providing them the means of making contact with the rest of India and consequently the capture of India. So when Gandhiji brought Assam to power with the freedom movement which eventually led to the overthrow of the British and restoring power to the common people. From an active role in making the history of this region to being quiet spectator in prehistoric occurrences and agitations of the region, Brahmaputra has played all roles. The puzzles of the history of thirteenth century still remain unsolved and blurred, if one can claim that Brahmaputra has been the cause of construction of this region, one cannot turn a blind eye to the destruction which it has caused. Sir Edward Gate in his book, "A History of Assam (1905)" tells us stories that reflect a strong and powerful civilisation of Assam, proof of which is also seen in he records of the Chinese traveler Hsansang and the copper straps.

As we discuss the above mysteries, one can not bypass the question as to why so little of the monuments of that age can be seen today. The answer to this major question is that perhaps nature destroyed them along with the men. Since there is no blockage in the land of Bhurbhuri, the heavy snowfall which comes out if this area turns to continuous fresh streams. But one can always overcome this and settle in this area for a short period of time. Due the

damage done to the rocks by cold conditions, it has become possible to construct a house in Guwahati. The bigger culprit of loss is the greenery in this region even though earthquakes come after a substantial period of time, it is still less dangerous. The Hindu temple in this region has only been visited by first infantry encroachers. To mention the unreasonable amount of loss and the Empire of terror of Burmese people in this region is also important. The loss of monuments is such that oldest remains in the valley can be traced back to Ujjala rocks in Heelanchal Mountains

Assam once, in medieval times, wanted to be known as Kamrup, which is closely related to Sati, Wife of Lord Shiva. On the hills and valleys of river Brahmaputra and its tributaries, many tribes had come and gotten settled there in small communities. This had begun as a reaction to the bitter strife which lasted for almost a 1000 years. Because of this upheaval, Kirat society (based on the ethnic culture of South Asian Mongol) was born which had its foundations of Aryan's religious culture. Since Kirat society had indeed constructed a strong empire on Brahmaputra's banks, it adds flesh to the argument made by Dr. S.K. Chatterjee that there was not just aggression which was external but also differences internally dispersed among the people of the community.

The Mongol tribes were not like today's nations and thus had no element or feeling of nationalism to bind them together instead the tibet lived in small communities separate from their neighbours with different warlords. Once in a while a brave local would voice their concerns and ambition and would overthrow these small princely states and become the sole master of the whole state. For the time being when the administration was active and well, the tribal chief was kept in check and prevented but in some generations when the administration was weaker, the chief would do as he wish and become independent. Until the time their plaque was overturned.

Historically, Brahmaputra region has followed the same pattern as Mongols. Often big empires like Pragyotisha which could be considered as the oldest and the most influential was spread beyond Brahmaputra valley expanding somewhat towards Bengal and touched the western boundary of Kortiya river. Ahom tribe, who came later could not challenge them. (Arun kumar dutta 2012)

Historical evidences recorded in stone and copper plates are available from the following region from the seventh century. The area was then known as Kamrup, ruled by the kings of Varman dynasty, among whom the most popular was Bhaskar Varman (643 BC). It was his

reign during which, the Chinese traveler visited the King's court of eastern India who produced a picturesque detail of the state. The Kamrup region has been spread across 27,000 km. The region is situated on lowland and perennially cultivated. The capital has been known for its architecture. Jackfruit and coconut trees are cultivated here, which are grown on a large piece of land. Brahmaputra and other rivers valuable support and sustained the whole economy of empire. The climatic condition of the region is equally pleasant. People nature wise are honest. The people's skin are deep yellow in colour and are short in height. Linguistically, they speak different language than what is spoken in central India and naturewise they are rampant and angry. Their memory is very fast and these people are very clever and writing skill is very good.

Historically, Brahmaputra region has been mentioned in Sanskrit literature around 13th century, though superficially only. Despite this fact, the Brahmaputra region has played a key role in Buddhist policies. One of the most popular ancient city in the region, Pragjyotishpur, was situated on the bank of Brahmaputra, where many fortifications came up in the medieval period. Aryans too must have considered the route of the Brahmaputra River and certainly followed by Mirajumala assailants. The Brahmaputra River provides the safest and the easiest route to access this region which had a dense population. The soldiers would walk along the banks of the river Brahmaputra and clearing clearing the way for elephants, and cavalry in the war.

Instances of aggressive and protective operations alongside the development of strong navy due to voluminous Brahmaputra river and its tributaries are common in Ahom history, which was no less superior than its adversaries. In the process, they became skilled in river navigation. Their greatest success was to discourage the Muslim invaders from time to time. Thirteenth century onwards, the Muslim rulers such as Pathan and Mughal tried at least 17 times to capture the region, without any success. Initially, Ahom was in a strong condition, as a result they successfully repelled any encroachments directly due to strong resistance provided by the local chieftains. In 1227, the Governor of Bengal successfully reached Sadia, moving beyond the river Brahmaputra, but eventually they also had to taste defeat. Subsequently, Tugril Khan in 1257 and Muhammad Shah in 1337 also tried to invade unsuccessfully (Arun kumar dutta 2012).

The Brahmaputra River originates in the Tibetan plateau flowing through the southern Tibet known as Yarlung Tsangpo in Tibet, joins Siang River while it enters Indian

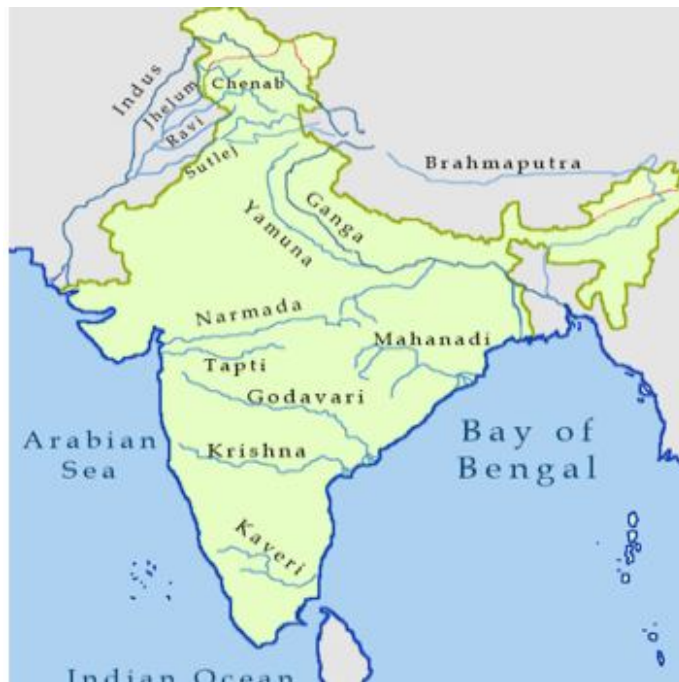
Territory and passes through the Indian states of Arunachal Pradesh and Assam. It enters joins Meghna in Bangladesh and finally drains into the Bay of Bengal. The Brahmaputra river basin is huge, running approximately for 1800 miles passes through Tibet, India, Bhutan, and Bangladesh. Its length in Tibet is approximately 704 miles. *“The Brahmaputra river carries approximately 2.7% of the total world freshwater discharge and is the single greatest source of sediment to the oceans” (Hren, et al 2007: 49).* Brahmaputra is considered as life line for around 625 million people inhabiting in its basin area, most of these people are engaged in agriculture, 80% of them being farmers who are dependent upon the Brahmaputra water for rearing livestock as well as for their crops and other purposes. Bangladesh is mostly dependent upon the waters brought from the Brahmaputra and Ganga river for their agriculture and other purposes (Verghese 1990: 7).

The Chinese government is engaged in building three new dams on the Brahmaputra river basin at a place called as Great Bend, connecting the Yellow river in the northeast end of the Tibetan plateau. Additionally, it is part of Chinese north-south water diversion project. It has resulted in vast displacement of people, salinisation and affected the quality of water in downstream regions of Bangladesh. Such Chinese activities are causing environmental and socio-economic in downstream riparian states.

Indian populations and economy are growing at a high rate in India. Water plays an essential role in human life for the sheer existence of it. Brahmaputra brings that vital water to the life of North-East India and Bangladesh. Same Brahmaputra also causes situation of drought and flood also. It causes every year loss of lives and livelihood. Thus, a better management of Brahmaputra River could overcome such disasters.

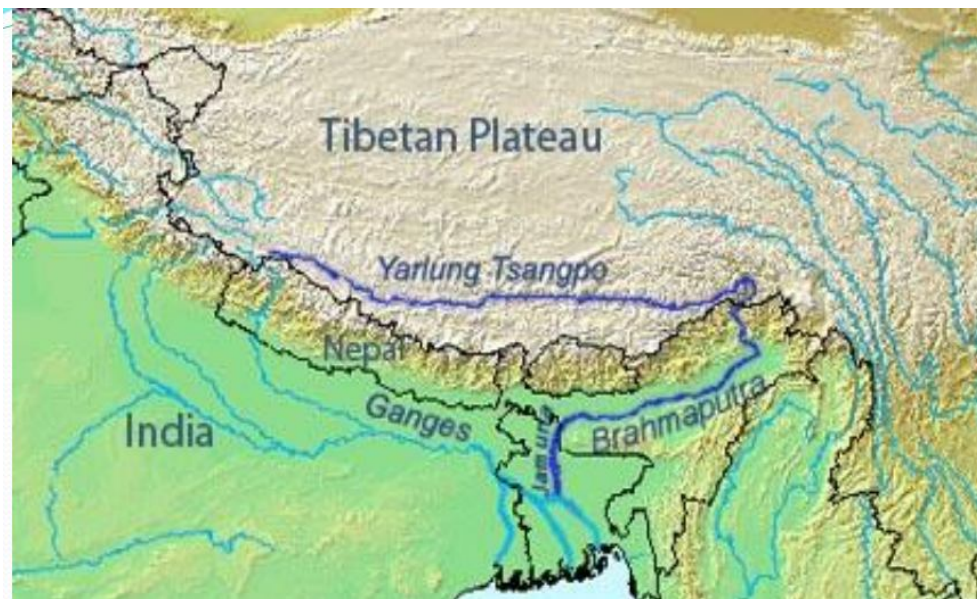


Map 11: Indian river basin:



Source: Meredith Brackett

Map12:Brahmaputra/YarlungTsangpo



Source [http://www.google.co.in/search?gs\\_rn=16&gs\\_ri=psy-ab&suggest=p&cp=12&gs\\_id=1a&xhr=t&q=brahmaputra+river&rlz=1C2CHMO](http://www.google.co.in/search?gs_rn=16&gs_ri=psy-ab&suggest=p&cp=12&gs_id=1a&xhr=t&q=brahmaputra+river&rlz=1C2CHMO)

Currently, the securitization of water and environmental concerns are growing with the ever rising presence of India in world politics. With economic growth the demand of water is also rising. Thus, it becomes imperative that India resolves its transboundary river disputes with its neighbors, securing its own interests. “The total water resources of river systems and ground water in India are estimated at 1900,000 million m<sup>3</sup>, of which 1645,000 million m<sup>3</sup> are in all the river systems, and 255,000 million m<sup>3</sup> are in ground water” (Kayastha 1981: 563). India is a lower riparian state as far as Brahmaputra is concerned. The management of trans-boundary water resources is important key to resolve issues among state such as China, India and South East Asian states which share water originating in Tibetan plateau. India and China never signed any water treaty to resolve the water conflict.

Scarcity of fresh water may pose internal and external security threat to economic growth, social progress, environmental sustainability, food security, public health and trans-boundary relations. India, being enforcing itself as international player, needs to tackle its immediate challenges, of which water security is of utmost importance. Water is robustly connected with the overall development framework in the Brahmaputra basin.

“However, the absence of integrated management of Brahmaputra water resources and lack of coordination among the riparian states constitutes an ongoing threat to the future development plan within the basin. There is the absence of any treaty of Brahmaputra really tough for water sharing between India China and Bangladesh. They have large populations depend on Brahmaputra water resources and Bangladesh mostly affected flood due to the absence of the institutional framework of the Brahmaputra river basin. It is essential to develop an integrated water resources management approach involving all riparian to foster regional development and overcome the prospect of severe water conflict along the Brahmaputra river basin” (Rahaman, and Varis 2009: 2).

Over one billion people living in the downstream are dependent over water flowing down from the Tibetan plateau. The diversion of water by Chinese heavily causes environmental degradation in India’s northeastern plains. China has used water as a political weapon against India. The power projects by Chinese pose an eminent threat to India’s water security. The effort to manage water by building river projects seemed

to facilitate water storage, however, they caused deadly flash floods. The reservoirs obstructed the nutrient-rich sediments that enriched the soil of these regions in reaching the river's delta. This could potentially escalate water war. (Arpi, 2003) China, on the other hand, has hardly any interest in addressing this ongoing water crisis faced by India. Consequently, they cause a great devastation to the ecology and pose a challenge to the economic sustainability of northeastern states of India. The discrete Chinese policy of water utilization has been provocative. Few scholars point out that Chinese thirst for water is extremely self centric and is hardly concerned about the lower riparian states (Sinha, 2012). It makes, Indian farming communities vulnerable and bring them frequent environmental hazards. Ever depleting water resource as well as frequent flooding in few regions have caused crisis like poverty, migration, violence and social instability. It further has given strategic advantage to China over India. A recently published book, Tibet's Water will Save China (2005) openly advocated for the northward rerouting of the Brahmaputra (Chellaney, 2009). It has left India worrying. If water is stored in the upper stream by China, there will be less water flowing, causing negative impacts on industrial and agricultural sectors. By controlling water in the upper stream, China could well exert its economic influence over India. India contends that China interferes during dry seasons as per Water Utility Journal 13 (2016) 95 and discharges water during rainy season as a means to put strategic pressure on Indian state. Thus, so far Brahmaputra's water is concerned India remains at the disadvantageous position. For instance, Beijing didn't care to give any prior information about the construction of the \$ 1.2 billion Zangmu dam on Brahmaputra to the Government of India. Further, China always keeps the issue of river water diversion discrete from India. The continuation of construction of power projects by China will not only cause disturbance in its neighbourhood but also jeopardize the regional stability in South Asia.

### **Flood Impact of Yarlung Tsangpo (Brahmaputra) on India and Bangladesh:**

Floods have a catastrophic impact over human society, bringing all kinds of destruction such as loss of human lives, livestock as well as that of property. Brahmaputra has been known for its disastrous floods in North East India and Bangladesh. "One of the areas

where information sharing is immediately required is in the area of sharing information related to floods in the shared rivers. The governments of many countries in the region seem to have a number of agreements to share information in this regard, including Pakistan-India, Nepal-India, Bhutan-India, Bangladesh-India and China-India, Unfortunately, the shared information on this aspect is not in the public domain” (Thakkar, 2013: 10).

“The valley of the Brahmaputra River covers almost 60 per cent of the state of Assam in northeastern India. The Brahmaputra river (known as the Yarlung Tsangpo in Tibet and Jamuna in Bangladesh), flows 2,900 km from its source in the southern Tibet to the Bay of Bengal, its course taking it through China, India (58 per cent of the basin is in India), and Bangladesh while its catchment area includes Nepal, Bhutan and Burma. The immense river is fed by the southwest summer monsoon, when over 80 per cent of India’s total precipitation occurs. Extremely high, 24 hour rainfall events can occur in parts of the catchment, leading to the Brahmaputra River having one of the highest flood potentials in the subcontinent. Floods are common during the monsoon rainfall; varying from five to 19 floods per season, although floods can develop into social and economic disasters causing loss of life, livelihoods and infrastructure in the region. Flooding is also part of the natural process which creates fertile lands. Indeed, the Brahmaputra valley is one of the most fertile stretches of land in India” (Mathur et al. 3).

“Assam has a primarily agricultural economy with 74 per cent of its population engaged in agricultural and allied activities. Monsoon-based rice production is the principal crop, covering 67 percent of the total cropped area. Nearly 500,000ha of the agricultural land are irrigated, over 50 percent of those from surface flow. Use of fertilizers and pesticides is increasing; fertilizer consumption rose from 14.2kg per ha in 1996-97 to 46.50kg during 2002-2003 and it has been found that pesticides are being used “randomly, without assessment of the pesticide formulation and quantity” mainly by farmers near urban areas who are converting to vegetable crops which are prone to pest attack. Assam contributes up to 55 per cent of India’s tea output, and 15.6 percent of world tea production” (Mathur et al. 3).

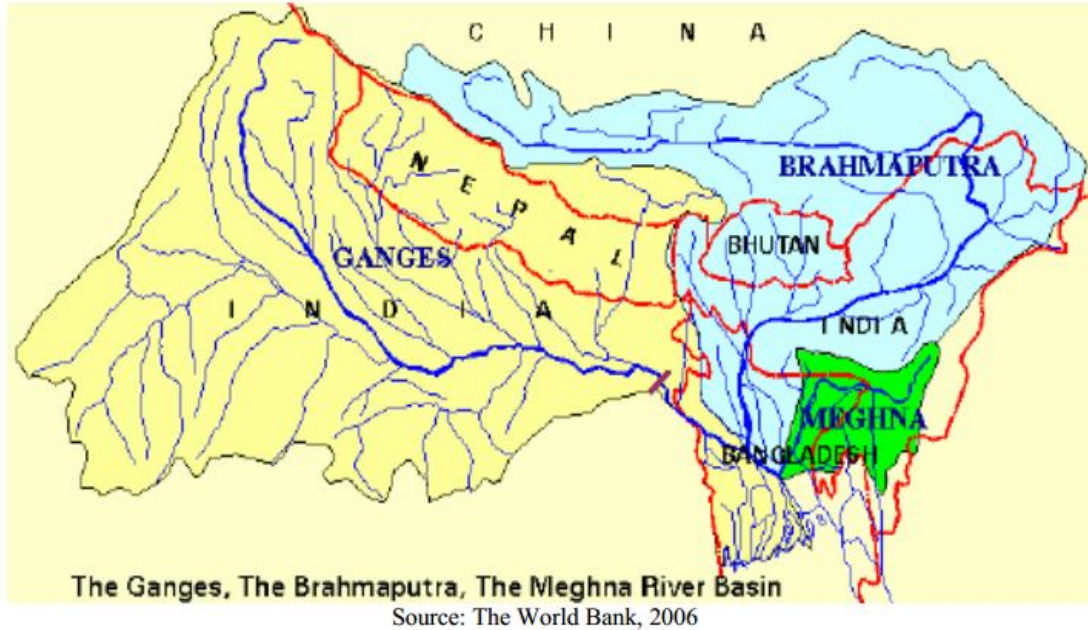
“The State of Assam covers almost an area of 78,438 Sq. Km. The Brahmaputra and Barak valleys, which are named after the mighty Brahmaputra and Barak rivers and two hill districts constitutes the total land mass of the State. The unique geographical location crisscrossed by a vast network of 48 major and 128 small rivers originating from the hills and mountains surrounding the State is largely responsible for the recurring floods and erosion of riverbanks. When the discharge in the rivers along with their tributaries synchronizes during monsoon, the State faces flood havoc and the damage caused is colossal. Further, deforestation in upstream and downstream areas of surrounding Hill States and Assam respectively has caused excessive siltation, resulting in an abnormal rise in the surfaces of major rivers. The siltation problem is acute in the case of rivers of Upper Assam, and Central Assam” (Economic survey Assam 2010-2011: 1).

“The Brahmaputra (Jamuna) river above Bahadurabad has a length of approximately 2,900 km and a catchment area about 5,83,000 sq-km. Started from the glaciers in the northernmost range of the Himalayas and flows east far above half its length across the Tibetan plateau. In the complex mountain terrain bordering northeast India and China it bends through a series of gorges and is joined by a number of major tributaries and the Dihang and the Lohit before entering its broad valley section in Assam. This stretch is about 720 km long to the border of Bangladesh and throughout most of this, the course is braided. This braided channel continues to the confluence with the Ganges, Within Bangladesh, the Brahmaputra receives four major Right Bank tributaries – the Dudkumar, the Dharla, the Teesta and the Hurasagar” (BWDB Annual Report, 2011: 12).

“The first three are flashy rivers, rising in steep catchments on the southern side of the Himalayas between Darjeeling and Bhutan. The Hurasagar River is the outlet to the Karatoya-Atrai river system, which comprises much of the internal drainage of northwest of Bangladesh. The Old Brahmaputra is the main left-bank distributaries of the Brahmaputra River presently known as the Jamuna. The shift of river course appears to have been taken place after a major earthquake and a catastrophic flood in 1787. It is now a high flow spill river contributing largely to flood, as in the Dhaleswari, and their behavior is highly dependent on the variations of siltation at their

entries” (BWDB, Annual Report 2011: 12). (See below map of Brahmaputra with Ganga, and Meghna).

Map 13: flood region



### **Impact of Dam on Ecology of Downstream States:**

Construction of Dams mostly effected the downstream states, its ecology and human life. Downstream states depends upon the upper-stream states for flow of water in their rivers. “Rivers have played a major role in shaping the earth’s physical and ecological landscapes through their unique hydrologic characteristics, as well as shaping cultural landscapes by providing food, water, and other ecosystem services. Negative environmental impacts of dams can occur upstream, downstream, and in reservoirs, in addition to habitat degradation or destruction, dams induce significant barrier effects by blocking the downstream flow of sediment and nutrients and preventing the migration of fish and other aquatic organisms”(Beck et al 2012: 2).

Brahmaputra dam's impacts on Indo-Burma biodiversity hotspots, one of the 34 biodiversity hotspots in the world. There is a serious impact on the livelihood of thousand people living in the catchment areas of Brahmaputra river basin, on the river

that are being dammed, It is feared that the Kaziranga National Park and the Manas National Park, both is established on the lower reaches of the Brahmaputra river basin which is china build the dam on the mainstream of the Brahmaputra as well as on some its major tributaries.

### **Impact on Kaziranga Tiger Reserve:**

“The Kaziranga Tiger Reserve has an area of 1033 sq.km. Which includes the Kaziranga National Park (859 sq.km.), BuraChapori Wildlife Sanctuary (44 sq.km.) and Laokhowa Wildlife Sanctuary (70 sq.km.). The reserve is located in Nagaon, Golaghat and Sonitpur District of Assam and is bounded by the Brahmaputra, and to the South of the KarbiAnglong Wildlife Sanctuary, the National Highway 37 separates the reserve from the said Sanctuary”(Environment and forest Government of India, ND).

“Kaziranga National Park in Assam has to be one of the best places to experience wildlife in India. Located in the floodplains of the mighty Brahmaputra River (YarlungTsangpo), the park's ecology is unique in that it is representative of three distinct bio-geographic regions the Eastern Himalayas, Indo-Malayan and Indo-Gangetic regions. Its location is at the junction of two global biodiversity hotspots - Eastern Himalayas and Indo-Burma. This unique situation has led to very high species diversity, which in turn implies that wildlife watching is quite rewarding here. The National Park's importance in wildlife conservation is among the highest in the world because it is one of the last remaining refuges for a large number of faunal species. It is the largest tract of wet tropical grassland habitat left in the Brahmaputra basin. UNESCO declared it a World Heritage Site in 1985”(Baruah 2006: 1). See below park's importance:

- “About 75% of the world population of Great One Horned Rhinoceros (~1800).
- About 70% of the world population of Asiatic Water Buffalo (~1500).
- Almost the entire world population of the Eastern Swamp Deer (~500).
- Highest density of tigers of any protected area in the world (~17 per 100 sq km).

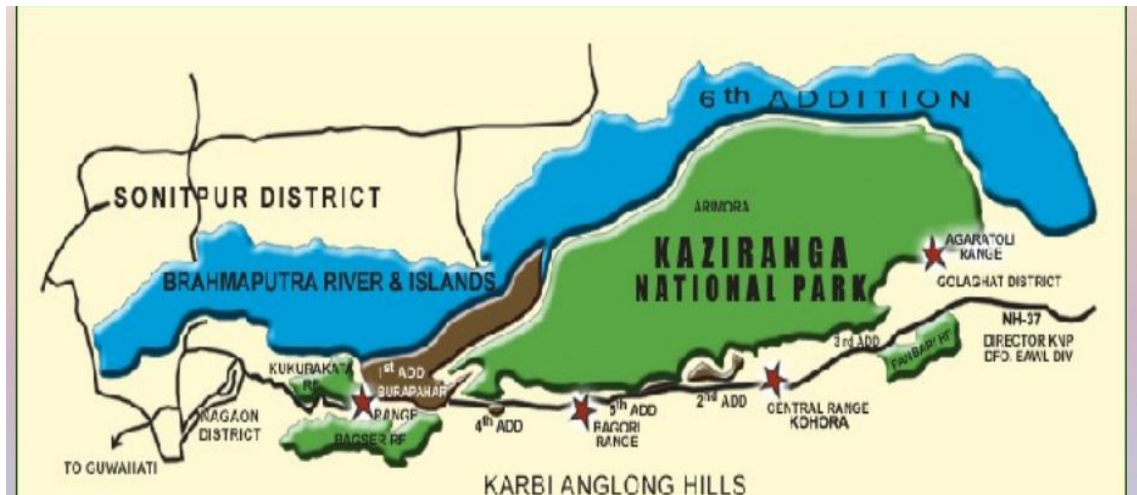
- Highest number of endangered, threatened and near-threatened bird species of any protected area in the Indian subcontinent (46).
- Globally significant population of Asian Elephant (~1200 importance”(Baruah 2006: 1).

The Kaziranga National Park has one of the largest grassland area in the state of Assam. It expands along the 50 km of the south bank of the Brahmaputra river basin. The annual floods in the river replenishes the wetlands and allow the grassland areas to thrive. Every year subsequent area of Brahmaputra river basin has been affected by severe erosion. Satellite data shows erosion of more than 51 km during the year of 1967-68 and 1998-99, whereas silt deposition also consequently resulted into formation of new lands in this area. There has been significant loss of numbers of animals due to floods. During the major floods in the year of 1998 many animals were drowned; for example, carcasses of 39 rhinos, 23 wild water buffalo, 19 wild boar (*Sus scrofa*) and 15 sambar deer (*Cervus unicolor*) have been found. In this subsequent case Hog deer (*Axis porcinus*) has been seriously affected, where 473 deaths has been recorded. Same species were also severely affected during the floods of 1988. Despite the fact, that accurate statistics of flood related mortality were not available, there have been recorded death of 2,900 deer due to subsequent floods in the census of 1991, compared to 10,000 in 1984. The wild boar also has seen a similar decline in their casualties that accounted 555 death in 1991 census compared to cumulative of 1,645 in the year of 1984.

Despite all the odds during the timeframe of 100 years, Kaziranga National Park has been successful in securing the habitat of various endangered species including rhino, elephant, tiger, wild buffalo and swamp deer. These attempts have been successful due to various factors of local, park, state administrative as well. The park managers, Frontline staffs, local communities and the civil society representatives under the guidance of administrative as well as political leadership of the State of Assam played a vital role in achieving this conservation (Mathur et al: 4). Brahmaputra river floodplain also affected the development of Kaziranga National Park. The Brahmaputra inundation have been an inherent and paramount aspect of the Kaziranga ecosystem in maintaining the biodiversity in subsequent region. (See below a map of Kaziranga National Park)



Map 14: Kaziranga National Park



Source:<http://www.assamforest.in/knp-osc/presentation-knp-n7w>

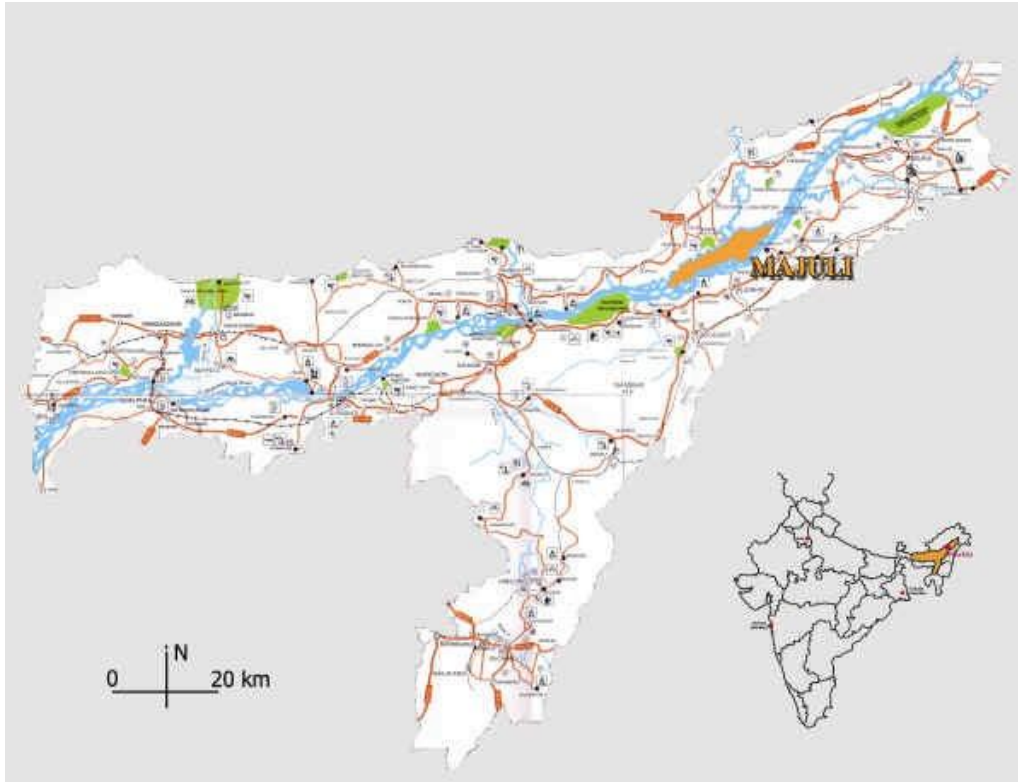
### Impact on Mazuli Island:

Island of Majuli is world famous. “Majuli Island, one of the largest riverine Island in the world situated between latitude  $26^{\circ} 45'N - 27^{\circ} 12'N$  and longitude  $93^{\circ} 39' E - 94^{\circ} 35'$  at an altitude of 60 –95m msl. Majuli, the world’s biggest inhabited River Island is located in Northern part of Jorhat district of Assam. The island is bounded by the Brahmaputra river basin on the South and the river Subansiri on the North-West and KherkatiaSuti in Northeast” (Kumar & Bordoloi Sabitry 2012: 1), the physical status of the island is alluvial. Four boundaries of the islands are natural barriers represented by the mighty river Brahmaputra and the Kherkatia–Lohit Channels. Majuli, one of the world’s biggest River Island was formed during the period between 1691 and 1696. “All of the above the river, its tributaries, the wet lands and the chaporis along with the island of Majuli make it the largest mid river delta system in the world”(Nath, 2012: 16). It is a pollution free fresh water island. Majuli is rich in biodiversity potentialities in the Brahmaputra Valley.

Majuli is the home of many people, they are different communities live together. Majuli is inhabited by different groups of people for instance Missing, Deori, Konch, Kolita, Ahom, Kachari (Sonowal Kachari) Koibatra, Nath (Yogi), Brahmin, Gosain etc. The

different tribes of indigenous people have been living in Majuli with peace, unity and amity, hope since time immemorial. The Island is the nerves centre of Neo-Vaishnavite cultural heritage of Assam state in India. Majuli has been regarded as the treasury of different types of indigenous and traditional culture and typical biological resources. The Good environment, life-style, special traditional food habits & house-types have been a unique feature of human ecology and geographical environment of Majuli (Nath 2012). Environment point of view Majuli is most important island in north east region. There is so many species live. Its area is rich for biodiversity region. Every year destroy the Majuli Island due to Brahmaputra river basin floods which is life line of Majuli Island and some time bad for island when floods came out in the region and destroy the home of people and species live there. (See below Majuli island map)

Map 15: Majuli Island:



Source:[http://www.google.co.in/search?rlz=1C2CHMO\\_enIN501IN502&q=majuli%20island%20images&psj=1&bav](http://www.google.co.in/search?rlz=1C2CHMO_enIN501IN502&q=majuli%20island%20images&psj=1&bav)

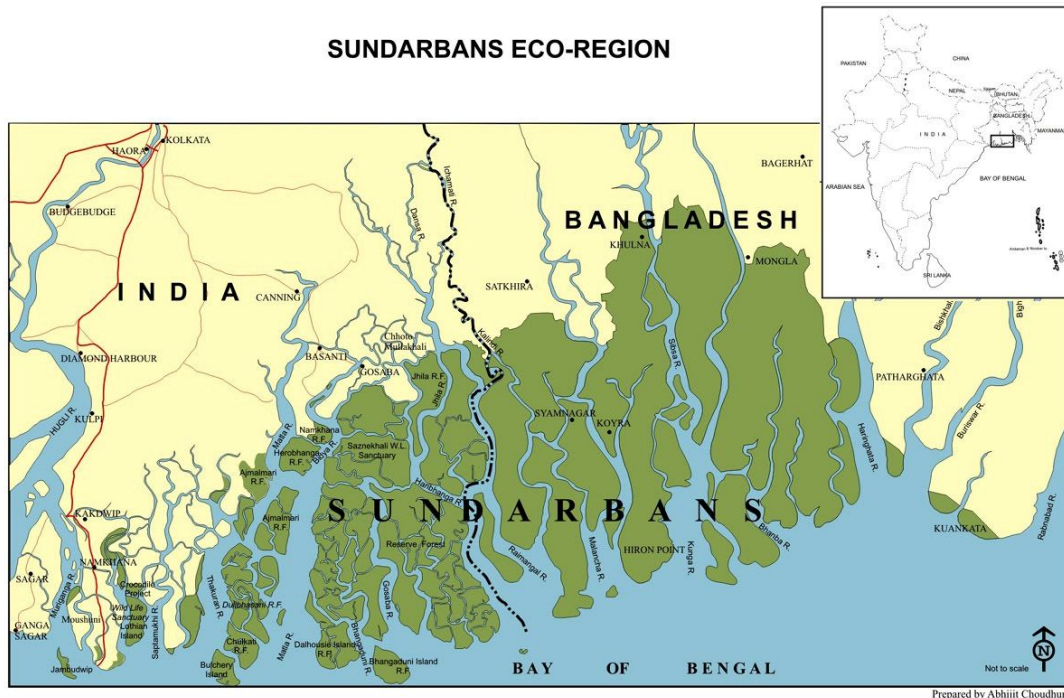
### **Impact on Sundarban Delta:**

Biodiversity of the Sundarban delta is exceptionally superabundant. “Sundarbans is the world’s largest prograding delta region that spreads over India and Bangladesh covering around 25,500 sq. km. The Indian part is approximately 9,630 sq. km, rest of the area covering of Bangladesh. The region consists of 102 islands out of which 54 are inhabited; this area is home to over 3.9 million people”(Human Development Report 2009: 291),the Sundarbans region, following the the Bay of Bengal has developed through quaternary (process that begin around the 2 million years earlier and extends through the contemporary time). Sediments deposited has been discovered primarily in the regions of riversmighty river Ganges, Meghna and, Brahmaputra and their variousother distributaries. Primarily following three river basins (Ganga, Brahmaputra

and Meghna) have built region of Sundarban delta. Brahmaputra River brought sediments from her upper region. This is important for made of Sundarban delta.

One good thing about Sundarbans delta ecosystem step has taken by the government of India. Sundarban has Mangrove forest which is most important for biodiversity conservation. “India has a large grant project in the Sundarbans Mangroves with the West Bengal Forest Department for 300,000 USD. The project is under formalization and the focus of the project is the reduction in anthropogenic pressures on the mangrove forest resources through the provision of alternative livelihoods and income generating options and it seeks to pilot disaster preparedness initiative and reduce the risk of damage to lives and livelihoods from flooding and other related natural disasters that the area is prone to, institutional building/strengthening is also a key component of the project” (Report to the people on Environment and forest Government of India 2011: 6). (See below the map of Sundarban)

Map 16 Sundarban Delta



Sources: [http://www.google.co.in/search?q=india+and+bangladesh+sundarban+delta+map&safe=active&rlz=1C2CHMO\\_enIN501IN502&source](http://www.google.co.in/search?q=india+and+bangladesh+sundarban+delta+map&safe=active&rlz=1C2CHMO_enIN501IN502&source)

Ecology of the Sundarban Delta:

“Presently Sundarbans has cover of 10,200 sq km forest areas which shared between India and Bangladesh. India’s share of this forest area is around 4,200 sq. km and Indian Sundarban also includes around 5,400 sq. km. area outside the forest cover that includes inhabited lands along the north and north-western boundary of the forest. The Sundarban areas are rich in biodiversity and the biotic factors here play a significant role in physical coastal evolution and for wildlife conservation. It has significant ecological implication for marine life and livelihood of coastal communities for a large part of south-east Asia. The Sundarbans includes 26 true mangrove species, 29 mangrove associates, and 29 back mangrove species of 40 families and 60 genera. The mangrove vegetation itself assists in the formation of new landmass and the intertidal vegetation plays an important role in swamp morphology” (Human Development Report 2009: 294).

### **Faunal Diversity in Sundarban:**

“In terms of faunal endowment Sundarban is famous for Royal Bengal Tigers. It is the only mangrove forest in the world that lives tigers here. It is also the single forest areas tract where the largest number of tigers is found. As per December 2001 census, the number of tigers in Indian Sundarban is 271. It is also home to a good number of globally endangered animals like estuarine crocodile, and fishing cat, and Gangetic dolphin, olive ridley and green sea turtles etc. Several bird species are found including a large number of migrants from the higher latitudes that visit the area in winter. Species composition and community structure vary from east to west, and along the hydrological and salinity gradients. Numerous species of phytoplankton, fungi, bacteria, zooplankton, invertebrates, molluscs, reptiles, amphibians and mammals are also found here. All these make Sundarban a biodiversity hotspot and its conservation is a global concern”(Human Development Report 2009 294).

Following species are worth mentioning here:

- Vertebrate Species = 481
- Invertebrate Species = 1104
- Hemichordate Species = 1
- Mammals = 58
- Reptiles = 55

- Protozoan Species = 106
- Birds = 248

**Species that have gone Extinct in the Last Hundred Years with Human Invasion:**

- Javan Rhino
- Barking Deer
- Wild Buffalo
- Swamp Deer

Region of Sundarban delta is ecologically paramount for India and Bangladesh. Prolific biodiversity of subsequent region maintains its regional ecology. Biodiversity of the following region is crucially significant upon the Brahmaputra River. In the following scenario, where China diverts its full water resources for the utilization of the Brahmaputra river basin, in that case following area would faces sever problems due to a shortage of water resources, upon which biodiversity of its region depends completely.

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**Impact of Climate Change on Yarlung Tsangpo (Brahmaputra) River Basin:**

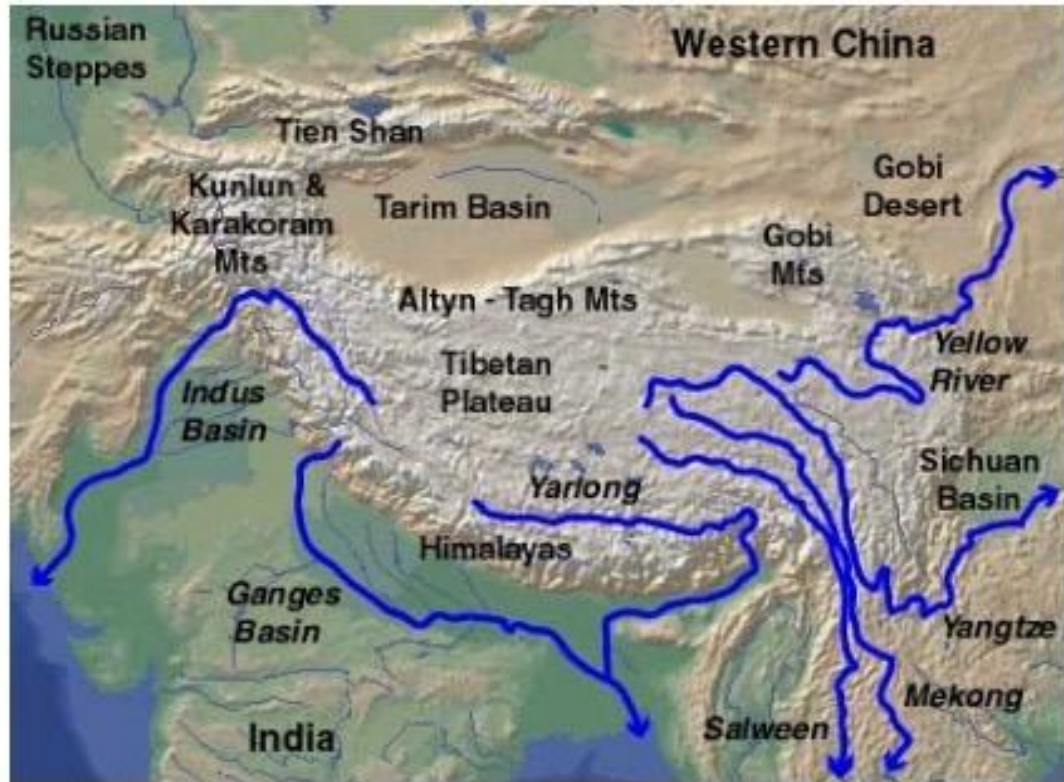
In contemporary times, climate change is of the prominent issue. We are discussing the following issues in the context of the Himalayan Glacier, which is the source of Basin of Brahamaputra/YarlungTsangpo River. Significant question we can ask here is that how climate change influences this region.

The climate can be defined, in its general terms, as cumulative changes in weather over a long period and which is affected not only by its latitude, altitude and terrain, but also by immediate water bodies and their currents as well. Human interference with the available and indispensable resource of nature and as a ramification of subsequent interference, the atmospheres of following region has been rendered as highly

vulnerable and unstable which will affect all spheres of life on the planet in recent future. One of the primary reasons of the global warming has been determined as anthropogenic factors, for example, emission of greenhouse gases that has been primary component and cause of the increase in the global temperature (Bajracharya et al.).

The Brahmaputra is one of the major transboundary river that passes through several nation-state. It originates in the glaciers of the Kailash range in Tibet Autonomous Region at the elevation of 5300m above the sea level. “The river has a length of 2900 km, drains an area of around 530 000 km<sup>2</sup> and traverses four different countries China (50.5 %), India (33.6 %), Bangladesh (8.1 %) and Bhutan (7.8 %). Average discharge of the Brahmaputra is approximately 20000m<sup>3</sup>” (Immerzeel, 2008). “The greater Himalayan region sometimes called the ‘Roof of the World’ is noticeably impacted by climate change. The most widely reported impact is the rapid reduction in glaciers, with profound future implications for downstream water resources. The impacts of climate change are superimposed on a variety of other environmental and social stresses, many already recognized as severe. The ‘Roof of the World’ is the source of ten of the largest rivers in Asia. The basins of these rivers are inhabited by 1.3 billion people and contain seven megacities. Natural resources in these basins provide the basis for a substantial part of the region’s total GDP, and important environmental services, which are also of importance beyond the region” (Mats Eriksson et al.). (See below the map of Tibetan plateau):

Map 17: Tibetan plateau



Source: Human Development Report 2007/2008

Climate change could cause catastrophic natural disasters such as floods, droughts and landslides that will impose significant challenges on the livelihoods of populations of mainland such as India and Bangladesh. Finally, as one of the serious ramifications of the melting of glaciers would “seriously threaten on water availability in the region, particularly during the lean flow seasons when melt water contribution is crucial to sustain the river flow which supports human activities and ecosystem services in the areas and downstream” (Shilpakar et al ND:2). In those regions whose more than 80% of the population's livelihood depends on agriculture, climate change would have a significant social and economic impact.

In contemporary times, climate change is attracting lot of attention around the world. There has been significant pressure on every country to maintain at least a minimum level of emission of greenhouse gases. In this direction, there has been



significant efforts to overcome these challenges and there have been significant number of treaties between various countries that are aiming to cut down the emission of greenhouse gases and maintaining the global temperature. Tibetan water resources would facing egregious catastrophic event, in a scenario where global temperature kept rising, which eventually would cause melting of Himalayan Glacier. Melting of Himalayan Glacier would overflow the Tibetan rivers that would cause severe floods in South and South East Asian region. In the following scenario, dams on the Brahmaputra River poses serious challenges in maintaining the water flow for downstream countries.

China claiming its upper hand on Yarlung Tsangpo River deprives its other co-riparian states to meet their water demands for their social and economic growth. Along with China, India and Bangladesh also are growing economies with increasing population. And Brahmaputra serves life line of such huge number. In such a scenario if any of its streams is diverted leaves great impact on the population residing on the downstream sides. From this above chapter of Diversion of Yarlung Tsangpo River, we can conclude China has been making consistent efforts to divert its water by constructing huge hydro engineering mega structures.

The imprints of the impacts can be traced with often resulting displacement of people, salinization of the water quality in the downstream flows, environmental degradation, flood disasters in the upstream, and drought situation in the downstream co-riparian States. Thus, attempts have been made to chalk out the impact of China Yarlung Tsangpo River's Diversion policy on India in context to its socio-economic development.

## **Chapter Five**

### **Establishment of YarlungTsangpo River's Management Institution**

It is extremely urgent to establish the YarlungTsangpo's institution in order to secure the livelihoods of millions of people and sustain the resources across the YarlungTsangpo region. An even greater attention needs to be afforded to the basin-wide cooperation on water management. Improving and maintaining water quality, issue of drainage, flood control, water harvesting, and watershed management are some further areas that call for an intervention through cooperation. A number of people inhabiting the north-east region of India are either killed or rendered homeless in the floods in the Brahmaputra every year. Managing the water levels of Brahmaputra River is vital in preventing natural disasters that effects both life and livelihood in North-East India.

To begin with, this research aims to provide an overview of hydropolitics of China in the YarlungTsangpo. It then goes on to provide a framework through which we could analyse conflict and cooperation between China and India through a focused effort. Sharing of water of water bodies that traverse through different regional borders is a contentious issue all over the world; some of these conflicts have been resolved while some continue to be debated even today. Hydro-politics has elicited new found interest in global politics as water scarcity has emerged as new form of politics at an international level due to limited supplies in the face of growing demands. In case of YarlungTsangpo's water resources, conflict arises when there is a shortage of water as well as an institutional incapability of dealing with the problems arising from said scarcity. Through the present study, it can be said that, where rivers, lakes, or aquifers are shared between politically defined boundaries of countries, transboundary water apportionment and supervision issues remains a chief challenge to the sustainability of domestic water ecosystems. In order to overcome this challenge, it entails international collaboration among sharing states of the water system, without adversely affecting the eco-system. YarlungTsangpo water resource clash may have the added advantage of inspiring greater administrative support for finding cooperative resolutions to share the YarlungTsangpo water resources amid India and China.

This research provides the information about how to share the water between India and China. The lack of data regarding the seasonal change in current water flow in the

YarlungTsangpo river which the dams will effect that flow, make it difficult to precisely predict the effects of the dams on the YarlungTsangpo regional ecosystem. YarlungTsangpo's dams bearing on downstream ecologically states are significant. Alteration of YarlungTsangpo River will affect economic growth, social progress, environmental sustainability, food security, public health in downstream states. The dams will change the life of the Indo-Burma biodiversity hotspots which is one of the 34 biodiversity hotspots in the world. There is a grave impact on Kaziranga National Park and the Manas National Park and Sundarban delta. It is fear that the most important species whose sustenance depends on Brahmaputra river water resources for their livelihood

In 2013, China settled to sign a memorandum of understanding (MoU) with India to provide hydrological data twice a day for the course of the flood season between June and October. Another memorandum of understanding (MoU) was also signed between the Indian ministry of water resources and China's national development and reform commission to boost bilateral cooperation by safeguarding water-efficiency irrigation with concentration on agriculture. But it is not operative on short water flow upstream and downstream states water of YarlungTsangpo. There is institutional gap between China (upstream state) and India (downstream state), which is the central issue to share the trans-boundary water resources of YarlungTsangpo River Basin. Under the law of non-navigation, equitable and judicious use of water among the states is very important to all kind of development of livelihood in this world. This research also provided the information of downstream states' rights for water resources. The study will provide inputs to management of YarlungTsangpo river water resources efficiently.

### **Measures to Boost Confidence**

In 1954, both countries signed a MoU to share hydrological data but the border war of 1962 ceased the development. In 2002, A MoU was signed for five years to help in projecting floods caused by Brahmaputra in North Eastern India. In agreement with the requirements of MoU, the Chinese side delivered hydrological information (Water level, discharge and rainfall) with respect to three stations namely Nugesha, Yangcun and Nuxia located on river Brahmaputra from the 1st June to 15th October every year through e-mail twice a day. Both nations have not shown any attention to the 1992 United Nations Economic Commission for Europe (UNECE). Another MoU was signed in April 2005 for supply of water flow information in respect of Sutlej in the flood season. In 2006, during

Chinese president's visit to India, an agreement was made for setting up an Expert-level Mechanism (ELM) to discuss communication and co-operation on the provision of flood season hydrological data, emergency management and other related issues (Raul, 2013). According to recent MoU(2013), both will give-and-take views on issues of mutual interest. The main concern for India is not only the Yarlung project in Brahmaputra water, rather China's determination of averting the water to its' arid Northern areas. In October 2013, Prime Ministers of both countries approved to fortify their co-operation on the trans-border Rivers through the prevailing Expert Level Mechanism to provide flood season data and emergency managing. Under the new agreement, the Chinese side decided to provide more flood data of Brahmaputra River from May to October as a substitute from June to October that was in practice beforehand.

Both China and India have been beset by drought and shortage of drinkable water. The water scarcities in the two countries present a massive threat to food security. Both leaders of the two nations seem to recognize these new challenges. Both need to develop a water sharing arrangement. China, India and Bangladesh should strategise a widespread river basin plan to regulate geological disasters and Water Utility Journal 13 (2016) 97 impact of the hydroelectric projects. The influence of ecosystem tipping points is also very distressing away from our current knowledge. Keeping this thing in view, there is a need to undertake and adapt strategies and action plans collectively. A unified negotiation is called for managing & reducing disaster along with the use of technology & resources. The security forces of both countries should be installed in the border areas for the timely reporting of any grave ecological fluctuations found in the region. There is a greater requirement for commission concerted scientific studies on glacier melting & its effects on the flow of the river (Gautam, 2012). It is essential to redefine Tibetan water sources as a 'commons' that would draw international responsiveness & encourage China to start a water dialogue with downstream countries. India has to put forward a strong case to China, based on the ecological, cultural and livelihood sustenance, the river provides the lives of people down-stream (IDSA, 2010). It is likewise important for India to frame policies that are not reactive but insightful. India should leave no stone unturned to draw China into a water dialogue diplomatically (Sinha, 2012). There is a need to set up mutual scientific and technological partnerships to optimize water efficiency, environmental protection and conservation strategies. As the international laws are weak in the governance of water, the best way for India to manage hydro-politics with China is through co-operative approach and institutional mechanism. Utilizing water resources in collaboration with neighbours

may indeed promote win solutions. A joint hydroelectric dam can be shared benefits to all lower riparian states and upper riparian states. Cooperation can be driven by benefits from the river and to the river through joint multipurpose projects, improving the management of water resources, monitoring changes in glaciers, coping with floods and strengthening natural disaster management. Emphasizing options for co-operation at various levels may broaden the basket of potential benefits to both upstream and downstream countries (Svensson, 2012). To moderate competition and build value-based co-operation, institutional mechanisms are most essential at bilateral or basin-wide level as there is no international treaty presently in effect. There are no practical enforcement mechanisms internationally available to prevent any country from materially altering cross border flows of a transnational water course through dam building. That is why it is important to build co-operation on the basis of jointly agreed rules. Inter country water institutions based on the international norms of fair utilization would help in facilitating constructing dialogue and structured co-operation. Although such co-operation is a daunting task, still such collaboration is necessary for maintaining the sustainability of basin resources, strategic stability and environmental protection (Chellaney, 2012). Such co-operation needs to be based on transparency, information sharing, dispute settlement mechanisms and a mutual commitment to refrain from projects diminishing water flows. There is need of a treaty on the Brahmaputra, but it cannot be a bilateral one between India and China; it will have to be a multilateral one covering China, India, Bhutan and Bangladesh, with a multilateral Brahmaputra Commission similar to the Mekong Commission. A joint India–Bangladesh approach to China on this matter would be far more effective than separate approaches (Iyer, 2015). Preserving rivers and ecosystems that support low energy-intensive livelihoods of rural populations, and help those livelihoods to be more sustainable, could be a better alternative for building hydropower dams. Such an approach to rivers is unlikely to cause any harm to co-riparians, a major principle of modern transboundary water laws (Baruah, 2014). Bilateral instruments India – China Memorandum of Understanding between the Ministry of Water Resources, the Republic of India and the Ministry of Water Resources, the People's Republic of China on Strengthening Cooperation on Trans-border Rivers, 2013 [MoU on Strengthening Cooperation on Trans-border Rivers] (SIWI august 2017)

River basin is very crucial for the development of human civilization because there is truth that civilization grew in and around the river basin. That's why it is also called as the cradle of human civilization. The present study analyzed the China's water diversion of the Brahmaputra River and Brahmaputra's Dam's impact on downstream states. The study

shows that there is a gap in institutional mechanism on water sharing of the Brahmaputra River, which again resulted into the Chinese overuse of water of Brahmaputra River. This has the overall implications on the livelihoods and ecologies of both downstream countries of India and Bangladesh. Brahmaputra is a big river basin area in the Asian region. It covers the countries of China, India, Bhutan and Bangladesh.

In ancient time river basin played the important role in developing our ancient society. Countries sharing the water of Brahmaputra River are countries of high population. They are living very near the river basin area because they simply find out the fresh water very near their home to different kinds of uses. Water is crucial to sustain human life. Without water in our planet, cannot be imagine the beautiful earth. Simply, simply say, No water, no life. Through different mission to different planets scientist are at first trying to confirm if the planet has the water. The moon mission can be a good example for this.

As the populations are growing high in the present scenario, the fresh water per capita demands and supply too is growing high. Fresh water is very useful for human life which is good for sustaining their long life. Fresh water has many sources for instance glacier, ground water, river water, rainfall etc. but among these most important is river water. We can reach for River water is very easily not like glacier and underground water because we tend to live near the river. Even the runoff water of the river is not that much costly in comparison with the other sources of water.

In case of India, many big cities established near river basins, for instance Kolkata is established on Hugli River, Allahabad is established near Ganga River etc. Interestingly, in case of the Brahmaputra River, it does not have big cities near its bank but it concentrates large population which depends on its water resources for use their own daily lives of China, India and Bangladesh.

Managing of Transboundary water resources is strategically important for equal utilization of water resources which shares the same river basin of water resources for social, economical and environmental. All over the world are about 261 major transboundry river basins. In case of Tibet's ten most important river basins are flown as a transboundry river basin in South and South East Asia. Almost 145 countries are sharing the transboundary water resources. Brahmaputra river basin is one all of them. Tibetan plateau has been given 90% fresh water as China, India, Bangladesh, Nepal, Bhutan, Pakistan, Thailand, Myanmar,

Laos, Cambodia, and Vietnam. 47% world populations have been taking the water of the Tibetan plateau.

Managing of Brahmaputra river water resources is becoming very tough between upstream and downstream countries. China did not sign in The UN Convention of Non-Navigation of Watercourses Law; it is a very important law for transboundary water resources management. This law provided rights for equitable utilization of water resources in which are sharing the same transboundary water resources. China occupied the Tibetan water resources which have a much transboundary river flow to Asian countries. Brahmaputra is mother of water of North East India and Bangladesh. This river is more important in this region.

Brahmaputra river basin is the most important river flowing control by China. China is utilizing the water of Brahmaputra River for her electricity generation and agriculture purposes, in southern and northern part of China. Brahmaputra river water is become as a hot issue between China and India; in current scenario because of China build the more dam on Brahmaputra river basin without concerning lower riparian countries (India and Bangladesh). China made the already Zangmu dam on the upper reaches of Brahmaputra river and working on electricity generation and divert the water of this river. China also made the South-North water diversion project for the Chinese Northern arid region because of the Chinese northern region is a very populated area not in China but also in the world. Chinese south-north water diversion project is three routes, one is the western route, second is middle route, and the third is an eastern route project which is planned to huge water diversion project linking of the Yangtze, Yellow, Huai, and Hai rivers. This water reduces the water scarcity problem in the northern region of China. China diverts the water on upper middle and lower of southern china to northern and northwestern Chinese region.

The Government of China is working on conserving energy generation during 2011-2015 time periods, total capacity of its 120 GW which will provide by 54 hydro power stations. Brahmaputra River's dam is part of it. China's coal reserve is facing the problem to sustain in a long term energy generation, and pressure of international to reduce the carbon emission. So China is very much looking at Tibetan water resources for energy generation. China is also an economic powerhouse in the world; it is the second largest economic power behind United States of America. It defeated the Japan of economy area in before couple of years. China would not be sustaining her high growth rate without energy

generation. China is established Tibetan plateau as future energy generation conserve the area. All of us know that coal energy is not a long-term energy area, it is not renewing resources. So China is focused on non-fossil fuel for long-term energy generation. Hydropower is not fossil fuel energy generation. China's 12<sup>th</sup> five-year plan (2011-2015) is more focus to production of energy generate. Recently China has been focusing on the Brahmaputra hydropower project; it is part of China long-term energy generates planning.

Chinese hydropower project on Brahmaputra is the effect of downstream water resources demands and supply. India and Bangladesh have been taking the water from Tibetan plateau transboundary water resources. China is exploiting water of Brahmaputra River; it is unparalleled to build the many dams on Brahmaputra river basin which will bad impact on downstream livelihoods. China focuses on the Brahmaputra River for fillip the gap of electricity generation and farming from Brahmaputra River's dam, Zangmu dam, Dagu, it is established less 18 km upstream of Zangmu. It is capacity 640 MW. Another 320 MW dam is built at Jiacha, it is established middle reaches of the Brahmaputra downstream of Zangmu. A third dam name is Jiexu which 11 km upstream of Zangmu. It is capacity yet not confirm. These dams have recently announced by the Chinese government. The Chinese government is working on this area to driven the water in the Great Bend area of this river, where is largest water resources store. China connected water from the Brahmaputra River to Yellow River; it is called a Great Bend area.

China is growing on industrialization and urbanization is growing, this sector is really increased of freshwater demands in China. China's northern area is a huge industry and largest population another place in China. They are really consuming huge capacity of water resources. Northern household water consumption is rising quickly. In Chinese northern region is a limited water resource. The Chinese government is driving the water resources from the southern region in the northern region for water demands. The agriculture sector is also rising in China; it is also wants to huge water demands and supply. This is the most important threat to the Chinese water supply sector. China is diverting the Brahmaputra river water for this sector through Yellow River. There is seeing here that China is diverting the Brahmaputra water for her own utilization.

The Brahmaputra water resources is not a China diversion issue, it is an issue of all riparian states which share the Brahmaputra water resources. Brahmaputra river basin is recognized as Transboundary River. China should not build the dams and divert of Brahmaputra water



for own utilization without downstream concern. China will do again and again; downstream countries will strongly raise the question of diversion of Brahmaputra water resources in front of the Chinese Government. This is a total violation of downstream water rights. There is issue of displacement of peoples, increased salinity, and decline of water quality makes to dam building to affect water flow of Bangladesh and India. They should make the institutional framework of the Brahmaputra river basin which will help to maintain the flow of river basins in all riparian states.

Brahmaputra river water resources are playing the important role between downstream and upstream state's water resources. When China diverted water of this river than downstream countries is fear about to maintain the flow of this river basin in the lower riparian region. Present time China is fully focused on Brahmaputra river basin water resources. China is making the dams on Brahmaputra upper, middle and lower riparian. It is diverting the natural way of Brahmaputra River. Around 625 million people are depending on Brahmaputra river basin area. This is most populated areas in the world. Around 80 percent people depend on this river for their agriculture, fisheries, economic activity, etc.

Indian northeastern people are most affected due to floods of Brahmaputra River in every year. They are dying and homeless due to Brahmaputra River's flood. Managing of Brahmaputra River water resources will be reduced this problem in North East India and Bangladesh whose are more affected of this cause. There is the absence of any treaty of Brahmaputra really tough for water sharing between India China and Bangladesh. They have large populations depend on Brahmaputra water resources and Bangladesh mostly affected flood due to the absence of the institutional framework of the Brahmaputra river basin. It is essential to develop an integrated water resources management approach involving all riparian to foster regional development and overcome the prospect of severe water conflict along the Brahmaputra river basin.

These are important changes as changer in the Brahmaputra River are extremely significant as they have major impact on a number of issues including economic growth, social progress, environmental sustainability, food security, public health in downstream states. Brahmaputra's dams impact on downstream ecologically. Brahmaputra dams change the life of the Indo-Burma biodiversity hotspots which is one of the 34 biodiversity hotspots in the world. There is a serious impact on Kaziranga National Park and the Manas National Park and Sundarban delta. It is fear about the most important species whose depends on

Brahmaputra river water resources for their livelihood. Diversion issue will be creating the problem two economic powers in the Asian region, India and China. Now China is economic hub and India is also growing as an economic power in the world. Those countries are facing the water scarcity problem; water diversion of Brahmaputra will play the important role interstate relationship. Balance of power is important for regional security, if China and India will not make a better relationship with each other than Asian region will not be maintained regional security. India, China have nuclear power states, they are a big power in the Asian region. They are going to the war situation, it will not good for whole regional security. An institutional gap of the Brahmaputra is a major issue between India and China.

Climate change will be a significant social and economic impact in this region. Current time climate change becomes the important issue in the whole world. In case of Tibet is very important, Tibet flows the fresh water in Asia which will be affected by climate change in future time. This will not happen good for Asian countries. Climate change will be create the problem drought and floods in anywhere anytime. We want to save the Tibetan water resources and Himalayan glacier for our future generation will consume. So there is important to managing of Brahmaputra water resources for future generation whose will consume water without facing any problem.

China is not working only diversion of water but also working on another tactic importance in South Asian region for other purposes. China has taken many areas for her strategically. China builds the Gwadar port in Pakistan; it is part of China's string of pearls strategic plan in South Asia. China also made the Chittagong port in Bangladesh, the Hambantota port in Sri Lanka. It's very important for Indian security purposes. India wants to make the balance of power in the Asian region for regional stability. China presence in South Asia will create the problem for her neighbour countries. Thus China's policy remembers like blue water policy of Portugal earlier British period in India. They were increased her power. Just like China is doing in South Asia.

This research will provide to managing of Yarlung Tsangpo (Brahmaputra) river water resources effectively. One thing to share here about Brahmaputra River, it should have legal institutional framework between upstream and downstream countries to solve the problem of water resources. China, India and Bangladesh will make an institutional framework for Brahmaputra River. This will reduce the problem of sharing of Brahmaputra water among

those countries. Nile and Mekong riparian have an institutional framework for using water resources. Why cannot be possible on Brahmaputra river. There is a good thing for using of Brahmaputra water resources.

Through the present study it can be said that, where rivers, lakes, or aquifers are shared between countries, transboundary water allocation and management issues remain a major challenge to the sustainability of inland water ecosystems. In order to overcome this challenge, it requires international cooperation among sharing states of the water system, without having a negative impact on the ecosystem.

In transboundary co-riparian states, upstream activities greatly affect the populous and livestock of downstream state. Damming activities of upstream nation to impound and divert water raise precarious existential questions for downstream dependent communities. Given these multiple ripple effects, it is de rigueur to fill this institutional gap for bilateral cooperation. The question being, can India enter into a river cooperation treaty with China and address the existing hydro-conflicts? Both, India and China's willingness to establish a dialogue can prove to be a watershed moment, and the two countries might soon be discussing equitable water sharing, free fluvial navigation and trade, and collective responsibility for river basins. ((Nimmi Kurian Centre for Policy Research Jan 2016. Flows and flaws: diverting debate on water with China).

Recent scientific studies have expounded critical error in current methodology to measure precipitation data. High-altitude precipitation in the upper Indus basin was found to be higher by a factor of 10 than what is currently estimated. Such irregularities are a result of insufficient meteorological stations on high altitude, owing to which datasets having to rely on a combination of satellite images and available measurements received from planar stations. A recent study by the International Centre for Integrated Mountain Development (ICIMOD) projects higher incidence of both floods and droughts in the Brahmaputra basin till 2050. (ICIMOD 2016) The capacity to predict water flows and water balance in any given transboundary river basin would hinge a great deal on addressing critical gaps in the knowledge base.((Nimmi Kurian Centre for Policy Research Jan 2016. Flows and flaws: diverting debate on water with China) Disputes over data, be it of access or of accuracy, can be dangerous and incite conflict among co-riparians. Establishing a baseline database for different biodiversity and ecosystems components will be an essential prerequisite to inform public policy on sustainable water governance. (Kurian 2013) The critical issue of plugging

knowledge gaps can be resolved by bringing together local, national, and regional stakeholders. A successful case in this regard is that of the Mekong Committee, the precursor of the Mekong River Commission, which foresaw the wisdom of investing the early decades of its institutional history to data-gathering projects.

### **A Piece by Piece Analysis of Diversion of YarlungTsangpo**

Rational choice is considered to be one of the key determinants in shaping state response. A primary hypothesis underlying this approach is that state interest is shaped by perceptions that are constantly fed by incorrect or imperfect information. For instance the current media coverage in India about the diversion of the YarlungTsangpo (Brahmaputra River) by China to meet its water needs in its Northern areas. The debate on diversion of Brahmaputra waters came to life again after India and China began bilateral talks on the issue of China diverting the Brahmaputra waters as part of its Great South-North water transfer scheme. Some media commentaries stated that China has already started the diversion. But the Chinese Foreign Ministry issued a statement that no such scheme exists and that the Indian media was confusing the “great Western project” with the “smaller Western project”. Even before this Chinese statement, on October 29, 2009, a report had stated that India has no objections to this Chinese project, since it is a run of the river project and that it would do no actual harm to India. In addition, on November 5, Pawan Kumar Bansal, the Union Water Resource Minister stated that there is no evidence of China diverting the Brahmaputra waters. He, however, confirmed the construction of a small dam upstream about 1,100 kilometres inside Chinese territory and that it was meant for ‘local use’. The issue of Chinese diversion of Brahmaputra waters first came to public attention in 1999, when Jiang Zemin announced the “Great Western Extraction” which potentially involved the massive transfer of water from Tibet into the Yellow River to compensate the exhaustion of the latter’s flow by developmental demands in Western China. The river water diversion schemes are in line with the water problem that China has been confronting. While South East China receives around 1,800 millimetres of rainfall, the North West receives around 200 millimetres. Approximately, sixty million rural people are deprived of water for daily use and 25% of China’s total population is without access to drinking water. China has increasingly been tapping subterranean water resources, owing to which the water table has drastically fallen at an annual rate of 1.5 meters. The fertile wheat growing areas of Huai and Yellow River basins, too, suffer from water scarcity. China has proposed three water diversion routes—Eastern, Western and Central. The Brahmaputra diversion is around the Western route,

diverting waters to the Xinjiang and Gansu provinces which fall in the Gobi Desert region. Here, there are two projects being sought after. One is the smaller “Western” project which intends to impound the Yalong, Dadu and the Jinsha rivers, tributaries of the Yangtse River, that empty into the South West China. This project only involves the construction of a 300 kilometre long tunnel, and the Brahmaputra diversion is purely a media created myth that erupted due to obfuscating ‘Yalong’ as ‘Yarlung’, and cite the former as the great diversion project. The second, the Greater “Western Project” which pertains to the Brahmaputra river diversion would link the Brahmaputra to the Yellow River through a tunnel. Some reports say that China’s appeal for exemptions from peaceful nuclear explosions from the ambit of the Comprehensive Test Ban Treaty might be in the wake of its plans to cut such a tunnel through the mountains with peaceful nuclear explosions. Another way through which Beijing can divert waters is through a link canal that would pass through the Salween, Mekong and the Yangtse, thus joining the Yellow River. But this would impact the lives of millions inhabiting countries downstream – India, Bangladesh, Cambodia, Laos, Myanmar, Vietnam, and Thailand. Moreover, intra China opposition to the massive Three Gorges Dam, which, apart from its exorbitant social and ecological costs, is also considered to be one of the main reasons for the depletion of water levels in the Yangtse, pose serious challenge to Beijing. China would thus have to take domestic and regional sensitivities into account before undertaking any large projects. Given domestic demands and regional constraints, the Brahmaputra river diversion can have the following three conclusions: The first is based on China’s diplomatic history and the water problem that confronts it. Given China’s aggressive dam building activities, a river diversion scheme is very much on the table. This is all the more probable considering that the current leadership is convinced about the benefits of dams and construction activities in Tibet. The success of the smaller diversion projects could drive China for the bigger ones that might follow. It is no hidden fact that China would face food and water shortages by 2050 and industrialization, demographic factors, urbanization and climate change are going to be the critical factors in shaping the country’s depleting water levels. Diversion of river waters, therefore, seems to be the best option that China might opt to come out of this crisis.

The second scenario would include India and a long string of bilateral talks at political level. It would spur debates in India about the costs that Brahmaputra Diversion could impose on lower riparian states. This downstream hydrophobia could complicate Sino-Indian relations. Further, water would often be used and perceived as a tool of political leverage. India would

then be tempted to play the Tibet card differently. In its counteraction, India could go on a dam building spree in Arunachal Pradesh to justify its water requirements. Thus, water could indeed become the defining issue for bilateral relations.

The third scenario would be that India and China agree to enter a water sharing treaty. India has already stated that it has no objection to any of the river projects. In fact, this would regulate water flows and in coming years could also give rise to an emerging buyer-seller relationship between India and China. The Brahmaputra River basin can be collaboratively developed by China, India and Bangladesh, and the three countries might agree to equitable water sharing and cooperation. It needs to be noted that tributaries originating on Indian territory and high precipitation rates form a major part of the Brahmaputra flow in India. Thus effective measures (local and community) and realistic evaluation would be required to contain these resources efficiently before any overtures on water sharing solutions are made towards Bangladesh and China. Overall, the issue of water allocation and water rights of Bangladesh, India and China could form the basis of a framework on which joint cooperation among the three countries can be formulated. In October 2007, General Zhao Nanqi former Director of the People's Liberation Army, stated that "even if we do not build this water diversion project, the next generation will... sooner or later it would-be done." An appropriate strategy for India must, therefore, persuade China for regional framework entrains-boundary river waters. Since, none of the South Asian countries are part to the UN Convention on Non-Navigational Uses of International Watercourses signed in 1997, interpretations and understanding based on precedents will only worsen the situation further. Bangladesh has already started staking claim on its water security needs and advocates multilateral cooperation on the issue. India perhaps needs to contemplate on some norms that govern the Ganga-Brahmaputra-Meghna basin. This would require India to bring Nepal, Bangladesh and Bhutan on the dais to generate a consensus on conflict-laden issues. The evolving situation indicates that India is at the verge of tackling water sharing issue in a more serious and holistic manner. Without this the conflict between India and China will increase, and also this will cause serious water scarcity in Bangladesh during the lean season, weakening the India-Bangladesh relations. Therefore, a bilateral cooperation is the need of the hour to benefit the region as a whole. (Medha Bisht diversion of Yarlung Tsangpo: A probability analysis 2009 nov 11)

## **The Himalayan Rivers: China and Challenges**

A series of climatic and social changes have impeded cooperation over the Himalayan rivers. Previous negotiations assumed a stable future for these rivers. They believed that the agrarian community was the main driver behind the fluvial social interactions, and that transboundary negotiations could be approached through traditional diplomacy. These notions changed with the change in century from twentieth to twenty first. Glacial Melting and unexpected climate change has completely dismantled these beliefs. The rapid industrialization in India and China has shifted fluvial society from agrarian to industrialists, thus establishing China as a possibly major player in these and other Himalayan rivers.

## **Glacial Melting and Climate Change**

Global Warming is already bringing changes in Himalayan glaciers. Next to follow is a change in precipitation patterns. These changes will be persistent but there is no certainty about the rate of these changes. They might, or might not be, non-linear. The primary Himalayan changes will be observed in the seasonal pattern of river flows, duration of dry season and river flow. With glacial melting, flows may increase substantially, thus causing floods. In a 2009 statement on water and climate change in South Asia The World Bank noted: "Climate change in South Asia is predicted to amplify current levels of variability and may fundamentally change most hydrological systems." Therefore, these changes will have serious implications on the lives and livelihoods in large parts of Northern South Asia. However, these changes are just a cue for more critical changes that are hard to assess. The proportion of the flow originating from snowmelt, glacial melting, rainfall, and groundwater infusion varies throughout a river's length and over time. The pattern and timing of rainfall contributions is hard to calculate. The already varying rainfall patterns are made more uncertain by the climate change. Thus, a study published by the World Wildlife Fund, based on country studies in Nepal, India, and China, describes changes on the Ganges and Brahmaputra: "For the Ganga, the response of the river, near the headwaters in Uttarkashi is significantly different from what is seen downstream at Allahabad. At Uttarkashi, flows peak at between +20 percent and +33 percent of baseline within the first two decades and then recede to around -50 percent of baseline by decade 6; further downstream the deglaciation impacts are barely noticeable (Chellaney 2014). In the headwaters of the Brahmaputra, there is a general decrease in decadal mean flows for all temperature

scenarios; glaciers are few in this area and flows recede as the permanent snow cover reduces with increasing temperatures.”

Recent research shows a complex pattern of change in four rivers of western Himalayas. Flood peaks have increased in the last 40 years on the Sutlej and Chenab rivers, decreased on the Beas, and changed little on the Ravi. The relative flow of Himalayan Rivers determines the power relationships between upstream and downstream states. The glacial and snow melting in the Tibetan plateau affect flow of the Brahmaputra reaching India and Bangladesh and , therefore, may influence China’s relationship these two downstream states. China’s diversion schemes are directly proportional to glacial melting. Vaidya and Karki call for Integrated Water Resource Management (IWRM) in the face of a climate change. Therefore, we are left with the following two conclusions: First, climate change nullify the past planning for the development of Himalayan rivers. The plans, for example, of the Indian government for interbasin transfer from the Brahmaputra to the Ganges, are topplrd by the change. Thus, water treaties require a regular follow up in case of a climate change. Second, climate changes and human intervention are a double blow to river ecologies. This has made determining precipitation patterns and seasonal variation in river flows difficult.

### **China’s Hegemony and Industrialization**

The damming spree on Himalayan Rivers indicates critical change in human demand. Multiple big dams have been planned in Nepal since 1960. But the damming wave has geographically spread since then. Multiple new dams are proposed in Arunachal Pradesh and Tibet on Brahmaputra River. Hydropower generation has overshadowed agrarian interests and flood control measures. Control of greenhouse gas emissions in hydropower plants is still a hidden fact. Recently India and China have catapulted their industrial growth. History suggests that Industrail demand will, sooner or later, equate agricultural demand, or may even surpass it. With rapid industrialization, water demand is at an all time increase in India. This is calling for a conflict between India and Pakistan, and India and Bangladesh. The Himalayan Water tower boasts the origin of three great South Asian river systems, the Indus, Ganges, and Brahmaputra, including the less important Kosi and Teesta, too. Being an upper riparian, China enjoys water leverage. This gives China absolute hydro-monopoly over the downstream territories. Formerly, Formerly, China’s influence over



these rivers was restrained due to two factors. First, Tibet's contribution to river flow is less than from those of downstream territories. Second, no river management treaty exist in China's section of rivers. Damming the Tsangpo, is China's top priority. Two potential projects on the Tsangpo, though uncertain, have consequences for South Asia. One is on the great bend of the Tsangpo in eastern Tibet as it turns south to enter India. The second is to the east of Lhasa at Shoumatan. China's size and power makes its plans hard to ignore, even if they are at the level of uncertainty. Although China is the upper riparian power on the Tsangpo- Brahmaputra, the consequence for downstream nations may be less serious than speculated. A report suggests that Tibet contributes 25% of the annual Brahmaputra flow in Bangladesh (Chellaney 2014). Heavy rainfall in Northern Arunachal Pradesh is sufficient to reduce the influence of any Chinese diversions. China's diversion also mitigates floods in Assam and Bangladesh. Also, it is China's obligation to maintain the flow of river in order to keep running its hydroelectric power projects, and thus abating influence over downstream states. Climate change might alter the relative importance of flow from Tibet. The consequence of even a 10 percent reduction in flow of the Brahmaputra could be significant. China's upstream position also magnify its influence. Fundamentally, India, China and all the other nations that rely on the Himalayan Rivers must enter a multilateral cooperation to avoid irreversible damage to their ecosystems and economies, and also avoid any hydroconflict.

Hydropolitics, i.e. the conflict and cooperation pertaining to transboundary water resources, and generally revolve around water allocation, distribution and management. At the centre of these disputes are the dams and other hydro-projects, and water sharing. Quoting United Nation Secretary General Ban Ki-Moon who warned, "Freshwater resources are stretched thin" and "problems that grow from the scarcity of vital resources tend to spill over borders." Fast growing water demand and an even faster growing water crisis has left us with critical water shortage, and on the cusp of an interstate and intrastate instability (Chellaney 2014).

Transboundary groundwater resources are the new seat of war. Given their subterranean nature and also an International institutional gap, the extent cross-border aquifers are hard to assess. This has quietly pushed us to a smouldering pumping race. Owing to the "use it or lose it" attitude, the political tension has been further incited. Exemplifying the conflict between Israel and the occupied Palestinian territories, and between Saudi Arabia and Jordan involving Saudi's fossil sandstone aquifer al-Disi are suffice to hint towards the

growing hydroconflict. Therefore, a legal framework is a need of the hour to foster interstate cooperation and attenuate conflict (Chellaney Brahma 2014, water peace and war).

Conflicts centered around the rivers are even more vigorous. Upstream hydro-projects to facilitate water supply and storage cause turbulence in downstream basins. Not only do they alter the natural flow of water and affect the ecosystem, but also cause downstream scarcity and abet an upstream-downstream divide, resulting to a violent conflict. The probability of a transboundary river conflict becomes higher when the rate of change within any basin becomes unbearable to the regional institutional capacity. A preventive hydrodiplomacy can exist only if it is realistic, strategic and instinctive.

### **Water Control: The New Political Weapon**

The status quo regarding hydropolitics is alarming. Upstream territories exploit the transboundary water resources, neglecting the interests of the downstream territories. Changing the natural flow of river, impounding water through dams and reservoirs, and construction of hydropower and irrigation structures, sow the seeds of conflict between co-riparian states. Foreign Direct Investments is also seen suspiciously as a way to control and strengthen hydro-supremacy.

For instance, by the agency of the Japanese Law that permits foreign ownership of forest real estate, and also owing to the decreased woodland price, China has extensively flowed capital into Japan and gained kosher control over Japanese forests and riverheads (Chellaney 2014). This has raised a national concern, and environmental scientist Hideki Hirano quotes, “interests backed by global capital have been making furtive moves to buy up forestry and water resources amid a prolonged slump in forest real estate.” Not only does this Chinese land grab hints towards controlling Japanese water resources, but also pose a threat to national security.

Dominance over water resources has also been the motive behind territorial claims, too. China’s reactivation of its stake over the Indian North-eastern state of Arunachal Pradesh is covetously linked to the region’s ample water resources. The claim rests on Chinese desire to stretch control over the Tibetan Plateau. Revealing its plans to assert hydro-supremacy, China plans to build multiple dams on the Brahmaputra River before it enters Arunachal

Pradesh. Such hydro-supremacy can be devised in form of water impoundment and control. This can lead to a violent conflict between the river-sharing states.

Many a times, upstream state asserts hydro-supremacy by referring to the protection of “historical rights.” This puts the upstream state in a commanding position to use water as a potential weapon against the downstream state. The former might restrict the flow of water or may discharge en masse to cause flash flood in the latter. Even if no such intentions are present, being upstream gives a state a considerable advantage that can be employed diplomatically to suppress the downstream state.

However, things might be the other way round if the downstream territory is dominant on military and economical front. Exemplifying Egypt in Nile River basin and Uzbekistan in Amu Darya River basin will adequately justify this. The 1959 Nile accord between Egypt and Sudan gave Egypt the annual “acquired right” over 48 billion cubic meter of river’s water. While Sudan was sanctioned 5 billion cubic meters annually, Ethiopia’s share wasn’t quantified ( Chellaney 2014). Tactically legitimizing the colonial-era treaty, Egypt has sent out regular threats of unspecified retaliation to Sudan, Ethiopia and other upstream territory if they are to assert their upstream appropriation and overuse Nile’s water.

Uzbekistan enjoys uncontested monopoly over half the Amu Darya’s water. Threatening the politically unstable and economically weak states of Tajikistan and Kyrgyzstan of military actions, it has successfully stemmed their efforts to construct dams and other hydropower projects on the river. Upstream assertion of hydro-supremacy often leads to violent conflicts. The Chile-Bolivia intercountry crisis is one such case study. In Rio Lauca, 1962, Chile diverted the transboundary water to irrigate Sobraya and Azapa. Bolivia had already warned Chile against any “an act of aggression.” Bolivia perceived it as a threat to its “territorial integrity.” Thus, it made Chile pay by breaking all diplomatic ties. This was followed by violent anti-Chile protests in the city of La Paz which claimed several lives. Taking a cue from Bolivia’s complain, The Council of the Organization of American States(OAS) intervened to end the conflict. In return, Chile contested that the diversion is a *fait accompli*. Therefore, the OAS settled for peaceful bilateral treaty( Chellaney 2014).

### **Redefining Political Boundaries**

The India-Pakistan’s is a long disputed affair. The British divided the nation hastily, drawing a line on the map of British-administered India. The line came to be known as Radcliffe line, owing its name to its illustrator, Cyril Radcliffe. Following the partition, the Indus Basin belonged to Pakistan and India

got stake over the upper tributaries and the watershed areas. Most canals and their associated farmlands fell into Pakistan. While most parts of the Indus River system comprising the Ravi, Chenab, Beas, Jhelum, Sutlej and Indus came to India. Since partition, the rivers and their hydropower projects have been a contested area between the two nations, along with Kashmir.

However, political boundaries have been shifted if the need be. In accordance with transboundary conflicts, international pressure, institutional obligation and other factors, political maps have been altered in the past. The disintegration of the Soviet Union and Yugoslavia is one such instance among others.

### **The Danube and Rhine Commission**

Nineteenth-century Europe witnessed a watershed moment in transboundary river collaboration. In the face of rapid industrialisation and trans-border trade, Europe gave in to the freedom of navigation. This catalysed the European growth and thus, open fluvial navigation became mandatory.

The Rhine and the Danube are Europe's longest rivers. The Rhine boasts the maximum commercial water traffic in the world. Its Riparians are highly populated and chiefly industrialised. Whereas, the Danube is Europe's longest river and harbours the most number of countries in the world, nineteen—Austria, Bulgaria, Germany, Croatia, the Czech Republic, Hungary, Moldova, Romania, Slovakia, Slovenia and Ukraine among others (Chellaney 2014).

With Industrialisation gaining momentum, a large, commercial water-transport system became obligatory. Up till now the Rhine and the Danube infamously has political barriers, halting extortions piratical activities and other threats; and therefore sanitisation of these rivers was necessary to encourage international trade. This was ensured in 1878 by the establishment of the European Commission of the Danube (ECD) through the Treaty of Berlin. In a first of its kind effort, it focused on providing a safe navigation passage on the Danube river. The ECD later doubled-up as a multipurpose authority after World War II.

For Rhine, the Central Commission for the Navigation of the Rhine was set up in 1815 at the Congress of Vienna. The treaty called for 'noninterference with shipping on transboundary rivers' and was later named the 'Act of Congress of Vienna'. The principle of this treaty was purely 'give and take.' Step by step, it nullified all political barriers and facilitated free navigation over Rhine (Chellaney 2014).

The ground for Danube Commission was prepared a decade ago by the 1868 Act of Mannheim. The 1868 Act itself came into effect after replacing the 1831 Convention of Mainz, which largely eliminated political barriers on Rhine.

A decade after Danube Commission, free fluvial navigation was extended to colonial Africa. This strengthened Europe's commercial position. Free navigation was opened to two African rivers—the Congo and the Niger—through the 1885 General Act of the Congress of Berlin.

The Danube and the Rhine Commission withstood the two World Wars and common waterways continued to exist. The two treaties are a concrete example of how hydro-cooperation can sustain even the bitterest political feuds and hostilities.

### **Treaties between US-Canada and US-Mexico**

Transboundary river cooperation has a legacy in North America. The International Joint Commission (ICJ) between Canada and US originating from the 1909 treaty, and the International Boundary and Water Commission (IBWC) of the United States and Mexico emerging from the 1944 water treaty are to name a few.

Given its economic prosperity, the United States greatly exploited the transboundary water resources pretentiously. Later, in the face of Canada and Mexico claiming stake over the resources for their development, an institutional intervention became mandatory to arbitrate conflict. Given US' high dependency ratio of 8.2% against Canada's abysmally low 1.8%, establishment of a transboundary river treaty became obligatory for US' economic and diplomatic gain (Chellaney 2014).

The United States' hegemony, however, facilitated in making the ICJ and the IBWC the most successful river-management institutions. Though US formulated both the institutions, it took care of its co-riparian's interest. Contemporary to these treaties was the 'Harmon Doctrine' which dictated that the United States owed no obligations under international law to Mexico on transboundary resources. The Harmon Doctrine promulgated that the United States enjoyed complete sovereignty over the portion of water resources that fell in its borders, and therefore can divert shared water as per its own will. It's surprising that the treaties came into effect even in the Harmon-era.

Apart from Rio Grande, US also shares the Colorado river with Mexico. The 1906 Rio Grande treaty mandated US to supply annually 74 million cubic meter water. The treaty didn't took cognisance of Mexico's prior legal claim, and served merely as a bilateral political compromise. Later, US also entered into a larger water-allocation treaty with Mexico in 1944. The treaty accorded the waters of

Colorado Rivers to Mexico in equitably. Coming into effect from 1950, the treaty mandated annually 1.85 billion cubic meters of Colorado River waters. Although, the US might reduce the committed water limit if it faces extraordinary drought.

In the 1909 Boundary Waters Treaty Canada agreed to the US proposal of exercising territorial sovereignty over waters within each other's territory, and put tributaries outside the scope of the treaty. The treaty also decreed remunerations to the downstream party if the upstream party causes material harm to the former. The US also agreed to grant a pacifier role and special powers to ICJ. The ICJ also administered that any national project on shared water resources must be approved mutually. Putting restrictions to overexploitation of shared water resources, the ICJ observed that each party is at potential risk from the other's resource abuse.

The 1924 Act that ensured cooperative and equitable use of the Colorado River originally laid the foundation for the 1944 US-Mexico treaty. The Colorado negotiations turned hostile with the construction of the Hoover Dam, named after US President Herbert Hoover. The treaty, besides allocating Colorado Waters, also stretched the International Boundary Commission to a new International Boundary and Water Commission (IBWC). The IBWC was constituted with a host of major roles: delivering Mexico with the mandated share of Colorado Waters; regulating the flow of Rio Grande; maintenance of hydro-projects, dams etc; controlling upstream activities that could injure downstream basins, and controlling flood by building check dams and floodways (Chellaney 2014). All and all, the IBWC gave bilateral solutions to resolve conflicts arising from Transboundary Rivers.

The Canada-US shared water resources are richly stretched along the borders. The Great Lakes-St. Lawrence boasts 20% of world's freshwater. It is also essential to the populous and livestock of eight US states—Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York, and Canadian provinces of Ontario and Quebec. The ICJ guides in the cooperation regarding these transboundary water resources. Also under the ICJ's purview are Souris River, Columbia River, Osoyoos River and Kootenay Rivers.

Not just conflict management, but the ICJ is also dedicated to maintain the ecology of the rivers. In the highly concentrated industrial zones of US and Canada around rivers, water contamination is a serious issue. The ICJ has mandated to efficiently treat industrial waste before disposal.

Despite IBWC's efforts, the friction between US and Mexico regarding Colorado river has long existed. Since the treaty has no clause for the quality of water accorded to Mexico, it has always expressed grievance about the volume and quality of water. Due to water siphoning by American states, the Colorado water never enters Mexico in the postulated quantity. This was rectified in 2012 by a "Minute 319" clause. As per the clause, America can only make a cut in Mexico's share if the

water level in Lake Meed is reduced to less than 312.4 meters relative to the mean sea level. It also allows Mexico to store water to counter drought conditions. The deal also opens cashflow for Mexico in return for water. It can sell 8.3% of its annual share to US at \$21 million. The money is designated to maintain and improve Mexican hydro-infrastructure. The 2012 accord also laid a structure for joint, cooperative programs to improve the Colorado river health and restore the ecological balance.

Reoccurring drought and over exploitation of Rio Grande waters has turned out to be disastrous for Mexico. In the face of the 1944 treaty, it owed millions of cubic meters of water to US which it repaid by transferring 264 million cubic meters of water and arranging extra water for southern Texas.

The ICJ and IBWC are, today, models for transboundary cooperative institutions. This is largely backed by the fact that these are autonomous bodies. Such is their success that intercountry water disputes in North America are better managed than intracountry disputed in US, Canada and Mexico. Although, a constructive suggestion for these institutions can be to also include subterranean water resources in their purview. This will better facilitate cooperation regarding transboundary resources and facilitate equitable utilisation of groundwater resources linked with rivers.

### **China's Hydro-Hegemony**

Communist victory in China proved to be a watershed moment in Asia's hydro-politics. China adopted an aggressive hydro-diplomacy after the 1949 shift in power. China, being an epicentre to the largest number of transboundary water resources, asserted its hydro-hegemony in Indo-China peninsula and South Asia, and over Kazakhstan and Russia. What made China so dominant is also the fact that it annexed a large number of hydro-rich ethnic-minority homelands. These conquered homelands, constituting 60% of its landmass, drastically changed Asian water maps (Chellaney 2014).

As a result of China's conquest it is an upstream basin to most Asian rivers. For instance, the confiscated Tibetan plateau's water storage capacity is next only to the Arctic and the Antarctica. It's hydro-geographical importance has earned it the insignia of "Third Pole". It encapsulates Asia's ten great river systems and serves as a "water tower."

China is a co-riparian with maximum number of countries in the world. This makes it more hydro-hegemonic than the US, Israel, Turkey and other hydro-dominant states. It controls the flow of more than a dozen major rivers. China's water policy affects the lives of half the global population. Yet China is unconcerned about sharing water resources. Hinting narcissism, China enjoys an institutional gap and is not bound by any water treat—not even one. Although, it's co-riparians are

legally obliged with self-negotiated treaty. Publicly asserting complete dominance over transboundary water resources, China voted against the International Water Law at the 1977 UN Conventions.

China's self-centred stance poses a great risk at Asia's growth. It has already flared conflict with India. Putting multilateral hydro-cooperation on back burners, China puts itself outside the scope the Mekong River Commission even though it is in its participating countries. Tacitly supporting bilateral cooperation, it has laid it aside too. Controlling the Amur, Arun, Brahmaputra, Ily, Irtysh, Mekong and Salween unilaterally, it has been carefree of the downstream interests. This has triggered some serious Chinese political discord with India, Nepal, Burma, Russia, Vietnam and other countries. China has tactically diverted global attention from its reluctance to share waters by offering a quid pro quo for hydrological data.

Also catalysing China's hydro-hegemony is the fact that it is the most dammed country. Constructing dams at an unprecedented rate has helped China to impound volumes of water. Numbers of dams in China catapulted to more than 25000 today from twenty-two in 1949 when the Communists took over. This has propelled China's irrigation and hydropower systems. Inspired by America's mega projects, like the depression-era Hoover dams, China built dams at such a rate that is soon surpassed America which boast an abysmally low figure of 5500. Channelling humongous capital into damming projects, China plans to overshadow US' lifetime damming numbers by 2025. Not only this, China is also the biggest 'dam exporter.' Its state-run companies build more dams around the globe than the cumulative of every other dam builder in the world. This has strengthened China economically and diplomatically, projecting it as a global leader.

Running parallel to dam exporting is China's desire to covetously hijack mineral ores and fossil fuels in foreign states. It has frantically exploited project sites to quench its power thirst. Though this has attracted protests, but China's rich economic profile has abated them all. Although, these extraction projects are seriously jeopardising the environment in those countries.

Championing building large dams, China has now shifted its focus to building mega dams. The Mekong river dam generates 4200-megawatt energy. Even the Eiffel Tower is a Lilliput to it. Next, it plans to build a 38-gigawatt hydro project at Motuo, close to the disputed Indo-China borders. China also plans a mega-dam on the Brahmaputra river to mitigate its flow before it enters Arunachal Pradesh, the disputed north-Indian state.

At such a high pace, China's damming activities have caused huge wear and tear to the ecosystem. Disrupting ecology, China's extraction and water impounding has affected the seismically sensitive areas. This has been identified as one of the major reasons for the frequent earthquakes near the project sites. Also accelerating seismic activities is the duo forces of gravity and hydro-pressure



generated due to stored water. Thus, keeping the ecosystem and downstream interests in purview, China must reconsider its stance to not enter any transboundary water treaty.

### **Bridging Transboundary Water Institutional Gap**

The development and implementation of transboundary water institutions involves a lot of backstage drama. The incubation period may be several decades or even more than a century. The European and North American institutions give sufficient facts to argue that such institutions become reality only after resolution and settlements of various co-riparian interests. Devising a formula to share water, developing a free water navigation system, maintaining the ecology of the rivers are the narrow issues, among others, over which the negotiations take place.

The two North American treaties, which serve as model for interstate water cooperation, involved a long, stretched series of discussion before becoming a reality. Pre 1909 treaty, US and Canada entered into a long string of pacts—Jay Treaty, 1794; Rush-Bagot Treaty, 1797; Webster-Asbhrton Treaty, 1842; Northwest Boundary treaty, 1846; St. Lawrence River Treaty, 1854 and Washing Treaty relating to navigation of St. Lawrence River. These negotiations were held when Canada was still a colonial state. Thus, they were held in Washington, Ottawa and even London (Chellaney 2014).

A total of eight treaties were involved in framing the structure of IBWC between US and Mexico. The two nations signed treaties between 1848 and 1933 including the 1848 Peace Treaty of Guadalupe Hidalgo and the Gadsden Treaty, 1853. These treaties defined the new US-Mexican border. Also, a series of conventions in 1882, 1906 and 1933 facilitated cooperation for Rio Grande.

But, these bilateral treaties aren't the eternal thing. These treaties were regularly followed up and amended to resolve the due issues. For instance, the 1974 US-Mexican agreement mandated to resolve the water quality issue since the 1994 treaty had mentions only of water quantity. Before the 1974 follow up, US neglected Mexico's interest and didn't discouraged Wellton-Mohawk project which dumped saline waste into Colorado river. Therefore, Mexican president Luis Echeverria, threatening ICJ intervention, entered a salinity-control pact with US president Richard Nixon (Chellaney2014).

The European Rhine Commission was initiated in 1815 Congress of Vienna but became a reality only in 1868 after the Convention of Mannheim. While the Danube Commission was instated in the 1856 Treaty of Paris. Going through several christening—Commission of the Danube River, European Commission of the Danube—it finally settled on International Danube Commission.

A separate International Commission for the Protection (ICPR) of the Rhine was setup in 1950 to supervise pollution control in Rhine. The ICPR became active only after the Basel accident where

tons of herbicides, fungicides, pesticides and dyes were dumped into the Rhine. This earned the Rhine the label of “The Sewer of Europe”, thus triggering the activation of ICPR (Chellaney 2014).

Europe made fluvial navigation its top priority in the nineteenth century. Keeping an eye on economic prosperity, Europe opted for greater interstate cooperation. Owing to this, water sharing has traditionally been on the back burners of the European nations. The reason for this being that European nations have sufficient water resources to meet their needs. This reduces Europe’s involvement with transboundary disputes to nil. Crossing out water sharing, European treaties have established water as a “non-commercial” product. The next step for Europe is to maintain and manage the ecology of rivers. This has been a serious issue in the past century.

Despite the treaties, US’ unilateral actions didn’t take cognisance of Mexican interests. Although, Mexico’s hydro dependency ratio of 10.6% didn’t put much stress on Mexico. The water treaties between US-Mexico and US-Canada were preceded by land treaties. Indeed, the International Water Commission came into effect only after the International Boundary Commission (Chellaney 2014)

In large part of the globe, water treaties aren’t taking final shape due to territorial disputes. This has been the biggest barrier in transboundary cooperation. The Senegal, Guinea, Jordan and Indus River basins are a few disputed sites to cite (Chellaney 2014). Also, most nations are still infants. Their decolonisation has redrawn political maps and retriggered co-riparian disputes. An example is the Indo-Pak dispute pertaining to the Indus River Valley. In such a changing global climate, building a successful transboundary river institution becomes a distant dream.

Lack of such cooperative institutional mechanisms may promote conflict and hydro-engineering project races thus claiming more water share and imposing unilateral solutions.

Developing authentic international legal standards and monitoring provisions would help to moderate the rising conflicts and water wars. These mechanisms should not be confined to only surface water river basins but should be considerate about the aquifers, ground water resources and its extraction.

Following are 18 out of 276 transnational or inter-country river basin agreements with specific allocations with calculated division of water shared and distributed which are mutually binding:

Date	River basin	Signatories	Accord
May 4 1948	Indus	Pakistan,India	Interdominion agreement on the canal water dispute between East and west Punjab
September 7,1950	Helmand	Afganistan,Iran	Term of the refrence of the Helmand River Delta commission
June 4,1953	Yarmouk	Jorden Syria	Agreement on utilization of the Yarmouk water
April 25, 1954	Kosi/Ganges	Nepal ,India	Agreement of the kosi project
August 18,1956	Amur	China, USSR	Agreement between USSR and china on joint research opration to determine the natural resources of the Amur river basin
August 11, 1957	Aras,Atrak	USSR Iran	Agreement for joint utilization of the frontier sections fo the Aras and Atrak rivers for irrigation and hydropower
October 31,1957	Mekong	Cambodia,LaosThailand,vietnam	Statute of the Committee for Coordinaton of Investigation of the lover Mekong basin
December 4 1959	Gandak	Nepal ,India	Agreement between Nepal and India on

			the Gandak Irrigation and power project
September 19, 1960	Indus	India, Pakistan and world bank	Indus waters Treaty partitions rivers between India and Pakistan
August 9, 1965	Jahore Tebrau, Scudai	Malaysia Singapore	Separation Agreement, also known as the Independence of the Singapore Agreement guarantees continuation of the 1961 and 1962 water accords between Malaysia Johar State government and Singapore City Council
December 19, 1966	Kosi	Nepal, India	Revised agreement concerning the Kosi Project
November 24 1972	Ganges-Brahmputra -Meghna	Bangladesh India	Statute of the Indo-Bangladesh joint River Commission
January 31, 1975	Mekong	Khmer (Cambodia), Laos, Thailand, Vietnam	Joint declaration of principles for utilization of the waters of the lower Mekong Basin
April 18, 1975	Ganges	Bangladesh, India	Provisional conclusion of a treaty on the

			division of the Ganges River water
December 26, 1975	Tigris –Euphrates-shatt al Arab	Iran Iraq	Agreement on the use of frontier watercourses
November 5, 1977	Ganges	Bangladesh ,India	Agreement on the sharing of the Ganges water at Farraka and augmenting transboundary flows
January 5, 1978	Mekong	Loas, Thailand, Vietnam	Declaration concerning the interim committee for coordination of investigation of the lower Mekong basin
April 7, 1978	Kosi	India, Nepal	Agreement on the renovation and extension of Chandra Canal, Pumped Canal, and distribution of the Western Kosi Canal
October 7, 1982	Ganges	Bangladesh, India	Memorandum of understanding on the sharing of Ganges waters at Farakka Barrage
July 20, 1983	Teesta	Bangladesh, India	Agreement on the ad hoc sharing of the Teesta river waters
June 28, 1988	Malaysian water exports	Malaysia, Singapore	Memorandum of understanding between the two

			countries prime minister on water and gas
April 17, 1989	Euphrates	Iraq, Syria	Joint minutes concerning the provisional division of Euphrates waters
August 27, 1992	Ob, Irtysh, Ishim, Tobol, Ural	Kazakhstan, Russia	Agreement on the use and protection of transboundary waters
March 26, 1993	Amu Darya, Aral Sea, Syr Darya	Kazakhstan Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan	Agreement on joint activities to help address the Aral Sea
April 29, 1994	Bor Nor Lake, Bulgan, Halaha, Kerulen	China, Magnolia	Agreement on the protection and utilization of transboundary waters
September 20, 1994	Al-Asi/Orontes	Lebanon, Syria	Bilateral agreement on the division of the water of Al-Asi river (Orontes)
October 26, 1994	Jordan river, fresh water springs, salin springs	Israel, Jordan	Bilateral peace treaty
February 11, 1995	Amur, Har Us Nur, Jenissei, Lake Baikal, Lake Ubsa-Nur, Onon, Pu Lun To, Selenga	Russia, Magnolia	Agreement on the protection and use of transboundary waters
March 3, 1995	Amu Darya, Aral Sea, Syr Darya	Kazakhstan Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan	Resolution of the heads of states of Central Asia on the work of the executive

			committee of the interstate council for the Aral Sea(ICAS) on implementation of the action plan
April 5, 1995	Mekong	Cambodia, Laos, Thailand, Vietnam	Agreement on cooperation for the sustainable development of the Mekong River Basin
September 28, 1995	Groundwater	Israel, Palestine Liberation Organization	Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip, including on supply and management of water resources and establishment of a Joint Water Committee
February 12, 1996	Mahakali	India, Nepal	Treaty on the integrated development of the Mahakali River, including the Sarada Barrage, Tanakpur Barrage, and PancheshwarProject
December 12, 1996	Ganges	India, Bangladesh	30-year treaty on sharing of the Ganges River Waters
November 10, 1997	Transboundary rivers	Russia, China	Agreement on principles of joint economic use of

			several islands and adjacent water areas of transboundary rivers
March 17, 1998	Syr Darya	Kazakhstan, Kyrgyzstan, Uzbekistan	Agreement on the use of water and energy resources of the Syr Darya Basin, along with a separate accord on the reservoirs of the Naryn-Syr Darya cascade
May 7, 1999	Syr Darya	Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan	Protocol on inserting amendments and addenda in the agreement on the use of resources of the Syr Darya
January 21, 2000	Talas	Kazakhstan, Kyrgyzstan	Agreement on the utilization of the water facilities on the Chu and Talas rivers
August 15, 2000	Water exports	Singapore, Malaysia	Agreed items on water and other issues between Malaysian Prime Minister Mahathir
April 20, 2002	Al-Kaber Al-Janoubi	Syria, Lebanon	Agreement on sharing the Great Southern River Basin water and building a dam jointly



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Sources: Chellaney 2014

What needs to be done?

- Develop non-conventional supply sources of water.
  - Innovative and sustainable management methods.
  - Need to understand how water productivity is directly proportional to productive economic gains.
  - Improving agriculture and industrial water use efficiency.
  - Upgrading the use of technology to enhance the water use efficiency.
  - Application of clean water technologies such as distillation, membrane technologies like (RO) reverse osmosis, nano filtration (NF), electro dialysis reversal (EDR) applications and such other technologies to treat high salinity ocean water.
  - Recycling municipal waste can also be lesser expensive option than desalination.
  - Apart from formulating and signing river basin agreements, these above measures will augment the water resources and shortages.
  - Developing infrastructure for storage and proper maintenance of leakages water supply facilities would also help to curb water crisis and manage water efficiently.
- These approaches and methodologies discussed above in this literature review chapter will manage and help to mitigate security and economic risks involved in water sharing and hydropolitics for transnational rivers like Brahmaputra too.

## Conclusion

The history of hydro-politics between India and China has remained a complex one. It cannot be seen either as a history of co-operation only or as a history of conflict only. But, one can say undoubtedly that phases of conflict (some limited and some escalated) has overshadowed the periods of limited co-operation. This may become more complicated and instances of conflicts may increase as all over the globe, water is becoming a prized resource in an unprecedented manner. Increasing demand for water consumption and decreasing availability of fresh water acts as two main factors that contributes to the exacerbation of the politics over water. The famous statement by Ismail Serageldin that, whereas the important wars fought in the twentieth century had been for oil, the important wars of the 21<sup>st</sup> century will be for water, rightly captures the seriousness of the problem. Eventhough there is a school of thought that strongly argues that water-disputes will be solved peacefully and will hardly lead to any war, this optimistic view is highly contested. It is argued that while examples of co-operation in water sharing is very much there, so are there examples of constant preparedness to go to war, which is caused by the fear of losing sovereign power over transnational water resources. Now coming to the case of India-China dispute over the Brahmaputra waters, China's plan to divert the Brahmaputra river northwards has remained as the bone of contention between the two countries. The diplomatic frictions caused by the construction of Zangmu, Jiexu and Jiacha dams as part of the 12<sup>th</sup> five year plan of China can be seen as one of the most escalated phases of this history of conflict. The 2013 MoU between India and China, in which China agreed to provide hydrological data twice a day during the flood season between June and October in Yarlung Tsangpo, had become a rare instance of co-operation as far as the hydro-politics between the two nations is concerned. Another memorandum of understanding was signed between Ministry of Water resources, Union of India and National Development and Reform Commission of China, which aimed at enhancing bilateral co-operation. Ensuring water efficiency irrigation with focus on agriculture was declared as the aim at that time. But even such rare instances of gestures towards co-operation has been largely been proven as ineffective. For example, when the Dokhlam stand-off happened between India and China in 2017, China virtually stepped back from the MoU signed in 2013. Thus, one can easily reach to the conclusion that the potential of this hydro-political conflict still remains high, whereas the prospects of co-operation still remains limited.

The dependability of both the countries (and also a thirdly country namely Bangladesh) on the Yarlung Tsangpo or Brahmaputra river for their irrigational, energy-production and other livelihood needs adds to the complexities of hydro-politics in the name of the river. The water scarcity in the northern part of China makes it important for China to make the best use of the water of Yarlung Tsangpo within their territory. Due to high intensive agriculture, increasing industrialization, and growing urbanization in Northern China, there is a great demand of water supply. South-Western part of China is also facing severe water crisis. So, China wants to use the abandoned water resources available in the Tibetan plateau, from where Brahmaputra is originating, for irrigation, hydro-power generation and other uses. It is also part of their large scale project to shift from power-generation using coal to power-generation using water. Like that, India cannot remain indifferent to the changes that China make in the flow of the river, as it will badly effect the interests of the Indian people. As it is well-known, fresh water resources is a key resource as far as developmental programmes are concerned,. It is even indispensable for human health. For food production and navigation too, the people of India and Bangladesh depend largely on the Brahmaputra river. It also need to be noted that the increasing scarcity of fresh water due to high levels of contamination of water by industrialization also makes fresh water a valuable resource, and makes it important for nation-states to deal with it sensitively. In this context, the prospects of an increased co-operation on the issue will be largely dependent on other factors- like the improvement in over-all relations between India and China, discovery of common areas of interests in the arena of international politics, a change in the balance of power between the two etc.

From the point of view of India, the hydro-politics over Brahmaputra is also closely linked with it's security concerns. The hydrological infrastructures like dams, being build by China in Brahmaputra, can be and have been used as defensive and offensive weapons during wars. The fact that China can unilaterally regulate or even deny water to the downstream countries remains as a threat to the downstream countries. But more importantly, it is linked with India's aspiration to emerge as a superpower. Against the background in which Government of India estimates that the country has a water requirement to be around 1093 BCM for the year 2025 and 1447 BCM for the year 2050, control over water resources and capability to make effective use of it is too important to be indifferent. The gravity of the situation will be more clear when we take into account the fact that the country is dependent on foreign-originating rivers for about a third of it;'s surface water. Thus an effective intervention in the hydro-political level and development of capabilities to manage the foreign-originating rivers

is strategically important for India. China tries it's best to stop India from developing it's own hydrological infrastructure in the parts of the river flowing through it's territory to tackle India from deriving economic-political benefits from it. China's attempt to block an Asian Development Bank loan to India's projected dam in Arunachal Pradesh remains as a glaring example for this.

The ecological implications of a possible alteration in the natural course of Brahmaputra also cannot be underestimated. Indo-Burma diversity hotspot is one of the 34 biodiversity hotspots in India. A unilateral alteration made by China in the natural course of Brahmaputra will have a destructive effect on this hotspot. This is besides the threat it will pose to Kaziranga national park, the Manas National park and Sundarben Delta. Brahmaputra has an annual flooding cycle and a disruption in it will affect the nutrition proportion suitable for cultivation of paddy for both India and Bangladesh. These ecological concerns also remain as an important priority for the Indian state when it negotiates with the Chinese attempts to manipulate the water of Brahmaputra in their favour. It thus adds an additional dimension to the issue and makes the chances of an easy solution hardly possible. It is interesting to note that a diversion of the Brahmaputra river will have ecological implications in China also. For example, the rainfall pattern in Tibet will be varied by such a move. But it seems China has made an assessment that the benefits of such a diversion will outweigh the ecological consequences. It is also inextricably related with the approach of China towards the region of Tibet. South to North diversion of the river will benefit mainland China at the cost of the ecology of Tibet, which as a province had been forcefully annexed by the Chinese state. Thus, a deeper analysis will show that the Chinese policy of making best use of the river, keeping in mind the interests of mainland China, is not only shaped by their non-cooperative approach towards the downstream countries but also with the exploitative approach they keep towards the province of Tibet, which they have forcefully occupied and where movements for freedom are still strong. Provinces like Yunnan and Tibet are considered as resource store-houses, whose resources are manipulated more or less forcefully. Concerns about ecological damage, displacement of ethnic minorities inhabiting in these regions, resentment against exploitation etc are either ignored or suppressed easily using coercive apparatus of the Chinese state. Even when the ethnic minorities inhabiting in regions like Tibet and Yunnan are directly affected by these projects, their representatives have no say in them. Along with the machinery of the state, the propaganda machinery of the Communist Party of China, has been also employed in order to garner legitimacy to this kind of exploitation of regions like

Yunnan and Tibet. Works like 'Tibet's Water will Save China' by Li Ling are examples for laborious attempts to give ideological-political justification to river-diversion projects and to appeal to the nationalistic aspirations of mainland China. But, even though concerns about regional autonomy and Tibetan population's control over their own resources or about the environmental consequences have no chance of becoming an effective barrier to the implementation of these big projects, it has been pointed out that the competition and clash of interest within the Chinese political elite may act as a check on the speedy implementation of these ambitious projects. There are also indications that the Chinese establishment under Xi Jinping is seriously considering the importance of making relations with neighbours including India better. It is expected that this too will have an impact upon the hydro-politics and China may in coming days become more sensitive to the grievances of the downstream countries. The prospects of growing co-operation between the two countries in platforms like BRICS, leaves the history of hydro-politics between India and China open-ended and with chances of quite unexpected turns in the future.

The institutional gap which is very evident in the management of the Yarlung Tsangpo river basin need to be understood against this background of complex international concerns. As long as military superiority of China over India naturalizes the overuse of water by China, an effective institutional mechanism cannot be built up. Or in other words, one will have to look beyond the situation of military strength getting translated into a near monopoly over the water resource, if an effective institutional mechanism is to be made in the management of transnational waters. The concerns of the downstream countries, i.e, India and Bangladesh, need to be effectively addressed by such a mechanism and China should co-operate with the initiatives such a mechanism will take. The present situation is that pathetic that we don't even having a water-sharing treaty for Brahmaputra. The absence of such a viable and institutional mechanism not only raises the question of fairness in international relations, but also raises the issue of how it gets affected the lives of people in real terms. The most self-explaining example is that of people in Bangladesh who repeatedly get affected by floods due to the absence of any institutional set-up to share information and real data about the floods. While all agree that such a mechanism will be instrumental in promoting regional development and putting an end to the water clashes along the Brahmaputra, China has continued to be reluctant to such initiatives. Their unwillingness to share hydrological data with the downstream countries, their refusal to sign the 1997 UN convention on the Law of

the Non-Navigational uses of International Waterways, its decision to keep the downstream countries in dark when they started building dam in the Mekong river basin are all examples for this reluctant, non-cooperative approach of China.

As this policy of China remains as an important factor in the history of hydro-politics between India and China, it need to be seen in its entirety, i.e, in relation to its policy of water-sharing with countries other than India and Bangladesh. Such an analysis can't help taking into account the fact that China has the ill-reputation of being involved in water disputes with many of its riparian neighbours. In most of the cases, China relies itself upon its superior military and economic strength to arbitrarily deal with water-sharing issues. Despite the fact that it is one of the largest supplier of river waters to many neighbouring countries, it has not signed even a single water-sharing treaty with any of these countries. China's obsession with unhindered control over water resources originating from their territories is a matter to be studied in more depth in order to correctly explain the ambiguities prevailing in what principles can be followed in water-sharing between China and its neighbouring countries including India. But as there are no strong international laws or convention to regulate water sharing disputes, and that a third party which can act as interlocutor is virtually absent, the downstream countries will have to creatively open up diplomatic channels with China which will persuade them for better co-operation. This means instead of just bargaining in lines of hard-power (military or economic strength), the downstream countries shall try to persuade China to concrete projects of cooperation such as joint hydro-electric projects, sharing of information and technology related to water management etc. The creativity of rulers and diplomats of the downstream countries in persuading China to such steps can make drastic change in the nature of hydro-politics between China and these countries. But it should also be noted that even such creative initiatives such as joint-projects should keep in mind, not only the interests of the present generation, but also the interests of the future generations too. The importance of Tibetan waters and the Himalayan glaciers for the continent of Asia is too great to be ignored. So the issue at hand also needs to be approached with convictions about the need to have a vision of sustainable development.

To summarize, only a creative approach of pushing for better diplomatic relations and envisaging projects of mutual co-operation can make it sure that a drastic change happens in the hydro-politics between India and China. There should be a mutual recognition of the energy and other livelihood needs of the three nations thorough which the river flows, and it should be thought how these issues can be addressed with a collective spirit. When the

importance of moving towards a vision of sustainable development is added to such a collective regional spirit, it can make changes of unprecedented magnitude to the nature of hydro-politics. For that, the governments of these riparian neighbours will have to take measures to discourage those elements who may try to spread mutual destruct along jingoist lines. In short, the solution to the conflict situation and advancement in the level of co-operation will be largely dependent on the ability to transcend the traditional models of diplomatic engagements and invent innovative models.

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## Appendices

### Appendix 1

#### Convention on the Law of the Non-navigational Uses of International Watercourses 1997

##### *Article 1*

###### *Scope of the present Convention*

1. The present Convention applies to uses of international watercourses and of their waters for Purposes other than navigation and to measures of protection, preservation and management related to the uses of those watercourses and their waters.
2. The uses of international watercourses for navigation is not within the scope of the present Convention except insofar as other uses affect navigation or are affected by navigation.

##### *Article 2*

###### *Use of terms*

For the purposes of the present Convention:

- (a) “Watercourse” means a system of surface waters and groundwater constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus;
- (b) “International watercourse” means a watercourse, parts of which are situated in different States;
- (c) “Watercourse State” means a State Party to the present Convention in whose territory part of an international watercourse is situated, or a Party that

is a regional economic integration organization, in the territory of one or more of whose Member States part of an international watercourse is situated;

(d) “Regional economic integration organization” means an organization constituted by sovereign

States of a given region, to which its member States have transferred competence in respect of matters governed by this Convention and which has been duly authorized in accordance with its internal procedures, to sign, ratify, accept, approve or accede to it.

### *Article 3*

#### *Watercourse agreements*

1. In the absence of an agreement to the contrary, nothing in the present Convention shall affect the rights or obligations of a watercourse State arising from agreements in force for it on the date on which it became a party to the present Convention.

2. Notwithstanding the provisions of paragraph 1, parties to agreements referred to in paragraph 1 may, where necessary, consider harmonizing such agreements with the basic principles of the present Convention.

3. Watercourse States may enter into one or more agreements, hereinafter referred to as “watercourse agreements”, which apply and adjust the provisions of the present Convention to the characteristics and uses of a particular international watercourse or part thereof. 4. Where a watercourse agreement is concluded between two or more watercourse States, it shall define the waters to which it applies. Such an agreement may be entered into with respect to an entire international watercourse or any part thereof or a particular project, programme or use except insofar as the agreement adversely affects, to a significant extent, the use by one or more other watercourse States of the waters of the watercourse, without their express consent.

5. Where a watercourse State considers that adjustment and application of the provisions of the present Convention is required because of the characteristics and uses of a particular international watercourse, watercourse States shall consult with a view to negotiating in good faith for the purpose of concluding a watercourse agreement or agreements.

6. Where some but not all watercourse States to a particular international watercourse are parties to an agreement, nothing in such agreement shall affect the rights or obligations under the present Convention of watercourse States that are not parties to such an agreement.

#### *Article 4*

##### *Parties to watercourse agreements*

1. Every watercourse State is entitled to participate in the negotiation of and to become a party to any watercourse agreement that applies to the entire international watercourse, as well as to participate in any relevant consultations.

2. A watercourse State whose use of an international watercourse may be affected to a significant extent by the implementation of a proposed watercourse agreement that applies only to a part of the watercourse or to a particular project, programme or use is entitled to participate in consultations on such an agreement and, where appropriate, in the negotiation thereof in good faith with a view to becoming a party thereto, to the extent that its use is thereby affected.

#### *Article 5*

##### *Equitable and reasonable utilization and participation*

1. Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.

2. Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to

cooperate in the protection and development thereof, as provided in the present Convention.

#### *Article 6*

##### *Factors relevant to equitable and reasonable utilization*

1. Utilization of an international watercourse in an equitable and reasonable manner within the meaning of article 5 requires taking into account all relevant factors and circumstances, including:

- (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
- (b) The social and economic needs of the watercourse States concerned;
- (c) The population dependent on the watercourse in each Watercourse State;
- (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
- (e) Existing and potential uses of the watercourse;
- (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
- (g) The availability of alternatives, of comparable value, to a particular planned or existing use.

2. In the application of article 5 or paragraph 1 of this article, watercourse States concerned shall, when the need arises, enter into consultations in a spirit of cooperation.

3. The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is a reasonable and equitable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.

#### *Article 7*

##### *Obligation not to cause significant harm*

1. Watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other watercourse States.

2. Where significant harm nevertheless is caused to another watercourse State, the States whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures, having due regard for the provisions

of articles 5 and 6, in consultation with the affected State, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation.

*Article 8*

*General obligation to cooperate*

1. Watercourse States shall cooperate on the basis of sovereign equality, territorial integrity, mutual benefit and good faith in order to attain optimal utilization and adequate protection of an international watercourse.
2. In determining the manner of such cooperation, watercourse States may consider the establishment of joint mechanisms or commissions, as deemed necessary by them, to facilitate cooperation on relevant measures and procedures in the light of experience gained through cooperation in existing joint mechanisms and commissions in various regions.

*Article 9*

*Regular exchange of data and information*

1. Pursuant to article 8, watercourse States shall on a regular basis exchange readily available data and information on the condition of the watercourse, in particular that of a hydrological, meteorological, hydro geological and ecological nature and related to the water quality as well as related forecasts.
2. If a watercourse State is requested by another watercourse State to provide data or information that is not readily available, it shall employ its best efforts to comply with the request but may condition its compliance upon payment by the requesting State of the reasonable costs of collecting and, where appropriate, processing such data or information.
3. Watercourse States shall employ their best efforts to collect and, where appropriate, to process data and information in a manner which facilitates its utilization by the other watercourse States to which it is communicated.

*Article 10*

*Relationship between different kinds of uses*

1. In the absence of agreement or custom to the contrary, no use of an international watercourse enjoys inherent priority over other uses.

2. In the event of a conflict between uses of an international watercourse, it shall be resolved with reference to articles 5 to 7, with special regard being given to the requirements of vital human needs.

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