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Framework of Win-Win Regional Cooperation for Water and Energy Security in the Ganges Basin

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Abstract

Having water storage potential of about 88 billion cubic metre (bcm), Nepal, contributes more than 40% of the total flow and over 70% of the flow of the Ganges with the main feeders being- Mahakali, Karnali, Gandak and Koshi water basins. Regarding trans-boundary water resources management, cooperation between the riparian countries is a must. Nepal, being at the north, is the major controller of the headworks of the Ganges and bilateral agreements have been made by India separately with Nepal and Bangladesh through signing and ratification of different treaties. Hence, Nepal, India and Bangladesh are the main riparian countries among which cooperation is needed with regard to Ganges Basin.

The trans-boundary water management principles and relevant articles of International Conventions/Agreements are the basic ground/footing for any bilateral/tripartite treaties. Till date, six bilateral agreements (treaties and three Memoranda of Understandings) have been signed between the riparian countries. Among these, Sharada Barage Treaty (1920), Koshi Treaty (1954 later amended on 1966), Gandak Treaty (1959 later amended on 1964), Mahakali Treaty (Tanakpur and Pancheswor, 1996) were signed between Nepal and India whereas Farakka Treaty (1977) for sharing of Ganges water at Farakka augmenting its flow and Farakka Treaty (1996) for sharing of Ganges water was signed between India and Bangladesh.

The social, economic and environmental necessities of the riparian countries could be easily met vide the coordinated and collaborative development of Ganges Basin depending on the total volume of water that it has. Benefits to the river, benefits from the river, reduction of costs because of the river and benefits beyond the river are among those which could be beneficially achieved from the Ganges Basin. The sustainable management and development of the Ganges Basin's Resources is a must which has been presented in the paper within the boundary of 10 questions.

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Regarding Ganges Basin development, all three riparian countries have their own perspective. Bangladesh feels Ganges as the reliable source to bridge the gap of severe water shortage that has been her major excruciation in the past. India's diplomacy is in developing inter-basin transfer of water from Bhramaputra (having untapped abundant water) to the Ganges Basin through a link canal to minimize flood hazards. Nepal's first and foremost prospicience from the Ganges is harnessing the huge hydropower potential for fulfilling her domestic/industrial demands and selling the surplus energy to India and Bangladesh.

Nepal has been struggling for her continued efforts for the lawful rights and benefits but yet unadmitted from the Ganges Basin, which is the fulfillment of her water demands, being at the upstream, with construction of large dam projects and share water resources from the snowcapped Himalayas for the collective benefit of all the people residing within the region. Another difficulty that Nepal is facing is the landlocked obligation for which she should have freely exercised the navigation rights but is deprived of. Barcelona Convention of 1921 and the United Nations Convention on Law of Seas (UNCLOS), 1982 and came into force in 1994, clearly advert the navigation rights of landlocked country, according to which shall have right of access to and from the sea for the freedom of transit through the territory of transit state without any custom duties, taxes or other charges except those in connection with traffic but Nepal has been deprived of her lawful right.

Hence, for the integrated balanced development of the Ganges Basin, trilateral dialogues/treaties involving Nepal, India and Bangladesh is a must which would inevitably cater for "win-win" situation to all the concerned stakeholders.

Keywords: Ganges Basin; trans-boundary; win-win; regional cooperation; water and energy security; Nepal; India; Bangladesh.

1. Introduction

Nepal, having water storage potential of about 88 billion cubic metre (bcm) with it's large water basins-Mahakali,,Karnali, Gandak and Koshi being the main feeders to Ganges ,contributes more than 40% of the total flow and over 70% of the flow of the Ganges [41]. Ganga or the Ganges, one of the indispensable rivers of South Asia, cover more than 1 million sq.km and spreads over four countries China, Nepal, India and Bangladesh [14]. But in terms at political, professional and regional level, it has been a high level of discussion especially among Nepal, India and Bangladesh for coordination, cooperation and collaboration in order to ameliorate the socio-cultural, socio-economic, socio-environmental and socio-political status of the people of these three countries. The location of the Ganges Basin is at 70°-88°30' east longitude and 21°-31° north latitude [3]. Gangotri glacier in the upper Himalayas is the main origin of Ganga at an elevation about 7010m above sea level. It is then followed in Rohtas district of Bihar Province in India and then it enters in West Bengal province where it swings round the range of Rajmahal hill and countries to flow towards south. The Ganga is divided into two arms nearly 400 km below Farakka, where the left arm called Padma flows eastwards into Bangladesh and the right arm called Bhagirathi continues to flow south in West Bengal. Hooghly is the term given to Bhagirathi flowing west and south west of Calcutta and after reaching Diamond Harbor, the Southward direction is attained and the streams are divided into two parts before joining Bay of Bengal where Haldi River also meets [9]. After

its entry into Bangladesh, it flows another 113 km before joining Brahmaputra near Goalanda. There are only two tributaries-the Mohananda and the Baral downstream of Farakka joining the Ganges. Padma,is the name given to combined course of Ganges and the Brahmaputra, joining the Meghna at Chandpur. From this confluence, the lower Meghna (combined course of these three rivers) continues to flow into the Bay of Bengal. The total length of Gangas is about 2600 km width with total drainage area of about 1,087,300 sq.km.

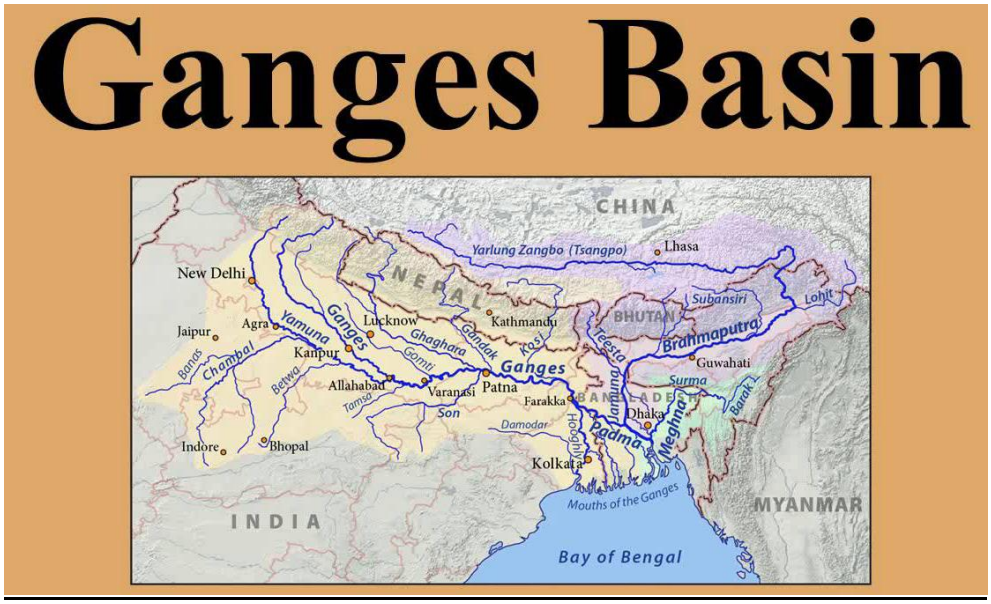

Figure 1: Diagrammatic Representation of the Ganges Basin

2. Objectives

- To focus on the framework of win-win regional co-operation for water and energy security in the Ganges Basin
- To emphasize on cooperation between riparian countries (Nepal, India and Bangladesh) regarding trans-boundary Ganges Basin Management
- To analyze the bilateral treaties between the riparian countries in regard to trans-boundary water resources management
- To enunciate on the sustainable management and development of the Ganges Basin resources
- To line up the perspective of riparian countries regarding Ganges Basin development
- To specify on the navigational rights of Nepal (as per International Conventions), being a landlocked country

3. Limitations/Constraints

The limitations of the author in presenting this paper is delineated as below:

- Nepal, India and Bangladesh (excluding China) has been considered the main riparian countries regarding Ganges Basin

- Only the main treaties and MoUs regarding Ganges Basin has been analyzed and other (minor) agreements have not been considered
- The perspective of each riparian countries is considered only regarding Ganges Basin but its indirect cumulative impact (adverse) is not considered
- The disputed issues of Nepal and India (Lipulekh, Limpiyadhura and Kalapani); and India and Bangladesh (Farakka Dam) is not analyzed.

4. Cooperation between Riparian Countries with regard to analysis of the bilateral treaties in the Ganges Basin in scope of the coverage of the principles of trans-boundary water resources management

Nepal, being at the north, is the major controller of the headwaters of the Ganges and bilateral agreements have been made by India separately with Nepal and Bangladesh through the signing and ratification of different treaties which are vividly illustrated as below.

4.1 Analysis of the bilateral treaties in the Ganges Basin in scope of the coverage of the principles of trans-boundary water resources management

The principles of trans boundary water Resources Management have been established and recognized by international conventions, judicial decisions and international treaties which form the basis of the 1966 Helsinki Rules on the uses of the Waters International Rivers (hereinafter Helsinki Rules) and the 1977 UN Convention on Non-Navigational Uses of International Water Courses (hereinafter UN Water Courses Convention) [28]. The tabular summarization of the above discussed relevant Articles endorsing those principles are portrayed as below:

Table 1: Trans-boundary water management principles and relevant Articles of international conventions, agreement/treaties

Principles	Relevant Articles			
	Physics	Helsinki Rules (1966)	UN Watercourses Convention (1997)	International Treaties
(a) Theory of sovereign equality and territorial integrity	The shared rivers on be freely used by territorial state but should not prejudice the right and interests of the co-riporiors. The co-riporiors have regional right and			➢ 1995 Agreement on Cooperation for sustainable development of the Mekong River Basin (Articles 4-7) ➢ 1995 SADC protocol on shared water course systems (Article 2) ➢ 2002 Framework Agreement on the Sava River Basin (Articles 7-9)

(b) Reasonable and equitable utilization	Subset of above theory (a). it refers to beneficial uses of water not necessarily an equal share but an equitable and reasonable share, depending on the geography, hydrology of the basin, population dependent on water, existing utilization, future potential needs and climatic and ecological factors.	Articles IV,V,VII, X, XXIX (4)	Articles 5,6,7,15,16 ,17,19	➢ 1995 SADC Protocol on Shared Watercourse Systems (Article 2). ➢ 2002 Save River Agreement (Articles 7-9), 1995 Mekong Agreement (Articles 4-6, 26)
(c) Not to cause significant harm	No state can use water courses in a Way that would cause significant harm to other basin states or environment, harm to human health or stately or even living organisms of the watercourse systems. Expressed as *sic utere too ut alienum non laedas*.	Articles V, X, XI, XXIX (2)	Articles 7,10,12,15, 16,17,19, 20 21(2), 22, 26(2), 27, 28(1), 28(3)	➢ 1995 SADC Protocol on Shared Watercourse Systems (Article 2) ➢ 2002 Save River Basin Agreement (Articles 2, 9) ➢ 1995 Mekong Agreement (Articles 3,7, 8)
(d) Cooperation and information exchange	Each riparian should cooperate and exchange data and information regarding the current situation and future planning of the watercourses.	Articles XXIX (1), XXIX (2), XXXI	Articles 5(2), 8, 9, 11, 12, 24(1), 25(1), 27, 28(3), 30	1960 Indus Waters Treaty (Articles VI-VIII), 1995 SADC Protocol on Shared Watercourse Systems (Articles 2-5), 2002 Save River Basin Agreement (Articles 3-4), Articles 14-31), 1995 Mekong Agreement (Precamble 1,2,6,9,11, 15,18,24,30).
(e) Notification, consultation and negotiation	Each riparian should notify and consult with each other regarding the utilization of watercourses and negotiate to the optimum standard.	XXIX (2), XXIX (3), XXIX (4), XXX, XXXI	Articles 3(5), 6(2), 11-19, 24(1), 26(2), 28,30	1960 Indus Waters Treaty (Articles VII[2], VIII), 1995 SADC Protocol on Shared Watercourse Systems (Articles 2[9], 2[10], 2002 Sava River Basin Agreement (Part Three and Four. Article 22), 1995 Mekong Agreement (Articles 5,10,11,24)
(f) Peaceful settlement of disputes	If negotiation could be made, all states in an international water course should seem for peaceful settlement of disputes.	Articles XXVI-XXXVII	Article 33	1960 Indus Waters Treaty (Article IX, Annexure F, G), 1995 SADC Protocol on Shared Watercourse Systems (Article 7), 2002 Sava River Basin Agreement (Articles 1, 22-24, Annex II), 1995 Mekong Agreement (Articles 18.C, 24F, 34,35).

(Source: [28])

4.2 Analysis of the Water Treaties in the Ganges Basin

The history of cooperation in the Ganges Basin dates back to 29 April, 1875 after signing of the Agreement between the British Government and the state of Jind, for regulating the water supply for irrigation from the Western Jumna Canal (amended on 24 July, 1982). On 29 August 1983, an agreement was signed between the British Government and the Patiala state regarding the Sirsa Branch of the Western Jumna Canal [21, 24].

Since then, six bilateral agreements (treaties and three Memoranda of Understandings) have been signed between the riparian countries which are-

(1) 1920 Agreement between His Majesty's Government of Nepal and India (the then British Empire) for constructing the Sharda Barrage on the Mahakali River.
(2) Agreement between His Majesty's Government of Nepal and the Government of India concerning the Koshi Project, 25 April 1954. The treaty was subsequently amended on 19 December 1966.
(3) Agreement between His Majesty's Government of Nepal and the Government of India on the Gandak Irrigation and Power Project, signed at Kathmandu, 4 December 1959. The treaty was subsequently amended on 30 April 1964.
(4) Agreement between the Government of the People's Republic of Bangladesh and the Government of the Republic of India on sharing of the Ganges waters at Farakka and on augmenting its flow, signed on 5 November 1977 at Dhaka.
(5) Treaty between Nepal and India concerning the integrated development of the Mahakali River including Sarada Barrage. Taknakpur Barrage and Pancheshwar Project, 12 February 1996, signed at New Delhi.
(6) Treaty between the Government of the People's Republic of Bangladesh and the Government of the Republic of India on sharing of the Ganga/ Ganges waters at Farakka, signed on 12 December 1996 at New Delhi.

4.2.1 Bangladesh- India Cooperation

Agreements and Treaties

On 5 November 1977, the first Water sharing agreement regarding Farakka was signed between Bangladesh and India for the duration of five years according to which the distribution of water was on a 10- day schedule basis in the dry-season (January-May). But due to inadequate progress on flow augmentation, no renewal of this agreement was done after it expired in November, 1982. [36] Later, on 12 December, 1996, after 14 years, **'Ganges Water Sharing Treaty'** was signed between India and Bangladesh, emphasizing on the two countries to have equal shares if 70,000 cusecs or less water is available at Farakka. But, if upto 75,000 cusecs of water is available Bangladesh will get 35,000 cusecs and India the balance of flow and in case water availability is in excess of 75000 cusecs, India will get 40000 cusecs and Bangladesh the balance of flow. As per the Joint Rivers Commissions Bangladesh, Bangladesh's share was nearly 13000 cusecs during the first 10-days of January. However, this treaty has not been able to address the water crisis during the dry season in the south-western part

of Bangladesh as approximately 50% less than the pre- Farakka average flow at Hardinge Bridge point of Bangladesh has been noticed [36].

Dam in Bangladesh-India Border: Farakka Dam

Farakka Dam in Bangladesh-India border, an earnest hydroelectric concern for Bangladesh, stands nearby where the main river enters Bangladesh and the tributary Hooghly continues in West Bengal past Calcutta. It was when India decided to construct the Farakka barrage for diverting water from Ganges to the Hooghly River to maintain navigability and flush out the deposited silt in the Calcutta port that the dispute arose in 1959 [29]. This barrage feeding the Hooghly tributary by a 26 mile long feeder canal was built without the consultation with downstream riparian state Bangladesh and hence has been a major source of dispute [3]. Starting its operation in 21 April, 1975 [7], flooding in monsoon and reduction of flow on dry season has caused a huge loss to Bangladesh in regard to socio-economy and environment [4]. Due to excessive withdrawal of Ganges water at Farakka in West Bengal and further upstream for about 28 years, Bangladesh claimed that it affected agriculture, fishery, navigation, industry and vegetation in her about one-fourth of the landmass [30]. Bangladesh claimed that India's consent for releasing water from the barrage was insufficient for them and in regard to it, complaint was lodged against the Farakka by Bangladesh to the UN General Assembly in 1976 [29] followed by another complaint about the misery of Bangladeshi people due to Farakka Barrage in 1993 [22].

4.2.2 Indo - Nepal Cooperation

Many ups and downs have been observed and felt by each of the riparians regarding Indo-Nepal Cooperation and all barrages constructed near to Indo-Nepal border are based on India's initiatives and needs [20]. The following are the treaties and agreements made between India and Nepal regarding the Ganges River Basin which were criticized by many in Nepal as a "sell-out / anti Nepalese" [28].

I. Sharda Treaty (1927)

After the exchange of some land between Nepal and India, Sharda Barrage was constructed by India in 1920 near the Mahakali River Border [28]. The treaty deals with Sharda Barrage pointing out Nepal to supply water from the barrage in wet and dry season in line with India to maintain a flow of no less than 350 cusecs downstream of the barrage for maintaining and preserving the river ecosystem [33].

II. Gandak Irrigation and Power Project (signed on 4 December, 1959 and subsequently amended on 30 April, 1964)

As early in 1871, a canal was planned on Gandak (Tribeni canal) to harness the large irrigation potential of Gandak River . A letter was written by the then food and Agriculture Minister, Dr. Rajendra Prasad to Government of Bihar for exploring the possibilities of constructing a canal system from the Gandak for irrigation. Finally, both parties (Nepal and India) agreed for an international agreement on 4 December, 1959.

A barrage from which two canals take off from either side, has been constructed at the Gandak River near

Bhaisalotan to regulate the water flow for irrigation and power purposes. The main Eastern canal lies in the Indian Territory except the one called Don Branch canal reaching Indo Nepal Border thereafter bifurcating into two out of which one passes through Bara, Parsa and Rautahat districts of Nepal respectively. The main western canal passes through a few kilometers in Nepal before reaching the India territory, thereby irrigating 47000 hectares of land in Nepal and 9, 30,100 hectares of land in India. Another Nepal western canal, taking off from the western side of the barrage, has 16,000 hectare of command area wholly in Nepal.

The annual irrigation from the Gandak project was estimated to be about 27.32 lac acres with total area to be irrigated in Nepal about 1.8 lac acres. Nepal was also to be given the compensation by India for the Nepalese land acquired for construction works and irrigation facilities by this project was also considered to be the cheapest. Nepal has also the right to withdraw water supply without affecting the requirement and both countries were also to be protected from floods and sedimentation after the construction of barrage. The Tirhut Main canal was opened in 1969 to provide irrigation to 18000 hectares in the Kharif season.

By utilizing the head drop in the main Western canal at Surajpura (in Nepalese territory), 15 MW of power is generated and the power house is intended to be handed over to Nepal after a certain demand condition , as stipulated in the agreement is met. Like the Koshi project, Gandak project was also protested in Nepal stating that the agreement undermined the interests of Nepalese people regarding it as highly condemnable and traitorous act unacceptable to Nepalese. But Late B.P Koirala and king Mahendra defended the project and endorsed its viability. The important aspects of Gandak Treaty are: (Agreement between HMG and Government of India on the Gandak Irrigation and Power Project amended, 1964)

(a) Land Acquisition

Article 3 guaranteed reasonable compensation to Nepal for her lands acquired or requisitioned. Article 11 strictly stipulated that nothing shall deem to derogate from the sovereignty and territorial jurisdiction of the Nepalese government.

(b) Irrigation

Article 7 provisioned that India shall Construct the Western and Eastern Nepal canal. According to Article 9, Nepalese Government continues to have the right to withdraw water for irrigation or any other purpose as required from time to time.

(c) Power

Article 8 entitled that Indian government shall construct one power house with an installed capacity of 15000 kW in the Nepalese territory on the western canal. Government of India also agreed to construct transmission line from Nepal's powerhouse to the Bihar border near Bhaisalotan and from Sugauli to Raxaul in Bihar in order to facilitate power supply on any point in the Bihar Grid.

(d) Conflict Resolution

Article 12 entitled the right to arbitration if any dispute or differences doesn't settle down by discussion.

III. Koshi Project (signed on 25 April 1954, subsequently amended on 19 December1966)

Initially in 1946 after a series of surveys and investigation for preparing project, a multipurpose scheme was envisaged regarding construction of

(a) Dam at Barahkshetra of a height of 235m to impound 0.85M ha-m in the reservoir.

(b) Barrage at Chatra with canals off taking from both sides to annually irrigate 13.9 lakh hectare in India and Nepal.

However, after further investigations and series of discussions among experts, the erstwhile Central Water and Power commission formulated a project in 1953 envisaging the construction of

(a) A barrage at Hanumannagar at a distance of 48 kms below Chatra to serve as a controlling structure and to provide gradient control in the steep reach of the river below Chatra.

(b) Flood embankments on either side of the river to confine its existing course.

(c) Canals on eastern side for irrigation facilities to both Nepal and India.

Later on 25 April 1954 an agreement was signed between the Government of India and HMG Nepal envisaging the construction of barrage and other components of the Koshi Projects. Despite being envisaged as a multipurpose project, immediate emphasis was given on benefits of flood control and to control recurrent flood devastation in the two countries. For this purpose, at 5kms upstream of Hanumannagar (8km inside Nepal), an 1150 meter barrage was built in Bhimnagar, mainly as a gradient control measure for controlling the meandering behavior of the river, soil erosion minimization and silt deposition. The construction of diversion helped feed the two canals, which took off from either side of the barrage. The eastern main canal lies entirely in the Indian Territory providing irrigation to 612,500 hectares of agricultural fond in India. By making use of the head drop of the canal at a distance of 11km from the barrage, power with an installed capacity of 4 units of 5000 KW each is generated. Nepal, though entitled to use 50 percent of the generated electricity situated within 10mile radius of the barrage but must pay for use of this power at a price fixed by mutual consent [2]. In light of oppositions in Nepal regarding some of the provisions of the 1954 agreement, it was revised in 1966.The main objection was regarding extra territorial rights being given to India for an indefinite period without adequate compensation and benefits from the project and the loss of Nepalese fertile land without equivalent gains in exchanges of it. Government of Matrika Pd. Koirala was accused of signing the treaty by buckling under India's pressure for agreeing on restricted use of water above the project site and trading the sovereignty of Nepal, for agreeing on loss of control (ownership) over the Nepalese land. India was criticized for delaying the payment of compensation and delay in implementation of rehabilitation scheme. In 1959, King Mahendra (who defended the project) formally inaugurated the Koshi Project in presence of the then Prime Minister of India, Jawaharlal Nehru [31]. Due to continued criticism of Koshi Agreement in Nepal regarding feeling of unfair treatment, the

1954 Treaty was replaced and immediately entered into force. The modified aspects of the 1966 Treaty were- [12].

(a) **Bilateral consultation**

Article 1 provisioned the bilateral consultation by India with Nepal for any construction and other under takings.

(b) **Operational Aspect** : Article 2 guaranteed the under taking of Surveys and investigations to be done inside the project area and for that it was agreed that Nepalese government shall facilitate the concerned officers for undertaking those works and may be done by India only after due intimation to Nepal.

(c) **Sovereignty over Land**

Article 3 provisioned the land to be acquired by Nepalese government and compensation to be paid by the Government of India. Article 5 (i) stipulates all lands acquired by Nepal to be leased to Government of India for a period of 199 years from the date of signing an amendment, at a nominal rate. Article 5 (v) enunciates the sovereignty rights and territorial jurisdiction of Nepal.

(d) **Right over of power and water**

Article 4 (i) guaranteed Nepal to have every right to withdraw water for irrigation and other purpose. Article 4 (ii) entitled Nepal to use 50% of the generated hydroelectricity within 10 mile radius from the barrage site.

(e) **Royalty**

Article 6 fixed Nepalese government to receive Royalty in lieu of power generated and utilized in India but no royalty to be paid on power sold to Nepal. Article 6 (ii) entitled Nepal government to receive royalty from India for stone, gravel and ballast obtained from Nepalese territory.

(f) **Labour**

Article 12 advocates for preference to the Nepalese laborers, personnel and contractors.

(g) **Civic Amenities**

Article 13 opened up India to establish schools, hospitals, water supply system, and electric supply system for the duration of project construction subject to prior approval of Nepal government.

(h) **Navigation and Fishing Rights**

Article 10 and 11 guaranteed navigation and fishing rights to rest with Nepal.

(i) **Arbitration and Establisment of Indo- Nepal Koshi Project Commission**

Article 14 entitled the provision of arbitration if any dispute or difference arising out of construction, meaning of the Agreement and respective rights / liabilities of the parties could not be settled down by discussion. Article 15 provisioned the establishment of Indo-Nepal Koshi Project Commission, consisting of four representatives from each country to be nominated by the respective governments, for discussion of problems in order to coordinate and cooperate between the two governments regarding matters covered in the agreement. Later in 1978, both countries entered into an additional agreement pertaining to irrigation from the Western Koshi Canal. The Western Main Canal, passing through a distance of 35km in Nepal before entering the Indian Territory, provides irrigation water to 11,300 hectare of agricultural land in Nepal and 356,610 hectares of agricultural land in India. Western afflux bund about 12km long and a 40km embankment along the eastern bank of river is a means of flood control in Nepal. Extensive embankments, about 220km long are constructed on either side of the river in Indian Territory to confine river flow and protect land beyond from the flood disaster (Agreement between HMG, Nepal and Government of India on the Renovation and Extension of Chandra Canal, Pumped Canal and Distribution System of the Western Koshi Canal in Nepal, 1978).

IV. The Mahakali Treaty between HMG and the Government of India concerning the Integrated Development of the Mahakali River including Sarada Barrage, Tanakpur Barrage and Pancheswar Project (12 February , 1996)

After a prolonged five years of discussion and negotiation of the Tanakpur Agreement (1991), a new era in the Indo Nepal Relations was opened when Mahakali Treaty was signed by then prime Minister of India Mr. P.V Narsimha Rao, and the then prime Minister of Nepal , Mr. Sher B. Deuba , in February 1996. The Mahakali Treaty subsumes all other Indo Nepal agreements relating to downstream projects on the Mahakali River, thus, it absorbed the regime established by the Sharda Treaty, validated the Tanakpur Agreement, and endorsed the idea of multipurpose Pancheswor project. This Treaty, aiming at the integrated development of Mahakali River, recognizes Mahakali as a trans-boundary river underlining obligations and corresponding rights and duties of both countries with regard to utilization of water of the Mahakali River. The Reflection of the Mahakali Treaty is summed up as below (The Mahakali Treaty between HMG and the Government of India, 1996):

Sharda Barrage

Article 1 points out that Nepal shall have the right to supply 28.35m3/s (1000 cusecs) of water from Sharda Barrage in the wet season (i.e.from 15th May to 15th October) and 4.25m3/s (150 cusecs) in the dry season (i.e. from 16th October to 14th May). Moreover, India is required to maintain a flow of no less than 10m3/s (350 cusecs) downstream of Sharda Barrage to maintain and preserve the river ecosystem.

Tanakpur Barrage

Article 2 of the Treaty entitled Nepal's continuation of exercising sovereignty over the land (2.9 hectare) needed for building the eastern afflux bund, as well as a hectare of the poundage area. It further embraced an enhanced package to Nepal regarding supply of 1000 cusecs of water in the wet season and 300 cusecs in the dry season, including 70 million KW hours of electricity (as against the earlier agreed figure of about 20 million kw hours)

free of charge from Tanakpur power station , with transmission line to its border following supply of half the incremental generated power at Tanakpur after river flow augmentation with commissioning of the Pancheswor dam but for this half the operational and any additional cost should be borne by Nepal. Along with the provision of supply of 350 cusecs of water for the irrigation of Dodhara Chadani area (Article 4). India shall also construct an all-weather road connecting the Tanakpur Barrage to Nepal's East-west Highway including several bridges on the route.

Pancheswar Project

Article 3 envisaged the construction of Pancheswar Multipurpose Project on the basis of 50:50 cost benefit split and the dam will straddle the border , which lies along median point of the river. Two power stations, one on either bank, with a total installed peaking capacity ranging between 5500 and 6480 MW at 20 percent load factor, are projected and a re-regulating dam could be built either at Purnagiri or further upstream at Rupali Gad to hold water passing through the Pancheswar turbines and provide regulated back season release to irrigate designated commands in Nepal and India. According to Article 3 of the treaty, both parties agreed to have equal entitlement in the utilization of waters of the Mahakali River without prejudice to their respective existing consumptive use of the waters. As this project is a joint one located on boundary, the general applicable principles are elaborated in a side letter exchanged by Prime Minister of the two countries. Article 3 also elaborates the principles committed by both sides to design and operate the project as a single, integrated scheme to yield "The maximum total net benefits accruing to them." Article 9 of the Treaty envisages the formation of Mahakali River Commission guided by the principles of equality, mutual benefit and no harm to either party, a joint Pancheswar Development Authority shall develop, execute and operate the Pancheswar project. The treaty, having life of 75 years, has been provisioned for review after 10 years.

The differences that has emerged in the post treaty period are: [34, 41]

➔ **The protection of Existing Consumptive Uses**

Nepal feels that only her existing consumptive used have been quantified without quantifying India's usage. The sharing of the capital costs of the Pancheswar project in proportion to the relative incremental benefits as per the treaty should be reckoned only after protecting the existing consumptive uses of the waters of the Mahakali. In addition, Nepal claims a half share in the incoming river flows between Pancheswar and Banbasa on the "equal entitlement" principle within the common boundary segment of the Mahakali.

➔ **Equal Sharing**

Nepal argues that each country owns 50 percent of water citing the wordings of preamble (equal partnership to define obligations along with corresponding rights and duties) and adverting to Article 3 & 5 of the treaty including cost sharing formula of the project.

➔ **The Kalapani Issue**

Nepal clearly objects the presence of Indian military in the Kalapani area and wants India to adhere to *status quo* position principle, which India demonstrated on border disputes with Bangladesh and Pakistan. But India believes that this issue has nothing to do with implementation of the Mahakali Treaty.

➔ **Phasing of the Project and site of the Re-regulating Structure**

Nepal prefers Rupali Gad as the best site but Indians believe that this site won't meet the irrigation demands. Indians prefer further downstream of Poornagiri but Nepal fears that it would inundate 250,000 hectares of fertile land and displace 56,000 people from Nepal hills. Nepal is basically keen on hydropower production while India is looking forward to irrigate vast tracts of land in Uttar Pradesh from the re-regulating structure.

➔ **Power Tariff**

Nepal infers power benefit as an 'avoided cost principle' i.e. India has to pay the price according to the cost of generating power through alternative means. But Indians argue that alternative means could be other HEPs, gas based projects, thermal projects etc. So, power tariff should be fascinating enough to Nepal warranting the undertaking of big project and affordable enough to India to warrant purchase form this source.

5. Potential benefits from coordinated and collaborative development of Ganges Basin

In absolute terms, the social, economic and environmental necessities of the riparian countries could be easily met vide the coordinated and collaborative development of Ganges Basin depending on the total volume of water that it has (Rahman, M.M., 2009). Types of benefits: benefits to the river, benefits from the river, reduction of costs because of the river and benefits beyond the river could be mounted up through the coordinated management approach of an international river (Sadoff and Grey, 2002). The same benefits could be beneficially achieved from Ganges Basin which are perspicuously depicted as below [28].

a. Benefits to the River

Both the surface and ground water quality is depleted to a great extent in Ganges Basin and hence integrated river basin management is a must which will aid in improving water quality, sustaining biodiversity, maintaining river flow characteristics and qualitatively reducing industrial pollution to the river. Water quality monitoring, water quality parameters standardization and Integrated Mechanism regarding real time data exchange could ensure better water quality resulting in the development of fisheries sector. As "EV water Framework Directive" (2000/60/EC) adopted by European Union is assisting in achievement of overall water quality in Europe, a similar legislation could be streamlined through cooperation between the riparian countries.

b. Benefits from the river

All three riparian countries; India, Nepal and Bangladesh, being a member of the United Nations, have ratified the Sustainable Development Goals (SDGs), built on the successes of Millennium Development Goals (MDGs). The major goals of SDGs could be successfully achieved through the integrated management of Ganges Basin.

More specifically, hydropower, meeting the agricultural needs for increasing population and flood and drought management are the impendent scope of development that this basin could cater for.

- **Hydropower potential from the river**

With the gross hydropower potential being 83,000 MW but economically feasible potential being about 40,000 MW in modest load curve, Nepal, having current installed capacity of about 1000 MW can fulfill its energy hunger from the Ganges aiding in promoting industrialization along with economic activities and can even sell the surplus energy in the northern and eastern regions of India and most probably if India permits, to Bangladesh and Pakistan as well. Bangladesh, having limited hydropower potential due to its flat terrain has installed power capacity of only about 3000 MW. The total installed hydropower potential of India is about 50,000 MW, which is only 10% of the country's total installed power capacity. India's demand for electricity is at an average increment of about 8-9% [38]. For eg. Northern India, alone, remains short of power to the tune of more than 50,000 MW [19]. Hence, to meet the rapid increasing demand of hydropower, exploitation of Ganges for huge hydropower potential through a regional grid seems indispensable. Hydropower, the best renewable source of energy which also does not omit greenhouse gases (except tittles due to rotten vegetation in reservoirs), is the best from of energy to ensure sustainable environment and economic prosperity for all the riparian people of the Ganges [28].

- **Flood and Drought Management**

Through the construction of large scale storage dams and reservoirs in upstream, the threat of flooding in downstream could be mitigated to a great extent. Flood Action Plan efforts executed in 1990 by the Government of Bangladesh after devastating flood of 1988 were abandoned in 1996 consequently actualizing that the flood mitigation / control measures need cooperation from upper riparian countries of the Ganges [10]. Besides this, the regulated flow can also be ensured during dry season and agricultural activities could be ameliorated as well.

- **Other Tangible Benefits**

Nepal is a landlocked country and north-eastern states of India are also seeking for direct access to other parts of India. To fulfill this accessibility hunger, round the year navigation could be ensured and a riverine transit through Bangladesh from Nepal to seaport and direct access for the north-eastern states of India could be provided through flow augmentation in Nepal [4, 19].

c. Reduction of costs because of the river

A major source of political tensions associated with an issue of sovereignty, strategic necessity, national pride and occasional exchange of fire has been the control of rivers and river flows between Arab and Israelis; Indians and Bangladesh; Americans and Mexicans; and all 10 riparian countries of Nile Basin [24]. Water has played a significant role in a number of recent disputes and conflicts around the world, so the dynamics of sharing water between the riparian could not be unbundled from other contributing factors in conflict and the international cooperation can readily ease such tensions and antagonism. In case of Ganges Basin too, integrated cooperation

among the riparian can promote long term benefits and minimize the costs to a great extent [13]. In case of Sharda Barrage (1920), Koshi Barrage (1954), Gandak Barrage (1919), Tanakpur Barrage (1996), Nepalese diaspora is observing them as "non-friendly activities" while Indian diversions of Ganges water through Farakka barrage is a major source of political tension, mistrust and non-cooperation between India and Bangladesh [19, 24]. Only bilateral agreements have been made regarding water management approach in Ganges basin which has failed to serve the interest of all three riparian countries. Only integrated management plan with dynamic participation of all riparian could reduce the conflict risks, even the military expenditure and could strengthen the relations broadening the cooperation, integration and stability among the riparian [28].

d. Benefits beyond the river

The doors of development in regional infrastructure, markets and trade industrialization due to available hydropower, educational development through expertise exchange, cross border relationship due to ease of tension and achievement of development with stability can be opened up and enhanced through improved coordinated management of rivers [13]. Taking an example of Thailand and Laos, who continued their hydroelectric trade despite animosity and hostility helped build a perfect ground to move on for healthy and friendly relations. Hence, a gigantic potential of being an economically solvent region could be attained by all riparian through the cooperation beyond the Ganges River.

6. Fundamental Guiding Questions Regarding Sustainable Management and Development of the Ganges Basin's Resources

The following ten questions primarily focuses on the future efforts to identify the potential and direct the limitations regarding water resources development in the Ganges basin, perceptions on the answers and findings based on analysis and modeling [43].

Question-1

Is there substantial potential for Upstream Reservoir Storage in the Himalayan headwaters of the Basin?

Perception: - Yes, there is huge potential for large storage project in Nepal.

Findings: - Not really.

If every of the 23 identified large dams are constructed in Nepal, the aggregate active storage could be only about 130-145 billion cubic meters, of which one-third already exists, which is very small compared to average annual flow of the Ganges (500 billion cubic meter).

Question- 2

Can upstream water storage control Basin Wide Flooding?

Perception: - Yes, Himalayan storage reservoirs can control flooding that plagues the Ganges plains and delta,

in areas of Bangladesh, Bihar and Eastern Uttar Pradesh.

Findings: - Not Really.

Since, the localized rainfall, high flows in smaller tributaries and embankment failures seem to cause flooding but not peak flow level in major tributaries, a moderate amount of augmentation at the sub-basin level is unlikely to reduce flooding.

Question-3

Can upstream water storage augment low flows downstream?

Perception: - Yes, in addition to holding back floods, upstream water storage can augment the low flows for agriculture, irrigation, ecosystems and other uses during the lean seasons, especially in the dry months preceding the monsoon.

Findings: - Yes, But ……

The modeling depicted in the World Bank report confirms the low flow augmentation, if all the considered large dams are built and even if a minor portion of flood flow is shifted to the dry season approximately doubling the driest low flow. But the economic value of this additional low flow augmentation is unclear because of water logging and low agricultural productivity in India and Bangladesh.

Question- 4

Are there good alternatives or complements to Reservoir Storage?

Perception: - No, there are no any good alternatives to reservoir storage because underground aquifers, lakes, glaciers, snow, ice are only a very small form of natural water storage.

Findings: - Yes, underground.

Increased strategic and sustainable use of underground vast aquifers in the central and lower reaches of Ganges Basin, if used in conjunction with a well-managed surface water could provide the benefits comparable to the reservoir storage as mentioned in the World Bank Report.

Question- 5

Is there substantial untapped hydropower potential in the Ganges Basin?

Perception: - Yes, Nepal has enormous hydropower potential.

Findings: - Yes,

It is estimated in Nepal to have more than 40,000 MW economically feasible potential hydropower but less than 2% has been developed. The suitable 23 dams, as examined in the World Bank Report, would have installed capacity of about 25,000 MW, producing an estimated 65-70 Tera Watt hours of power annually (saving up to 52,000-56,000 tons of carbon equivalent per year), having net value of about 5 billion USD annually.

Question- 6

What is the magnitude of potential economic benefits from multipurpose water infrastructure, and what are the tradeoffs among different water uses?

Perception:- Big gains, big tradeoffs are the common perceptions from the relative values of hydropower, flood control and low-flow augmentation.

Findings:- Big gains, but modest tradeoffs.

The gross economic benefits of additional hydropower from the considered 23 new dam projects, is estimated to range from 3 to 8 billion USD per year (assuming 25% to be sold as peaking power in India yielding an average power value of 0.1 USD per kilowatt hour). Since, 23 projects are estimated to cost around 2 billion USD per year, the total net value of hydropower would likely be about 5 billion USD per year. Benefits from additional ecosystem and irrigation would be about 1-2.5 billion USD.

Question- 7

What are the cost and benefits sharing dynamics of upstream water storage development?

Perception

Downstream countries would greatly benefit from upstream development and therefore should share the costs of that development, primarily by sharing the initial capital costs.

Findings: - Huge benefits, mostly in hydropower.

If upstream multipurpose dams are built, an over whelming share of economic benefits would be derived from hydropower with current low agricultural productivity and little flood benefit. Neglecting the ecosystem and navigational values of enhanced low flows in the deltas, if the agricultural productivity dramatically rises, the distribution of benefits could change.

Question- 8

Is large Infrastructure the best strategy for protecting communities from floods?

Perception

Yes, building infrastructures is the most effective, reliable and sustainable way to protect communities from flooding.

Findings: Not everywhere, and not exclusively

To protect communities in the Ganges basin, identified by highly variable monsoon with its thousands of tributaries, focus on flood management would be rather more effective than flood control. But yet large infrastructures (dams and embankments) would be fairly effective and greater emphasization should be done on regional forecast and warning systems, embankment asset management , drainage and more importantly localized 'soft' responses including disaster preparedness , land Zoning , insurance, training and communication campaigns etc.

Question 9

Is it possible to control sediment in the Ganges?

Perception

Yes, watershed management and upstream storage can control huge sediment loads.

Findings: Not Really

Due to high altitude, steep terrain of the sediment source regions, nature of the sediment and ongoing tectonic processes, watershed management for control of sediment yields is quite difficult. Moreover, the volume of sediment is so huge that it would be highly costlier for capturing it behind large dams and the reservoir of these structures would quickly fill up thereby producing very few benefits.

Question 10

What will climate change mean for the basin?

Perception

Enormous change could be meant regarding climate change for the basin as many predict that the melting of Himalayan glaciers could change the perennial Ganges river to seasonally flowing water and that changing temperatures and precipitation patterns shall create crippling water stress and more frequent droughts and floods.

Findings: - Uncertainties are great, but immediate actions can be taken. Climate change is a matter of great uncertainty for the Ganges Basin but the range of mean basin run off prediction is roughly comparable to the recent historical record and basin's highly variable climate. Management of current hydrological variability could be a better platform to commence in addressing the future climate change challenges of the Ganges.

7. Perspective of Riparian Countries Regarding Ganges Basin Development

The analysis of the riparian countries regarding Ganges Basin Development portrays that the interest of Nepal and India lies in exploiting the huge hydropower potential whereas Bangladesh desires the regulated flow in a way to minimize flooding during monsoon months and wants the water management in a way as to fulfill the demand of water shortage during dry months [28].

Bangladesh's Perspective

A severe water shortage has been the major excruciation for Bangladesh in the past and Ganges is the reliable source for her to heal her agony. The fundamental advocacy of Bangladesh is the execution of large dam projects upstream of Ganges at appropriate sites to be primarily planned by the co-basin country under an extensive regional plan. The inner wish of Bangladesh is that she wants Nepal, having total storage capacity of high dams in the order of 88 bcm live storage that would regulate over 95% of the total annual flow (Bangladesh - Nepal Joint Study Report), to construct huge storage dams in order to regulate the lean seasonal flow and augment the Ganges water so that needs of both countries in lean season could be plied with. Nepal, having augmentation potential during the dry season ranging from 2400 to 4950 cumecs, (over four times the present lean seasonal flow in Ganges at Farakka) if wishes to construct huge storage reservoirs can with stand the vast monsoon run off within Nepal and subsequently aid in mitigating adverse flood in India and Bangladesh. Karnali project proposed in Nepal alone has the augmentation potential more than double the existing flow of Ganges. This regulated flow can also be used for irrigating 27 million hectares of land which can enhance the quality of life through achievement of nutritional self-sufficiency [4]. Bangladesh has a great fear that if India diverts water from Brahmaputra and Ganges, which provides 85% of Bangladesh's fresh water flow in the dry season, an ecological disaster could be the consequence [11].

India's Perspective

The main diplomacy of India lies in developing the inter-basin transfer of water from Brahmaputra Basin (having untapped abundant water) to the Ganges Basin through a link canal so as to minimize the flood hazards which Brahmaputra faces advance of two months compared to the Ganges. Bangladesh is quite pessimistic about this proposal, as it would be riskier if she would bear the same sufferings as in Ganges at Farakka. Nepal is also reluctant about it because of the fear that the minimum augmented volume of water she should get might not be guaranteed and moreover the upstream beneficial rights that she should exercise might not be enjoyed if the agreement resembles to that of Koshi, Gandaki and Mahakali agreement [28]. India also wants to exploit the huge hydropower potential from the Ganges Basin as discussed earlier.

Nepal's Perspective

Nepal's first and foremost prospicience from the Ganges is the huge hydropower potential for fulfilling her domestic and industrial demands and sell the surplus energy to India and Bangladesh. Secondly, Nepal wants to be benefited from enhanced / developed in land water ways in basically, the Koshi River for her access to the sea. Though being a landlocked country, Nepal has not exercised any navigational rights in contrast to the

existing conventions and treaties. India should be optimistic regarding this issue about Nepal seeking access to the sea by developing a navigation channel from Nepalese territory. Thirdly, if high dam projects are to be constructed, Nepal not only wants to get the desired reasonable share from those projects but also the necessary rights that the upstream riparian state could freely exercise. (Rahman, M.M., 2009). But, Nepal is loath and antipathetic to the construction of large dams as it would cause the submergence of huge tracts of lands, displacement of thousands of people and great loss of the places of historical importance. Merely on this ground, Government of Nepal has rejected the study findings and notified the World Bank accordingly [14].

8. Nepal's continued efforts and her lawful rights and benefits but yet unadmitted from the Ganges Basin

The estimated annual runoff from the rivers of Nepal is about 220 billion cubic meters along with her extensive ground water resources, with an average annual precipitation of 1530 mm [42] and Ganges is the natural drainage of all rivers flowing from Nepal. Nepal's overall contribution to the Ganges is about 46 percent of its flow and it is as high as 75 percent during the lean season (March to May) with that of the Farakka flows [34]. In addition to the huge water resources, the suitable sites that Nepal possesses for large dam projects has storage capability of about 77 billion cubic meters of water, constituting about 68% of the total monsoon flow (Poudel, 2009). Nepal, after fulfilling her water demands, can contribute to the downstream during the lean period. Nepal, for the first time commenced herself setting forth a proposal for cooperation in water resources sector with India in 1977 and since then, she is continuously proposing this cooperation at both the government and Track II levels [14].

Late Birendra Bir Bikram Shah Dev, the then king of Nepal, during his address at a gathering of foreign delegates to the 26th Colombo Plan Consultative Meeting in Kathmandu in 1977 had referred to the :

Plentiful water resources of the country and demonstrated Nepal's readiness to develop and share water resources from the snow-capped Himalayans for the collective benefit of all the people residing within the region [25].

In the first summit of the Heads of States or Governments of Association of South Asia Association for Regional Cooperation (SAARC) held in Dhaka in 1985 too, King Birendra again emphasized on water resources for regional cooperation in the integrated development of water and had put forward his ideas as:

Nepal, naturally gifted by High Himalayas as one of the great assets and borne with a capability of a vast reservoir of yet untapped water resources that can quench the thirst of basic needs of millions of Nepalese, wishes to harness the priceless resources for the benefits of people [21].

Responding to Nepal's proposal, India's prime minister, indirectly gave away a visit that bilateral matters shall be dealt bilaterally. Bangladesh is quite positive regarding the offer of Nepal and adverted it as a 'positive move' which was however later seen and misinterpreted as a ganging up against India. It was only on 1986 (after the establishment of SAARC) that the Joint Committee of Experts (JCE) from India and Bangladesh finally visited Nepal despite their different manner of approaching Nepal to seek and collect data regarding the possibility of augmentation of Ganges at Farakka through the construction of 7 storage projects in Nepal. Nepal expressed her

dissatisfaction to the Indo-Bangladesh JCE for their reluctance to involve Nepal in the joint study. The committee later went back without any success and later terminated in November 1986 and their efforts too did not bear any fruit [14]. Nepal and India have a long, historical, cultural and political relations sharing permanently intertwined destinies. The political relation was formally regularized in the form of Peace Treaty in 1815, between British India and Nepal. After India's independence, a new treaty of Peace and Friendship was signed between the countries in July 1950. Pandit Jawaharlal Nehru, facilitated the process of modernization and development of Nepal very early, advising on social programs and helping draft a democratic constitution. Pandit Nehru visioned of jointly utilizing water of some of Himalayan Rivers which he pointed out in a joint communiqué issued at the end of his visit to Nepal on 14 June, 1959 stating that the "geographical contiguity of the two countries, however makes it inevitable that certain development projects can be best planned and executed by the joint endeavors of the two countries." He was apparently referring towards the cooperation between the two countries for development of river waters [35].

9. Navigation Rights of Nepal and the existing possibilities

Nepal is a landlocked country and this land locked obligation has become a great obstacle to her industrial growth and overall economic prosperity. It approximately costs about NPR 66 million (USD 943,000) to transport 100,000 tons of freight from Calcutta to Kathmandu, whereas transporting by water would have cost only about NPR 6.7 million (approximately USD 96,000) [40]. Only one-tenth of the prevailing cost would be adequate enough if transportation of freight had been through water which could save millions of Nepalese expenditure. Barcelona Convention of 1921 and United Nations Convention on Law of Seas (UNCLOS) are some of the prevailing international laws and conventions which perspicuously advert the navigational rights of a landlocked country.

Barcelona Convention and Statute on the Regime of Navigable Waterways of International Concern (Freedom of Transit), 1921

The Barcelona Convention and Statute on Freedom of Transit is an International treaty signed in Barcelona on 20 April 1921 which ensures freedom of transit for various commercial goods across national boundaries. It was registered in League of Nations Treaty Series on 8 October 1921 and went into effect on 31 October 1922 and the convention is still in force at present.

Article 1 of the statute defined transit as movement of persons and goods from one sovereign state to another. Article 2 recognized the freedom of sovereign governments to make transit arrangements within their territories. Article 3 prohibited governments from demanding payments for transit rights, except for dues designated to cover operational expenses. Article 4 made compulsory for governments to apply equal transit dues to all persons, regardless of nationality. Both Nepal and India are signatories of this treaty which was ratified by India on 2 August 1922 and by Nepal on 22 August 1966 and is still in force.

United Nations Convention on the Law of the Sea (UNCLOS), 1982 and came into force in 1994

UNCLOS, as a law of the sea came into operation and became effective from 16th November 1982 to ensure the

legal power that could bring about international governance over the oceanic floor and bed. It defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. All three riparian countries of the Ganges Basin have signed this convention in which it was ratified by India on 29 June 1995, Bangladesh on 27 July 2001 and Nepal on 2 November 1998. According to UNCLOS Part X, Landlocked state shall have right of access to and from the sea for the freedom of transit through the territory of transit state without any custom duties, taxes or other charges except those levied for the specific services rendered in connection with such traffic. According to Article 125 (1), Land-locked States shall have the right of access to and from the sea for the purpose of exercising the rights provided for in this Convention including those relating to the freedom of the high seas and the common heritage of mankind. To this end, land-locked States shall enjoy freedom of transit through the territory of transit States by all means of transport.As per 125 (2), the terms and modalities for exercising freedom of transit shall be agreed between the land-locked States and transit States concerned through bilateral, subregional or regional agreements. As per 125 (3), transit States, in the exercise of their full sovereignty over their territory, shall have the right to take all measures necessary to ensure that the rights and facilities provided for in this Part for land-locked States shall in no way infringe their legitimate interests. Article 127 mentions the custom duties, taxes and other charges in which sub article (1) alludes to that traffic in transit shall not be subject to any customs duties, taxes or other charges except charges levied for specific services rendered in connection with such traffic. According to 127 (2), means of transport in transit and other facilities provided for and used by land-locked States shall not be subject to taxes or charges higher than those levied for the use of means of transport of the transit State. Article 128 mentions that for the convenience of traffic in transit, free zones or other customs facilities may be provided at the ports of entry and exit in the transit States, by agreement between those States and the land-locked States.

But despite Nepal's relentless prolonged efforts and bilateral dialogues, India has neither rendered access to the nearest Port of Calcutta in her territory nor has granted the permit to use her Shiliguri corridor access to reach either the Chittagong Port or Port of Mongla in Bangladesh

The potential of developing water transportation is high in the rivers like Karnali, Gandaki and Koshi in Nepal, the Ganges and Brahmaputra in India and the Brahmaputra and Meghna in Bangladesh which would heavily support inland water transport facilities. It is technically feasible for Nepal and even Bhutan to gain direct access to the sea. The possibility of boat travel could be from the Hooghly (in India) along the Ganges (in Bangladesh) via Farakka and Kanpur in India to several points of Nepal, such as Bhardaha on the river Koshi, Narayanghat on the Gandaki and Chisapani on the Karnali [38]. A feasibility study is on the way on developing a navigable canal waterway extending from Chatra in Nepal to Kursella in Bihar, India for linking the Koshi navigational canal to the National Waterway No.1 of India [41].

10. Conclusion

Hydro politics in today's era has substantially become the influencing factor in geopolitics, diplomacy and even conflict. One of the biggest challenges of the next few decades seem to be maintaining the ultra- sensitive statistics of water management as water demand is expected to grow up in the range of 50 to 60 percent between

2000 and 2050. Despite buzzing news and alarmist headlines about "water wars", the rising hyper nationalism worldwide is stymieing the diplomatic efforts across the board. For the upstream countries like Nepal, which are subjected to decades of war and upheaval, the sustainable development of water resources could be a gigantic boon. The four types of benefits i.e. benefits to the river, from the river, because of the river and beyond the river as discussed earlier could offer "win-win" situations for each riparian in the Ganges basin for providing social, economic, political and environmental benefit for the riparian states and could even reverse antipathy and aversion to sympathy and fondness between the riparian. Post bilateral efforts have not been conducive enough for integrated balanced development of the Ganges. Hence, trilateral dialogues involving India, Nepal and Bangladesh could serve a solid foundation for building trust among the nations and the unique cooperation between the professionals and the institutions eventually forming a group working in the field of water resources among these three countries would inevitably cater for "win-win" situation to all the concerned stakeholders.

11. Recommendations

Based on the analysis of various aspects as manifested above, the following recommendations has been put forward:

- Tripartite agreement between Nepal, India and Bangladesh is must for integrated trans-boundary water resources management of Ganges Basin
- The potential benefits from coordinated and collaborative development of Ganges Basin is to be equally shared between the riparian countries
- The treaties signed by India separately with Nepal and Bangladesh should be revised taking into account the proportionate sharing for the sustainable management and development of the Ganges Basin Resources
- Since, Nepal is a landlocked country, the navigational rights of her is unconditionally reserved as per the International Conventions which she is deprived of till date.

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