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## **COMPARATIVE ANALYSIS OF TRANS-BOUNDARY WATER GOVERNANCE OF GANGES-BRAHMAPUTRA-MEGHNA (GBM) AND LA PLATA RIVER BASINS: ISSUES AND CONCERNS**

### **Abstract**

It is an un-denying fact that trans-boundary waters are the most critical natural resources which are not attributed to the political frontiers of the modern day countries. Trans-boundary water resources are essential to the continued life and wellbeing of the people, villages, cities and societies across the basin countries. However, the complexity arises on the issue of governing trans-boundary water resources. In this backdrop, this article attempts to bring examples of water governance practices aimed to manage La Plata river basin in Latin America in order to assess the current state of trans-boundary water governance of Ganges-Brahmaputra-Meghna (GBM) river basin in South Asia. The paper is based on the argument that sharing of the trans-boundary river requires governance mechanism at the regional level to make it effective and beneficial for all basin countries.

### **1. Introduction**

South Asia and South (Latin) America from the global-south will emerge as major economic powerhouses in near future. South Asia and China as well as Latin American countries will cover over sixty per cent of the world's Gross Domestic Products (GDPs) by 2050. These two regions have now Big Emerging Markets (BEMs) such as Brazil, Argentina, India and China. In this, the present times have been called the "Asian Century" and the "Decade of Latin America and the Caribbean" at once.<sup>1</sup>

Both the regions, thus, have emerging economies as well as increasing growth of population which have strides on the extraction of natural resources including resources from the trans-boundary rivers. Latin America and South Asia are well known for their great rivers. The Ganges, Brahmaputra and Meghna (GBM) river basin of South Asia is the third largest freshwater outlet to the world's oceans, being

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<sup>1</sup> Iromi Dharmawardhane, "South Asia and Latin America: A Powerful Friendship to be Nurtured", paper presented to the Second Global South International Studies Conference of the International Studies Association (ISA)'s Global South Caucus (GSCIS) and Singapore Management University (SMU), Singapore, on 08-10 January 2015.

exceeded only by the Amazon river system in Latin America and the Congo river systems in Africa.<sup>2</sup> The Amazon, the Orinoco and the Rio de la Plata (La Plata) rivers of the Latin America contain 28 per cent of the world's freshwater resources.<sup>3</sup> These three trans-boundary rivers system is the world's largest groundwater body covering more than 1,200,000 square kilometres (kms).<sup>4</sup> Among the three trans-boundary rivers, the La Plata river basin extends over 3.1 million kms., comprising the Paraná, Paraguay and Uruguay river systems including important parts of Argentina, Bolivia, Brazil and Uruguay, and the whole territory of Paraguay.<sup>5</sup> La Plata covers around fifty-seven large cities, about 132 million inhabitants (nearly 60 per cent of the total population of Latin America) and about 70 per cent of the GDP of basin countries.<sup>6</sup> The potential hydropower in La Plata basin has been estimated as 92,000 Megawatts (MWs).<sup>7</sup> The waterways of the drainage system provide an important transportation artery linking Brazil, Paraguay, Uruguay, Bolivia and Argentina.

GBM basin of South Asia has coverage over 1.9 million kms.<sup>8</sup> The GBM constitutes the economic and cultural backbone of this region. This basin is mainly shared by the South Asian countries e.g., India, Nepal, Bhutan, Bangladesh and also China. The Ganges, the Brahmaputra and the Meghna Rivers have contributed to the rise and prosperity of many great civilizations in South Asia and China, and now are the sources of livelihoods for billions. The tributaries of these three rivers are also trans-boundary in nature which constitute rich ecosystem and sources of irrigation to millions of hectares of agricultural fields.<sup>9</sup>

The two regional trans-boundary river basins, La Plata and GBM are facing similar problems. The increasing growths of economic activities, over extractions of water resources, growth of population and expansion of industrial and agricultural frontiers have caused significant pressures on these water resources. The Latin American countries realised these potential resource problems in the days to come. Since 1967, Latin American countries have been working together to manage water resources of the La Plata river. It is evident that, historically, trans-boundary water

<sup>2</sup> Rashed Chowdhury and Neil Ward, "Hydro-meteorological Variability in the Greater Ganges-Brahmaputra-Meghna Basins", *International Journal of Climatology*, Vol. 24, Issue 12, October 2004, pp. 1495-1508.

<sup>3</sup> David Steven, Emily O'Brien, Bruce D. Jones (eds.), *The New Politics of Strategic Resources: Energy and Food Security Challenges in the 21<sup>st</sup> Century*, Washington D.C.: Brookings Institution Press, 2014.

<sup>4</sup> Available at <http://www.gwp.org/gwp-in-action/South-America/>, accessed on 11 December 2017.

<sup>5</sup> Víctor Pochat, "The La Plata River Basin", paper presented at the 7th Biennial Rosenberg International Forum on Water Policy on Water for the Americas: Challenges and Opportunities, Buenos Aires, Argentina, 15-17 November 2010, available at <http://ciwr.ucanr.edu/files/168777.pdf>, accessed on 10 October 2017.

<sup>6</sup> Víctor Pochat, *Transboundary Dimensions in Managing La Plata System*, 2004, available at [ciwr.ucanr.edu/files/168979.doc](http://ciwr.ucanr.edu/files/168979.doc), accessed on 12 September 2017.

<sup>7</sup> *Ibid.*

<sup>8</sup> Food and Agriculture Organization (FAO), "Ganges-Brahmaputra-Meghna River Basin", available at <http://www.fao.org/nr/water/aquastat/basins/gbm/index.stm>, accessed on 15 February 2017.

<sup>9</sup> Asit K. Biswas and Juha I. Uitto, *Sustainable Development of the Ganges-Brahmaputra-Meghna Basins*, 2001, available at <http://unu.edu/unupress/backlist/ab-ganges.html>, accessed on 14 February 2017.

management of La Plata river has been less confrontational when compared to African or South Asian countries. No doubt, the absence of cooperation, sharing of information about water development projects and negotiations for equitable distribution of water resources among the co-basin countries make trans-boundary rivers governance process a daunting task. The La Plata river management and governance process over the decades have been promising and noticeably open and candid in nature among the Latin American countries. They have identified common threats, interests and future goals regarding trans-boundary water governance of La Plata. Management of trans-boundary rivers in South Asia is critically important for the basin countries in this region. Increasing demands on water resources in South Asia make trans-boundary waters a competitive commodity which engaged South Asian countries in competition to each other to ensure their adequate access and utilisation. This means that the South Asian nations are in water stress conditions due to the increasing growth of population and rapid growth of industrialisation which requires power and energy. Policy makers of the South Asian countries are concerned about how to utilise trans-boundary rivers for generating hydraulic electricity and commercial irrigation for supporting their agricultural and industrial sectors.

In this backdrop, this paper brings examples of water governance good practices regarding La Plata river basin in order to assess the current state of trans-boundary water governance of GBM in South Asia. The paper is based on the argument that sharing trans-boundary rivers may instigate conflicts in the region if there is no effective water governance mechanism in place. In this regard, the paper attempts to make case by case analysis between La Plata river governance mechanism and the current state of GBM river governance in South Asia. With this view, the paper is divided into five sections including introduction and conclusion. Section two discusses about the conceptual understanding of trans-boundary water governance and its relations with the looming water related conflict and crisis in current day inter-state relations. Section three briefly discusses about the geographical, environmental and socio-economic features of the La Plata and the GBM river basins in Latin America and South Asia. Section four draws examples of good practices regarding La Plata river governance in order to reflect on the current states of the GBM river basin governance.

## **2. Conceptual Understanding of Trans-boundary River Governance and Water Conflict**

Nature's water resources are not contained by the political frontiers of the modern day countries. It is an un-denying fact that water is the most critical natural resource, essential to the continued life and wellbeing. However, complexity arises regarding the water governance due to the uneven distribution of this resource. As countries progress technologically, the amount of water that is desired and used by

its population increases.<sup>10</sup> The river which crosses two or more countries' borders is known as trans-boundary river. According to the Atlas of the International Freshwater Agreement (2000), nearly half of the trans-boundary rivers are shared by two or more countries.<sup>11</sup> However, the Atlas pointed out that in the question of utilisation of these rivers, friction might arise among the basin states and can pose strain on the trans-boundary water governance mechanism. The conflict related with the river basin is likely to emerge when the rate of changes and alterations of water flows exceeds the institutional capacity to manage and absorb such changes.<sup>12</sup> As for example, constructions of dam, barrage and water diversion projects cause unpredicted and permanent changes of water flows and that reduce institutional capacity to resolve water disputes emerging out of these changes. In the absence of trans-boundary water management treaty and governance mechanism, construction of dams gives leverage to the powerful and upper stream countries to divert water unilaterally from the trans-boundary river system. It becomes a problematic issue when a river is shared by more than one country. When multiple countries are jointly dependent on the same international river system, the diversion of water may cause upstream/downstream conflict. Basin countries engage in conflict and hostile relations on the question over adequate access to water resources. Access to water remains as key concern of all countries. Within states, water scarcity can assume an increasingly contentious and violent role when, for example, water-dependent sectors such as irrigated agriculture can no longer sustain farming livelihoods, leading to destabilising migration flows.<sup>13</sup> Realising this, former Secretary General of the United Nations (UN), Kofi Annan remarked that "fierce competition for fresh water may well become a source of conflict and wars in the future".<sup>14</sup>

It is interesting to note that the word "rival" derives from the Latin word "rivus" which means using the same stream (rivus).<sup>15</sup> The potential rivalry between riparian countries over the construction of dams and water diversion may start at the diplomatic level. If it is not properly addressed, it can culminate to the level of conflict *i.e.*, non-armed or armed characters. As for example, there has been conflict and tension between Israel, Jordan, Lebanon, Syria and West Bank regarding the

<sup>10</sup> Peter Gleick, "Water and Conflict: Fresh Water Resources and International Security", *International Security*, Vol. 18, No. 1, pp. 79-112, 1993.

<sup>11</sup> United Nations Environment Programme (UNEP), *Atlas of International Freshwater Agreements-2000*, available at [http://www.transboundarywaters.orst.edu/publications/atlas/atlas\\_pdf/1\\_Front\\_atlas.pdf](http://www.transboundarywaters.orst.edu/publications/atlas/atlas_pdf/1_Front_atlas.pdf), accessed on 14 December 2017.

<sup>12</sup> D. Petersen-Perlman, Jennifer C. Veilleux, Matthew Zentner and Aaron T. Wolf, "Case Studies on Water Security: Analysis of System Complexity and the Role of Institutions", *Journal of Contemporary Water Research & Education*, Vol. 149, Issue 1, December 2012, pp. 4-12.

<sup>13</sup> Alexander Carius, Geoffrey D. Dabelko and Aaron T. Wolf, "Water, Conflict, and Cooperation", The United Nations and Environmental Security, *ECSP Report*, Issue 10, 2004, p. 60, available at [https://www.wilsoncenter.org/sites/default/files/ecspr10\\_unf-caribelko.pdf](https://www.wilsoncenter.org/sites/default/files/ecspr10_unf-caribelko.pdf), accessed on 05 August 2017.

<sup>14</sup> *Ibid.*

<sup>15</sup> Ashok Swain, *Managing Water Conflict: Asia, Africa and Middle East*, New York: Routledge, 2004.

sharing of water from Jordan River basin.<sup>16</sup> Since 1920, Egypt and Sudan have been sharing Nile river based on mutual agreement. Now, Ethiopia is planning to build dam on Nile which will affect water supply to Egypt and Sudan. In Europe, Hungary and Slovakia have been struggling over controlling water of Danube river. Slovakia, several times in the past had blamed Hungary for constructing Gabčíkovo/Nagymaros dam on Danube river.<sup>17</sup> The construction of dam on Han river by the South Korea led to the potential conflict between South and North Korea in early 1980s.<sup>18</sup> Given these increasing phenomena of water conflicts, the World Bank Vice President for Environmentally Sustainable Development, Ismail Sergeldin in 1995 argued that “the war of the next century will be over waters.”<sup>19</sup> Therefore, lack of adequate water governance institutions and lack of necessary infrastructure create and sustain water related conflicts among the basin countries.

The Hague Conference on water security defines trans-boundary water governance as a process to governing the water wisely, to ensure that involvement of the people and the interests of all stakeholders are included in the management of water resources.<sup>20</sup> Latter, the Global Water Partnership Dialogue on Effective Water Governance creates a framework of characteristics for good governance that is specifically related to water.<sup>21</sup> In this, the water governance should be open, transparent, equitable, accountable, responsive and sustainable. The principles of trans-boundary water governance have also been codified by the UN General Assembly in the UN Watercourses Convention (UNWC) in 1970. The convention recognised three fundamental principles of water governance *i.e.*, equitable and reasonable use, duty to cooperate, and dispute prevention and compliance. These principles ensure certain obligations to the riparian states. Among them equitable and reasonable use is considered as the fundamental principle for maintaining effective trans-boundary water governance. Moreover, transparency in river management initiatives by the riparian states is crucial to determine whether these usages are equitable and

<sup>16</sup> Munther J. Haddadin, *The Jordan River Basin: A Conflict Like No Other*, 2014, available at [https://environmentalpeacebuilding.org/assets/Documents/LibraryItem\\_000\\_Doc\\_933.pdf](https://environmentalpeacebuilding.org/assets/Documents/LibraryItem_000_Doc_933.pdf), accessed on 12 October 2017.

<sup>17</sup> Heiko Fürst, *The Hungarian-Slovakian Conflict over the Gabčíkovo-Nagymaros Dams: An Analysis*, Institute for Peace Research and Security Policy, available at <http://www.columbia.edu/cu/ece/research/intermarium/vol6no2/furst.pdf>, accessed on 10 October 2017.

<sup>18</sup> Jin-Tae Hwang, “The Chun Doo-Hwan Authoritarian Regime’s Securitisation of Water: The Case of the Peace Dam, South Korea”, *Scottish Geographical Journal*, Vol. 132, Issues 3-4, 2016, pp. 234-245.

<sup>19</sup> Barbara Crossette, “Severe Water Crisis ahead for Poorest Nations in Next 2 Decades”, *The New York Times*, 10 August 1995, available at <http://www.nytimes.com/1995/08/10/world/severe-water-crisis-ahead-for-poorest-nations-in-next-2-decades.html>, accessed on 11 October 2017.

<sup>20</sup> Ministerial Declaration of The Hague on Water Security in the 21st Century, available at [http://www.worldwatercouncil.org/fileadmin/world\\_water\\_council/documents/world\\_water\\_forum\\_2/The\\_Hague\\_Declaration.pdf](http://www.worldwatercouncil.org/fileadmin/world_water_council/documents/world_water_forum_2/The_Hague_Declaration.pdf), accessed on 10 October 2017.

<sup>21</sup> Peter Rogers and Alan Hall, “Effective Water Governance Global Water Partnership Technical Committee (TEC)”, TEC Background Papers No. 7, *Global Water Partnership*, 2003, available at [http://www.orangesenquark.org/UserFiles/File/GWP/GWP%20TEC%20Paper%207\\_English.pdf](http://www.orangesenquark.org/UserFiles/File/GWP/GWP%20TEC%20Paper%207_English.pdf), accessed on 10 October 2017.

reasonable. Helsinki rules demonstrated that each state is entitled to a reasonable and equitable share in beneficial usage of waters of an international drainage basin.<sup>22</sup> The UNWC also obliges the basin states that they should participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Therefore, trans-boundary river governance requires both rights and duties of the basin states. Basin states have the right to utilise the watercourse and they also have duties to cooperate with basin states in the protection and development of trans-boundary water resources.

The cooperation principle of trans-boundary water governance refers to the duty of the basin states to manage their shared water resources in a cooperative manner. In this, mutual information exchange, response and process of notification are important aspects of cooperation principles of trans-boundary water governance.<sup>23</sup> The free flow of information about water development policies and plans among the basin states help to reduce misconceptions and alleviate the level of accountability. Article 8.1 of the UNWC declares that the watercourse states shall cooperate on the basis of sovereign equality, territorial integrity, mutual benefits and good faith in order to attain optimal utilisation and adequate protection of an international watercourse.<sup>24</sup> The third and final important principle of trans-boundary water governance cooperation is dispute resolution mechanism and compliance in the basin. The UNWC proposes for the creation of a fact-finding commission in the event of dispute among the basin states to facilitate negotiation process for resolving such dispute.

In light of the above three main principles of water governance, it can be argued that the La Plata river management framework has proved to be effective and depicted the goodwill of the basin's five riparian countries to ensure cooperation and joint management of water resources. The La Plata river basin encompasses an area of 3.2 million square kms including territory in Argentina, Bolivia, Brazil, Paraguay and Uruguay. Like GBM, the basin is comprised of three large river systems, namely, the Paraná, the Paraguay and the Uruguay rivers. The basin is the life sustenance for much of the agricultural and industrial sectors of the riparian states and has become a source of alternative energy and economic possibility. This river basin has been treated as the backbone of agricultural and industrial interdependence of these countries. As for example, Bolivia, Paraguay and Uruguay's agriculture economies

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<sup>22</sup> "The Helsinki Rules on the Uses of the Waters of International Rivers", available at <http://www.colsan.edu.mx/investigacion/aguaysociedad/proyectorfrontera/Helsinki%20Rules%201966.pdf>, accessed on 10 August 2017.

<sup>23</sup> United Nations Water, "Water Cooperation in Action: Approaches, Tools and Processes", 2013, available at [http://www.un.org/waterforlifedecade/water\\_cooperation\\_2013/pdf/water\\_cooperation\\_in\\_action\\_approaches\\_tools\\_processes.pdf](http://www.un.org/waterforlifedecade/water_cooperation_2013/pdf/water_cooperation_in_action_approaches_tools_processes.pdf), accessed on 08 December 2017.

<sup>24</sup> "Convention on the Law of the Non-navigational Uses of International Watercourses-1997", available at [http://legal.un.org/ilc/texts/instruments/english/conventions/8\\_3\\_1997.pdf](http://legal.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf), accessed on 11 October 2017.

depend on the basin as crucially as the industrial sectors of Argentina and Brazil.<sup>25</sup> Large amounts of grain, beef, wool, timber and some manufacturing goods are exported from this region to other parts of the world.<sup>26</sup> The 1969 La Plata River Basin Treaty, the umbrella treaty, of which all of the riparian are signatories, provides a framework for joint management, development and preservation of the basin. As compared to La Plata, water governance is highly critical in the context of GBM basin. The GBM river basin covers the areas of China, India, Bhutan, Nepal and Bangladesh. The GBM basin is the most populous area in the world with a population density of around 700 per sq. km. The basin as a whole covers approximately one per cent of the earth's total land surface and contains the largest concentration of people on the planet.<sup>27</sup> The management of trans-boundary river without ensuring basic principles of good water governance makes water sharing a complex issue in GBM basin. Countries of GBM basin have commissioned hundreds of water development projects including constructions of hydro-dam, barrages, embankments and water resource management projects. In the subsequent sections this paper attempts to explore La Plata river governance mechanism further and compare this with the existing water governance in the context of managing GBM trans-boundary river basin.

### 3. Geographical, Environmental and Socio-Economic Features of the La Plata and the GBM River Basins

The La Plata river Basin is considered as one of the greatest river systems of the world draining approximately one-fifth of the South American continent. The basin is comprised of three large river systems, namely, the Paraná, the Paraguay and the Uruguay Rivers. The table below presents lengths and distribution of three major rivers of La Plata basin<sup>28</sup>:

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<sup>25</sup> Aaron T. Wolf and Joshua T. Newton, *Transboundary Dispute Resolution: The La Plata Basin*, available at [http://www.transboundarywaters.orst.edu/research/case\\_studies/La\\_Plata\\_New.htm](http://www.transboundarywaters.orst.edu/research/case_studies/La_Plata_New.htm), accessed on 09 October 2017.

<sup>26</sup> Arun P. Elhance, *Hydropolitics in the 3rd World: Conflict and Cooperation in International River Basins*. Washington D.C.: United States Institute of Peace, 1999.

<sup>27</sup> FAO, "Ganges-Brahmaputra-Meghna River Basin", *op. cit.*

<sup>28</sup> United Nations Environment Programme (UNEP), Global Environment Facility (GEF), Concept Document for Sustainable Water Resources Management in the La Plata River Basin, prepared by the Intergovernmental Coordinating Committee of La Plata River Basin Countries (CIC) and the General Secretariat of the Organization of American States (GS/OAS), 2003.

**Table 1: Rivers of the La Plata Basin**

Area (km <sup>2</sup> )				
Basin Countries	Paraná	Paraguay	Uruguay	Total for Country
Argentina	565.000 (37.5%)	165.000 (15.0%)	60.000 (16.4%)	920.000 (29.7%)
Bolivia	*	205.000 (18.7%)	*	205.000 (6.6%)
Brazil	890.000 (59.0%)	370.000 (33.9%)	155.000 (42.5%)	1415.000 (45.7%)
Paraguay	55.000 (3.5%)	355.000 (32.4%)	*	410.000 (13.2%)
Uruguay	*	*	150.000 (41.1%)	150.000 (4.8%)
% of La Plata Basin	1510.000 (48.7%)	1095.000 (35.3%)	365.000 (11.8%)	3100.000 (100%)

Source: "A Framework for Sustainable Water Resources Management in the La-Plata Basin with Respect to the Hydrological Effects of Climatic Variability and Change", Concept Paper Annexes (1) Profiles of GEF International Waters Projects in the La Plata Basin, pp. II-3, available at <https://iwlearn.net/resolveuid/3e3ccfe4669709702c3e4e8df58aa0aa>, accessed on 11 January 2018.

Note: \* Not applicable

The La Plata basin remains at the economic heartland of Latin America. Almost fifty-seven large mega cities are located across La Plata basin areas. Its total population has grown from 61 million in 1968 to about 132 million in 2000.<sup>29</sup> Almost 60 per cent of the total population of the five countries is living in this basin.<sup>30</sup> The urbanisation in La Plata basin is increasing rapidly from an average of 45 per cent at the beginning of the 1960s to an estimated present average of 77.5 per cent.<sup>31</sup> According to the United Nations Environmental Programme (UNEP), about 70 per cent of the GDP of the five countries is generated within this drainage area.<sup>32</sup> However, the levels of industrialisation vary among the basin countries. The economy of Brazil is thriving along with Argentina and Uruguay, while the economies of Bolivia and Paraguay remain more broadly-based on agricultural production. La Plata is the source of hydropower (almost 92,000 MW) in the Latin American region.<sup>33</sup> Basin countries have already used 60 per cent of them. More than 90 per cent of

<sup>29</sup> United Nations Environment Programme (UNEP), "Patagonian Shelf", *GIWA Regional Assessment*, No. 38, 2004.

<sup>30</sup> Victor Pochat, *Transboundary Dimensions in Managing La Plata System*, *op. cit.*

<sup>31</sup> *Ibid.*

<sup>32</sup> Alberto Garrido and Mordechai Shechter, *Water for the Americas: Challenges and Opportunities*, New York: Routledge, 2014.

<sup>33</sup> Mariana Suzuki Sell, "International Water Law in the La Plata Basin: Regional Application of Principles and Procedural Rules of General International Water Law", *Journal of Law and Politics in Africa, Asia and Latin America*, Vol. 39, No. 2, 2006, pp. 176-191.



the energy used by Brazil comes from hydropower, with the greater part of it being generated by impoundments on the Paraná river and its tributaries of La Plata.<sup>34</sup> La Plata basin countries also adopted bi-national type river development infrastructural development to share cost and benefits. As for example, Brazil and Paraguay signed a bilateral agreement in 1973 to build Itaipu hydroelectric project on Parana river.<sup>35</sup> Major bi-national hydroelectric projects on La Plata are mentioned in the following table<sup>36</sup>:

**Table 2: Joint Mega Water Development Projects on the La Plata River Basin**

Countries sharing dam	Name	River	Year	Purpose
Brazil and Paraguay	Itaipu Dam	Parana River	1994	Hydroelectricity
Argentina and Paraguay	Yacyretá Dam	Parana River	1994	Hydroelectricity
Argentina and Uruguay	Salto Grande Dam	Uruguay River	1979	Hydroelectricity
Argentina and Brazil	Proposed Garabí	Under negotiations		

Sources: Patrick Gilman, Víctor Pochat and Ariel Dinar, "Whither La Plata? Assessing the State of Transboundary Water Resource Cooperation in the Basin", *Natural Resources Forum*, Vol. 32, 2008, pp. 203-214; and Víctor Pochat, "The La Plata River Basin", *op. cit.*

The waterways of the La Plata river drainage system provide an important transportation artery linking the five basin countries. The industrialisation of the cities of these countries attracts many rural poor to migrate and settle in cities around La Plata. Therefore, water demand is increasing in the urban areas. Moreover, incomplete treatment of urban wastewater affects both water quantity and water quality in the basin. At present, it suffers from pollution due to the growth of population, industrialisation and over use of waters and unplanned waste disposals. The erosion of productive land, silting of waterways and reservoirs, soil and water pollution, and loss of habitat for fish and wildlife are also present in the La Plata river basin.

The GBM rivers constitute the main trans-boundary river basin in South Asia. This basin is the source of fertile agricultural flood plains which feed millions of people in South Asia. GBM is also contributed to the creation and sustenance of the largest mangrove forests Sunderban in this region. However, the region's socio-economic conditions are low. In terms of social indicators such as education, health, malnutrition, child mortality, access to safe drinking water and energy, this region lies well behind other regions of the world.<sup>37</sup>

<sup>34</sup> Alberto Garrido and Mordechai Shechter, *op. cit.*

<sup>35</sup> Guillermo J. Cano, "Argentina, Brazil, and the De La Plata River Basin: A Summary Review of Their Legal Relationship", *Natural Resources Journal*, Vol. 16, No. 4 (Symposium on Water Resources Management in a Changing World), Fall 1976.

<sup>36</sup> For details see Víctor Pochat, *The La Plata River Basin*, 2010, available at <http://ciwr.uconn.edu/files/168777.pdf>, accessed on 10 September 2017.

<sup>37</sup> Asit K. Biswas, "Water and Regional Development", in A. K. Biswas, O. Unver and C. Tortajada (eds.), *Water as a Focus for Regional Development*, New Delhi: Oxford University Press, 2004.

The three rivers of GBM basin have different characteristics and flow through different countries in this region. The GBM covers 1.7 million kms area owned by five countries. These are India (63 per cent), China (18 per cent), Nepal (9 per cent), Bhutan (3 per cent) and Bangladesh (7 per cent).<sup>38</sup> These three rivers have joined together only few hundred kms., upstream of the mouth in the Bay of Bengal. The GBM has unique geographical characteristics as the three rivers have created different tributaries/ main arteries of rivers, canals and water bodies in different countries. As for example, Nepal is located in the Ganges river basin, whereas Brahmaputra constitutes the main tributary in Bhutan. According to the Joint Rivers Commission in Bangladesh (JRCB), GBM basin covers the following areas:

**Table 3: Rivers of the GBM Basin**

Rivers	Area in kilometers	Countries included	Area of country in basin (in km)	As % of total area of the basin
Ganges	1087300	India	860000	79
		China	33500	3
		Nepal	147500	14
		Bangladesh	46300	4
		Bhutan	*	*
Brahmaputra	543400	India	195000	36
		China	270900	50
		Nepal	*	*
		Bangladesh	39100	7
		Bhutan	38400	7
Meghna	82000	India	47000	57
		China	*	*
		Nepal	*	*
		Bangladesh	35500	43
		Bhutan	*	*
Total	1712700	India	1102000	64
		China	304400	18
		Nepal	147500	8
		Bangladesh	120400	7
		Bhutan	38400	3

Source: Food and Agriculture Organization (FAO), "Ganges-Brahmaputra-Meghna Basin", Regional Report 37, 2011, available at [http://www.fao.org/nr/water/aquastat/basins/g\\_b\\_m/in dex.stm](http://www.fao.org/nr/water/aquastat/basins/g_b_m/in dex.stm), accessed on 12 December 2017.

Note: \* Not applicable

<sup>38</sup> Thomas S. Bianchi, *Deltas and Humans: A Long Relationship Now Threatened by Global Change*, London: Oxford University Press, 2016.

Both the Ganges and the Brahmaputra rivers originate in the Himalayan mountain range in China. From the origin, the Ganges river takes the southwest route to enter into the Indian region and creates many tributaries in India and Bangladesh when it turns southeast and enters Bangladesh as the Padma river. On the other hand, the Brahmaputra river originates from the Angsi Glacier in Himalayan region near Burang County in Tibet as the Yurlung Tsangpo river.<sup>39</sup> Brahmaputra takes the southeast route to flow over Yarlung Tsangpo Grand Canyon and enters the Arunachal Pradesh in India. In Arunachal, it is known as Dihang or Siang. After that it turns southwest through the Assam valley as Brahmaputra and enters Bangladesh from the north and flows through south of Bangladesh as Jamuna river.<sup>40</sup> About 1,800 miles (2900km) long, the Brahmaputra is an important river for irrigation and transportation in this region. The tributaries of the Meghna river originate in the mountains of the eastern India mainly Manipur called Barak. It flows south-westerly winding its way along the hill ranged for about 250 kms. It changes direction to the west and follows a course until it enters Bangladesh. Near the border the Barak is bifurcated into two rivers, the Surma and the Kushiya, which joins again, and takes the name of Meghna before it meets Padma near Chandpur inside Bangladesh.<sup>41</sup> All the three rivers are flowing over Bangladesh towards the Bay of Bengal. Bangladesh has mainly fertile lowland constituted by the GBM and become part of the Greater Bengal plain. The GBM is the highly populated basin in the world. Almost 630 million people live in the GBM river basin which is almost two thirds of the population of Africa.<sup>42</sup> Interestingly the size of the GBM is 18 times smaller than the African continent. Therefore, GBM is the highly densely populated area *i.e.*, about one-fourth of the world's population but only contains about 4.5 per cent of the world's annual renewable water resources. Due to increasing pressure of population and related agricultural, industrial and domestic usage of water in GBM basin, the per capita access to water is low as compared to the other regions of the world. The per capita investment in water resource management is also very low. The volume of per capita water usage goes down due to the increase of population. The big challenge that GBM basin countries face today is to manage water resources along with the trans-boundary rivers for ensuring maximum benefits including access to safe drinking water, sanitation, irrigation for agriculture and electricity for supporting growing manufacturing sector of these countries. Water management also includes controlling floods, river banks erosions and most importantly river pollutions across the countries. The water quality of GBM has been deteriorating due to the increasing rate of industrialisations along the river banks, discharges of industrial chemicals, wastes and agrochemicals into the rivers.

The water development activities in GBM basin dates back to 2000 years ago in which people thought about irrigation system in the rivers to support their agricultural

<sup>39</sup> Nayan Sharma, *River System Analysis and Management*, Springer, 2017.

<sup>40</sup> For details, see [http://www.fao.org/nr/water/aquastat/basins/gbm/gbm-CP\\_eng.pdf](http://www.fao.org/nr/water/aquastat/basins/gbm/gbm-CP_eng.pdf), accessed on 18 December 2017.

<sup>41</sup> Mahesh Chandra Chaturvedi, *Ganga-Brahmaputra-Meghna Waters: Advances in Development and Management*, Florida: CRC Press, 2012, p. 5.

<sup>42</sup> *Ibid.*, p. 3.

productions.<sup>43</sup>The canal systems were built to direct water from the GBM main rivers to the agricultural fields. At present the total area of GBM river basin that is covered for irrigation is estimated to be around 35.1 million ha., of which 82.2 per cent in India, 14 per cent in Bangladesh, 3.3 per cent in Nepal, 0.4 per cent in China and 0.1 per cent in Bhutan.<sup>44</sup>In spite of building canals, countries of GBM basin have also built mega dams for water diversion, irrigation and hydroelectricity generation. In Bhutan, several dams were constructed for hydroelectric power generation. These include the 40m high Chhukha dam on the Wang river, 91m high Tala-Wankha dam on the Raidak river and 33m Kurichhu dam on the Kuri river.<sup>45</sup>The total hydropower generation capacity was 477 MW which is 96 per cent of the country's electricity generating capacity in Bhutan. India is considered as high potential of hydropower country in the world. The country has potential to generate 1,48,700 MW hydropower in which the combined Ganges, Brahmaputra and Indus river can contribute about 80 per cent of the power. In Nepal, two large water diversion barrages were built on the Kosi and Gandaki rivers in GBM basin.<sup>46</sup>Being a lower riparian country Bangladesh has not been able to build any large dam on the GBM river basin. Bangladesh has constructed three barrages on the Teesta, Tangon and Manu rivers for irrigation purposes.

**Table 4: Dams and Barrages on GBM Basin**

Country	Name	Nearest City	River	Year	Purpose
Bhutan	Chhukha	Chhukha	Ti Chu	1988	Hydropower
	Tala-Wankha	Phuntsholing	Wang (Raidak)	2006	Hydropower
	Kurichhu	Gyelposhing	Kuri	2002	Hydropower
	Basochu	Wangduephodrang	Baso Stream	2001	Hydropower
India	Rihand	Sonbhadra	Rihand	1962	Hydropower
	Farakka Barrage	Murshidabad, Malda	Ganges	1974	Irrigation
	Bhimgoda	Haridwar	Ganges	1983	Hydropower
Nepal	Kali Gandaki	Mirmi	Gandaki	2002	Hydropower
	Kosi	Sunsari and Saptari	Kosi	1956	Flood control
Bangladesh	Manu Barrage	Maulvibazar Sadar	Manu	1990	Irrigation and fish pass
	Tangon Barrage	Boda, Panchagarh	Tangon	1989	Irrigation and fish pass
	Teesta Barrage	Saidpur	Teesta	1998	Flood control and irrigation

Sources: FAO, "Ganges-Brahmaputra-Meghna Basin", *op. cit.*; International Rivers, "Status of Hydropower Dams in Bhutan", 2015, available at <https://www.internationalrivers.org/resources/8703>, accessed on 11 January 2019; and Anil Bose, "List of Dams and Barrages in India with River", available at <https://www.importantindia.com/4399/list-of-dams-and-barrages-in-india-with-river/>, accessed on 12 January 2018.

<sup>43</sup> FAO, "Ganges-Brahmaputra-Meghna Basin", *Water Report 37*, 2011, available at <http://www.fao.org/nr/water/aquastat/basins/gbm/index.stm>, accessed on 08 August 2017.

<sup>44</sup> *Ibid.*

<sup>45</sup> *Ibid.*

<sup>46</sup> *Ibid.*

Recently, countries of the GBM basin have been increasingly planning to construct large and mega dams on these rivers. Two of the three rivers of GBM are originated from the Himalayan belt which is the source of freshwater resources for the countries downstream. Most of the existing and under construction dams are mainly storage dams which have larger reservoir capacity of water. These vast reservoirs of water provide as the first line of defence against flooding. Also these dams are built to provide irrigation to the agricultural sector, store water for dry seasons and power generations. China has adopted the newly North-South water transfer project which will contribute to the country's economic, security, energy and food production.<sup>47</sup> Therefore, nationally constructed water projects by the basin countries in this region are nothing but a reality which increases the need for water resource governance mechanism as well. In this context, the following section reflects on the water governance mechanism of La Plata river to explore present situation of the GBM governance mechanism.

#### **4. Comparative Analysis of the Trans-boundary Water Governance of the La Plata River Basin in Latin America and the GBM River Basin in South Asia**

The trans-boundary water governance has been regular discourse since the 1992 UN Conference on Environment and Development (UNCED). The Rio-sustainable development principles have been modified and integrated into the trans-boundary water governance issues at the Expert Group Meeting on Strategic Approaches to Freshwater Management in Harare in 1998, the Ministerial Meeting on Water Resources and Sustainable Development and the Sixth Session of the Commission on Sustainable Development.<sup>48</sup> In these meetings trans-boundary water governance includes universal guiding principles. These are:

- Principle I: Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- Principle II: Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
- Principle III: Women play a central part in the provision, management and safeguarding of water.
- Principle IV: Water has an economic value in all its competing uses and should be recognised as an economic good.<sup>49</sup>

<sup>47</sup> "China's Water Diversion Project Starts to Flow to Beijing", *The Guardian*, available at <https://www.theguardian.com/world/2014/dec/12/china-water-diversion-project-beijing-displaced-farmers>, accessed on 01 October 2016.

<sup>48</sup> Dr Owen McIntyre, "Improving Trans-boundary Water Governance through the Application of Integrated Water Resources Management", *Background Paper*, National University of Ireland, available at <http://www.unep.org/environmentalgovernance/Portals/8/ENGLISH%20Improving%20Transboundary%20Water%20Governance.pdf>, accessed on 05 January 2018.

<sup>49</sup> *Ibid.*

Based on the above universal guiding principles, trans-boundary water governance is recognised as a process which promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and livelihoods of people. However, the major challenges trans-boundary water governance face are about water management and appropriation at the individual, local, national and the regional levels. Trans-boundary rivers like La Plata and GBM are the sources of freshwater which are shared and used by multiple users across the boundaries. The beneficiaries of these rivers have diverse needs, aspirations and values toward water usages among the basin countries. In this way La Plata and GBM rivers not only cross boundaries of basin countries but also encompass different economic and agricultural sectors, legal jurisdictions, policy goals, security concerns and political interests. Trans-boundary water governance is a complex one as the governance mechanism requires management of political, cultural and social aspects of water and this integrated management is dependent on extremely intricate awareness of the decision-making process by the policy makers.

Drawing from the examples of La Plata river governance, the following discussion analyses the current state of trans-boundary water governance of GBM in South Asia on the basis of three principles of water governance. These are: equitable and reasonable use of water; duty to cooperate; and dispute prevention and compliance that are elaborated below.

#### **4.1 *Equitable and Reasonable Use of Trans-boundary Water Resources in La Plata and GBM River Basins***

Nearly half a century ago five countries of the La Plata basin had initiated their joint efforts to develop water resources and ensure equitable and reasonable usages. As mentioned earlier, trans-boundary rivers collate different regions and their diverse interests emerged out of different historical, geographical, social and political background. La Plata was not an exception. However, the basin countries did overcome and had pursued their common goals. In this regard, the five basin countries first organised a meeting at the Foreign Minister's level in 1967 in Buenos Aires to assess their needs and declared their joint goals regarding the La Plata basin as "it is a decision of our governments to carry out the joint and integral study of La Plata Basin, with a view to the realization of a program of multinational, bilateral and national works, useful for the progress of the region."<sup>50</sup> By this declaration, they expressed their solidarity towards achieving progress of the region. The Intergovernmental Coordinating Committee of the Countries of La Plata Basin (CIC) was established with the aim of drawing up a statute for its definitive constitution. Since 1967, there had been regular meetings and negotiations among the basin

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<sup>50</sup> Alberto Garrido and Mordechai Shechter, *op. cit.*

countries. In regard to the equitable and reasonable use of La Plata, Article V of the Basin Treaty states that:

“Any joint activities undertaken by the Contracting Parties shall be carried out without prejudice to such projects and undertakings as they may decide to execute within their respective territories, in accordance with respect for international law and fair practice among neighbouring friendly nations.”<sup>51</sup>

However, there was a disagreement between Argentina and Brazil regarding this principle. Brazil proposed that instead of accepting general rules applicable for all basin countries La Plata basin treaty should encompass context based rules and guidelines. Brazil had a logic that a country possessing the sources of a drainage of the basin could not willingly limit itself on the use of the water. As for example, the long Paraná river sub-basin, situated in Brazilian, Argentinean and Paraguayan territories, has relevant conditions for hydroelectricity, such as appropriate slope, important flow, basaltic structure and embanked stretches.<sup>52</sup> Since 1960, Brazil had launched the construction of numerous dams in the basin, in a restless building effort which is still current and will extend into the future. Paraguay and Argentina, lower riparians, had planned to construct two important dams in their shared stretch at the same period in the 1970s. Uruguay is not a riparian state of the Paraná river and Paraguay adopted a waiting role. To avoid such disagreement among the basin countries, in 1971, they adopted basic principles for water management applicable to La Plata basin riparian states in the ‘Asunción Declaration on the Uses of International Rivers’ for ensuring equitable and reasonable use of trans-boundary water resources.<sup>53</sup> These are:

1. In contiguous rivers, as riparians share their sovereignty, every use of the watercourse should be preceded by bilateral agreement of riparian states.
2. In successive international rivers, where riparians do not share their sovereignty, each state is able to use the watercourse according to its needs provided the uses thereof do not cause appreciable harm to another basin state.
3. And states are required to take into consideration the living resources of basin waters into their planning.

These basic principles upheld the international watercourse principle of equitable and reasonable use of freshwater resources. In this regard, basin countries of La Plata agreed upon causing no “appreciable harm” in the utilisation of trans-boundary rivers.

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<sup>51</sup> Lilian del Castillo-Laborde, *The Río de La Plata and Its Maritime Front Legal Regime*, Leiden, Bostin: Martinus Publishers, 2008.

<sup>52</sup> Víctor Pochat, *Transboundary Dimensions in Managing La Plata System*, *op. cit.*

<sup>53</sup> *Ibid.*, p. 15.

The principle of equitable and reasonable use of trans-boundary water resources is challenging in GBM basin. It is imperative to note that the GBM basin countries have faced challenge to collate their national demands with the regional demand and interest regarding the use of GBM water resources. It is a reality that all GBM basin countries are constantly facing scarcity of water at their domestic levels. As for example, India is currently facing rapid decreasing of water supply. It is expected that by 2030, water shortage will reach up to 50 per cent.<sup>54</sup> The largest rivers of South Asia *i.e.*, Indus, Brahmaputra and Meghna are under special consideration for all its basin countries.

GBM basin is located on the foothills of Himalayas. Geographically China is situated in the upper riparian of GBM basin. Therefore, China has geographic advantage over its neighbouring basin countries. China is currently facing rapid industrialisation, urbanisation and population growth. These issues foster China to develop water resources management infrastructures. China's energy needs are estimated to grow up to 60 per cent from 2012 to 2035.<sup>55</sup> China is now building huge hydro project to meet its energy demands. The UNEP and the Asian Institute for Technology (AIT) in 2009 published a report<sup>56</sup> that indicated over-exploitation, climate change and inadequate cooperation among countries threaten some of the world's greatest river basins including GBM. South Asia's struggle for gaining control over rivers has already gaining international attentions regarding the future stability of the region. The race for water will make South Asia a water-stressed region. Lower riparian countries like Bangladesh in South Asia witnesses too much water during the monsoon. The growing population, rapid industrialisation, farming and domestic usages of water in South Asia make policy makers to develop policy or strategy to build infrastructures on GBM which needs to have a comprehensive trans-boundary governance mechanism to ensure equitable and reasonable use of GBM's resources among the basin countries.

#### **4.2 Cooperation Principle of Trans-boundary Water Governance in La Plata and GBM River Basins**

The cooperation principle of trans-boundary river governance requires mutual cooperation for the development of river basins for common interests. In this regard, cooperation principle stimulates basin countries to share their information

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<sup>54</sup> Anjal Prakash, Medhavi Sharma and Jayati Chourey, *Water in India: Situation and Prospects*, Delhi: UNICEF, 2013.

<sup>55</sup> U.S. Energy Information Administration (EIA), "Annual Energy Outlook 2012 with Projections to 2035", available at [https://www.eia.gov/outlooks/aeo/pdf/0383\(2012\).pdf](https://www.eia.gov/outlooks/aeo/pdf/0383(2012).pdf), accessed on 12 January 2018.

<sup>56</sup> Mukand S. Babel and Shahriar M. Wahid, "Freshwater under Threat: Vulnerability Assessment of Freshwater Resources to Environmental Change, Ganges-Brahmaputra-Meghna River Basin, Helmand River Basin, Indus River Basin", 2008, available at [https://digital.library.unt.edu/ark:/67531/metadc28587/m2/1/high\\_res\\_d/southasia\\_report.pdf](https://digital.library.unt.edu/ark:/67531/metadc28587/m2/1/high_res_d/southasia_report.pdf), accessed on 10 January 2018.



regarding respective water development projects. Basin states also need to notify the potential project and impacts of such project on the water resources of basin countries. The La Plata river basin agreement enhances the cooperation principle in various ways. During the second Ministerial Meeting in May 1968 basin countries have agreed on the following principles to enhance their cooperation in the development of basin areas.<sup>57</sup> These are:

1. Joint inventory and analysis of basic information on the basin's natural resources and related subjects;
2. Initiate joint study of problems to be solved and projects of measures to be taken (dredging, obstacle removal, signalling, buoyage, etc.) in order to allow permanent navigation and to secure its maintenance in the Paraguay, Paraná, Uruguay and La Plata rivers;
3. Provide facilitation and assistance with regards to navigation;
4. Achieve the preservation and the improvement of animal and vegetal life; and
5. Promote other projects of common interest and especially, those that have relation to the inventory, assessment and development of the natural resources of the area.

The basin treaty preceded by 'Asunción Declaration on the Uses of International Rivers' in 1971 recognised that:<sup>58</sup>

- Riparian states of La Plata should exchange hydrological and meteorological data and cartographic results from field measurements;
- There is an emphasis on the improvement of river navigability and a warning that future works should not hamper navigation; and
- States are required to take into consideration the living resources of basin waters in works planning.

Based on the above cooperation principles, La Plata basin countries have initiated many bi-national and regional development projects in early 1970s. In

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<sup>57</sup> Victor Pochat, "Identification, Collection of Information and Compilation of Examples of Relevant Practices Concerning the Integration Into Policy/Normative Frameworks and Implementation of Key Priority Issues", *International Policy in Shared River Basins*, 2009, available at [http://staging.unep.org/dams/files/Compendium/Report\\_InterRivers.pdf](http://staging.unep.org/dams/files/Compendium/Report_InterRivers.pdf), accessed on 08 January 2018.

<sup>58</sup> FAO, *International Conventions of Regional Application*, available at <http://www.fao.org/docrep/005/w9549e/w9549e03.htm>, accessed on 02 January 2018.

1973, Brazil and Paraguay have concluded a bilateral treaty for constructing Itaipú development project. On 19 November 1973, Argentina and Uruguay signed the 'Treaty on the La Plata River and the Corresponding Maritime Boundary'.<sup>59</sup> This treaty settled the controversial situation about the exercise of jurisdiction over that vast river waters and improvement of navigation, fishing, bed and subsoil of the river. Both the countries supported the setup of two permanent commissions: the Administrative Commission of the La Plata River and the Joint Technical Commission for the adjacent maritime zone and the overlapping common fishing zone to monitor and prevent pollution, pilotage, works, scientific research and rescue operations.<sup>60</sup> On 3 December 1973, the Yacyretá Binational Entity was established by agreement between Argentina and Paraguay, with the purpose of constructing Yacyretá development.<sup>61</sup> Subsequently, on 26 February 1975, Argentina and Uruguay agreed on the establishment of a special body for their shared stretch of the Uruguay river to work for improving navigation, works, pilotage, bed and subsoil resources, fishing, pollution prevention etc.<sup>62</sup> On 7 July 1977, Brazil and Uruguay signed the 'Treaty on Cooperation for the Utilization of the Natural Resources and Development of Mirim Lagoon Basin', aiming to improve water supply for domestic, urban and industrial uses, stream flow regulation and flood control, setting up of an irrigation and drainage system, production, transmission and utilisation of hydroelectric energy and increase of means of transport and communication.<sup>63</sup>

In 1980, Brazil and Argentina agreed upon the use of their shared stretch of the Uruguay river and decided to build the Garabí dam as a joint project. And, in the financial field, it should be noted that the Financial Fund for the Development of La Plata Basin (FONPLATA) was created during 1976 within the framework of the Treaty to lend financial support to the activities envisioned in the Treaty.<sup>64</sup> The GBM basin countries can take into consideration these impressive examples of cooperation in La Plata river basin. GBM requires greater degree of cooperation among the basin countries in future. It is a fact that all basin countries require huge amount of water and energy. China at present is engaging in a push to build hydroelectric dams on a scale unprecedented in human history.<sup>65</sup> China in search

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<sup>59</sup> Victor Pochat, "International Agreements, Institutions and Projects in La Plata River Basin", *International Journal of Water Resources Development*, Vol. 27, Issue 3, 2011.

<sup>60</sup> Asit K. Biswas, Newton V. Cordeiro, Benedito P. F. Braga and Cecilia Tortajada (eds.), *Management of Latin American River Basins: Amazon, Plata, and São Francisco*, Tokyo: United Nations University, 1999.

<sup>61</sup> Asit K. Biswas (eds.), *Managing Transboundary Waters of Latin America*, London: Routledge, 2013.

<sup>62</sup> Del Castillo Laborde, "The Plata Basin Institutional Framework", in *Management of Latin American River Basins: Amazon, Plata and São Francisco*, 1999, *op. cit.*

<sup>63</sup> Victor Pochat, *Transboundary Dimensions in Managing La Plata System*, *op. cit.*

<sup>64</sup> Alberto Garrido and Mordechai Shechter, *op. cit.*

<sup>65</sup> Lewis Charlton, "China's Great Dam Boom: A Major Assault on Its Rivers", available at [http://e360.yale.edu/feature/chinas\\_great\\_dam\\_boom\\_an\\_assault\\_on\\_its\\_river\\_systems/2706/](http://e360.yale.edu/feature/chinas_great_dam_boom_an_assault_on_its_river_systems/2706/), accessed on 15 December

of renewable electric power has been constructing mega dams. Some of them are larger than the world known *viz.*, Hoover Dam on the Colorado river which is 221 metre high and capable of generating more than 2000 MWs power.<sup>66</sup> By 2020, China aims to generate more than 120,000 MWs of hydroelectric renewable energy. China recently undertook the South-to-North water project which is considered as the largest project ever taken in China.<sup>67</sup> The project will link China's four main rivers *i.e.*, the Yangtze, Yellow, Huaithe and Haihe. Chinese dam building project will require cooperation among the basin countries as these rivers are shared by many countries including Mekong in Southeast Asia and the Nu called the Salween in Burma and Yarlung Tsangpo known as Brahmaputra in India and Bangladesh.<sup>68</sup> Originated from Tibetan plateau, the Brahmaputra river is considered to be the highest river on earth with an average altitude of 4,000 metres. It runs 2,057 kms in Tibet before flowing into India, where it becomes the Brahmaputra. China has already commissioned Zangmu Hydropower station in Tibet which stands more than 3,300 metres above the sea level.<sup>69</sup>

The Brahmaputra/ Tsangpo in the GBM basin is always considered as the fresh water source of the millions of people of lower riparian countries including India and Bangladesh. This river has been divided in hundreds of channels and tributaries and forms the Bengal delta. Therefore, constructions of numbers of dams on Brahmaputra would require assessment of the needs of the basin countries. Also, all the basin countries should act together to tackle increasing salinity and sedimentation and ensure fishing and navigation in this river. Brahmaputra has been the key issue of the policy makers in this region for quite a long time. Bangladesh as a lower riparian country has reason to concern that such constructions of dams in upper streams of the GBM basin would significantly cause reductions of water flow in future. This may lead to the adversarial ecological and environmental conditions. It will upset the natural balance of water flow and those sedimentation processes that are vital to the survival and growth of floodplains in the Bengal delta. This may result in a rise in sea level in the Bay of Bengal which will in turn result in submergence of land and displacing millions of people in Bangladesh.

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2017.

<sup>66</sup> "Do Dams Bring More Harm or More Good?", *Environmental News Network*, 04 November 2013, available at [https://www.enn.com/articles/46634?utm\\_source=feedburner&utm\\_medium=feed&utm\\_campaign=Feed%3A+GlobalPollutionAndPreventionNews-Enn+%28Global+Pollution+and+Prevention+News++ENN%29](https://www.enn.com/articles/46634?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+GlobalPollutionAndPreventionNews-Enn+%28Global+Pollution+and+Prevention+News++ENN%29), accessed on 10 January 2018.

<sup>67</sup> "China's Water Diversion Project Starts to Flow to Beijing", *The Guardian*, available at <https://www.theguardian.com/world/2014/dec/12/china-water-diversion-project-beijing-displaced-farmers>, accessed on 19 February 2018.

<sup>68</sup> Lewis Charlton, "China's Great Dam Boom: A Major Assault on Its Rivers", *op. cit.*

<sup>69</sup> "China opens Mega dam on Brahmaputra", *The Daily Star*, 25 November 2014, available at <https://www.thedailystar.net/china-opens-mega-dam-on-brahmaputra-51969>, accessed on 10 January 2018.

### 4.3 *Dispute Resolution Mechanism of La Plata and GBM River Basins*

It is quite clear that water development projects in any river basin may lead to dispute among basin countries. In this regard, International Water Laws which are mostly treaty laws offer some dispute mechanism remedies. The trans-boundary river basin must require treaty to develop regional water development mechanism for water resources which are critical for improving human access to water, irrigations, energy productions and meeting human health goals. The experience of La Plata river treaty and subsequent bilateral treaties and water development project stipulate the fact that if riparian countries start cooperation from the outset of a conflict, instead of letting it to create deeper position, the economic and joint management prospects are much greater.<sup>70</sup> Neither Brazil nor Argentina has used their economic or military superiority to maintain greater control over water resources or hydroelectric potential in La Plata. The La Plata basin has allowed for increased cooperation between the riparian nations when many times conflict could have arisen and defeated the benefits the states are receiving today. As for example, on 26 February 1975, Argentina and Uruguay agreed on the establishment of a special body for their shared stretch of the Uruguay river. The purpose of setting this body was to resolve dispute between the two riparian countries and also extended cooperation regarding navigation, works, pilotage, bed and subsoil resources, fishing and pollution prevention.<sup>71</sup>

The La Plata treaty ensures open communication among the basin countries. The treaty has helped bring five nations together and resolve their disputes. These countries have been able to extend their cooperation in improving education, health and management of 'non-water' resources (e.g., soil, forest, flora and fauna) across the La Plata basin. Drawing from the example of La Plata basin, it is argued that an effective treaty is the pre-requisite for successful management of shared water resources.<sup>72</sup> Such treaty contains some basic principle to avoid dispute among riparian nations. As for example, the 'Doctrine of Absolute Integrity' stipulates that a state may not alter the natural flow of waters passing through its territory in any manner which will affect the water in another state, be it upstream or downstream.<sup>73</sup> And the 'Doctrine of Limited Territorial Sovereignty' conforms to the general legal obligation to use one's property in a

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<sup>70</sup> Kishor Uprety and M. A. Salman, "Legal Aspects of Sharing and Management of Transboundary Waters in South Asia: Preventing Conflicts and Promoting Cooperation", *Hydrological Sciences Journal*, Vol. 56, Issue 4, 2011,

<sup>71</sup> Victor Pochat, "International Agreements, Institutions and Projects in La Plata River Basin", *op. cit.*

<sup>72</sup> Anna Schulz, "Creating a Legal Framework for Good Transboundary Water Governance in the Zambezi River and Incomati River Basins", *Georgetown International Environmental Law Review*, Winter, No. 19, Issue 2, 2007.

<sup>73</sup> Objia Borah Hazarika, "Riparian Relations between India and China: 63 Exploring Interactions on Transboundary Rivers", *International Journal of China Studies*, Vol. 6, No. 1, 2015.

manner which will not cause injury to others. The third doctrine is the 'Harmon Doctrine of Absolute Sovereignty'. This doctrine claims the absolute freedom of a riparian state, often the uppermost riparian, to utilise the waters flowing through its territory, regardless of the effect of its actions on other riparian states. Article 5, contained in Part II of the Convention on the Law of the Non Navigational Uses of International Watercourses of 1997, requires that a state sharing an international watercourse with other states utilises the watercourse, in its territory, in a manner that is equitable and reasonable *vis-à-vis* the other states sharing it.<sup>74</sup> The dispute settlement mechanism in GBM is highly critical in future to resolve concerns which may arise among the basin countries out of increasing need for the utilisation of trans-boundary water resources. Future demands of trans-boundary water resources in GBM suggest that countries will share information about their projects and engage in negotiations for their effective and beneficial utilisations.

## 5. Conclusion

This paper has highlighted the evolving governance mechanism in the La Plata river basin where respective countries engage in cooperation and adopt pragmatic approach to meet their own needs as well as other basin country's interests. In GBM, the future of effective utilisation of trans-boundary water resources also requires cooperation among the basin countries. In fact, in a longer timeframe, there is no other viable alternative for the countries of GBM than to co-operate with each other in managing their transboundary water bodies. Trans-boundary river management is complex, which involves many cross-cutting political, cultural and security issues of the region. Therefore, only an evolving governance mechanism can resolve such issues and lead to successful water sharing and development mechanism. Over the decades, La Plata governance mechanism has been consistent and helped to develop political interrelationships between the co-basin countries. The experience of La Plata gives clear indication to the GBM that trans-boundary river governance is essential to generate water as regional public good which could provide benefits to the people of South Asia.

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<sup>74</sup> "Convention on the Law of the Non-navigational Uses of International Watercourses 1997", available at [http://legal.un.org/ilc/texts/instruments/english/conventions/8\\_3\\_1997.pdf](http://legal.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf), accessed on 20 December 2017.