RIVER BASIN

BRAMHAPUTRA

[INDIA]

SCHEDULE A ASSESSMENT OF RIVER BASINS (RBs) IN SOUTH ASIA		
Sr. No.	**Details**	**Response**
1	**Physical Features - General Information**	
1.1	Name of River basin & Regional Name	Bramhaputra (India), Tsangpo (Tibet, China), Jamuna (Bangladesh)
1.2	Relief Map and Index Map of RB with Country / State / Province boundary marked to be attached.	Refer Annexure I
1.3	Geographical location of place of origin (Country / Distric0)	Mainstream originates from the Chema Yundung glacier on the Tibetan plateau
1.4	Area (in Sq. Kms.),	580,000 sq. km. Is the total drainage area, and 194413 km2 is drainage area in India. (5.9% of total geographical area of India) (Ref: Major River Basins of India, Ministry of Water Resources, Central Water Commission)
1.5	Population (in Millions); Name of population centers / Cites - (a) More than 0.5 Million - 1 Million	174 people per sq.km. concentrated in 14 large cities in the basin. Urban areas are growing at 5% per year. Surge of immigrations from Bangladesh and West Bengal
	(b) More than 1 Million – 10 Million	
	(c) More than 10 Million	29.1 million

1.6	Approximate areas of upper regime, middle regime and lower regime;	2880-km long Brahmaputra traverses its first 1,625 km in Tibet, the next 918 km in India and the remaining 337 km in Bangladesh. Upper portion of the basin in Arunachal Pradesh and Nagaland is mostly mountainous and the portion in Assam, Meghalaya and West Bengal is covered by hills and forests. Lower part of the basin in West Bengal has fertile plains. (Ref:http: / / wrmin.nic.in / riverbasin / barak.htm)
1.7	Country and States (Province) in which the basin lies (indicate % area covered);	50.5 percent lies in China, 33.6 percent in India, 8.1 percent in Bangladesh and 7.8 percent in Bhutan. Its basin in India is shared by Arunachal Pradesh (41.88%), Assam (36.33%), Nagaland (5.57%), Meghalaya (6.10%), Sikkim(3.75%) and West Bengal (6.47%). (Ref:Major River Basins of India, Ministry of Water Resources, Central Water Commission Refer Annexure II)
2	**Hydrological and Land use Features:**	
2.1	Average annual rainfall (in mm);	1000 mm to 4000 mm, most of which occurs during the monsoon months of June to September.
2.2	Maximum-minimum temperatures in Degree Centigrade	Climate: Sub-tropical South East Asiatic monsoon. Complete absence of North East Monsoon. Temperature varies from 13 degree centigrade in January to 28 degree centigrade in April. The rising temperature develops surface depression and results in stormy weather. Divided into four macro-climatic zones: North Bank Plain (NBPZ), Upper Brahmaputra Valley (UBVZ), Central Brahmaputra Valley (CBVZ) and Lower B'putra Valley (LBVZ)

2.3	Average annual yield (discharge) of water in Cubic Meter and the average yield for last past five years	585.6 km3. Of which 24.0 km3 is utilisable water. (Ref: Water Sector at a glance, Water Resources Ministry. Refer Annexure III)
2.4	Major tributaries	Important tributaries of the river in India are the Dibang, the Luhit, the Subansiri, the Manas, the Sankosh, the Tista, the Dhansiri and the Champamati.
2.5	Percentage shares of major water uses & Surface and groundwater abstraction in percentages-Convert into Table (a.) Agriculture,	Replenish able groundwater resources: 35.07 BCM. Available groundwater for irrigation: 22.56 BCM (Ref: Water Sector at a glance, Water Resources Ministry. Refer Annexure IV). Agriculture in this region is largely carried out under rainfed conditions. The irrigation potential is very high, but compared to a total potential of about 4.26 million ha, the area presently under irrigation is only 0.85 million ha (Ref: Towards sustainable development of the Brahmaputra) Refer Annexure V
	(b.) Industries,	
	(c). Domestic,	
	(d). urban,	
	e). environmental flows.	
2.6	Major cropping pattern	
2.7	Cultivable area under irrigation	Total culturable area: 13.04 M. ha. which is 7.1% of the total cultivable area of the country.
2.8	Cultivable area not under irrigation	
2.9	State other Water Uses- eg. Navigation, power, recreation etc.	Navigation (National Waterway No. II), Hydropower generation: 33,054 MW at 60% load factor, fisheries, 41% of the total

		hydropower potential, although only 3% of this potential has been tapped so far
3	**Ecosystem Features**	
3.1	Agro-climatic zones	Eastern Himalayan Region, Zone includes Sikkim, parts of North West Bengal and the entire North Eastern region. Hill areas are sparsely populated with a mix of several ethnic origins and culture. The climate varies from tropical in the plains to Alpine in the high hills. Nearly a third of the cultivation is of the shifting *(Jhum)* type. Sub-agro-climatic zones: Himalayan Hills includes northern tip of West Bengal - Darjeeling and northern territory of Sikkim; North East Hills includes Karbi Anglong and Cachar Hills in Assam and entire territories of Arunachal Pradesh, Nagaland and Meghalaya; Southern Hills covers Manipur, Tripura and Mizoram; Lower Brahmaputra includes the most populous part of Assam i.e. the districts of Barpeta, Dhubri, Nagaon, Darrang, Kamrup, Goalpara, Kokrajhar and Sonitpur (in this area, nearly a quarter of the net sown area is irrigated); Upper Brahmaputra comprises of the districts of Lakhimpur, Sibsagar, Cachar, Dibrughar, Jorhat and Karimganj (all in Assam) and Jalpaiguri and Koch Bihar in West Bengal. (Ref:http: / / agricoop.nic.in)
3.2	Major sub ecosystems (zoogeographical zones)	Floodplain ecosystems, aquatic ecosystems, semi-evergreen forests, alluvial grasslands and savannas along the foothill valleys are among the tallest in the world, drought-deciduous trees, Characteristic sps of *Dipterocarps,* Golden langur *(P. geei)* which

		is restricted to the semi-evergreen and temperate forests north of the Brahmaputra River, elephant population in grasslands and forests north of the Brahmaputra River is one of India's largest and most important
3.3	Major soil types	laterite, red loamy and yellow soils and alluvial soils.
3.4	National parks / sanctuaries, lakes, wetlands, etc.	Manas and Kaziranga, the Buxa tiger reserve the Phibsoo reserve forest (Bhutan)
3.5	Brief information about the delta region of the basin (area, location, major urban centers in the delta, etc.)	The enormous delta of the Ganges-Brahmaputra River in Bangladesh, and surrounding areas of India, is the lifeblood for one of the largest populations on Earth. Decending from the Himalayan plateau to a lowland upper delta plain, the rivers experience rapid lateral migration, producing a patchwork of flood plains of various ages. In the eastern lower (tidal) delta plain, the rivers enter the sea through the Meghna estuary, a 100-km-wide zone of multiple distributary channels and migrating islands. Coalescing sub aqueous sand shoals in the river mouths form a delta front clinoform that is prograding seaward over the topset beds of muddy sub aqueous delta on the continental shelf. West of the river mouths, the lower delta plain is covered by a mangrove forest (Sunderbans), drained by a network of river distributary and secondary tidal channels and formed in an earlier phase of Holocene delta progradation. The Ganges-Brahmaputra delta is under increasing environmental pressure today in response to the needs of a rapidly growing and modernizing population. (Ref: http: / / cat.inist.fr / ?

		aModele=afficheN&cpsidt=2359269)
4	**Water Quality**	
4.1	Prevailing water quality standards (e.g. Class I, II, III.etc, indicating permitted uses)	The river carries a heavy sediment load of 735 million tones per annum.
4.2	Stretches (along the River) in Kms. with water quality classes indicated (may be marked on the map)	
4.3	Sources of Pollution, with data indicating quantum and / or severity.	
4.4	Prevailing abatement techniques e.g: ETP, STP, legislation,etc.	
5	**Current status of the resource development & potential for development**	
5.1	Water availability: a. Per capita water availability (in lpcd)	
	b. Per hectare water availability (in Cubic meters for cultivable command area):	As against the national per capita (based on 1991 census) annual availability of 2214 cubic metres of water, the average availability in Brahmaputra river basin is as high as 18470 cu.m.
	c. Availability of environmental flows (Current reserve, if any):	
	d. Availability of ground water / Average annual ground water abstraction / recharge.	Availability of groundwater at relatively shallow depths is also a feature of the region, especially in the valleys. However, less than 5% of the potential has been developed so far, much below the national average of 32%.

5.2	Structures: a. Major dams / barrages (with utilization categories):	
	b. Proposed dams:	
	c. Live storage of major dams:	2.33 BCM
	d. Live storage through proposed dams:	9.35 BCM
	e. Inter basin transfer systems:	
	f. Any Other:	
5.3	Command area of major dams	
5.4	Agencies functioning in the basins: a.] Public agencies / CSOs which construct / implement the infrastructures projects: b.] Private agencies / CSOs involved in infrastructure development	Brahmaputra Board, Brahmaputra Authority
6	Existence of National / State / Provincial Laws or Notifications relating to water- Management / use / development / opportunity for private sector participation or for privatization of water resources	

7	Key Issues:	• With 40% of its land susceptible to flood damage, the Brahmaputra Valley here represents one of the most hazard-prone regions in India. • Weak geological formation, active seismicity, accelerated rate of erosion, rapid channel aggradation, massive deforestation, intense landuse pressure, and rapid population growth, especially in the floodplains, along with ad hoc flood control measures, are the main factors causing and / or intensifying floods in Assam. • The situation is exacerbated by myriad social, environmental, and economic factors. India and China currently dispute on 83,000 sq km within the basin. Much of th boundary between the two countries is based on administrative units that do not shift with the river as it changes course or level over time. Alluvial or 'char' land that is exposed has lead to a dispute as the land is highly valued for agriculture. Floods have remained a scourge in this region since 1950, when a devastating earthquake, not only raised the bed f the Brahmaputra, but also changed its course. The area has of recent years experienced drought. Source : http://indianexpress.com/story/217052.html
8	Enabling instruments- Law / Policy / Economic & Financial Measures for introducing IWRM in	The Brahmaputra Board has completed an outline of a Master Plan for utilisation and development of water resources, flood control, power generation and irrigation in the Brahmaputra and

	the basin	Barak basins (Ref: 8th Five Year Plan, Volume II, Irrigation, command area development and flood control). Assam government has embarked upon an ambitious mega project called North Eastern Integrated Flood & River Bank Erosion Management Project.

SCHEDULE B

ASSESSMENT OF RIVER BASINS (RBs) IN SOUTH ASIA

Sr. No.	Details	Response
1	**Legal / Political Mandate**	
1.1	Is there any RBO? If yes, Give Name.	Brahmaputra Board. 1980
1.2	How has it been constituted? (Statutory / Voluntary / Any other form).	Statutory body set up by the Govt. of India under an Act. of Parliament i.e. Brahmaputra Board, Act, 1980 (46 of 1980) under the Ministry of Irrigation (now renamed as Ministry of Water Resources).
1.3	State objectives and organizational structure of the RBO in outline & enclose brochures	For objectives and organization structure, refer annexure I (a) and I(b). BOARD MEMBERS: Full time members - 4 (Chairman, Vice-chairman, General Manager, Financial Adviser) Part time members - 17 (Representatives of NE states - 7, Representatives of central ministries - 5, representatives of central govt specialized departments viz: GIS, CWC, CEA, NEC & IMD - 5) (Ref:http: / / www.brahmaputraboard.org / organisation_1.htm)

1.4	Functioning level of the RBO (watershed / micro basin / sub-basin / basin, etc	JURISDICTION: Arunachal Pradesh, Assam, Meghalaya, part of Manipur, part of Mizoram, part of Nagaland, Part of Tripura. It is proposed to include Sikkim and North Bengal and left out portions of NE States in the jurisdiction of Brahmaputra Board. Map of jurisdiction attached. (Ref:http: / / www.brahmaputraboard.org / organisation_2.htm)
1.5	What are the major activities carried out by the RBO since inception?	Refer Annexure
1.6	What are the proposed activities of the RBO?	Refer Annexure
1.7	Details of Contact person / s (Name, designation and contact numbers, address, & emails).	Refer Annexure
1.8	Presence of a regulatory framework wherein national or regional supra basin authority regulates the functioning of the RBO	
1.9	Legal / political mandate wherein stakeholders can appeal for redress / decision and conflict resolution	
1.1O	Does the RBO have an appellate authority?	
1.11	Is the RBO an autonomous body?	
1.12	Is it regulated by a supra basin authority, if so, how?	

1.13	Is the RBO authorized to raise capital for management and / or implementation in open market.	
1.14	Does the RBO receive direct budgetary grants? (From Govt. / Statutory Bodies / Public donations / Any Other Agencies.)	
1.15	Nature of mandate for delegation of powers and / or functions (within RBO's constitution) to the lowest possible scales so as to encourage stakeholder participation. (Kindly elaborate the mode of delegation).	
1.16	Policy of the RBO on – (i) Water allocation between users / sectors / sub-basins; and	
	(ii) Procedures and processes for determining the above.	
1.17	Presence of Trans-boundary Water Agreement or Treaty in case of a trans-boundary basin.	
1.18	Presence of a 'Tribunal' appointed in case of intra basin or inter basin disputes.	
1.19	Is the RBO responsible for preparing Basin Management Plan. If yes, please enclose a copy	
2	**Processes of community / stakeholder participation in the functioning of the RBO**	

2.1	Are the stakeholders from the basin included in the governing body of the RBO ?	
2.2	Elaborate the nature and frequency of public consultation initiated by the RBO.	
2.3	Elaborate efforts at outreach by the RBO.	
2.4	Elaborate efforts made for creation of participatory platforms at minor / major tributary or watershed levels for encouraging participation	
2.5	Interaction of the RBO with organizations working in water management at different watershed / micro basin, sub-basin or basin.	
2.6	Stakeholder participation sought by the RBO for preparing Basin Management Plan	
3	**Conflict resolution and negotiations**	
3.1	Involvement of the RBO in negotiations between stakeholders at various levels through an appellate authority mentioned above;	
3.2	Negotiation and participation encouraged at mini / micro basins for consensus building and / or conflict management.	

SCHEDULE C
ASSESSMENT OF RIVER BASINS (RBs) IN SOUTH ASIA

Civil Society RBOs (CSOs working in River Basin issues or those physically involved in infrastructure development and articulating / advocating a River Basin perspective maybe be considered as Civil Society RBO. Please note that some of this organisation may not be calling themselves as RBOs. This is despite the fact that they function in most, if not all areas in which a statutorily constituted RBO operates)

Sr. No.	Details	Response
1.1	Constitution of the organization in terms of involvement of local action groups / initiatives, stakeholders, water users groups, and irrigation groups / committees, traditional water groups urban and industrial users etc. are a part of the organization);	River Basin Friends [RBF] is an CSO at Village Akajan, District Dhemaji, Assam. PIN 787059. Convenor Rabindranath. E-mail riverbasinfriends@yahoo.co.in
1.2	Reflection of basin perspective in the organization's constitution / past / planned work and activities?	
1.3	Scale of work: Sub-basin / basin scale?	
1.4	Consideration of upstream and downstream impacts of water management activities in the RB and issues like inequitable distribution of water between intra and inter sectors;	

1.5	Has the organization prepared a Basin Master(Management) Plan? Does it contain elements different from or alternative to that of the government organizations?	
1.6	Efforts taken by the Civil Society RBO to upscale the vision / activities at basin level	
1.7	Participation in lobbying and advocacy at appropriate levels (provincial, national, international)	