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Adaptation in water resources

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The increase of the annual mean surface air temperature has been evidenced in Bangladesh during the period of about 50 years. The warming of the sea surface temperature (SST) and rapid rise of Sea level (4-7.8 mm/year) in the Bangladesh coast of the Bay of Bengal have also been observed. The Fourth Assessment Report of IPCC has shown that the global mean surface air temperature scenarios will attain the values between 2.4 6.4o C by 2100, where the best estimate is 40C using A1F1 (the fossil intensive storyline with rapid growth) scenario of GHG emission. This was obtained from the climate simulation using a number of Global Circulation Models (GCMs). The projection for global sea level rise was estimated as 24-67 cm by 2100 based on the same GHG emission storyline.

According to IPCC the global sea level of Bangladesh is expected to rise by 67 mm by 2100 in the worst case. In Bangladesh, the current net sea level rise is 4-7.8 mm/year which accounts for the combined effect of global warming and geological subsidence of the tectonic plate. Subtracting the current rate of global sea level 1.8 mm / year due to warming from the total sea level, rise it is seen the contribution from subsidence is 2.2-6 mm /year. If we take the worst case the net sea level rise due to warming as well as geological subsidence will exceed 1m in the coming 100 years in the Bangladesh coast.

With the above climate change scenarios, Bangladesh will face severe consequences to its disasters, economy and environment. Most severe impacts will be experienced in the following sectors:

- Fresh water resources, Floods and droughts t
- Coastal zone and coastal resources
- Agriculture
- Forests and bio-diversity
- Fisheries
- Human health
- Socio-economic impact.

Table 1: Climate change projections for 2050 and 2100 as obtained from GCMs taking 1990 as the reference year.

Year	Parameter	DJF	MAM	JJA	SON	Annual
2050	Temp (C)	1.7	1.9	1.4	1.8	1.8
2100		3.6	3.5	2.6	3.1	3.3
2050	Rainfall (%)	10.5	15	11	7.5	10.4
2100		25	25.4	22.5	13	18.4

Note: DJF: December, January and February; MAM: March, April and May; JJA: June, July and August and SON: September, October and November

Vulnerability in fresh water resources, floods and drought

Floods: Bangladesh is a flood-prone country. Analysis of past floods suggests that about 26 percent of the country is subject to annual flooding and an additional 42 percent is at risk of floods with varied intensity. According to government sources, the 1998 flood inundated about 100,000 km2. In contrast, the 1987 flood had inundated about 57,000 km2 and the 1988 flood inundated 89,000 km2. The 1998 flood affected 68% of the country, and seriously impacted the livelihoods of 30 million people. Overall damage was estimated at two to three billion US dollars. The 1998 floods lasted for over 10 weeks. The 2004 flood affected about 57% of Bangladesh. It has been observed that the return period of severe floods is decreasing. For an increase of monsoon rainfall of 22.5% by 2100, the runoff is expected to increase by 40-50%. This will cause the increase of flood depth and inundation areas. The sea level rise causes delaying of the discharge of flood water due to the decrease of the sea ward gradient of water.

Due to prolonged discharge of floodwaters, the rate of sedimentation will increase. As a result, both the riverbed and the bed of the adjacent floodplains will rise leading to further drainage congestion, and possibly more intense flooding in the following years. Such a cyclic course of events would intensify flood problem in the already flood-prone areas of the country. Moreover, instead of fertile silt, if infertile sand or coarse sediments are deposited with flooding, it will severely reduce productivity of the topsoil.

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Droughts: The source of water resources for Bangladesh is rainfall, water flowing along the rivers from upstream and ground water. Because of high increase of temperature the evaporation rate will be higher and the soil moisture will dry up rapidly and the surface water areas will shrink. Further it has been found that the river flow of the rivers is decreasing especially in the dry season. Thus the water demand for agriculture, industries and household purposes will increase. The demand for water will further increase due to population increase and increased economic development. The flow deficiency in the Ganges over Bangladesh in the dry period has caused the flow of the southern rivers to decrease; as a results these rivers are being silted up. Because of this, this vast area is facing severe salinity problem in the soil and both in surface and ground water.

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