Global Climate Change and Bangladesh

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During the last 100 years human population soared from little more than one to six billion and economic activity increased nearly 10-fold between 1950 and 2000. The world's population is more tightly connected than ever before via globalization of economies and information flows. Half of Earth's land surface has been domesticated for direct human use.

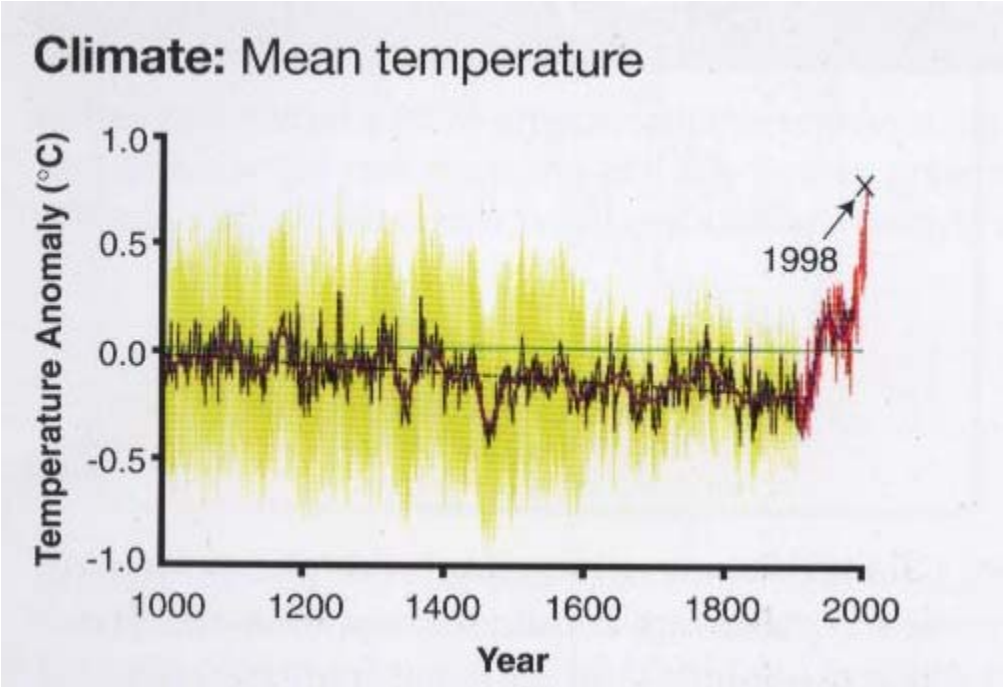
It is now known that the accelerating pace of human activities (both agricultural and industrial) has caused, among other things, an increasing accumulation of polyatomic molecules such as carbon dioxide (CO_2), various chloroflucarbons ($CFCs$), methane (CH_4), nitrous oxides and other which absorb the infrared radiation emitted by the Earth's surface (Figure 37). They add to the "greenhouse effect" of atmospheric water vapour and natural CO_2, causing an augmentation of long wave infra-red radiation emitted downwards by the atmosphere and absorbed by the Earth's surface. This is largely responsible for what is now referred to as global warming.

1. The evidence that these changes are affecting the basic functioning of the Earth System particularly the climate grows stronger every year.

2. Global warming is the observed increase in the average t4emperature of the Earth's atmosphere and oceans in recent decades. The Earth's average near-surface atmospheric temperature rose 0.6 ± 0.2^0 Celsius (1.1 ± 0.4^0 Fahrenheit) in the 20th century. The prevailing scientific opinion on climate change is that "most of the warming observed over the last 50 years is attributable to human activities. The increased amounts of carbon dioxide (CO_2) and other green house gases ($GHGs$) are the primary causes of the human-induced component of warming. They are released by the burning of fossil fuels, clearing, agriculture, and lead to an increase in the greenhouse effect. The term 'global warming is a specific case of the more general term 'climate change'.

3. Based on estimates by NASA's Goddard Institute for Space Studies, 2005 was the warmest year since reliable, widespread instrumental measurements became available in the late $1800s$, exceeding the previous record sit in 1998 by a few

hundredths of a degree Celsius. The enclosed diagram shows that the global temperature has recently moved well outside the range of natural variability exhibited over at least the last half million years. Its magnitude and rate of change is unprecedented in human history and perhaps in the history of the earth.



4. The global sea level has risen by between 10 and 20 cm over the past 100 years and much of the rise may be related to the increase in global mean temperature. From around 1850 onward, most of the world's glaciers including those of the Alpine regions, Mt. Kilimanjaro in Africa and Mt. Chacaltaya in Bolivia, have been retreating. The retreats of glaciers in the mountainous regions of the world are striking indicators of climate changes. The Arctic ice is thinning. The ice is about 40 per cent thinner than what it was at the beginning of the last century. It is spread has also noticeably declined. The WMO/UNEP Intergovernmental Panel on Climate Change (IPCC) has predicted that the globally averaged surface temperature is projected to increase by 1.4-5.8 ^{0}C between 1990 and 2100. It is very likely that nearly all land areas will warm more rapidly than the global average. Global mean sea level is projected to rise by 9-88 cm between 1990 and 2100. The prospect of rising sea level is one of the most widely recognized potential impacts of climate change. Sea level rise as well as climate and weather extremes cause problems associated with beach erosion, siltating of waterways and flood risk in coastal communities.

5. Bangladesh would be one of the most severely affected countries in this regard. Under the present estimate of about one meter rise of sea level by the year 2100, a substantial area of the country will go under water. One-meter rise of sea level will inundate approximately 17% of the total area of Bangladesh. This will affect 7% of GDP of Bangladesh. Thus, it has far-reaching consequences for Bangladesh if the estimate comes true. This rise of ocean water will force more population to be congested into smaller areas and will force migration, inundate wetlands and lowlands, accelerate coastal erosion, and increase salt water intrusion into rivers, agricultural and coastal forest lands and into groundwater. This will in turn create multiple problems in coastal urban areas, cause damage to port facilities and coastal embankments/structures, destroy agricultural land, dislodge mangroves and fisheries, and affect cyclone and storm surge protective measures in coastal areas. The poverty alleviation programme will be seriously hampered and there will be serious damage to bio-diversity. UNEPJ reported that loss of original habitat in Bangladesh is already 94%. A theoretical model of tropical storms suggests that maximum possible intensity would increase by 40% in its destructive power for an increase of 3^0C of SST*s*. The enhanced evaporation over the Bay of Bengal during the monsoon season as predicted in the model simulation, leading to increased moisture convergence and latent heat release may increase the number and duration of tropical cyclones in a warmer atmosphere.

6. The number of severe cyclonic storms that affected Bangladesh over a ten year period from 1780-1998. This shows that in the past, in some ten, twenty or thirty year period Bangladesh was not affected by any tropical cyclone. But this has changed in recent years. Since 1960 onwards, there is no ten year period when tropical cyclone was absent. During the period 1960-1970, there occurred ten severe cyclones in Bangladesh averaging one cyclone every year. The human casualties were also tremendous. During the 12 Nov. 1970 cyclone alone, five lakh people died. Though the frequency has decreased recently than during 1960-70, it still has a significant value. During 29 April, 1991 another cyclone of very severe intensity hit Bangladesh, where human casualty was one lakh thirty eight thousand. In the last few years, human casualties have declined because of taking protective measures. 1997 Cyclone of Bangladesh was almost of the same intensity as in 1970 or 1991 but the casualty has been much less. In the coastal areas, some 2500 cyclone shelters have been built. Thus we find that during the last forty years, tropical cyclones hitting Bangladesh far exceeds those in any corresponding period of recorded history.

7. **Flood:** The flood-affected area of Bangladesh has also undergone significant increase. There is no adequate record of past flood data. However, from 1954 onwards, flood record exists. Significant peak flooding occurred in 1955, 1974, 1987, 1988, 1998 and 2004. It is significant that in each succeeding peak year, the area affected exceeds that in the previous peak. In 1998, nearly two third of the country was affected by flood which lasted for more than two months which is rather very unusual.

10. **Rainfall trend:** A regression analysis of rainfall for various stations in Bangladesh was carried out for the years 1960-1992. The analysis shows an increasing trend in rainfall between 150-350 mm in most of the places at 95% confidence level. This gives an annual increase of 8mm/year of rainfall in Bangladesh. The rainfall decreased somewhat during last few years. But it may start increasing again.

11. Sea level rise of 4mm - 7.8mm / year at different points of Bangladesh coast has been reported by SAARC Meteorological Centre, located at Dhaka. Part of this rise is due to subsidence and part due to global warming.