Changes occurring in Bangladesh

DR. D. A. QUADIR

GLOBAL warming and climate change is a well accepted phenomenon which has been extensively studied all over the world. According to the Fourth Assessment Report of Intergovernmental Panel on Climate Change (IPCC), the global mean temperature has increased by 0.740C during the past 100 years from 1906-2005. The linear warming trend over the last 50 years (0.130C per decade) is nearly twice that for the last 100 years. The causes of this warming are attributed mainly to the increase of enhanced anthropogenic emission of the greenhouse gases (GHGs). There are dozens of human-produced greenhouse gases, three of them get special attention: carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Landuse change and deforestation processes also act as substantial contributor of the GHG to the atmosphere. The atmospheric GHGs absorb part of the long wave radiation emitted from the earth's surface in such a way that the global average energy of the earth-atmospheric system balances to keep more or less a constant temperature of around 150 C. Because of the anthropogenic increase of the GHGs mainly from the burning of fossil fuel in the era of the post-industrial revolution, the unique nature of the energy balance began to disrupt and the temperature started rising. The warming process has accelerated during the last few decades and the last 25 years from 1980 was found to be the warmest period of the past 100 years. According to estimation reference to 2004, it is seen that Bangladesh contributes to 0.24% of the global emission of CO2. The major share of GHG production goes to the industrialised countries. Though, Bangladesh has contributed the least for the global warming but the impacts are expected to be the worst. The following factors would aggravate the sufferings further: lack of awareness, extreme poverty, and high vulnerability to disaster, lack of technical knowledge to overcome the impacts, low economic growth and high population density.

The warming of the land-ocean and atmospheric system is not geographically uniform. Some areas are warming rapidly compared to others and some areas are found to have been cooling with a net effect of global warming. The differential pattern of the global, regional and sub-regional warming results in the variation and change in the atmospheric pressure fields, circulation patterns and thermodynamic characteristics causing the precipitation pattern to change. Thus, the atmospheric warming causes serious impacts on the environment, ecology, land-use pattern and socio-economic activities through the joint effect of warming and water balance. The sea-level rise is another impact of global warming which threatens the low lying islands and coastal zones to inundate. The climate change has enhanced in the global and regional scales the incidents of floods, droughts, severity of tropical cyclones, melting of ice, glaciers and snow packs, heat stress and cold waves, vector and water born diseases, lung and respiratory problems. The sectors like agriculture, water resources, forest and ecology and coastal zones are supposed to be highly vulnerable due to the climate change. The food security might be at stake due to failure of some crops because of the rise temperature to the critical stage.

Regional climate change

So far, the discussions were made on the general aspects of global climate change and vulnerability. Now, we cast our sight towards the regional status of climate change and its link with Bangladesh. We all know that Bangladesh is a disaster prone country. Floods, droughts, tropical cyclones and associated storm surges, river bank erosion and landslides are very common disasters having hydro-meteorological origin. Thus most of the territories of Bangladesh are situated in the low lying delta of the gigantic river systems, Ganges, Brahmaputra and Meghna (GBM). We know that the rivers Ganges and Brahmaputra originate in the Himalayan Mountains and traverse thousands of kilometers before entering Bangladesh. The river Meghna originates from a number of streams entering to Bangladesh from the Khashi-Jaintia Hills. About 92% of the catchments of GBM lie in the upstream territories outside Bangladesh. These rivers carry huge amount of sediment laden water from the upstream hills and mountains along their channels and innumerable tributaries and distributaries and flush to the Bay of Bengal. Being situated in the monsoon region, the basins of these river systems get water mostly from the monsoon precipitation during June-September. The snow melt water and that deposited in the reservoirs in the Himalayas in the form of snow, glaciers and liquid water are the source of flow for the rivers in the dry seasons. From this consideration, Bangladesh is vulnerable to the impacts of climate change both inside and outside the country, especially in the water resources sector. Both Nepal and India reported rapid increase of temperature over the high mountains of the Himalayas, where the snow and glaciers are retreating. Most of the devastating floods of Bangladesh are caused due to excessive rain in the upstream. On the other hand the failure of monsoons along with possible interventions of river flows in the upstream might cause several ecological and environmental problems in Bangladesh. Thus, the climate change impacts should be treated as a national as well as regional problem. It is expected that a comprehensive adaptation plan may be developed with mutual collaboration among the neighbouring countries or under the SAARC umbrella for resolving the climate change impact and adaptation issues. Joint studies on regional level may be undertaken on the climate change issues. The SAARC Meteorological Research Centre (SMRC), which is situated at Dhaka may work as a regional platforms for this purpose. SMRC has already completed a number of climate change related studies for this region.

SK. ENAMUL HAQ

Observed Climate Change, impacts and adaptation in Bangladesh

Temperature: The climate change of Bangladesh has been analysed using the country average meteorological data of 57 years (1948-2004) by the author. The analysis shows that the minimum temperature of all months expect May shows warming with very strong increasing trends in the range 0.13-0.25oC per decade (ten years) for the months of February-March and November-December. The warming of the minimum temperature in the months of December-February has adverse impacts on wheat production in Bangladesh.

On the contrary, the maximum temperature from January-April shows cooling with no change in May, while rest of the months show strong warming at the rate of 0.14-0.29 0C per decade except the month September which do not show much of trend. The cooling in maximum temperature in the winter may be related with the enhanced fog and precipitation activities over Bangladesh, which has serious negative impacts on the Ravi crops such as mustard and pulses through the fungal attack. It has been found that the maximum temperature of September, October and November has negative correlation with Aman rice yield. The correlation is quite strong for October. Thus, higher maximum temperature for these months will lower the yield of Aman rice. The annual minimum temperature shows stronger increase (0.09o C/decade) compared to the maximum temperature (0.05 o C per decade). In a warmer atmosphere, the consumption of water will go up. The evaporation rate will be higher for higher temperature, which will cause rapid drying of the soil and the reservoirs. Thus there are more chances of droughts in a warmer condition. Because of the rapid evaporation, the irrigation will need higher volume of water. In a warmer air temperature some diseases such as diarrhoea, malaria, dengue, heat stress and heart, lung and respiratory diseases are expected to increase.

The adaptation in the agriculture sector due to warming may be done through crop diversification and land-use change. Moreover, the heat resistant variety of wheat or other ravi crops may be developed using bio-technology.

Rainfall: The country average annual rainfall for 57 years (1948-2004) shows increasing trends of 45 mm/decade (2% with respect to the mean) with the seasonal distribution of 5.6 mm (7.1%) in winter (December-February), 21.4mm (5%) in pre-monsoon (March-May) and 21.2mm (1.3%) in monsoon (June-September). Post-monsoon (October-November) does not show much of changes. The pre-monsoon indicates relatively strong increasing trends compared to the monsoon in terms of the percent increase relative to the mean. The pre-monsoon flash floods in the northeast and southeast Bangladesh have become very common. Though the monsoon rainfall does not exhibit much of trends, the variability was found to increase in the recent decades. This means that frequency of the extreme rainfall is increasing which causes more frequent floods and droughts of severe nature. The historic floods of 1974, 1987, 1988, 1998, 2004 and 2007 may be mentioned as the evidences of frequent occurrence of floods. The floods of 1988 and 1998 were caused by the rainfall over the northern Bangladesh and associated territories of India in the north and west. The other floods were contributed by the combined rainfall over Bangladesh and upstream territories of the neighbouring countries. The floods cause damages to the agricultural crops, economy, infrastructures and causes sufferings to the livelihood of the people. Because of the scarcity of food and potable water during the floods, many diseases including diarrhea, respiratory problems, typhoid and skin diseases prevail among the flood victims.

Some studies were conducted to understand the impact of variability of precipitation on Aman rice. It is found that the yield of Aman rice increases with the increase of rainfall up to certain level beyond which the yield decreases. The correlation of Aman yield with the rainfall of individual months show that excess rainfall in August lowers the yield while the rainfall of October increases the yield.

Surprisingly, the farmers of Bangladesh have adapted coping mechanism after 1988 and 1998 floods very efficiently by cultivating more and more bore rice during the subsequent winter. In some highly flood prone areas, the aman rice is cultivated as a bonus, while the boro rice is treated as the main crop. The October rainfall is crucial for good yield for aman rice. Thus if the weather prediction indicates low precipitation, supplementary irrigation is to be applied to the crop. Thus, weather services and agromet advisory are very important for adaptation to climate change. In the areas where water logging is a problem and the agriculture has suffered to a large extent, it is suggested that those areas are converted to shrimp and fish culture. For mitigating the floods, it is necessary to improve the drainage capacity of the rivers and canals and protect the socio-economically important zones by embankments. The embankments require timely maintenance. The houses are to be made on high platforms higher than the highest flood level. In the same way, the foods and seeds are to be protected in the raised stores, where water will not reach. The tube wells are to be built in the high raised platforms so that drinking water is not contaminated. The farmers should prepare seed beds in the high lands so that they are able to transplant just after the recession of the floods. The flood warning activities of Bangladesh have developed a lot in Flood Forecasting and Warning Centre (FFWC), which is to be further improved and the system of dissemination of the warning is to be strengthened. The Information Technology (IT) and mobile phone system may play important role in addition to the Radio and TV broadcasting. I am sure the internet has the access to the upazila level. The flood warning is available in the websites. Any responsible person dealing disaster management may download the up-to-date warning and extract the flood warning for their areas and then communicate to the Union Parishad by telephone. In this way high technology can play role. Not only that. The agriculture

CONTINUEDON PAGE 14