Air quality in Bangladesh: Sources, Atmospheric Interactions, Impacts, Control Strategies, and Recommendations

Speakers: Mr. Mahbubul Islam (US EPA), Dr. Abdullah Mahmud (California Air Resources Board), Dr. Muntaseer Azkar (Manitoba Department of Environment and Climate), and Dr. Mostafijur Rahman (University of Southern California) – all members of BEN air pollution expert panel.

Abstract: Air Quality of Bangladesh and particularly of its capital, Dhaka City, has been reported as one of the worse in the world. University of Chicago, which publishes Air Quality Life Index (AQLI) of all countries of the world, recently reported that on an average the life expectancy in Bangladesh could be increased by almost 7 years if the country meets the WHO air quality guideline values. During the winter season, Dhaka City's particulate air pollution rarely meets the country's air quality standard established in 2005. While local air pollution sources including fossil fuel burning, brick kilns, road dust, persistent traffic, and ubiquitous construction choke the air in Bangladesh, transboundary pollution from Indo-Gangetic Plan (IGP) and bordering Indian States exacerbates the already buildup of local pollution. In the context of such alarming and worsening levels of air pollution in Bangladesh, Bangladesh Environmental Network (BEN) air pollution subcommittee has organized a webinar on Air Quality of Bangladesh on July 29, 2023.

In this Webinar, Bangladeshi origin air quality experts practicing in US and Canada will present a comprehensive picture of air quality in Bangladesh**: Sources, Atmospheric Interactions, Impacts, Control Strategies, and Recommendations.** Expert speakers will utilize a story telling approach to integrate all aspects of air quality to impart a complete understanding of air quality in Bangladesh. The first speaker, Mahbubul Islam will lead off with a presentation which will provide foundational basis for the rest of the webinar. Mahbubul Islam will particularly describe air pollution sources, atmospheric interactions, impacts, and control Strategies for Bangladesh**.** The second Speaker, Dr. Muntaseer Azkar will delineate Air quality trend in Bangladesh, both short and long term. Based on the ambient monitoring data collected in Bangladesh, Dr. Azkar will discuss seasonal and diurnal variation of air quality, dynamics during a high pollution episode, contribution, and importance of transboundary air pollution in Bangladesh. Dr. Askar's presentation will conclude with following key points:

- PM2.5 pollution level has increased more than 80% throughout the whole country in last 20 years.
- Pollution level in some smaller cities, such as, Gazipur, Narshingdi, and Narayanganj are even higher than Dhaka.
- Annual average PM2.5 pollution level exceeds both national and WHO standard over 6 and 20 times respectively, throughout the whole country.
- Night-time pollution is very high in Dhaka. Understanding the chemical transformation of pollution in the atmosphere at night is needed for effective solutions to improve air quality.
- Transboundary transport of pollution is very important for Bangladesh. Significant amount of PM2.5 (minimum 20%, maximum 40%) may be transported from West Bengal and North Indian regions during winter season.

Third Speaker, Dr. Abdullah Mahmud shares knowledge about the intersection of climate change and air quality as they are the two largest threats to human health and the environment. He points out that:

- Human activity induced emissions that contain greenhouse gases and particulate matter impact both air quality and climate, and poor air quality and climate also influence each other at regional levels.
- Global climate impact will be different at different regions in world. As a result, it requires a better understanding of the geophysical and socioeconomic characteristics of a region of interest in order to address the challenges of poor air quality and climate change.
- Climate change and air quality are intertwined intricately in the Earth-atmosphere system, so a comprehensive mitigation plan should be adopted to reduce their synergistic impacts on human health and the environment.

The Fourth Speaker, Dr. Mostafijur Rahman will provide a detailed analysis of air pollution, temperature, and health using epidemiological data collected from Bangladesh. His studies conclude that:

- There is confirming evidence of the detrimental cardio-respiratory health effects of Dhaka particulate matter air pollution. However, cardiorespiratory toxicity of $PM_{2.5}$ mass is found to vary with source. Greater adverse health impacts are from fossil-fuel combustion derived $PM_{2.5}$ than from other sources of $PM_{2.5.}$
- Dhaka is among the top five most climate vulnerable cities in the world. In addition to an average temperature increase, one of the most frequent impacts of climate change is increased variation of temperature due to more unstable weather.
- He found important evidence that cardio-pulmonary health in Dhaka is adversely affected by day-to-day increases in temperature variability. His study further showed that respiratory disease emergency visits among older adults were markedly increased by temperature variability
- The most striking finding is that Co-exposure to both extremes (air quality and temperature) had a greater mortality effect which was beyond the sum of their individual effects. Older adults above the age of 75 years were more susceptible to the mortality effects of co-exposure.

Finally, the lead presenter, Mr. Mahbubul Islam, provides strategies and recommendations to improve the country's alarming air pollution.