

1.079 Chemical Composition and Health Risk Assessment of Atmospheric Fine Particulate Matters in Bangladesh.

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Abstract:

Atmospheric particulate matters (PM) have significant impact on human health, climate change, agriculture, and ecosystem. Fine PM can easily enter into the human respiratory system, brain, and blood and can cause many diseases (respiratory infection, COPD, stroke, and cancer). Bangladesh is the top most country in the world for deaths due to environmental pollution accounted up to 25% of the total. Air pollution caused 2/3 of these deaths in Bangladesh. Particulate matters have both absorbing and scattering properties depending on their chemical composition and sizes.

PM_{2.5} samples and aerosol optical depth (AOD) have been collected at urban Dhaka and a rural Bhola since 2013. Dhaka is a highly polluted Southeast Asian megacity with a population of about 20 million. Coastal Bhola is an outflow location of the Ingo Gangetic Plain (IGP) to the Bay of Bengal. Black carbon, water soluble ions, trace metals and PAHs were measured in PM_{2.5}. PMF model for source apportionment and HYSPLIT model for trans-boundary pollution have been applied. Health risk assessment was estimated with US EPA model for non-cancer and cancer risks using Hazard Quotient (HQ), Health Index (HI) and Lifetime Cancer Risk (LCR).

The average PM_{2.5} is 62.0 μg m⁻³ with a winter high of 500 μg m⁻³ in Dhaka. BC in PM_{2.5} is 12.4 μg m⁻³ which is much lower than previous measurement in Dhaka for TSP, but still many times higher than the cities in developed countries. Five main sources are identified with PMF. Both urban and background locations have significant influence from IGP during winter, and also relatively clean air masses from the Bay of Bengal during monsoon. The LCR values of naphthalene, fluoranthene, chrysene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthrene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene are 1.14x10⁻², 8.06 x10⁻⁴, 9.29x10⁻⁴, 1.56x10⁻³, 4.8x10⁻³, 1.68x10⁻⁴, 7.04x10⁻³, 3.60x10⁻⁴, respectively. These values are higher than the safe limit value indicating potential carcinogenic risk of PAHs in Bangladesh.