CE 435: Environmental Pollution Management

January 2018 Semester
Level-4, Term II

CN-3

Department of Civil Engineering
Bangladesh University of Engineering and Technology (BUET)

Air Pollution

Air Quality Scenario in Bangladesh

Air Quality Monitoring Facilities in Bangladesh

Continuous Air Quality Monitoring Stations (CAMS):

Dhaka:

(1) Shangshad Bhaban CAMS: since April 2002

(2) BARC, Farmgate CAMS: since June 2008

(3) Darus Salam CAMS:

Chittagong:

(4) TV Station CAMS: since January 2008

(5) Agrabad CAMS:

Air Quality Monitoring Facilities in Bangladesh

CAMS in Other Cities:

(6) Rajshahi CAMS: since April 2008

(7) Khulna CAMS: since January 2010

(8) Satkhira (trans-boundary) CAMS: operational

(9) Narayanganj CAMS:

(10) Gazipur CAMS:

(11) Sylhet CAMS:

(12) Barisal CAMS:

Other air quality data sources:

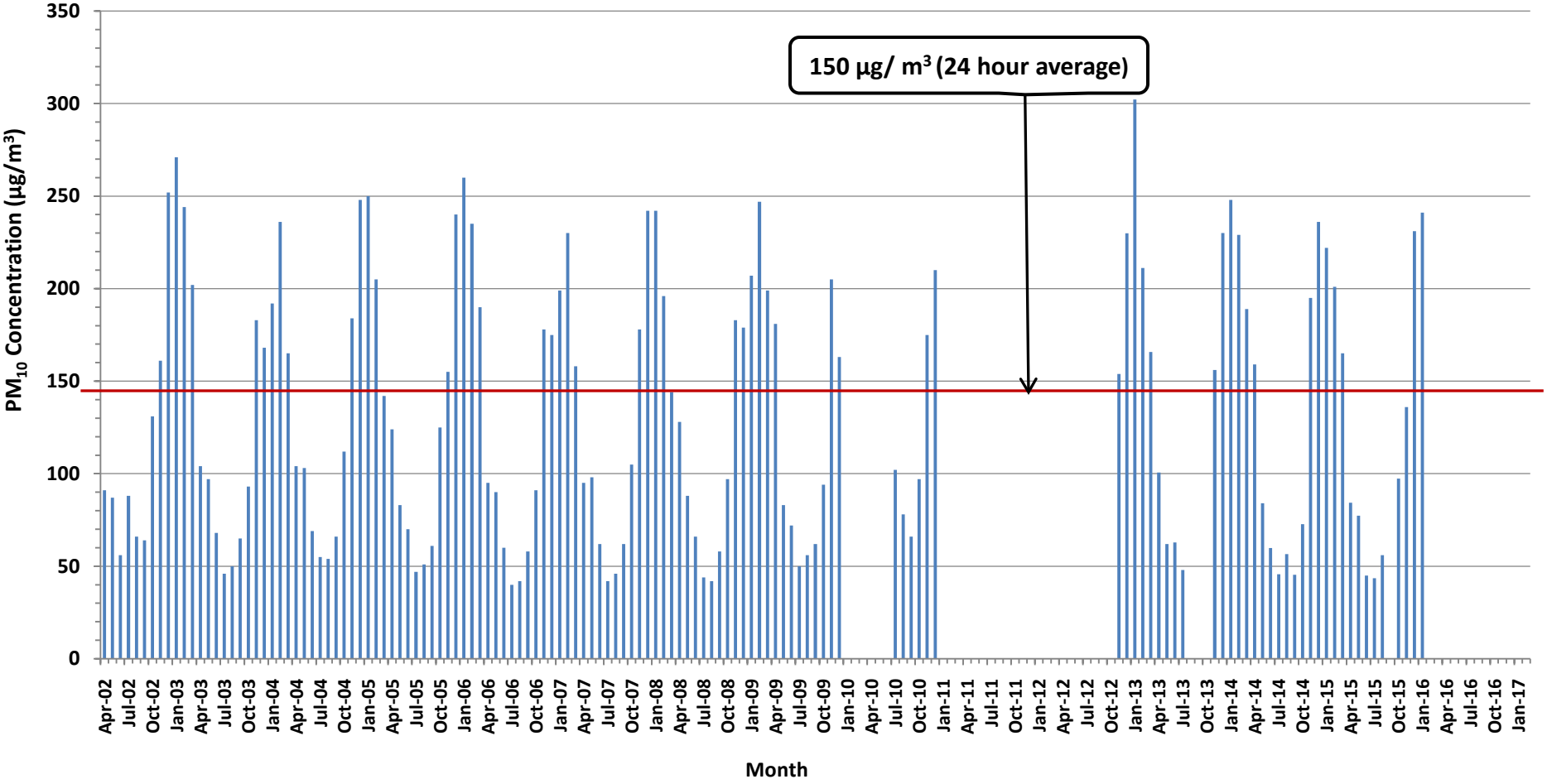
- Bangladesh Atomic Energy Commission (BAEC)
- Graduate research works/thesis
- Limited data on indoor air quality

Locations of CAMS in Bangladesh

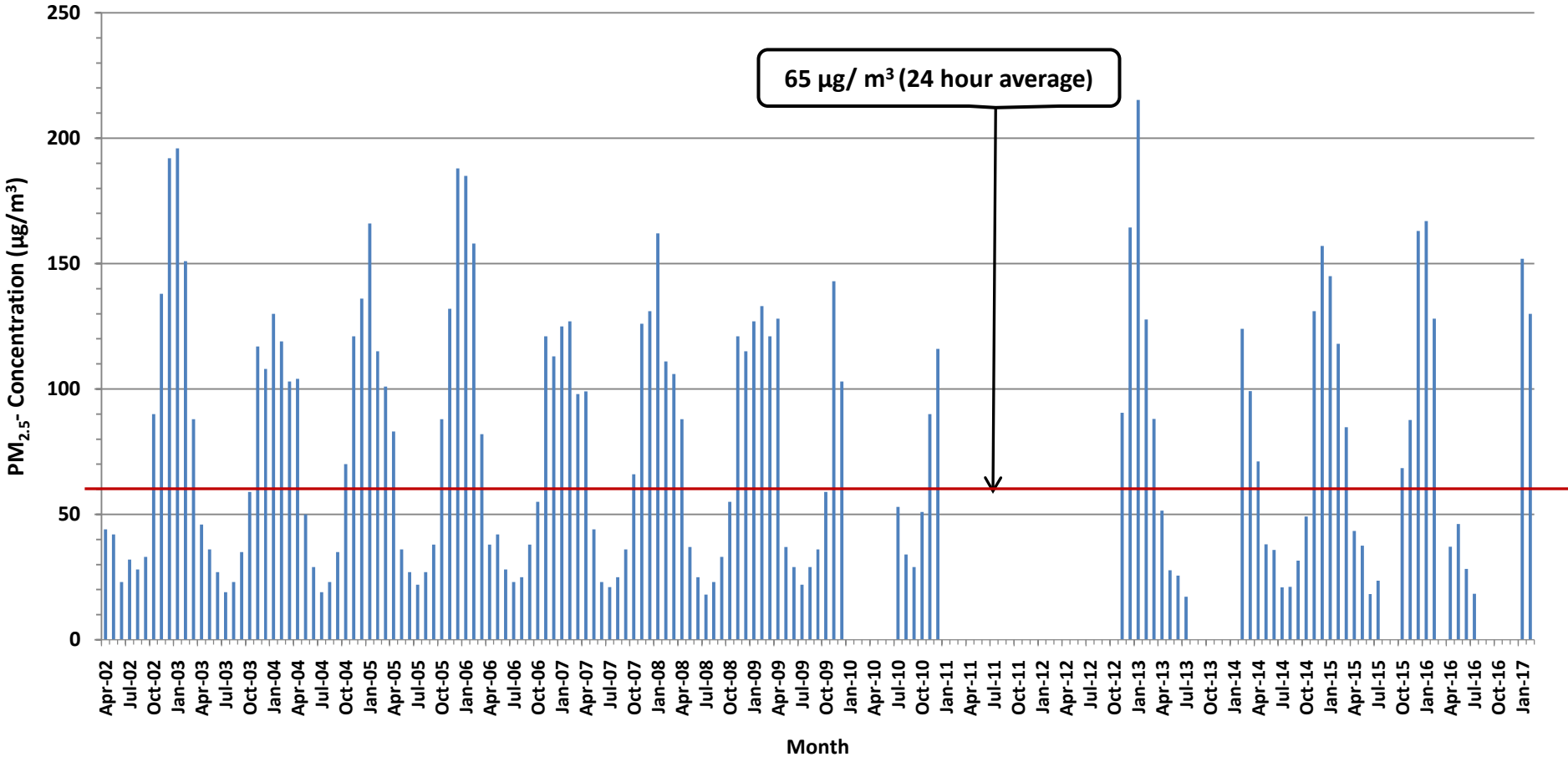
Parameters Monitored at CAMS

- PM_{10}
- $PM_{2.5}$
- CO
- SO_2
- NO_2
- O_3

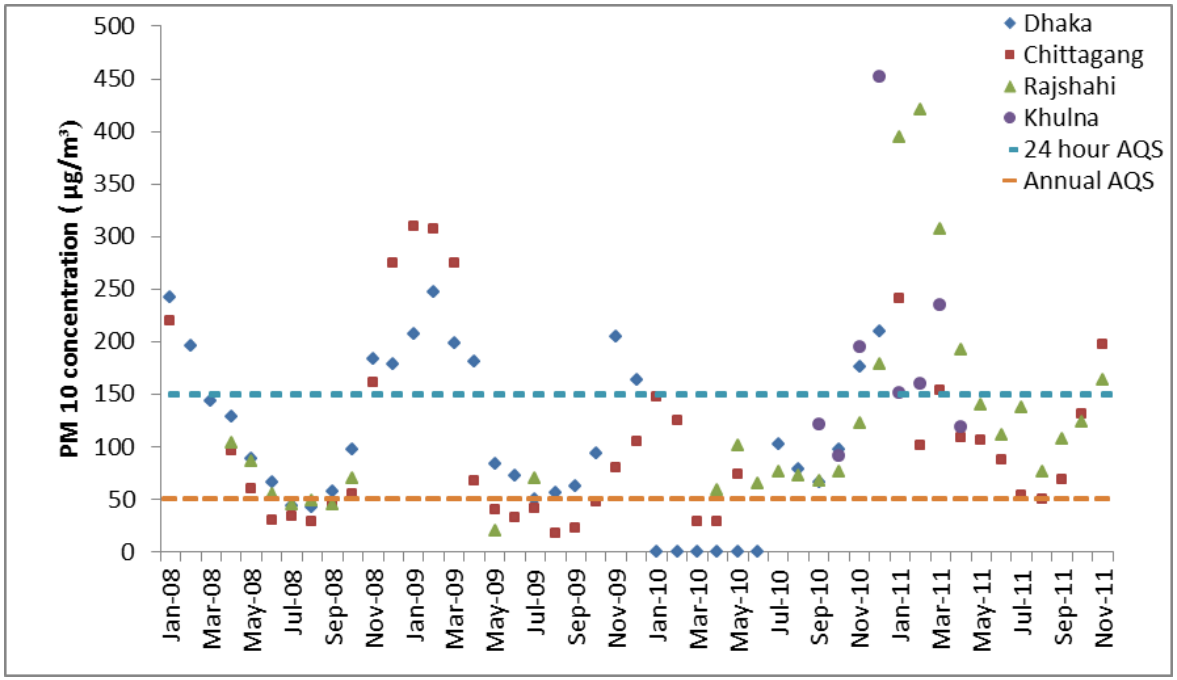
Monthly Avg. Concentration of PM_{10} at Sangsad Bhaban

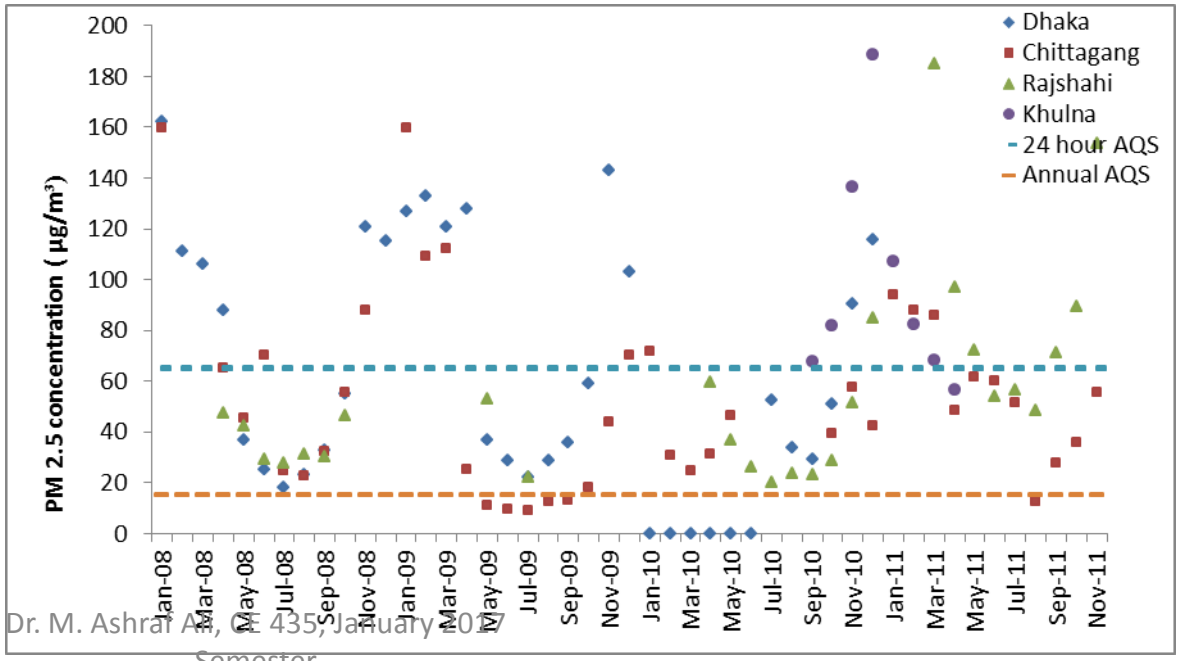


Monthly Avg. Concentration of $PM_{2.5}$ at Sangsad Bhaban

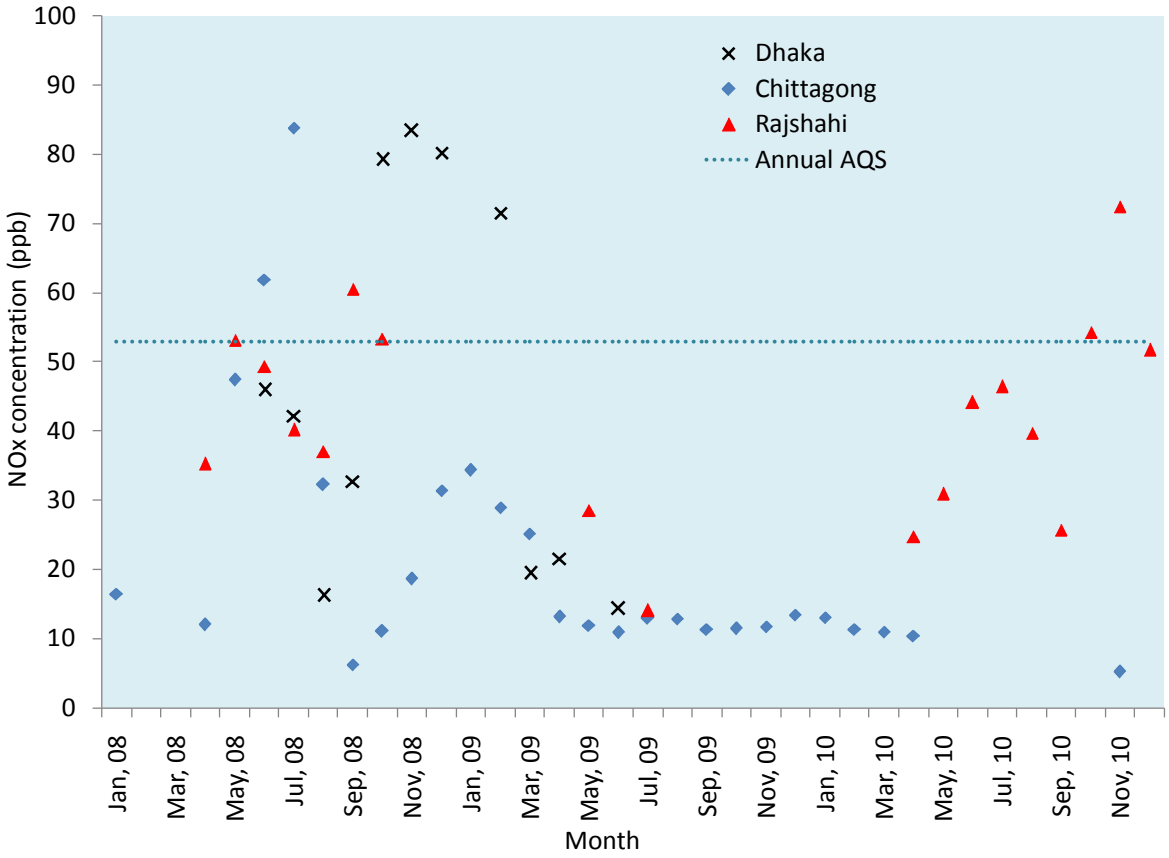


PM
in different Cities

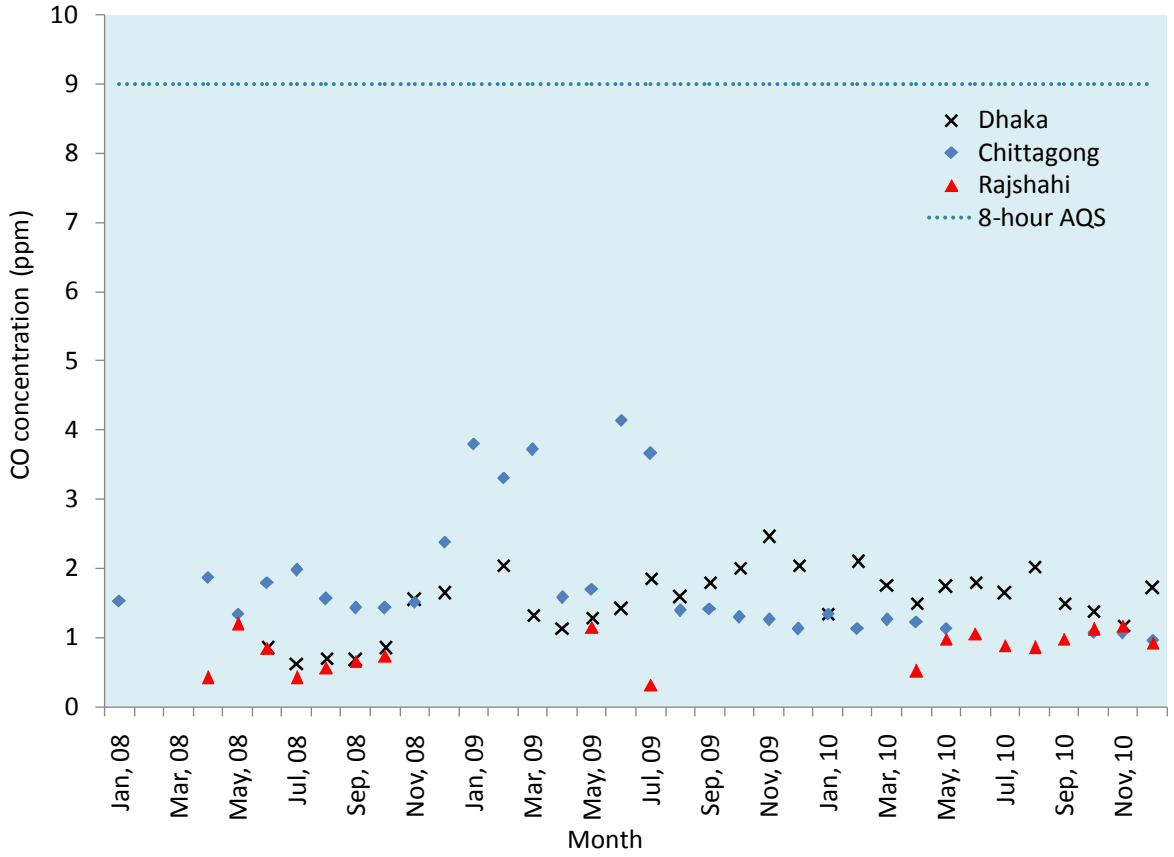




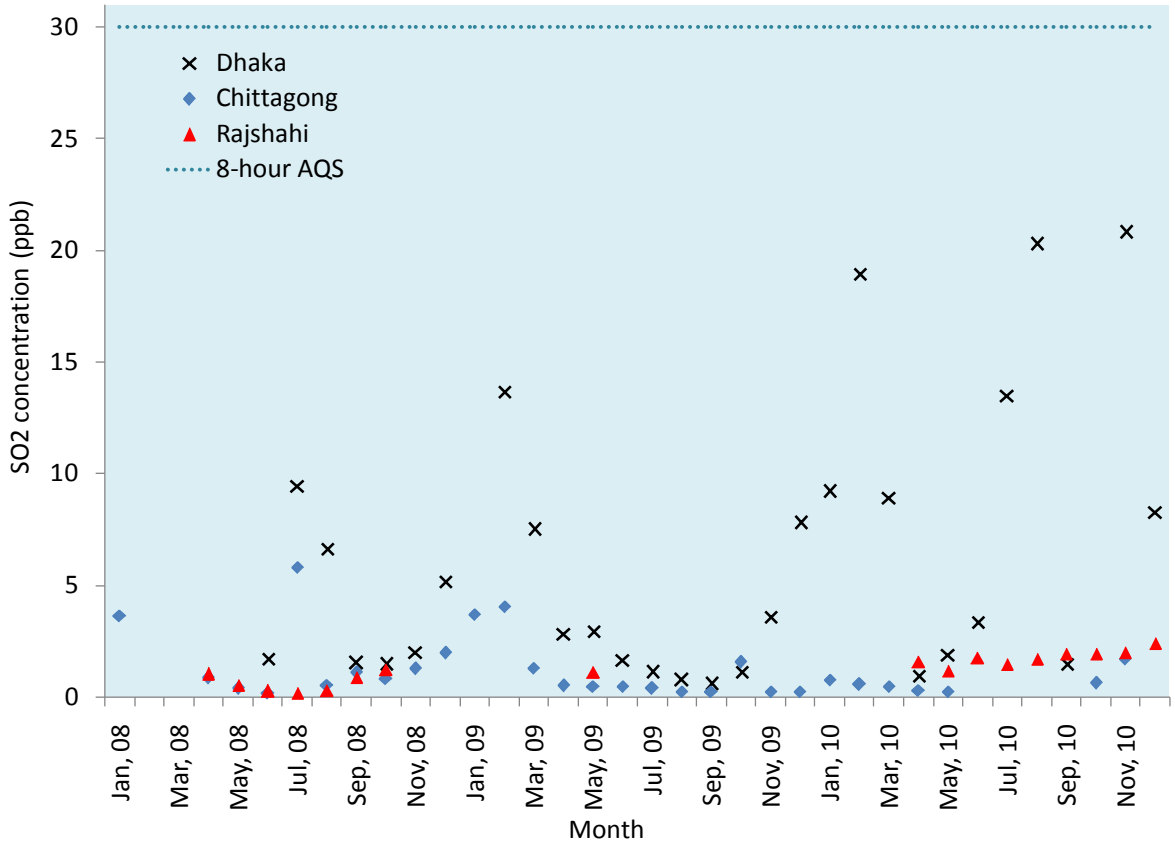
Nitrogen di oxide (NO_2): Shangshad Bhaban CAMS



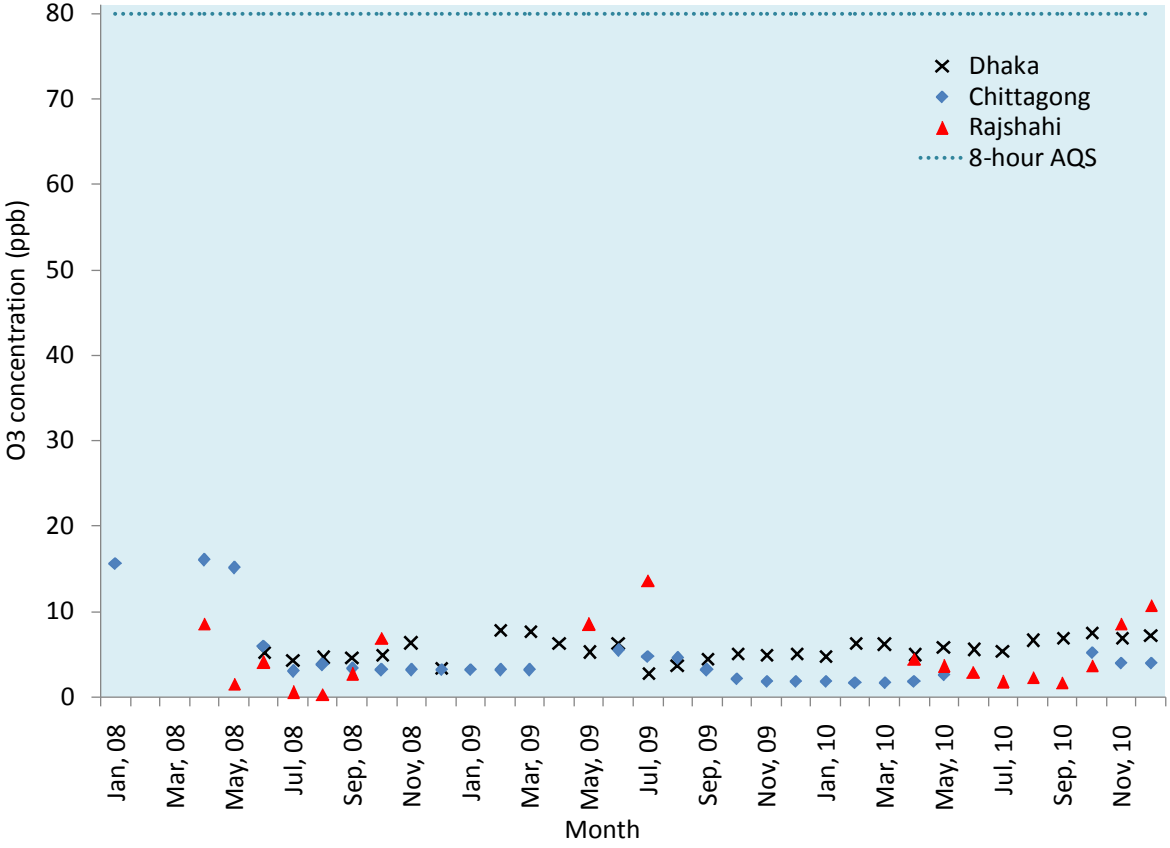
Carbon Monoxide (CO): Shangshad Bhaban CAMS



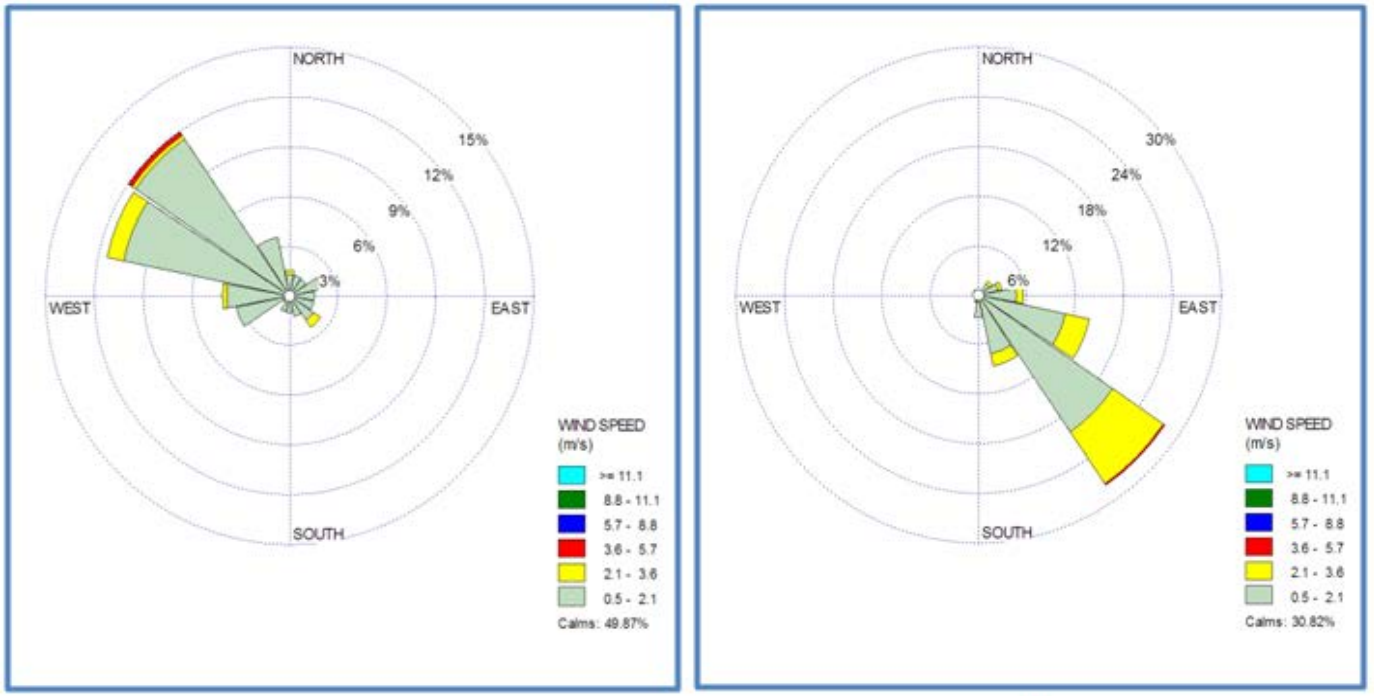
Sulfur di oxide (SO_2): Shangshad Bhaban CAMS



Ozone (O_3): Shangshad Bhaban CAMS



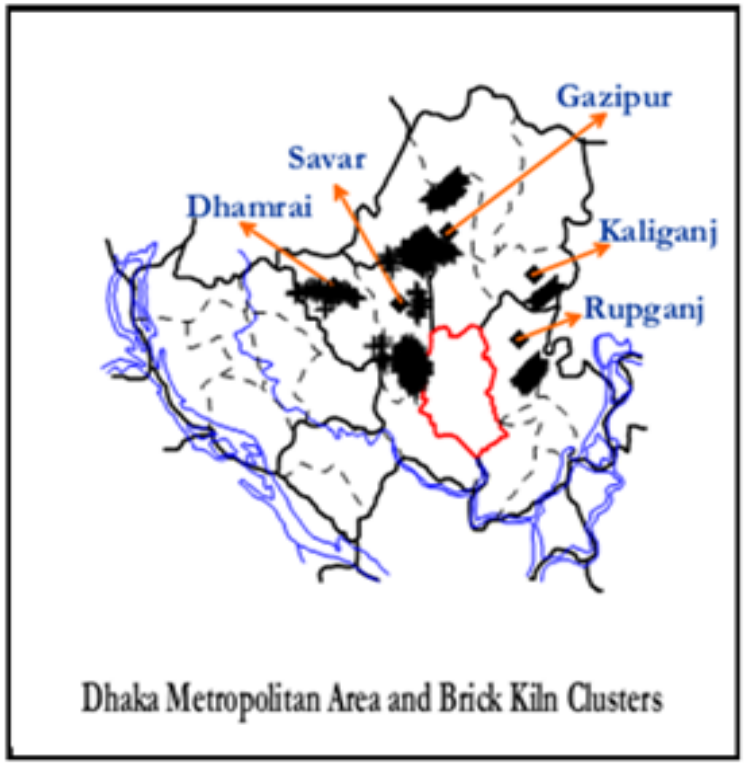
Air Quality in Dhaka: Effect of Seasonal Weather Pattern



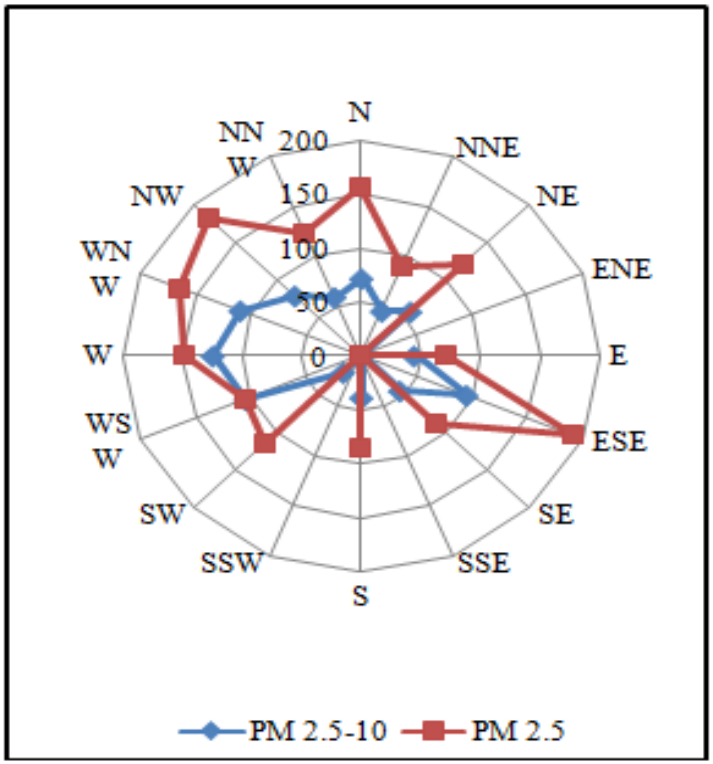
(a) (b)

Wind rose plots in (a) Dry season and (b) Wet season

Air Quality in Dhaka: Effect of Seasonal Pollution Sources



Brick clusters around Dhaka City



Distribution of $PM_{2.5}$ and $PM_{2.5-10}$ for different wind directions in dry season

Air Quality in Major Cities of Bangladesh

- Ambient air quality is characterized by strong seasonal variation, with higher concentration during dry season (November to April), and relatively lower concentration during wet season.
- The seasonal pattern of air quality is primarily due to the operation of brick kilns during dry season in up-wind locations, coupled with dry weather condition (lack of precipitation).
- PM is the pollutant of most significant concern. PM_{10} and $PM_{2.5}$ concentrations exceed the air quality standard by a huge margin, especially during the dry season.
- Other pollutants (other than NO_2) appear to satisfy the ambient air quality standards.

Major Actions for Improving Air Quality

- Introduction of unleaded gasoline from July 1, 1999.
- Banning import of 2-stroke engines and older vehicles.
- Banning 2-stroke 3-wheelers in Dhaka from January 1, 2003.
- Banning of buses older than 20 years and trucks older than 25 years from January 1, 2002 (has not been successful).
- Promoting increased use of Compressed Natural Gas (CNG), a cleaner fuel, in vehicles (since 2002).
- Banning operation of commercial trucks in Dhaka city during daytime.
- Strict emission standards being formulated.
- Banning use of wood in brick kilns (1989); banning Bulls Trench Kilns (BTKs) (2004); at least 120 ft tall smoke stack in Fixed Chimney Kilns (FCKs) (2002); banning of FCKs (to be replaced with modern technologies, e.g. ZK, HHK) (by 2013).
- Programs/projects to promote Improved Cooking Stoves (ICSs) (1 million in use; 5 million to be distributed by 2017, and 30 million by 2030).
- Improved technology (boiler) for rice parboiling units being promoted.

Transformation of Brick Kiln Technology

- Until February 2017, 4,227 brick kilns out of 6,646 have been converted into modern ones.
- Of them, 4,108 kilns have been converted into zigzag or improved zigzag kilns, and the rest into Hybrid Hoffman Kiln (HHK) and tunnel kilns, according to DoE.
- Some 2,541 Fixed Chimney Kilns (FCK) are yet to be converted into modern kilns, according to DoE.