Comprehensive Study on Air Pollution and Green House Gases (GHGs) in Delhi

(Final Report: Air Pollution component)

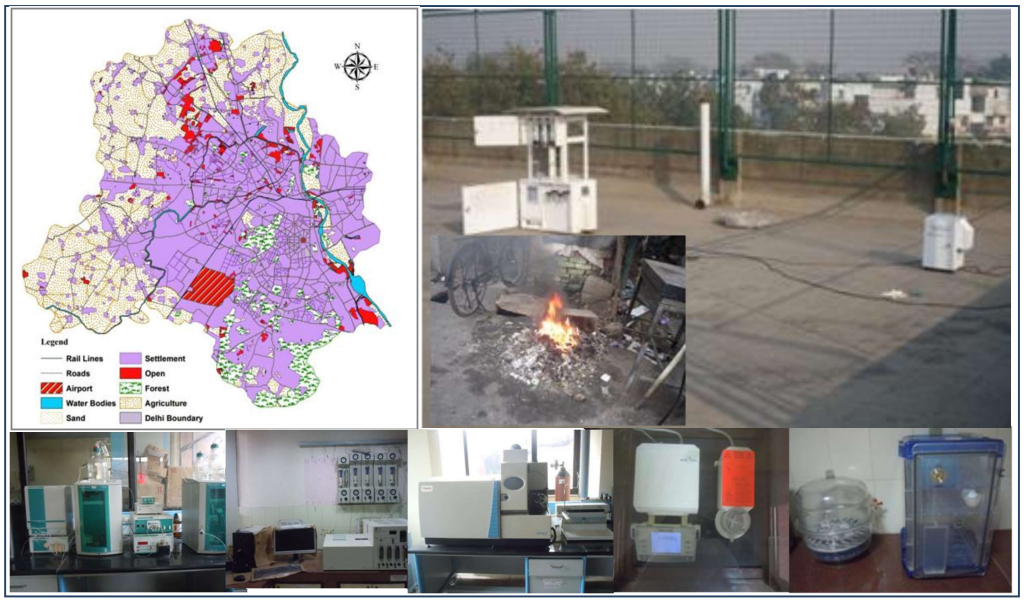
Submitted to

Department of Environment

Government of National Capital Territory of Delhi

and

Delhi Pollution Control Committee, Delhi



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expected PM control will be about 15 to 30 % from this source and SO_2 emissions will become negligible.

Diesel Generator Sets: The primary pollutants from internal combustion engines are oxides of nitrogen and PM. For Delhi and NCR, the sulphur content should be reduced to 500 ppm in HSD (if not already in use) as has been done for vehicles; a reduction of 15 to 30% of PM emission from this source is expected. It will have a major impact on reduction of SO_2 and secondary particles. The DG sets should be properly maintained and regular inspection should be done. All efforts should be made to minimize uses of DG sets and regular power supply should be strengthened. Since small DG sets are used at the ground level and create nuisance and high pollution, it is recommended that all DG sets of size 2 KVA or less should not be allowed to operate; solar powered generation, storage and inverter should be promoted.

- Secondary particles

  What are the sources of secondary particles, the major contributors to Delhi's PM? These particles are expected to source from precursor gases (SO_2, and NO_x) which are chemically transformed into particles in the atmosphere. Mostly the precursor gases are emitted from far distances from large sources. For sulfates, the major contribution can be attributed to large power plants and refineries. The NW wind is expected to transport SO_2 and transformed it into sulfates emitted from large power plants and refineries situated in the upwind of Delhi. However, contribution of NO_x from local sources, especially vehicles and power plants can also contribute to nitrates. Behera and Sharma (2010) for Kanpur have concluded that secondary inorganic aerosol accounted for significant mass of $PM_{2.5}$ (about 34%) and any particulate control strategy should also include control of primary precursor gases.

  There are 13 thermal power plants (TPP) with a capacity of over 11000 MW in the radius of 300km of Delhi, which are expected to contribute to secondary particles. Based on the study done by Quazi (2013), it was shown that power plants contribute nearly 80% of sulfates and 50% nitrates to the receptor concentration. A calculation assuming 90% reduction in SO_2 from these plants can reduce 72% of sulphates. This will effectively reduce PM_{10} and $PM_{2.5}$ concentration by about 62 $\mu g/m^3$ and 35 $\mu g/m^3$ respectively. Similarly 90% reduction in NO_x can reduce the nitrates by 45%. This will effectively reduce PM_{10} and $PM_{2.5}$ concentration by

about 37 μg/m^3 and 23 μg/m^3 respectively. It implies that control of SO_2 and NO_x from power plant can reduce PM_{10} concentration approximately by 99 μg/m^3 and for $PM_{2.5}$ the reduction could be about 57 μg/m^3.

- Secondary Organic Aerosols

  The contribution of secondary organic aerosols (SOA) in Delhi has not been done. However, Behera and Sharma (2010) have estimated that the SOA is about 17 percent of total $PM_{2.5}$ in Kanpur, another city in Ganga basin. This implies that emissions of VOCs (volatile organic compounds) need to be controlled both in and outside of Delhi, as SOA can be formed from VOC sources at far distance from the receptor. It is recommended that all petrol pumps in Delhi should install vapour recovery system to reduce VOC emissions both at the time of dispensing petrol/diesel but also at the time of filling of storage tank at the petrol pumps.

- Biomass burning

  The enhanced concentration in October-November is possibly due to the effect of post-monsoon crop residue burning (CRB). The CRB should be minimized if not completely stopped. All biomass burning in Delhi should be stopped and strictly implemented. Managing crop residue burning in Haryana, Punjab and other local biomass burning is important. Potential alternatives to CRB: energy production, Biogas generation, commercial feedstock for cattle, composting, conversion in biochar, Raw material for industry

Action Plan

The study recommends that the following control options for improving the air quality, these must be implemented in a progressive manner.

- Stop use of Coal in hotels/restaurants
- LPG to all
- Stop MSW burning: Improve collection and disposal (landfill and waste to energy plants)
- Construction and demolition: Vertically cover the construction area with fine screens, Handling and Storage of Raw Material (completely cover the material), Water spray and wind breaker and store the waste inside premises