

POLLUTION EMERGENCY OF SUMMER IN DELHI-2018

(12-17 JUNE' 2018)

**-Gufran Beig
Project Director, SAFAR
IITM-Pune (MoES)**

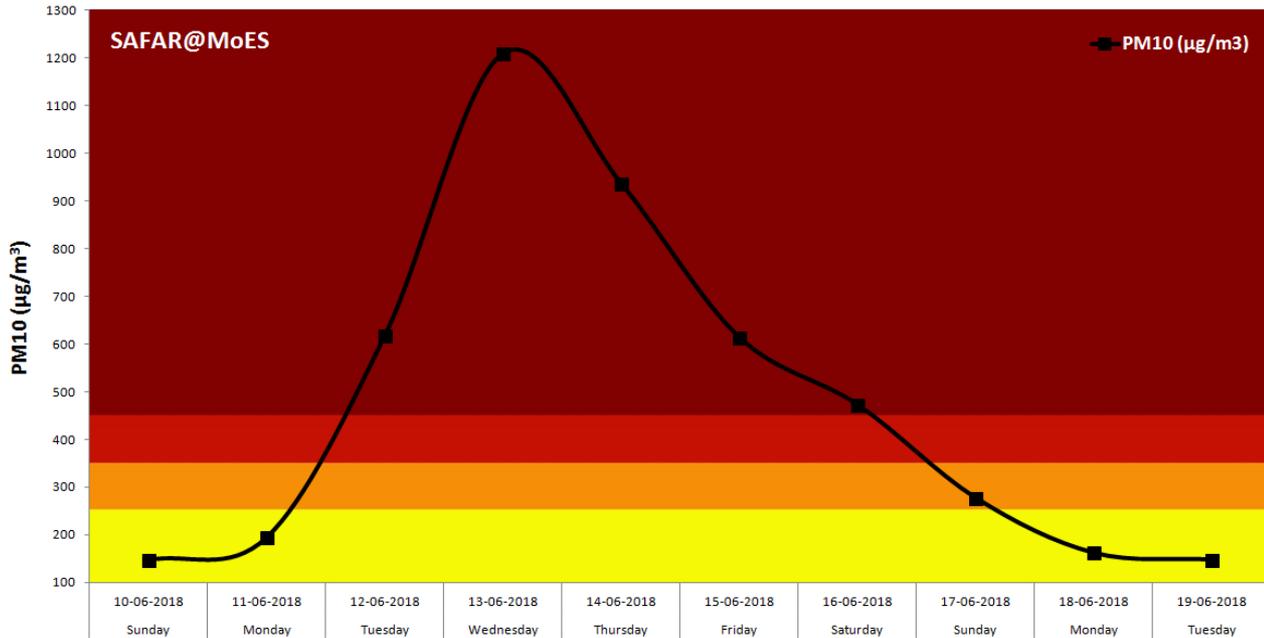
DELHI plunged into environmental emergency during June 12-17, 2018. The air pollution level in Delhi NCR region had spiked to an alarming "severe plus" category on 12th June 2018 due to heavy and surface elevated dust storm originating from neighbouring areas of Rajasthan and adjoining areas of Pakistan resulting in thick cover of haze and dust. Such dust storm increased coarser particles (PM10 and above) rapidly in the air and finer particles only slowly. This made PM10 (24h Average) level over Delhi to touch a peak of 1200 $\mu\text{g}/\text{m}^3$ (~3 times the Severe limit on 13th June but PM2.5 (24h Avg) level peak touched only 240 $\mu\text{g}/\text{m}^3$ (very poor). Because high abundance of bigger particles of dust (much bigger than even PM10) tends to reduce the wind speed towards stagnation and opposes the flush out which aggravated the situation further and made to hang 5-6 days before getting flushed out. Air Quality improved to Moderate level on 17th June after remaining at Severe+ level for about a week. The high pollution levels during this time of the year in Delhi are unusual.

It all started on 12th June after a change in wind direction and witnessing signs of weakening of monsoon circulation pattern. The western disturbance as an upper air cyclonic circulation at 3.1 km above mean sea level over Eastern parts of J&K and neighbourhood was developing. Strong North-westerly /westerly winds were prevailing in the lower levels over Northern Plains on 12th June 2018. Temperature over the neighbouring areas of Rajasthan and adjoining areas of Pakistan has seen a more than normal heating trend this year resulting in excessive dryness in air and hence dust-holding capacity was very high. The region has been unusually hot causing dry season to become even drier than usual and prompting the region for dust storm. This situation causes something of a feedback loop, with the dust trapping additional heat, make temperatures to sour and consistently reach above 40 degrees. On 12-13th June 2018, these drier winds from North-West at the time of change-over became too strong (more than 30kmph) and carried additional load of dust which lifted up a bit from the usual surface level, facilitating the faster drift and hence speedy journey towards Delhi. Dry dust loaded winds with lack of moisture content also increases the upward flux to help enter in upper atmosphere where its travelling capacity increases many folds. The severity of the dust over Delhi can be traced out from the fact that the air quality has worsened and has reached at severe plus levels with 24h rolling average PM10 recorded remained consistently around 1000 $\mu\text{g}/\text{m}^3$ during the crisis period. This dust cover also restricted the escape of the outgoing long-wave radiations, which is getting trapped in the atmosphere, and increased the night temperature.

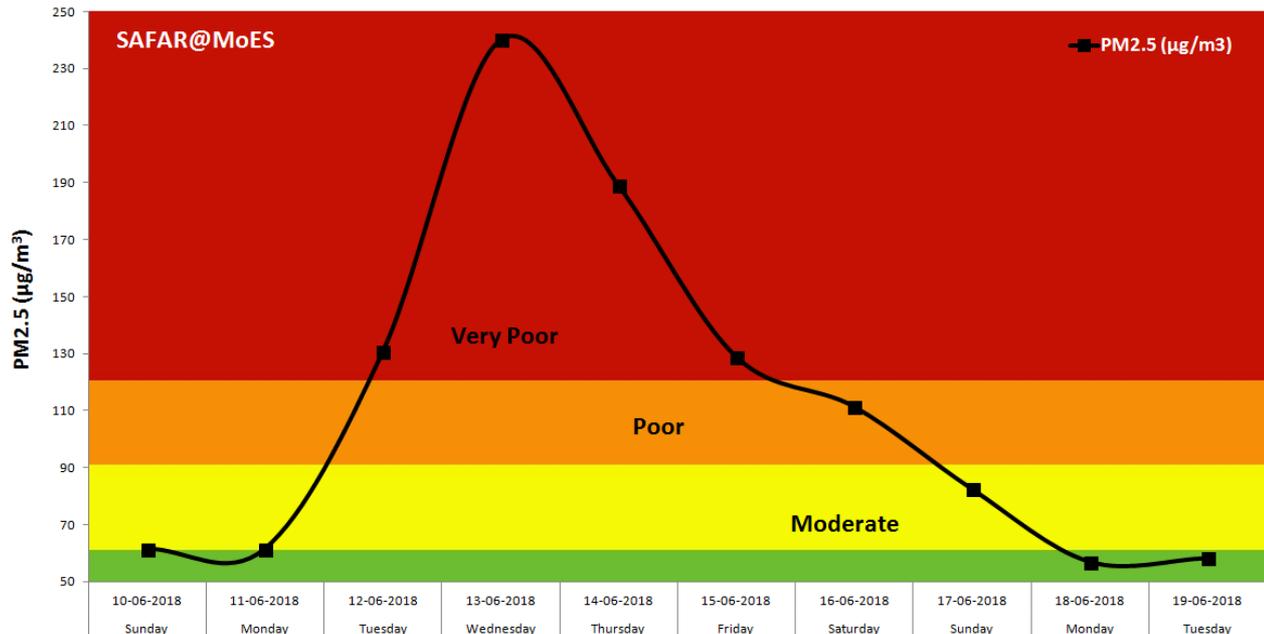
Once in Delhi atmosphere, storm found a barrier due to landlocked geography of Delhi and aerosol layers stacked for a day before the influx stopped and Delhi got enveloped under thick layers of dust. Normally, moderate to faster winds in summer do not allow dust to accumulate longer unlike winter. However, this time even in summer, winds became almost stagnant. Why? ***Because high abundance of bigger particles of dust (much bigger than even PM10, say even PM20-50-100) tends to reduce the***

wind speed and opposes the free flow. This was one of the major reasons for unusually slow wind speed in this season that made cloud of coarser particles to hang 5-6 days before rapidly getting flushed out. Summer time stagnant wind condition is quite rare. However, when temperature sours and thunderstorm activity develops, it will push wind speed up and stagnation cannot last longer. The moisture content in air increased on 17th June that also helped in settling down the dust. Hence, 2-way cleansing process: Flushing out due to moderate winds and settling down due to moisture content) made rapid improvement in air quality. In view of this, the deadlock of slow wind broken on 15th June and moisture content started to increase on 17th June. This made Delhi air quality plunged back to its normal level with PM10 and PM2.5 particles settled down back to Poor to moderate.

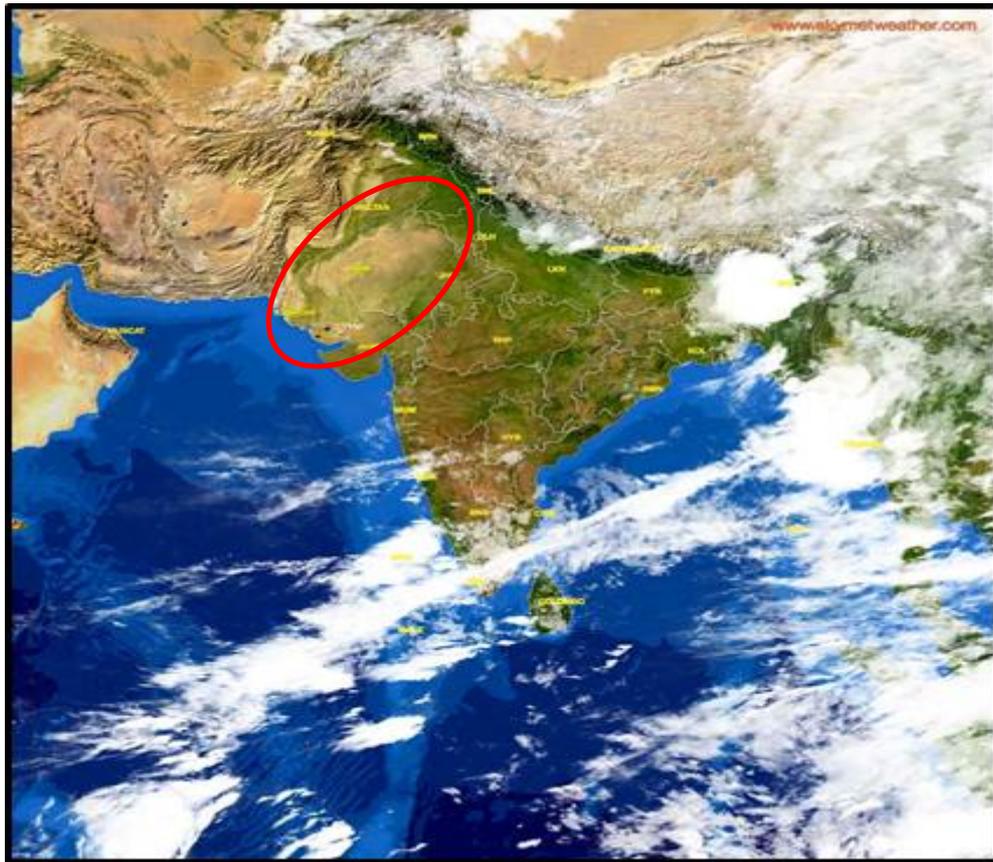
SUMMER DUST STORM (10-19 June 2018)



SUMMER DUST STORM (10-19 June 2018)



Satellite image showing the haze /dust over North-West India (13th June 2018)



Model Forecasted PM10 ($\mu\text{g}/\text{m}^3$) over West-North part of India at the onset (13th June 2018) of Dust Storm and End of Extreme event (17 June 2018)

