Assessment of impact of Odd-Even Scheme on air quality of Delhi

The Government of NCT of Delhi had implemented odd-even scheme from 1st to 15th January, 2016 with the objective of reducing air pollution in Delhi. The odd-even scheme applied to four wheeler Passenger/Private Cars. The public transport buses, two wheelers, trucks, CNG operated passenger/private cars, three wheeler were exempted from the scheme. In addition, cars driven by women were also exempted apart from a select number of VIP and emergency vehicles.

The air quality in Delhi is monitored through a set of Continuous Ambient Air Quality Monitoring System (CAAQMS) and manual stations (NAMP). The present analysis is based on the data collected by CPCB from 08 operational CAQMSs including 04 of its own (Shadipur, Dwarka, Dilshad Garden & Parivesh Bhawan) and 04 belonging to DPCC (Mandir Masg, R. K. Puram, Punjabi Bagh & Anand Vihar). Apart from this, data has also been collected from 07 manual stations of CPCB (Pitampura, Sirifort, Janakpuri, Nizamuddin, Shahzada Bagh, Shahdara & BSZ Marg) which operate on alternate days.

The overall contribution of vehicular pollution in ambient air in Delhi during winter season is estimated to be around 20-25% in respect of PM_{10} and $PM_{2.5}$. However, in terms of emission load, it contributes about 9% and 20% respectively for PM_{10} and $PM_{2.5,}$ as per IIT Kanpur study, of which the 4-wheeler passenger cars contribute about 10%. The odd-even scheme could have theoretically contributed to PM reductions in respect of exhaust emissions from off-road odd or even cars, marginal reduction in road dust and secondary particulates.

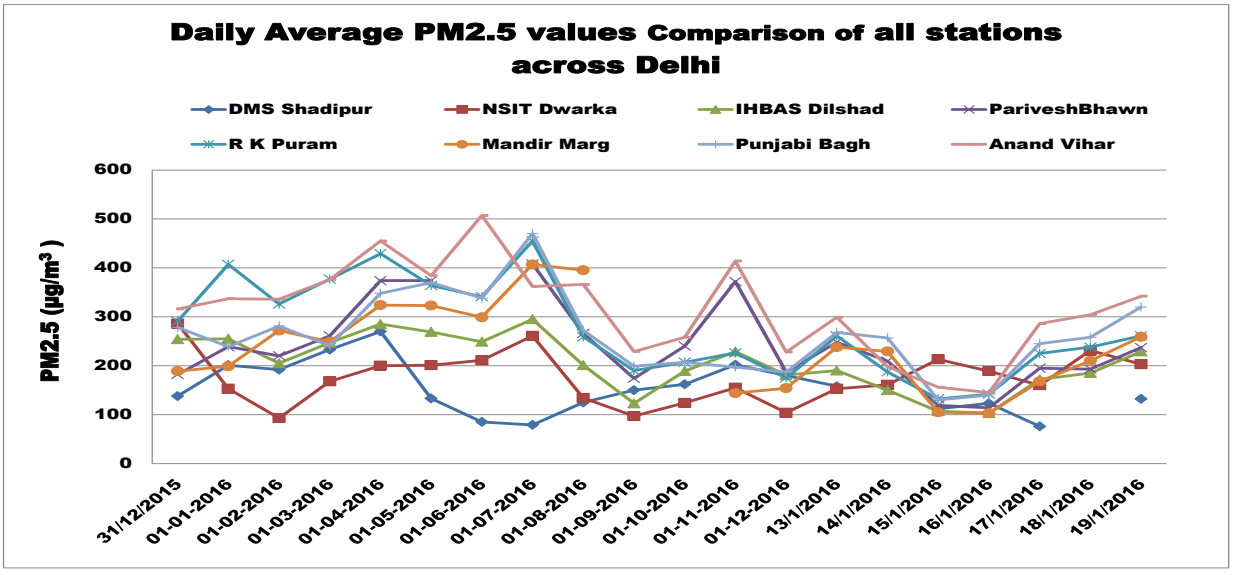
The pollutants for which data have been considered for the above said assessment include PM_{10}, $PM_{2.5}$, SO_2, Benzene, O3, NO_2 and CO. The data is presented in Tables-I, II & III. It may be seen that during January 1-15, 2016, the pollutants viz., PM_{10} ranged between (161-629 µg/m^3); $PM_{2.5}$ (79 – 507 µg/m^3); SO_2 (4-42 µg/m3); Benzene (1-11 µg/m^3); O_3 (2-66 µg/m^3); NO_2 (9-159 µg/m^3) and CO (280 – 1990 µg/m^3).

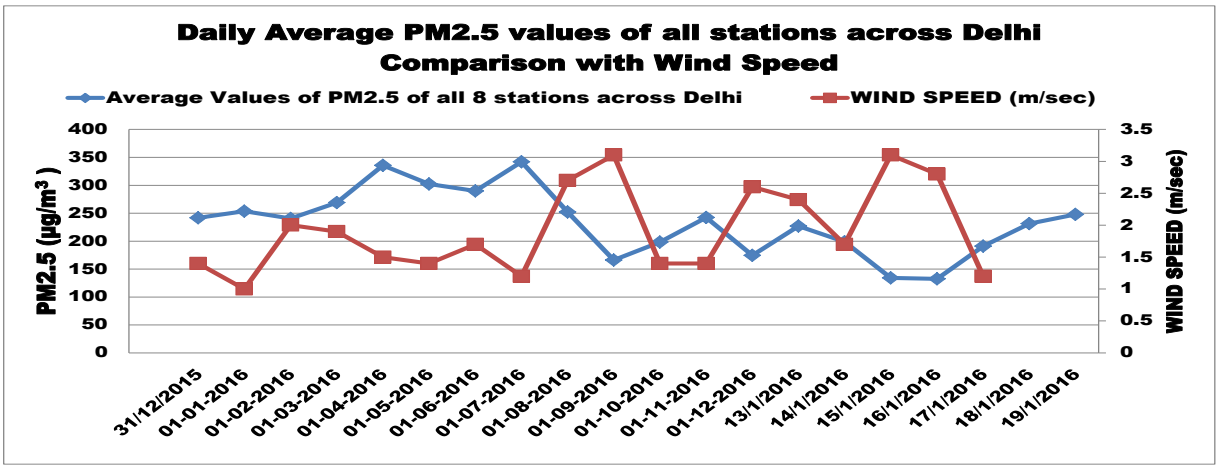
The data analyses for days preceding (period from 25th to 31st December, 2015) and post (period from 16th to 21st January, 2016) to the odd-even scheme, shows that during pre-odd-even scheme December 25-31, 2015; the pollutants viz., PM_{10} ranged between (142-454 µg/m^3); $PM_{2.5}$ (52-298 µg/m3); SO_2 (4-31 µg/m3); Benzene (1-7 µg/m^3); O_3 (18-48 µg/m^3); NO_2 (5-116 µg/m^3) and CO (114 – 1244 µg/m^3); while during post odd-even scheme, January 16-21, 2016; the pollutants viz., $PM_{2.5}$ ranged between (76-342 µg/m3); SO_2 (4-13 µg/m3); Benzene (1-7 µg/m^3); O_3 (13-34 µg/m^3); NO_2 (17-47 µg/m^3) and CO (278 – 1316 µg/m^3).

With no clear trend and wide fluctuations observed in the concentrations, it is evident that the meteorology and emissions from other polluting sources have been major factors impacting air quality of Delhi during the period. Higher wind speeds and mixing height in general result in better dispersion and lower pollution levels (Figure-I).

Overall, it can be stated that while some reduction in air pollution is likely to happen due to odd-even scheme, a single factor or action cannot substantially reduce air pollution levels in Delhi. Therefore, a comprehensive set of actions following an integrated approach is required to make substantial improvement in air quality.

Figure – I
SHOWING $PM_{2.5}$ PROFILE, CO-RELATION OF $PM_{2.5}$ WITH MIXING HEIGHT AND WIND SPEED.





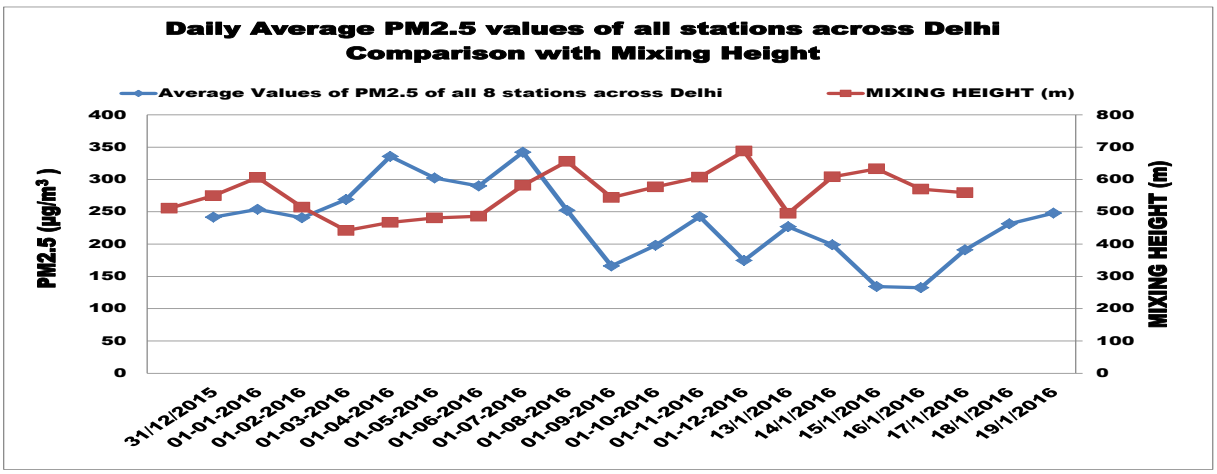


Table: I

Central Pollution Control Board Air Quality Profile (Daily average in µg/m^3) (CAAQM Stations of CPCB in Delhi)																			
Stations (CPCB Stations)	**Parameters**	**Pre Odd Even (25-31 December, 2015**						**During Odd-Even (1-15 January, 2016)**						**Post Odd-Even 16-21 January, 2016)**					
		PM2.5	**CO**	**NO2**	**O3**	**Benzene**	**SO2**	**PM2.5**	**CO**	**NO2**	**O3**	**Benzene**	**SO2**	**PM2.5**	**CO**	**NO2**	**O3**	**Benzene**	**SO2**
DMS Shadipur	***Max***	141	1244	72	48	3	31	270	1990	126	45	8	26	165	604	47	34	4	13
	Min	65	114	35	34	1	22	79	280	14	2	1	7	76	278	20	13	1	7
NSIt Dwarka	***Max***	298	698	12	40	7	28	261	1061	33	66	11	8	235	675	28	32	7	7
	Min	52	484	5	18	3	8	93	438	9	4	2	5	160	502	17	13	3	4
IHBAS Dilshad Garden	***Max***	221	1006	71	NA	NA	19	295	1610	148	NA	NA	12	229	1316	44	NA	NA	8
	Min	85	321	51			7	107	371	29			6	103	363	27			7
Parivesh Bhawan	***Max***	NA	NA	NA	NA	NA	NA	408	NA	NA	NA	NA	NA	237	NA	NA	NA	NA	NA
	Min							119						114					

Table: II

Central Pollution Control Board

Air Quality Profile (Daily average values in µg/m^3)

(Manual Monitoring Stations in Delhi)

Manual Stations (CPCB Stations)	Parameters & data range	Pre Odd Even (25-31 December, 2015				During Odd-Even (1-15 January, 2016)			
		PM10	PM2.5	NO2	SO2	PM10	PM2.5	NO2	SO2
Pitampura	***Max***	420	NA	44	9	541	429	98	17
	Min	142	NA	43	5	207	116	15	4
Sirifort	***Max***	Data inadequate				548	286	98	39
	Min					301	168	33	4
Janakpuri	***Max***					614	259	97	34
	Min					367	102	24	4
Nizamuddin	***Max***	270	NA	71	13	294	185	81	11
	Min	253	NA	51	13	161	84	31	4
Shazada Bagh	***Max***	309	233	93	17	607	166	93	15
	Min	301	193	52	5	172	81	50	4
Shahdara	***Max***	Data inadequate				629	231	106	42
	Min					217	82	26	4
BSZ-Marg	***Max***	454		116	4	516		159	17
	Min	254		77	4	169		64	4

Table:III

Central Pollution Control Board PM2.5 Profile (Daily average values in µg/m^3)			
CAAQMS Stations (DPCC stations)	Data Range	**During Odd-Even (1-15 January, 2016)**	**Post Odd-Even (16-21 January, 2016)**
R.K. Puram	***Max***	429	261
	Min	132	142
Mandir Marg	***Max***	407	259
	Min	105	103
Punjabi Bagh	***Max***	470	320
	Min	130	140
Anand Vihar	***Max***	507	342
	Min	156	145