

Periodic Research

Impact of Odd – Even Scheme on Air Quality of Delhi



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Abstract

Emerging environmental movements and debates in various parts of the world during recent times indicate that concern about environmental degradation is increasing. Now environmental degradation has become a global issue affecting each and every one. The urban centres in general and metropolises in particular are the most sufferers of degradation in the environmental quality. Air pollution is one of the most important issues in the metropolitan centres of India. Delhi is the most polluted metropolitan city of the India. During winter season pollutants concentration near the ground level has been recorded to be very high due to inversion of temperature. In perspective of seriousness of winter season's bad air quality Government of NCT of Delhi had implemented odd-even scheme for the betterment of air quality. The present paper is an attempt to study and analyse the impact of odd even scheme on the air quality of Delhi.

Keywords: Metropolitan City, Air Pollutants, Air Pollution, Particulate Matter, Temperature Inversion, Odd-Even Scheme.

Introduction

The environment in the Indian cities is getting degraded at a rapid rate. India is facing an alarming growth of population, excessive urban growth and metropolitanisation since past three decades. Environmental problems tend to develop because urban population growth is faster than economic development in Indian cities. Indian population was recorded as 121.01 crores in 2011 census out of which 31.16 percent or 37.7 crores people were living in urban areas. The size of the urban population of India far exceeded the total population of all countries except China.

The dynamics of India's urban population has been characterized by a small number of mega and metro cities with a heavy concentration of population, while a large numbers of medium and small towns had a meagre population base. Such a trend of unbalanced urban population distribution and distorted settlement structure has serious impact on the urban environment of the metropolitan cities. The metropolitan cities of India constituting 53 in number accounted for 42.6 percent of the total urban population (census 2011). Such type of population distribution has resulted in growth of large number of vehicles, haphazard development, growth of slum areas and large quantity of garbage which in turn adversely affected the environment of these cities. Many of the Indian metropolitan cities have now become congested and overcrowded. These metropolitan cities are contributing enormous amount of harmful pollutants to the atmosphere and air in the most of these large cities is polluted. A large number of people in these cities are facing severe traffic congestion and suffering from air pollution related diseases.

Review of Literature

The above discussion reveals that degradation in the quality of air is very serious issue in the Indian Metropolitan Cities. Therefore, it is important to look at the literature available on the topic in order to understand the processes involved in the deterioration of air quality. *Detwyler* has outlined that air pollution is mostly caused by the burning of fossil fuels for energy. He has concluded that automobiles are the greatest source of air pollution in the cities. *Yuhnke* pointed out that air pollution issue is the one of the most demanding of attention as it affects all of us who live in urban areas. The study shows vehicles to be the main source of air pollution in the cities. Yuhnke concludes his study with remark that "there is a set of issues that links the patterns of urban

development around the world. One of the most significant issue faces all urban centres of significant scale is how to design an urban environment that will not demand, that we use automobiles as the principal basis for transportation, yet at the same time will meet the need for mobility in those environments". *Mlay* shows that industrialization with little care for environment has created atmospheric pollution, toxic wastes, acid rain, loss of wetlands and other natural habitats. He pointed out that "even new technological discoveries which acted as the engine for economic growth, have in the long run created new forms of pollution which threaten to destroy not only the planet's ecological balance but also the very existence of human and other species."

As for as the studies on the Delhi metropolitan city are concerned, there are some reports available, which show that the quality of air in Delhi is deteriorating very fast. *White Paper on Pollution in Delhi* highlighted the poor condition of environment in Delhi. Paper revealed that due to growth in vehicles and industrial activities, air of Delhi has been polluted. Paper highlights that concentration of Suspended Particulate Matters is very high in the atmosphere of Delhi. *Environmental Status Report on Delhi by the World Wide Fund* showed high concentration of pollutants in the atmosphere which has turned Delhi into one of the most polluted cities in the world. Report pointed out that the incidence of respiratory disease in Delhi is 12 times higher than national average and 30 percent of the Delhi's population suffers from respiratory disorders due to air pollution. Above discussion shows that many studies are available on the air pollution problem. Review of available literature on the issue is very useful as it helps in understanding various aspects related to the present study.

Delhi Metropolitan City

The present study pertains to Delhi metropolitan city. Delhi with 1.64 crores population (census 2011) is the second largest city of India. Population of Delhi has been growing at an alarming rate. This is mainly due to migration from backward regions and it has put tremendous pressure on the resources of the capital. The physical infrastructure is inadequate to cater to the needs of ever increasing population. Civic amenities like housing, water supply, sanitation facilities and public transport etc, which form precondition for keeping the environment in shape, have been deteriorating rapidly especially since the last twenty five years.

Degradation of the quality of air is a major issue in Delhi. Delhi is one of the most polluted cities of the world. Huge numbers of petroleum fuel based vehicles, construction activities, haphazard industrialisation and poor inadequate public transport system is mainly responsible for the bad air quality of the city. According to ambient air quality data measured by Central Pollution Control Board the concentration of Particulate Matter (PM), Carbon Monoxide (CO), Nitrogen Dioxide (NO₂) and Sulphur Dioxide (SO₂) in the atmosphere has increased considerably since 1989 at the most of the monitoring

stations situated in different parts of Delhi. Now the degradation of air quality is a very serious issue in the capital city of India. During winter season pollutants concentration near the ground level has been recorded to be very high due to inversion of temperature. For this reason winter season is very uncomfortable and unhealthy for the residents of Delhi.

Objectives

Keeping above discussion in mind, the present study has following objectives:

1. To understand the status of air quality in Delhi Metropolitan city.
2. To understand the odd-even scheme of the Delhi Government.
3. To study and analyse the impact of odd-even scheme on the air quality.

Data Base and Methodology

Data is very important for air quality analysis. Only secondary data have been used in the present study as the measurement of air quality require scientific monitoring instruments which are available mainly with the government agencies. The data pertaining to the quality of air has been taken from Central Pollution Control Board (CPCB) . The present analysis is based on the data collected by CPCB from its three ambient air quality stations (DMS Shadipur, NSIT Dwarka, and IHBAS Dilshad Garden) and four other air quality monitoring stations of Delhi Pollution Control Committee (R.K. Puram, Mandir Marg, Punjabi Bagh and Anand Vihar), which are located in the various parts of Delhi.

Odd – Even Scheme of Delhi Government

Keeping the seriousness of winter season's bad air quality in mind 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 and three wheelers were exempted from the scheme. In addition, cars driven by women were also exempted apart from a select number of VIP and emergency vehicles.

Discussion and analysis of Odd – Even Scheme

The present study is based on the data analysis of four air pollutants which include PM_{2.5}, CO, NO₂ and SO₂. The data is presented in Tables-I, II. It may be seen that during odd even scheme days (January 1-15, 2016) the pollutants concentration value ranged between; PM_{2.5} (79 – 507 µg/m³), CO (280 – 1990 µg/m³), NO₂ (9-148 µg/m³) and SO₂ (5-26 µg/m³). The data analyses for post odd even days (period from 16th to 21st January 2016) shows that pollutants concentration in the atmosphere ranged between; PM_{2.5} (76-342 µg/m³), CO (278 – 1316 µg/m³), NO₂ (17-47 µg/m³) and SO₂ (4-13 µg/m³). The air quality data range shows that PM_{2.5} concentration was very high and its concentration in the atmosphere was much higher than prescribed permissible limit (appendix). Very high concentration of PM_{2.5} is very serious health issue for the residents of Delhi.

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The above data trend reveals that there is a wide fluctuation in the concentration of pollutants and there is no positive impact on the air quality by the implementation of this scheme. It is evident that the meteorology and emissions from other polluting sources have been major factors impacting air quality of Delhi during this period. Meteorological variables such as temperature, wind speed and precipitation have a significant impact in the short term. We can say that there is no any conclusive evidence to prove that the odd even policy improved Delhi's air quality. There are many reasons responsible for this:

1. During the winter months ground based temperature inversions are the regular features in the Delhi. Temperature inversion is the phenomena which the temperature instead of falling increases with height above ground. With the colder and heavier air below, there is no upward current and turbulence is suppressed. In such conditions low level pollutants discharged become trapped sometimes for long period. Due to this reason in winter months pollutant concentration has been recorded to be very high in the lower atmosphere of Delhi.

2. The speed and direction of the wind are very important meteorological parameters responsible for dispersion of pollutants. Stronger the wind greater will be dissipation of pollutants to a larger area and more dilution of emitted pollutants from air pollution sources. Winter months of Delhi are relatively calmer than other months. The prevailing calm conditions facilitate more stability to atmosphere which restricts dispersion of pollutants and results in their concentration around the vicinity of pollution sources.

3. Besides four wheelers, other petroleum based vehicles (two wheelers, commercial vehicles etc), construction activities, air polluting industries, burning of garbage at landfill sites and neighbour districts air pollutants have been major factors impacting air quality of Delhi.

It is observed that during odd even scheme, traffic was smooth and there was very less congestion on the road. Vehicles were running smoothly on the road. In general, the public perception is that during odd even scheme days they were feeling better on the road. It was a major achievement of the scheme.

Table 1
Status and Trends of Air Quality at DMS Shadipur, NSIT Dwarka, and IHBAS Dilshad Garden (Air Quality Profile : Daily Average in µg/ m3)

Stations	Parameters	During Odd - Even (1-15 January 2016)				Post Odd - Even (16-21 January 2016)			
		PM 2.5	CO	NO ₂	SO ₂	PM 2.5	CO	NO ₂	SO ₂
DMS Shadipur	Maximum	270	1990	126	26	165	604	47	13
	Minimum	79	280	14	7	76	278	20	7
NSIT Dwarka	Maximum	261	1061	33	8	235	675	28	7
	Minimum	93	438	9	5	160	502	17	4
IHBAS Dilshad Garden	Maximum	295	1610	148	12	229	1316	44	8
	Minimum	107	371	29	6	103	363	27	7

Source: Central Pollution Control Board, New Delhi

Table 2
Status and trends of air quality at R.K. Puram, Mandir Marg, Punjabi Bagh and Anand Vihar (PM 2.5 Profile : Daily Average in µg/ m3)

Stations	Data Range	During Odd -Even (1-15 January 2016)	Post Odd – Even (16-21 January 2016)
R.K. Puram	Maximum	429	261
	Minimum	132	142
Mandir Marg	Maximum	407	259
	Minimum	105	103
Punjabi Bagh	Maximum	470	320
	Minimum	130	140
Anand Vihar	Maximum	507	342
	Minimum	156	145

Source: Central Pollution Control Board, New Delhi

Suggestions

1. Improvement in the public transport system is very necessary. A better public transport system will reduce the use of personal /private car.
2. Only one car should be allowed to a person. There should some strict norms for registration of new vehicles.
3. Traffic management system should improve; this will reduce travel time and congestion during peak hours.

4. Public awareness towards environment and air pollution is the need of the hour, without public participation any scheme can not get fruitful results.
5. An integrated approach is required to make substantial improvement in air quality.

Conclusion

Overall, there is no very positive impact of this scheme on the air quality of Delhi due to various reasons. However it can be stated that some

improvement in traffic congestion, reduced travel time and better feeling during driving are the positive outcome of odd-even scheme. A single factor or action cannot substantially reduce air pollution levels in Delhi. This is important to note that engine technology, total number of vehicles, structure and age of vehicles, fuel quality, traffic management system, nature of industries, garbage disposal techniques, construction activities and public awareness, all play an important role in determining the air quality. Therefore, a comprehensive set of actions and an integrated approach is required to make substantial improvement in the air quality of the national capital of India.

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APPENDIX

National Ambient Air Quality Standards (Notification dated 18th November, 2009 by the govt. of India)

Pollutants	Time Weighted Average	Concentration in Ambient air (µg/m3)	
		Industrial /Residential /Rural and other areas	Ecologically Sensitive areas (Notified by Central Government)
Particulate Matter (PM2.5)	Annual Average	40	40
	24 Hours Average*	60	60
Carbon Monoxide (CO)	8 Hours Average	2000	2000
	1 Hour Average	4000	4000
Nitrogen Dioxide (NO ₂)	Annual Average	40	30
	24 Hours Average*	80	80
Sulphur Dioxide (SO ₂)	Annual Average	50	20
	24 Hours Average*	80	80

*24 Hours Average or Daily Average

Source: Central Pollution Control Board, New Delhi