

## THE EFFECT OF AIR POLLUTION ON HEALTH IN DELHI

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### ABSTRACT

Growing hand in hand with the Development story, India is facing pollution as a major challenge at all levels. Air pollution is considered to be one of the complex problems in Delhi. The major sources of Air Pollution in Delhi include vehicle pollution due to increase in transportation activities, burning of fossil fuels like coal and natural gas and all the emissions from industrial processes. The various chemical compounds which are added in the atmosphere due to the above processes are carbon dioxide, carbon monoxide, oxides of nitrogen, sulphur dioxide and suspended particulate matter (SPM). As recent data shows that, Delhi, the capital of India has worst air pollution among all the world capitals (Iyengar, 2014). The air we breathe in is very hazardous and have very serious consequences on health. The air pollution results in global climate change, impact on health, economics and quality of life. Air pollution causes long term problems as dust particles from construction sites and poor air quality together leads to lung function disorder, causing respiratory problems as well as cardiovascular diseases. The paper aims to study the current scenario of air quality of Delhi, current measures being taken and the scope for further steps that need to be taken to clean Delhi's Foul air. It also lists the various measures the government must enforce to help Delhi breathe easy and to show the way to other seriously polluted cities to clean up their act too.

**Keywords : Air pollution, Air quality of Delhi, Vehicle pollution, Suspended Particulate Matter**

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## INTRODUCTION

Delhi, the capital of India, is one of the most populated and polluted cities in India. According to census in 1991 population of Delhi was 94.21 lakhs. As per census 2011, 97.50 % of population lives in urban area. Density of population has increased from 9340 persons per sq.Km.in 2001 to 11320 persons per sq Km in 2011. The population of Delhi in 2015 is estimated to be 18.2 million (Economic Survey, 2014-15). There is a huge growth in population every year (Population Map, 2015). Due to increase in population and growth in economic activity has resulted in increase in pollution in Delhi. The total number of vehicles on road in Delhi as on 31<sup>st</sup> March 2015 is 88.27 lakhs, which shows an increase of 6.4 percent over the last year (Economic Survey, 2014-15). The major increase in vehicle population has resulted in corresponding increase in pollutants from these vehicles. Currently more than 65 tonnes of pollutants are added by the vehicles in the atmosphere daily. However, Delhi has 88,27,431 number of registered vehicles and 60,000 commercial vehicles enter Delhi everyday and 1500 cars are added to fleet every day. Due to higher economic growth and more disposable income, the availability of easily credit and the resultant onset of consumerism and better road facilities have led Delhi with the highest number of vehicles in the city. Not only the vehicles but the construction activity in Delhi –NCR is going at a very high pace, often in violation to ecological norms set by National green Tribunal has considerably contributed lot to growing levels of air pollution. Urbanization and Industrialization are together creating challenges for air quality in high-growth cities around the world. Delhi, capital of India, landscape, landlocked location, weather patterns, commercial activities, rising energy needs and rapidly increasing traffic all contributes to the increasing air pollutants in the city which is most harmful to human health.

### Air Pollution in Delhi

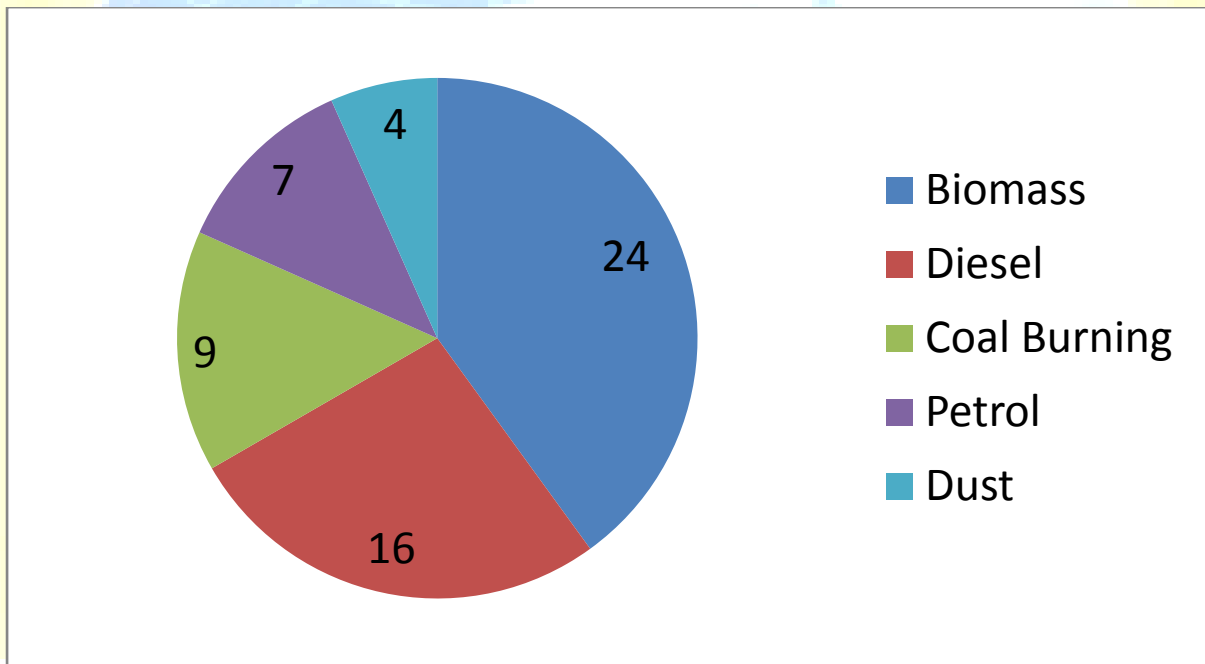
Air pollution is considered to be one of the most complex problems and major cause of concern in Delhi. The pollutants which are added to the environment contains so many known and unknown parameters. The ambient air quality of data of Delhi shows very high value of suspended particles. These suspended particles are beyond the permissible limits continuously from last several years.

A report by (CPCB, 2014) Central Pollution Control Board, the concentration of oxides of sulphur and oxides of nitrogen and all particulate matters have been found consistently much higher than permissible limits.

According to (Economic Survey, 2014-15), the quality of air has been deteriorated over the years due to increase of particulate matters levels beyond the permissible limits due to vehicle and industrial emissions.

A report by the (MoEF, 2014-15), explains that environmental situations in Delhi is of major concern. Air Pollution is considered to be more hazardous .It was estimated that Delhi produces 8360 tonnes of solid waste per day. It runs on technology which is environmental unfriendly. The burning of just a fraction cause 2% to 3% of waste contributes to emission of 2000kg/day PM10, 1800 kg/day PM2.5.

According to (Ministry, 2015) Health Ministry in 2015, the 5 major pollution sources are 24 % from Biomass burning, 16% from Diesel, 9% from coal Burning, 7% from Petrol and 4% Road dust .More than 65 tonnes daily is the PM10 burden from Road dust .Dust contributes over 26% to PM10 and PM2.5.

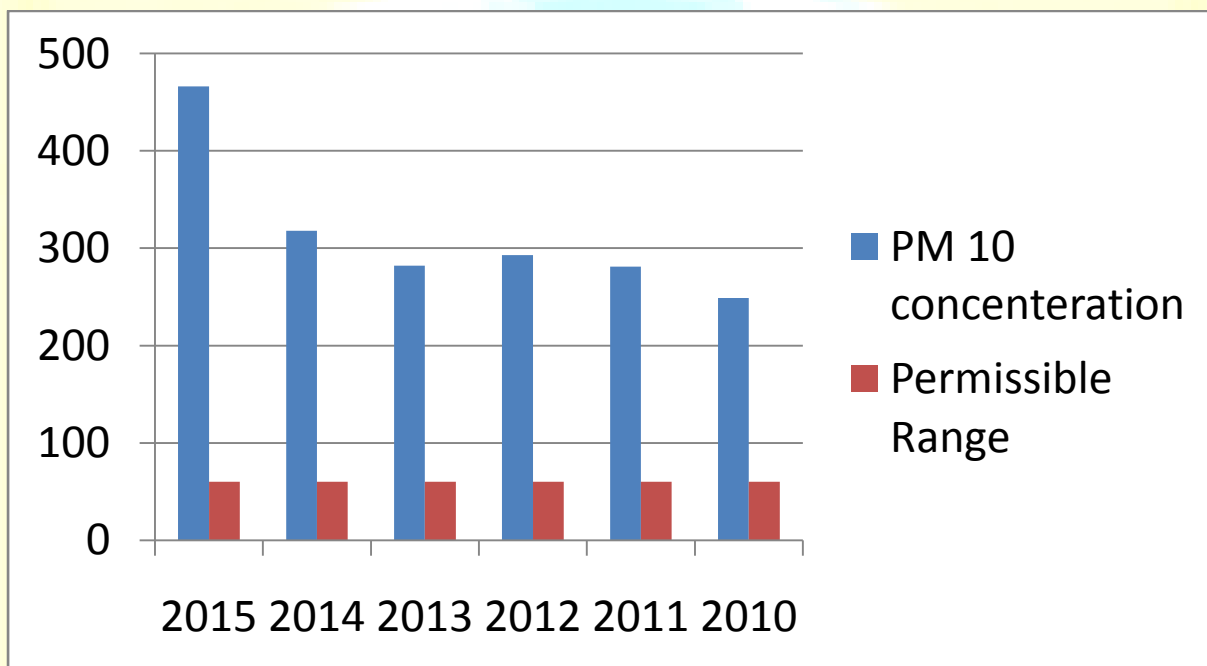


#### Particulate Matter

Particulate matter is a mixture of extremely small particles and liquid droplets like acids, chemicals, gas, water, metals, soil dust particles and measurement of this gives an idea of pollution in the city. Particulate matter 10 is a pollutant found in windblown dust, smog, pollens, and construction activities, which causes respiratory problems and aggravate asthma. The concentration of PM10 (particulate Matter) levels has been continuously increasing from past several years.

Year	PM10 (micrograms per cubic meter)	Permissible Range (Micrograms per cubic meter)
2015	466	60
2014	318	60
2013	282	60
2012	293	60
2011	281	60
2010	249	60

Source: System of Air Quality and Weather forecasting and Research (SAFAR)



Concentration of PM2.5 varied from 125 to 191 microgram per cubic meter over the last year as opposed to the annual standard of 40 microgram per cubic meter.

According to World Health Organisation, particles with a diameter of 10 or less such as PM2.5 and PM10 can cause severe health problem as it has an ability to travel deep into the respiratory system.

The value of carbon monoxide varies from 1.28 to 2.64 mg/m<sup>3</sup> in 2014 and the prescribed limit for carbon monoxide is 2mg/m<sup>3</sup>. The average value of nitrogen dioxide in 2014 is 79µg/m<sup>3</sup> and this also exceeds the permissible limits of 40µg/m<sup>3</sup> (Source: Economic Survey of Delhi 2014-15).

### **Adverse Effects of Air Pollution on Health**

The air quality in Delhi is at an alarming stage which is causing more harm than we can ever imagine. Pollutants in the air are very dangerous for health which causes not just breathing issues but also leads to cancer. Particulate matter enters our respiratory system through nose and throat. PM<sub>2.5</sub> penetrates into lungs which causes lung and heart problems. As pollution is a major cause for concern in Delhi. Due to this air pollution there 10,000-30,000 deaths annually and is the fifth largest cause of death in the country (Hindustan times - 16dec'15). According to Centre for Science and environment (CSE) outdoor air pollution kills 6,20,000 people and indoor pollution kills 1.5 million people in India annually .

Large number of studies has examined the effect of Air pollution on Health. The study conducted by Central Pollution Control Board 2008, has identified the various significant association with all relevant adverse health outcomes. It was found that Delhi had 1.7 times higher prevalence of respiratory symptoms.

World Bank Development Research Group carried out a research to study the effects of air pollution. According to the study, the average suspended particulate level in Delhi was approximately five times more than the average standard. The study concluded that that impact of particulate matter is dangerous and causes more number of deaths and deaths were occurring at a younger age.

It's high time we recognize that problem is multi-fold and multidimensional. It requires the detailed analysis and proactive planning. Delhi is now struggling to control runaway pollution.

### **CONTROL MEASURES INITIATED BY THE GOVERNMENT OF DELHI**

The various control measures are initiated by the government of Delhi for protecting the environment is the Ministry of environment and forests at the Centre and Department of Environment of the Government of National Capital Territory of Delhi .The various environmental Regulations/ legislations/standards are implemented by Government of India like

- The Air (Prevention and Control of Pollution) Act, 1981 provides the control of air pollution. It ensures the power of enforcing this Act to the Central Pollution and Control Board (CPCB).
- Vehicular Emission Norms, Control measures in vehicles so far included are the introduction of unleaded petrol in 1998, catalytic converter in passenger cars 1995, reduction of sulphur content in Diesel 2000, and reduction of Benzene content in fuels 2000. Others include with the introduction of mandatory "Pollution under Control" certificate with three months validity which is according to Bharat Stage II (equivalent to Euro –II norms), phasing out of very old commercial vehicle.
- National Air Quality Monitoring Programme
- Ambient Air Quality Standards, The Delhi Pollution Control Board Conducts monthly Ambient Air Quality Monitoring at more than 40 locations in Delhi, and takes corrective action wherever necessary.
- Fuel Quality Specifications
- The Motor Vehicles Act, 1988 states that all hazardous waste should be properly packed, labelled and then transported.
- National Bio fuels Policy, 2008.

The National Bio –Fuel policy envisages that bio-fuels like biodiesel and bio-ethanol may be bought under the ambit of "declared goods" by the government to ensure unrestricted movement of bio fuel within the states. It is also mentioned in the policy that no taxes and duties should be there on bio-diesel. A target of 20% by 2017 has been proposed for the blending of bio-fuels- bio-ethanol and bio-diesel.

Implementation of Odd-even Rule, conducted as a trial for 15 days to cut down vehicular pollution. Through this odd –even rule, people of Delhi have really supported it but then also to control pollution level, capital needs a long term planning.

Government has also launched the Swachh Bharat Abhiyan programme for clean environment.

Various Government Bodies which are working on Air Pollution are:

- Ministry of environment and forests
- Central Pollution Control Board
- Central Road Research Institute
- The Energy Research Institute



- National Environmental Engineering Research Institute
- National Physical Laboratory
- Delhi pollution Control Committee

Though the government are taking lot of initiatives to control pollution but still there is a long way to control it Apart from Government citizens also incorporates some initiatives to control the situations. According to a (Srivastava, 2016) Delhi needs long term planning to control pollution.

### Conclusion and Analysis

The Government of Delhi has taken several steps to reduce the level of air pollution in the city from past several years. Lot more efforts are needed to further reduce the levels of air pollution. The corrective measures are needed to be more strengthen and magnified to a larger scale. The government efforts and participation of Public together is needed to make a palpable effect in the reduction of pollution. Multi-level, Multi-agency simultaneous approach required

- The use of Public Transport needs to be promoted. To ensure last mile connectivity According to (Dholakia, 2015), lack of robust and unsafe public transport system, last mile connectivity issues, inadequate monitoring system are the key challenges to towards the usage of Public Transport. The mind-set not to use Public transport among affluent citizens should be changed by providing effective and efficient system.

Case of Metro Rails: The use of Public Transport can only be promoted if there is more number of Metro rails to ply with desired frequency and number of stations should be expanded to provide the last mile connectivity. Metro has 160 stations in Delhi-NCR. Two new corridors will add 108 stations which will be operational by end -2016. During the odd – even trial, in Delhi metro saw daily ridership jump by 2 lakhs. Despite the expansion in metro rails, Metro remains as an inconvenience public transport in Delhi. It is because either a station is too far or a problem of last mile connectivity. Increasing the number of trains is not enough but last mile connectivity should be there so that commuters can cover last mile easily and safely. Metro rails also increase the travelling time at certain locations.

As distance between two stations is crucial and according to Global norms, one station every 600m, but in Delhi it is about 1.2 Km average distance between two stations. Now new stations may not be feasible on existing lines, but for new ones, DMRC must follow government norms.

Case of DTC buses: DTC buses cannot keep 16 lakhs of cars off the road. According to a CSE (Centre for Science Environment) report, 21% of the scheduled trips are not operated due to poorly maintained fleet and Shortage of drivers. Yet DTC carries 35L passengers daily, which is approx 10 L more passenger than metro. Currently, Delhi Government has 6,000 bus fleet and utilization during the 2014-2015 is only 86% as more than 400-500 DTC buses were unutilized due to poor maintenance or missed trips. There is a requirement of 11,000 buses which can complete the scheduled trips and also eliminates the missed trips. If 11,000 buses are added, then it can carry approximately 25L passengers more in order to remove 16 L cars from the road. Government can also give employees' commuters' subsidies for public transport or car pooling.

- **Enforcing Norms for Waste –Disposal**

According to Health Ministry, Delhi Produces 8360 tonnes of solid municipal waste per day and burning of this waste contributes to the emission of 2,000 Kg/day PM10 and 1800 Kg/day PM2.5. So to avoid burning of municipal waste there should be strict enforcement of penalty of Rs.5000 for burning of this municipal waste. There should be proper measures to deal with collection, segregation and disposal of solid waste. Dealing with this waste in a preventive way can tackle up to 24% source that contributes to pollution load.

- **Controlling Road dust And Building norms**

According to report from CSE, Road dust contributes to 4% in air pollution. More than 65 tonnes of PM10 daily contributes as road dust. It can be controlled by following simple things like covering scaffolding, hosing roads can slash dust load. Vacuum cleaning roads, paving footpaths help control dust, as do growing of plants and grass.

The MoEF's 2010 rules must be followed at construction sites. The penalty of Rs.50, 000 must be enforced for not following MoEF's steps. The MoEF's steps are commonsensical like cover trucks ferrying materials, cover debris, and sprinkle water to control construction dust among other measures.



- Increase in Number of CNG filling Stations

The entire fleet of public transport has switched from diesel to CNG. CNG is better than diesel as it burns more effectively unlike petrol and diesel and very little of it is left un-burnt. Moreover CNG is cheaper than petrol or diesel. The main problem is that there are only 270 filling stations for 5L registered CNG cars, which in Delhi NCR is not enough. Since January 1, 2016, 60,000 cars have converted to CNG as per government authorities. So more number of filling stations or pumps are essentially required and there is a need to increase the pressure of gas at existing CNG stations. From March 2016 it is estimated that all Delhi NCR cabs, around 80,000 cabs must run on CNG so there must be more distribution and filling stations to ensure uninterrupted supply. There must be a fixed deadline for the planned 104 CNG filling stations in Delhi –NCR.

The difference in pricing should be waved off as in Delhi CNG costs Rs 37.20 /kg while in NCR it costs Rs.42.60/kg.

There are only 21 CNG retro –fitting stations which should also be increased.

- To encourage the use of Hybrid Cars.

Taxes and tolls should be waved off on Hybrid cars as it reduces the load of vehicle pollution .In April 2015; the Centres FAME India Scheme was launched of fering electric and Hybrid cars incentives of up to Rs1.38 L and Rs 29,000 for bikes. Another way to encourage the electric cars there must be free /paid charging units set up government. As in California, where half of electric cars in US are registered, the state has invested a huge amount in public charging infrastructure and incentivised buying e-cars. The individuals and Business owners who opt for e- cars ,both are benefited through offers and rebates in Clean Vehicle Rebate Programme.

- Ensure The Implementation of Bharat Stage-VI norms

For reducing the vehicle pollution more initiatives are taken including phasing out of old vehicles, use of unleaded petrol, use of low-sulphur petrol and diesel and use of catalytic convertor in vehicles, application of stringent pollution norms for vehicles. The biggest challenge is to switch to Bharat Stage –VI norms which are equivalent to Euro -VI standards by 2020. Various oil companies has put Rs 30,000 crores between 2005-10 to upgrade to BS-IV standards but the next switch is likely to come with more a financial and technical

problem. Government says PSU's will invest over Rs 20,000 crores in the up gradation, gearing up the quantum leap from BS-IV to BS-VI.

- Burning of Coal and fly ash are the contributors in Air Pollution. They add PM10 and PM 2.5 in the atmosphere. In Delhi, 10% families uses bio-mass to cook and average coal consumption in tandoors is 30 kg/day. Banning Tandoors and Bio-mass for cooking and shifting to LPG will help in splashing down the air pollution.
- Power Plants

The power Ministry in Delhi is leaning towards including buying power generated from solid waste by amending the electricity Act, 2003. But Delhi government should also push through the idea of converting coal-based thermal power plant into waste-to-energy plant at Rajghat Power house, which is not used from 8 months now.

Delhi government must also speed up the closure of Badarpur Thermal Power plant as it is one of the most polluting thermal power plants.

The Indraprastha Power Plant is supposed to be converted into a ground-based solar power system.

- The apex court ban on Delhi-NCR registration of diesel cars and Suv s of 2,000 cc and above must be implemented along with the court's directive to double green compensation charge for loaded truck entry in the city.

According to Research at Centre for Science and Environment, Anumita Roychowdhury, executive director suggests some measures to control air pollution in Delhi like Introduction of Car Parking permits. Shutting Down of two coal-based Power plants in the city.

According to (Godbole, 2015) tackling Delhi's air pollution is a major challenge. Delhi can learn from Beijing, and understands the problem and solutions on environmental issues and controlling air pollution. The first response towards controlling air pollution problem is both the countries have moved polluting industries outside the core city limits. The various advocacy campaigns and efforts are made to eliminate the in-house coal burning change their domestic heating systems from coal to electric ones or on LPG's. Government has also taken

initiatives by providing subsidies to LPG users. In Delhi, people should be made aware about the harm of the open-air fires and the use more of efficient electric heating systems.

The use of Social Media can also contribute to environmental clean-up. As monitoring and sharing the city's pollution levels on social media which is visible to everyone can result into a social pressure compelling the city administration to swing into faster action. Another way to clean up environment is by using the environmental non-government organisations. They will educate the citizen to create a niche for themselves. They can collaborate with media to increase awareness, Expose default organisations and official corruptions to tackle the pollution challenge.

Completely ban on Diesel vehicles, vehicles not complying with emission norms, Implementation on latest technology and moving toward BS-VI standards are the initiative measures which should be followed strictly.

One of the effective steps to reduce pollution, Uber Kolkata on 15<sup>th</sup> January 2016 has launched a car pool services in Kolkata who share cab rides, offering atleast 30% lower fares. This initiative should also be practiced in Delhi to reduce vehicle pollution. All the measures are needed to control Air pollution.

Its high time, we have recognized that the problem is multi-level and multi-dimensional, multi-pronged approach and a single solution of the problem will not work upon it and it requires a detailed analysis and pro-active planning. According to TERI, Delhi is a big city with huge population and the various steps taken like a trial odd-even, tax on old and commercial vehicle that may help the city up to an extent but to clean Delhi it needs a long term planning. So all the authorities including the central and state government and even citizens along with the environment experts should make collaborative efforts to come up with a solution. The process should be very transparent, accurate, real time insight and it should also be participative by all. Citizen participation, the government's will to implement the laws, corrective measures – has to go hand in hand. The recent self-regulation exhibited by ordinary citizens during the odd-even experiment shows that citizens are more than willing to come forward when their overall health is in danger- government has to concentrate on providing the necessary support and infrastructure. Health of an individual, as

we all know, is of great importance. It plays an important role in one's life, so there is a need to safeguard our environment in all the ways. All those which impacts environment directly or indirectly needs to contribute to safeguard human health by controlling all these factors. So let s contribute to breathe in clean and healthy environment. Hope that lessons from New Delhi may spread to other Indian cities, a national drive to tackle air pollution.

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