Air Pollution in Select Indian Cities

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Pollution has become a great topic of debate at all levels and especially the air pollution because of the enhanced anthropogenic activities such as burning fossil fuels, i.e. natural gas, coal and oil-to power industrial processes and motor vehicles. The burning of these fossil fuels release different harmful chemicals to the atmosphere, like carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NO_X), Sulphur dioxide (SO_2), and tiny solid particles-including lead from gasoline additives-called particulates. Urbanization in India is rapid around the major cities in India. Population growth has been accelerated in cities due to migration of rural population. Increase in industrial activities, population both endemic and floating and vehicular population etc. has led to a rapid increase in environmental problems like Air pollution.

Within the transport sector, other vehicles moved to BS-IV standards, trucks still remained on BS-III standards because of their nation-wide movement. The recent announcement of Ministry of Road and Transport Highways (MoRTH) to shift directly to BS-VI vehicle emission standards (including trucks) is a very important step for longer term reduction in vehicular emissions and improvement in air quality. However, timely and proper implementation of these standards needs to be ensured. With this, it is equally important to reduce emissions from in use vehicular fleet. Fleet modernization and old vehicle scrappage programs need to be developed to enhance early influx of newer and less polluting vehicles. Most importantly, with the introduction of BS-IV and BS-V quality of fuel in 2017 and 2019, respectively, the old diesel vehicles can be retrofitted with tail-pipe emission control technologies like Diesel Particulate Filters (DPF) for substantial control of tail-pipe emissions.

53 cities have identified as Metropolitan cities, according to census 2001. There are 207 monitoring stations in 49 metropolitan cities, out of these, 49 cities are covered under National Air Monitoring Programme executed by Central Pollution Control Board, Central Pollution Control Board (CPCB) in India implements the National Air Quality Monitoring Programme through a network comprising 544 operating ambient air quality stations covering 224 cities/towns in 26 states3 and 5 union territories of the country. Agra falls under ecologically sensitive area, while others are industrial/residential areas.

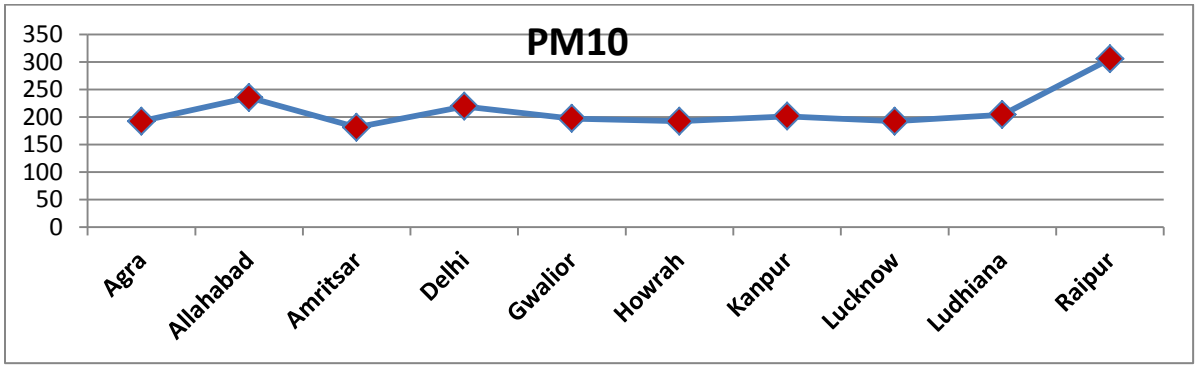
Under National Air Monitoring Programme three criteria pollutants (NAMP) viz. PM_{10} (Particulate Matter having an aerodynamic diameter less than or equal to 10 µm), Sulphur dioxide (SO_2) and Nitrogen dioxide (NO_2) were identified for regular monitoring at all locations. Additional parameter like Carbon monoxide (CO), Ammonia (NH_3), Lead (Pb) and Ozone (O_3) are being monitored at selected locations. The other parameters as notified in revised NAAQS (National Ambient Air Quali Standards) viz. $PM_{2.5}$ (Particulate Matter having an aerodynamic diameter less than or equal to 2.5 µm), benzo(a)pyrene (BaP), arsenic (As) and nickel (Ni) are slowly being added under the monitorir network. The monitoring of meteorological parameters such as wind speed, wind direction, relative humidity and temperature has also been integrated with air quality monitoring. The monitoring of pollutants is carried out for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampli for particulate matter) with twice a week frequency to have 104 observations in a year.

Air Quality Trend

More than 80% of people worldwide livings in urban areas that monitor air pollution are exposed to air quality levels that exceed the World Health Organization (WHO) limits. While all regions of the world are affected, populations in low-income cities are the most impacted. According to the WHO Global Urban Ambient Air Pollution Database 2016, 98% of cities in low- and middle income countries with more than 100 000 inhabitants do not meet WHO air quality guidelines. However, in high-income countries, that percentage decreases to 56%.

In India parameters monitored under NAMP are three criteria pollutants viz. PM10 , Sulphur dioxide (SO2) and Nitrogen dioxide (NO2) were identified for regular monitoring at most of the cities in India.

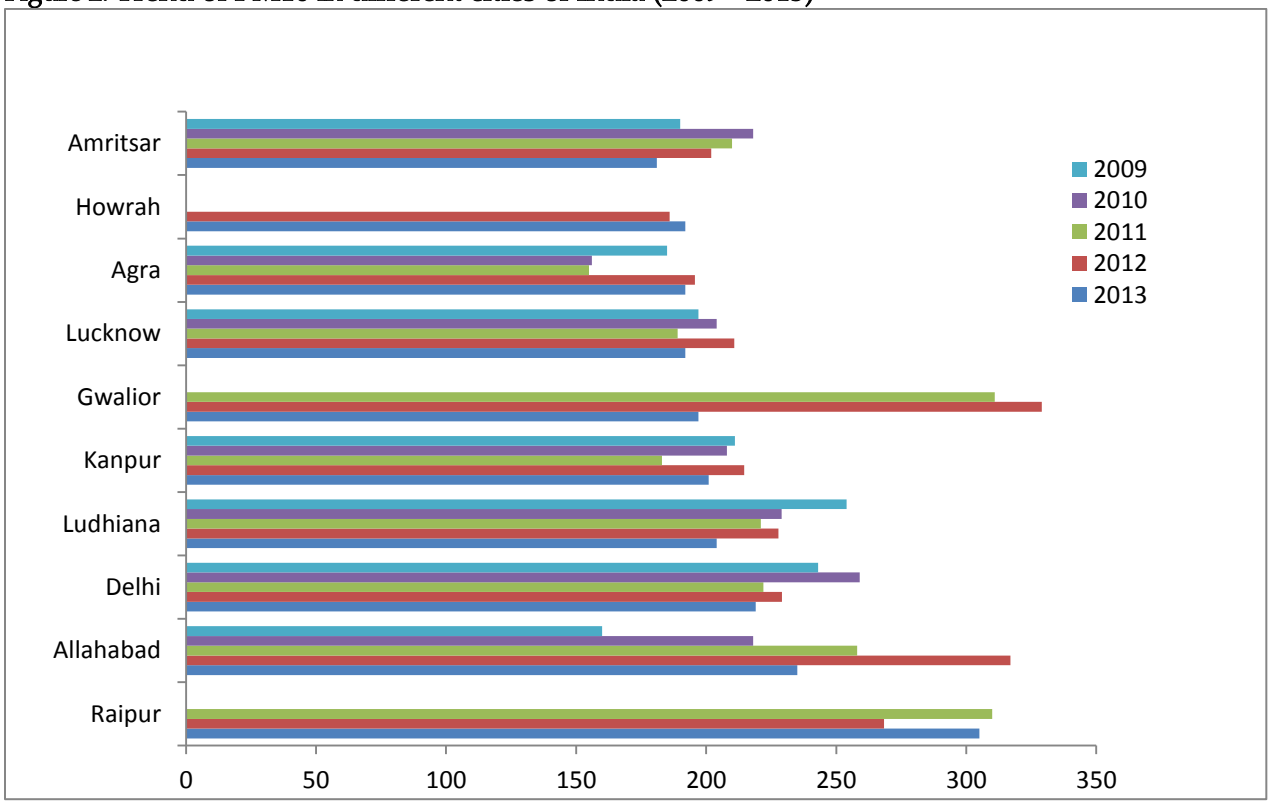
Figure 1: Respirable Suspended Particulate Matter in 2013 (RSPM/PM10) in top ten Polluted Cities



Source: Central Pollution Control Board, 2013

Figure 1 shows that in India, Raipur with 305 µg/m3 is the most polluted city recorded this time followed by Allahabad 235 µg/m3, Gwalior 197 µg/m3 and Agra 192 µg/m3. New Delhi, India's capital recorded with PM_{10} measurement of 219 µg/m3 which is slightly less than recorded in 2012 of 229 µg/m3. Government of Delhi has recently tested out measures like Odd Even scheme to restrict the number of cars on its roads. The first phase of the scheme was launched in January 2016 and thereafter it was re-introduced from 15–30 April 2016.

Figure 2: Trend of PM10 in different cities of India (2009 - 2013)



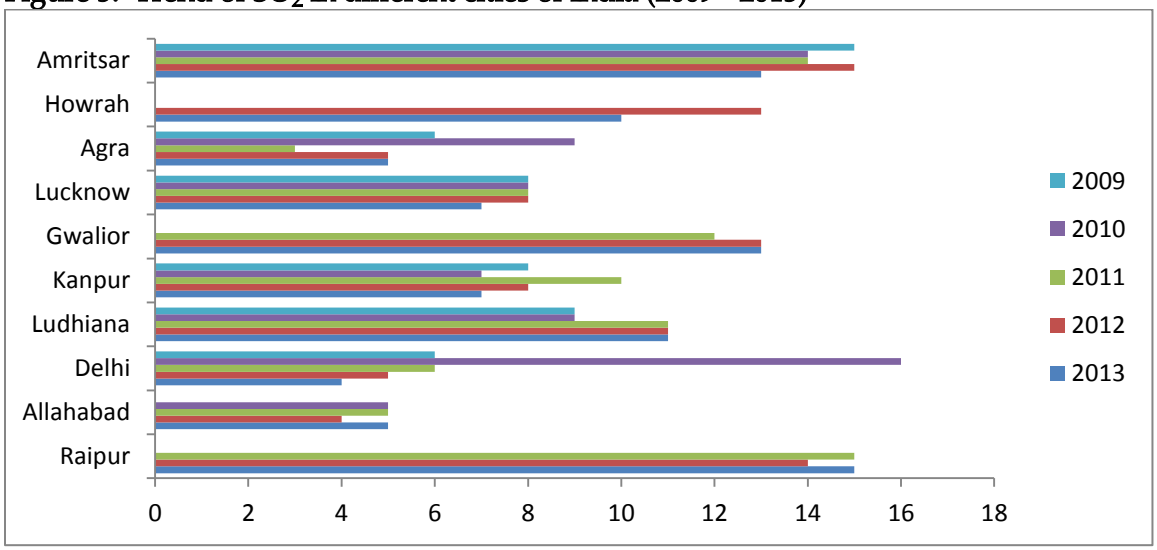
(Source: **Central Pollution Control Board 2009, 2010, 2011, 2012, 2013)**

Above Figure 2 shows the last five year trends of PM_{10} measurements of Ten Indian Cities. Raipur shows the highest PM10 measurement in 2013 of 305 µg/m3 followed by Allahabad of 235 µg/m3 but the city shows improvement from the previous year of 317 µg/m3. While Uttar Pradesh has four polluted cities Allahabad with 235 µg/m3, Kanpur 201 µg/m3, Agra 192 µg/m3 and Lucknow with 192 µg/m3.

According to the WHO report – the Global Urban Ambient Air Pollution Database 2016 – showed India's upcoming towns and cities were grappling with toxic air, possibly because of limited government intervention towards pollution and increasing vehicular congestion. National mean of PM_{10} concentration shows fluctuating trend exceeding the NAAQS. The

reasons being emission from gensets, small scale industries, biomass burning, and suspension of traffic dust, natural dust, commercial and domestic use of fuel and vehicular emission etc. Furthermore, the increasing trend of PM10 may be attributed to the increasing number of vehicles and re-suspension of natural dust.

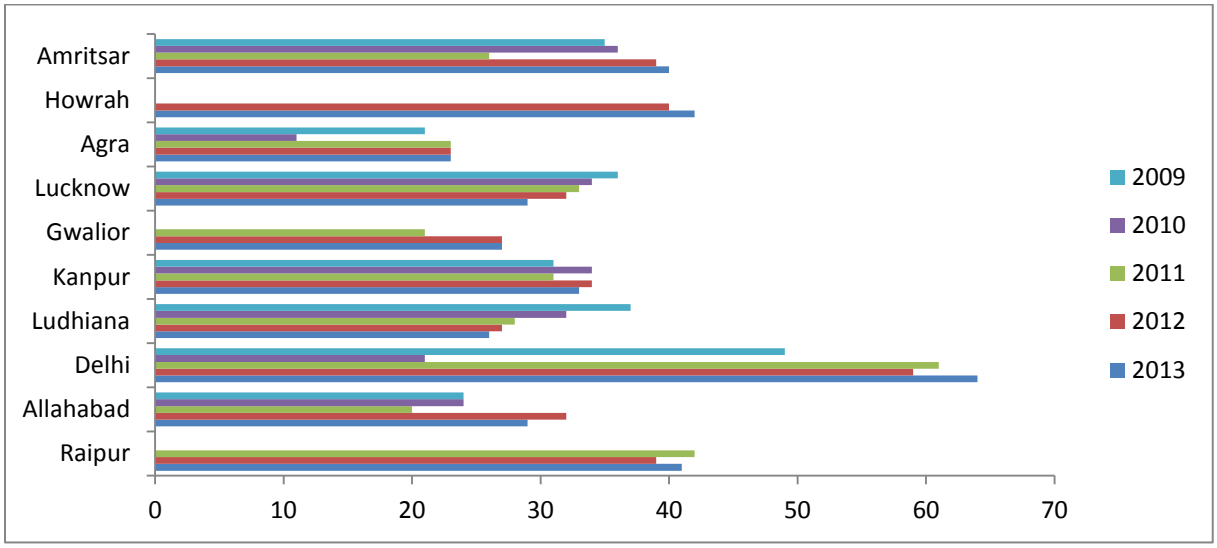
Figure 3: Trend of SO_2 in different cities of India (2009 - 2013)



(Source: Central Pollution Control Board, 2013)

Above figure shows that the National mean of SO_2 concentration over the years indicates a decline in SO2 levels. The decreasing trend may be due to various interventions that have taken place in recent years such as reduction in Sulphur level in diesel, use of cleaner fuel such as CNG in metro cities, change in domestic fuel from coal to LPG etc.

Figure 4: Trend of NO_2 in different cities of India (2009 - 2013)



(Source: Central Pollution Control Board, 2013)

National mean of NO_2 concentration has remained stable over the years with a slight decrease in last three years despite increase in sources like vehicles. The reason for this may be various intervention that have taken place such as improvement in vehicle technology and other vehicular pollution control measures like alternate fuel etc. While few cities have increased NO_2 concentrations like Raipur, Delhi etc. However, the improvement may be the way air quality data has been assessed this time. WHO took data from 10 stations for its 2016 report while in 2014; just five stations were taken into account.

The WHO categorized air pollution as the sixth biggest cause of deaths in India, triggering an alarm with studies showing breathing ailments were on the rise in Indian cities. India lost 1.4 million lives to air pollution in 2013, while in China the toll was 1.6 million, estimates a report, released by the World Bank and the Institute for Health Metrics and Evaluation.
This report estimates that the concentrations of O3 has increased by 10 to 20% in India between 1990 and 2013 which leads to serious health impacts like reduced lung function, chronic obstructive pulmonary disorder (COPD), aggravating asthma and respiratory conditions, but also with widespread crop loss.

Challenges

Air pollution remains a problem everywhere, but low- and middle-income countries carry the greatest air pollution burden. The following are the principal challenges to be faced:

- Cities are growing fast, but most in an uncontrolled manner or based on outdated models of urban development that lead to pollution and ill-health. Sustainability and a Health-in-All-Policies approach need to be mainstreamed into urban development.

- The polluting sectors are largely unaware of the potential health benefits cleaner policies could bring, and the health sector often lacks access to the knowledge, tools and skills to support multisectoral action to tackle air pollution.

- Resources are needed to support investments in technology improvements to tackle the sources of air pollution in low- and middle-income countries.

- Comprehensive monitoring of air pollutants and their sources is still lacking in many countries, limiting decision makers' ability to assess risk, set targets and measure progress.

- Both of these are highest in low-and middle-income countries where governments are faced with many other competing health and development challenges and limited resources.

In India the major factors for increasing Air pollution are:

- Growing number of cars in cities, private & commercial vehicles are the major factor for causing air pollution. Low standards for vehicle emissions & fuel have resulted in increased levels of Nitrogen Oxides & Sulphur di-oxide.
- As per Census 2011, 87% of rural households and 26% of urban households depend on biomass for cooking. Burning of biomass is a leading cause of indoor air pollution and is responsible for respiratory and pulmonary health issues.
- Kerosene lanterns used in rural areas are a primary source of emission of black carbon soot and cause significant health impact, particularly in the case of women and children.
- As of Jan 2015, coal-powered thermal power plants account for 60.72% of India's total power generation, according to data available from Central Electricity Authority (CEA), 2015. Coal plants happen to be one of the leading sources of SO2 and NO2.

- Agricultural burning of residues is another factor which contributes to the problem seasonally. A business model needs to be developed for waste to energy conversion using biomass gasification technology.
- Dusty construction sites have multiplied; outdoor air pollution has become a major health hazard.
- Heavy duty vehicles (trucks and interstate buses) have the highest share in vehicular emission.

Positive Developments: Worldwide

- Government has become very active to promote and creating awareness among citizens about the Renewable Energy.
- Sustainable policy options for Transport which includes mass transit development encouraging walking and cycling is also one of the major factors in reducing pollution.
- Energy efficient buildings and industry, waste reduction and recycling is one of the other initiative which includes avoid burning of solid and agricultural waste.
- National and international emissions benchmarks have created a level playing field that has enabled industry to develop and use more efficient and less polluting products.
- International initiatives, such as the UN Secretary-General Sustainable Energy for All Initiative, the Climate and Clean Air Coalition, the Convention on Long-Range Trans boundary Air Pollution, the Partnership for Clean Indoor Air, the Global Alliance for Clean Cook

Government Initiatives & Policy Measures in India

The Central Pollution Control Board (CPCB), a statutory organization under the Ministry of Environment Forests & Climate Change (MoEFCC) has been entrusted with the responsibility of ensuring ambient air quality and has been conferred and assigned the power and functions to achieve the stipulated objective. Thereby, the CPCB in association with various State Pollution Control Boards (SPCBs) monitors the ambient air quality according to the National Ambient Air

Quality Standards (NAAQS) with the help of 580 manual stations established in 244 cities, towns and industrial areas.

1. India started adopting European emission and fuel regulations for all categories of vehicles. Under this plan, the Bharat Stage II emission standards were introduced initially in few cities to manage the amount of air pollutants released by the internal combustion engine equipment's by using cleaner fuel with low sulphur content and improved combustion engines. As of 26th November 2011, BS – IV norms are applicable in 34 cities whereas BS –III norms are applicable in the rest of the country. However, India has been following European norms with a time lag of five years. The Saumitra Chaudhari Committee, formed to look into automobile fuel emission standards, has recommended that the government introduce the Bharat Stage – VI norms across the country by 2020.

2. National Mission for Electricity Mobility (NMEM) is aimed at enhancing penetration of efficient and environmentally friendly hybrid and electric vehicles; Ministry of Heavy Industries & Public Enterprises , Government of India earmarked 1,000 crores for the Plan in 2015 with an eye to decrease CO2 emissions by 1.2- 1.5% in 2020.

3. National Urban Transport Policy: Encouraging greater use of public transport in urban areas. Most Indian cities are increasingly relying on motorized personal transport. With this in mind, the National Urban Transport Policy launched in 2006 by the Ministry of Urban Development (MoUD) and reviewed in 2014 seeks to prioritize the use of public transport running on cleaner fuel and technology and develop a people-centric sustainable multi-modal urban transport network, taking into consideration the unique characteristics and specific situations prevalent in cities. Therefore, various cities have either adopted or are in the process of developing public transport systems such as Mass Rapid Transit Systems (MRTS), Light Rail Transit System (LRTS) & Bus Rapid Transit Systems (BRTS).

4. National Biomass Cookstoves Programme: Improved cookstoves to reduce indoor air pollution The National Biomass Cookstoves Programme (NBCP) was launched during 2009-10 by the Ministry of New and Renewable Energy to promote the use of improved cookstoves, which would result in reduced emissions and offer cleaner cooking energy solutions. As part of this programme, the government undertook wide consultations with NGOs, entrepreneurs and industries in the country with the objective of identifying ways and means for the development and deployment of improved biomass cook stoves across a large number of community undertakings and individual households.

5. The Electricity Act, 2003 proposed mandatory Renewable Purchase Specifications (RPS) for all states in order to increase the uptake of electricity from renewable energy sources. 26 State Electricity Regulatory Commission (SERC) specified the mandatory purchase obligation for purchase of fixed percentage of energy generated from RE sources.

6. The Jawaharlal Nehru National Solar Mission (JNNSM), part of the missions launched as part of the National Action Plan on Climate Change seeks to tap the immense potential of solar power as a future energy source in the country. As part of the mission, it is envisaged that the installed capacity of solar power – both solar thermal and solar photovoltaic - should be ramped up to 20 GW by 2022 in three phases; in order to achieve the same, an enabling policy framework for manufacturing solar components and setting up power plants should be created.

7. India is among the few countries in the world to have introduced clean energy cess. The cess is collected as National Clean Energy Fund and is disbursed for renewable energy-based initiatives and power projects.

8. National 'Air Quality Index' to enable common man to understand Air Quality Announced in October 2014 by the Ministry of Environment, Forests and Climate Change, the National Air Quality Index (AQI) is a measurement index consisting of 8 parameters.

Conclusion

Air Pollution is a complicated and a big issue and negatively impacts the health of citizens as well as the economy of the country. Both indoor and outdoor air pollution have emerged as one of the leading cause of deaths in India. The Government of India and the state governments have recognized the adverse effect of air pollution and taken few steps to control. There is increased seriousness about addressing the air quality issue among all stakeholders. Furthermore, recent efforts such as the launch of National Air Quality Index point to the need for enhancing public awareness on the quality of air they are breathing. Recently The National Green Tribunal (NGT) has ordered the Road Transport Office (RTO) of Delhi to de-register all diesel vehicles over 10 years old. Old diesel vehicles are the biggest cause of vehicular pollution mostly because they are badly maintained. Many steps in terms of introducing policies and increasing awareness towards clean Energy have taken place however lot needs to be done. A shift towards renewable energy is part of the plan to reduce dependency on fossil fuels as well as provide clean energy to households, which are currently using kerosene for lighting purposes. It is important that a comprehensive, integrated and long-term plan of action, involving coordination between different ministries and departments, is drawn to address the issue, reduce air pollution and ensure that citizens breathe clean air.

For More Information Kindly Refer:

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