Young Scientist- Tomorrow's Science Begins Today
Vol. 1, Issue 1 - 2016
ISSN: 2581-4737

AIR POLLUTION

DR. PRATIBHA RAO
*Lecturer Department of Chemistry, S.M.M. Government Girls College, Bhilwara (Rajasthan)

ABSTRACT

Air pollution problem has become a major concern globally! High concentration of air pollutants are putting millions of people's health at risk. India is one of the countries that is severely affected by air pollution. Its adverse impact on population is pervasive; on human health, environment, economy and social well-being. Inspite of so many action plans and programs, the situation has not improved and has shown alarming trends. This paper, draws attention to the issues that influence air pollution. Air pollution has also severe adverse impacts on flora and fauna in different regions, threatening the environment and ecosystem and even leading to extinction of some species.

INTRODUCTION

Air pollution poses a multi-faceted risk due to its adverse impact on health. It is estimated that 9 out of 10 people worldwide are exposed to air pollution. India is one of the most affected countries by air pollution and there are increasing evidences of adverse effects on health due to air pollution. The increasing urban population and vehicular traffic increases the pollutant emissions and aerosol load in the atmosphere. The increasing urbanization along with growing population and industrialization has been stated as one of the key reasons for high aerosol loading in the Indian sub-continent.[1] The climate change and air pollution remain one of the biggest threats to human health and well-being in cities and are interlinked with each other.

The knowledge of air pollution and their sources with potential interventions to curb air pollution may help to reduce the air pollution problem in long run. Several studies have been conducted to assess the contribution of various sources in air pollution and the most commonly identified sources are vehicles, manufacturing and electricity generation industries, construction activities, road dust, waste and agriculture burning, combustion of oil, coal and biomass in the households, and marine/sea salt.[2]

In recent years, air pollution has spread in small cities and towns. In large cities and metropolitan areas, excessive smog has forced closure of schools, offices and a certain population were guided to stay indoors. Continuous degradation of ambient air and pollution in the mega cities and spread in small cities, towns and villages in India demands effective measures to curb air pollution. The lack of infrastructure facilities, inadequacy of financial resources to implement advance infrastructural innovations, difficulty in relocation of the

industries from the urban centers and the behavioral pattern of people in accepting the green solutions are some crucial major challenges to curb air pollution.

Increase in level of air pollution leads to increase in expenditure on health infrastructure, diminished the labour productivity and agricultural productivity.

Major air pollutants include carbon monoxide –CO, ammonia -NH_3 ,nitric oxide –NO, nitrogen dioxide -NO_2 ,ozone-O_3, particulate matter Sulphur dioxide SO_2 and volatile organic compound.

Sulphur dioxide in the air results primarily from activities associated with the burning of fossil fuels or from copper smelting once released into the environment Sulphur dioxide moves to the air, in the air sulphur dioxide can be converted to sulphuric acid sulphur trioxide and sulphates.[3] Sulphur dioxide tends to be a problem in urban industrial areas particularly those where industrial activities utilises the combustion of fuels.[4] SO_2 also form secondary particulate matter when combined with other compound such as ammonia in the atmosphere

Carbon monoxide is a colourless, odourless and tasteless toxic gas it is emitted directly from vehicles and combustion engines, other sources of the gas are power plants, biomas burning, forest fire and wood industry. On entering the blood stream carbon monoxide inhibit the body' s ability to carry oxygen to organs and tissues ,high concentration can cause death.

Nitric oxide, also called nitrogen monoxide is also a toxic gas and formed through the combustion process of coal and petroleum. Main source includes motor vehicle and thermal power plant. Nitric oxide dissolve in atmospheric water vapour to form acid that damage vegitation, buildings and materials which contribute to the acidification of terrestrial and aquatic ecosystem.

Nitrogen dioxide NO_2 is formed through the oxidation of nitric oxide .It has an adverse effect on respiratory system of humans and animals increasing risk of stroke. Just like NO it dissolves in water vapour to create acid rain. Form secondary particulate matter when combined with other atmospheric compound such as ammonia.

Ozone it is mainly formed through the photochemical reactions of other pollutant such as nitrogen oxide, carbon monoxide and volatile organic compound from strong sunlight and UV radiation. It is suspected to have carcinogenic effects leads to reduced lung function and respiratory diseases .Ozone also damage vegetation contributing to a decrease in crop productivity and forest decline.

Main source of ammonia is agriculture process particularly in fertilizer production and live stroke waste management. Indoor causes include cigarette smoke and cleaning solutions. Ammonia forms secondary particulate matter $PM_{2.5}$. when combined with other pollutants in the atmosphere.

Airborne particulate matter represents a complex mixture of organic and inorganic substances. Particulate matter PM consist of airborne liquid and solid particles, primary particulate matter is emitted from a direct source including power plant, vehicle traffic, construction site. On the other hand secondary particulate matter is formed as a result of chemical and physical reactions with various compounds including SO_2, NO_2 and NH_3

Volatile organic compound volatile organic compounds refer to a large group of carbon containing substances including hydrocarbon, alcohol. aldehyde and organic acid.

The extent of health damage caused by particulate matter is determined by the size of the particles. The fine fraction contains most of the acidity and mutagenic activity of particulate matter, although in fog some coarse acid droplets are also present.[5,6]

Particles with a mass media diameter of less than 10 micron is called PM_{10} while particles with a mass media diameter of less than 2.5 micron is called $PM_{2.5}$. $PM_{2.5}$ are also called fine particles, newer classification can also include PM_1 so called ultrafine particles, the smaller the particle the higher the health risk due to their ability to penetrate deep into the respiratory and circulatory systems causing damage to lung, heart and brain.

The majority of manmade sources of PM are concentrated in limited areas i. e. the urbanized area where populations are also concentrated.[7] Central pollution control board notified the standard value of the primary pollutants of air in 2009 known as National Ambient air quality standard.[8]

MAJOR POLICY INITIATIVES BY THE INDIAN GOVERNMENT

Various initiatives have been taken by the Indian government to control air pollution. One can also see many focused new schemes/programs that have been created such as Clean Fuel Research Initiative, National Mission for Cleaner Coal utilization, transition to cleaner fuel, special mission on clean fuel, promoting indigenous clean air technologies, start-ups in this area etc. Many programs have strong central-state synergic partnership, has public-private partnerships, involvement of international organizations/foundations. The major policies that cover the air-pollution mitigation and move towards clean air are: The Air (Prevention and Control of Pollution) Act, 1981, National Air Quality Monitoring Programmed (NAMP), National Ambient Air Quality Standards (NAAQS) , National Air Quality Index (AQI).

The Jawaharlal Nehru National Solar Mission (JNNSM), Environment Pollution (Prevention and Control) Authority (EPCA), National Clean Air Programme (NCAP), Pradhan Mantri Ujjwala Yojana, playing an important role in controlling air pollution. Central Pollution Control Board One of the key stakeholders of the Government. The Central Pollution Control Board (CPCB), a statutory organization under the Ministry of Environment, Forest and Climate Change. It was constituted in September 1974 under the Water (Prevention and Control Pollution) Act 1974 which was further entrusted with [13] powers and functions under the Air (Prevention and Control Pollution) Act 1981. It was established with the aim to

improve the quality of air and to prevent, control or abate air pollution in the country. The increasing urbanisation, economic growth that has led to increasing consumption driven economy, multi-fold growth of vehicles, etc. has had an adverse impact on environment leading to climate change, air pollution, water depletion, etc. CPCB has expanded its scope, programs and policies to address the new challenges. It plays an important and key role in abatement and control of air pollution in the country and active role in generating, compiling and collecting data, providing scientific information, rendering technical inputs for formation of national policies and programmes, training and development of manpower and through activities for promoting awareness at different levels of the Government and Public at large. One of the important initiatives for air quality evolution is Air Quality Index (AQI) launched by Prime Minister Narendra Modi in 2015. AQI is a tool for transformation of complex air quality data of various pollutants into a single number, to keep people informed about the status of air quality.

CONCLUSION

The use of advanced technologies such as satellite data with geospatial techniques can be of great help in monitoring and mapping of spatial-temporal distribution patterns of the air pollution and climate change and associated health impacts. So, while focusing on building smart cities in developing nations like India, proper urban planning and sustainable measures should be taken for sustainable urban environment to avoid adverse health impacts.

REFERENCES

1. Kaskaoutis, D. G., Singh, R. P., Gautam, R., Sharma M. Kosmopoulos, P. G., and Tripathi, S. N. (2012). Variability and trends of aerosol properties over Kanpur, northern India using AERONET data (2001–10). *Environ. Res. Lett.* 7:024003. doi: 10.1088/1748-9326/7/2/024003
2. Guttikunda, S.K., Goel, R., Pant, P. (2014). Nature of air pollution, emission sources, and management in the Indian cities. Atmospheric Environment, 95, 501-510. DOI: 10.1016/j.atmos env.2014.07.006 10.
3. Zhang J., Li Z., Qie M., Zheng R. Shetty J. and Wang J. Food and Chemical Toxicology 94,103(2016)
4. Schlesinger R. B. Toxicology of sulphur oxides In Air pollution and health p. 585 (1990) Academic Press
5. Ediagbonya T. F., Ukpebor E. E. and Okieimen F. E. Journal of Applied Sciences and Environmental Management 17,441 (2013)
6. Syla A., Veliu A., Berisha K., Karakashi E.and Fejza I. Journal of International Environmental Application and Science 2 ,51 (2007)
7. Agarwal A. K. Biofuels application as fuels for internal combustion engines, Progress in energy and combustion science 33, 233(2007)

8. National Ambient Quality Standards Central pollution control board Gazette notification no. B-29016/20/90/PCI-I dt. 18 th November 2009

