

Air Quality in Metropolitan Areas in India

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ABSTRACT

This paper examines the increasing levels of air pollution in Indian cities. Indian cities are compared to the world scenario and it is found that industries, unregulated transport by sometimes highly polluting diesel fueled vehicles, construction activity, indiscriminate burning of garbage, smoke from the crematoria, besides other factors are responsible for this. The impact of poor air quality on the elderly and child population besides the sick is quite appalling. While awareness, precaution and regulatory protocols are definitely required to address this issue, yet an alternative approach like purifying the air in addition will go a long way in tackling the issue. This requires technological intervention for a human welfare issue.

1. Introduction

India and many developing countries of the world are witnessing huge streams of rural to urban migration owing to the pangs of finding employment in a rural setting. The mélange of poor prospects in rural areas, the magnetism of urban areas and migration lead to huge population densities. This become perilous to the health and welfare of people when the urban areas are also engaged in unrestrained industrialization where the industries spew out fumes besides toxic fluids and now also where the urban areas are engaged with the IT sector. The vehicles which transport the IT workers have an endless run five days a week and are a major cause of unhealthy air along the roads, at road intersections and even in the residential areas that they traverse in the course of picking up the employees of the IT sector and dropping them back home. Not to be left out from the equation is the increasing number of private vehicles hitting the road in most cities and cutting down of trees to facilitate construction activity besides burning of garbage and other factors.

Health and well-being of people in urban areas which not only have a high population density but also more of new construction, renovation, demolition, and emissions are likely to be impacted. Elevated levels of formaldehyde, PM2.5 (Particulate Matter which is 2.5 micrometers or smaller) and asbestos lead to poor air quality. All of them can lead to serious health hazards impacting lungs and heart when inhaled besides

causing eye, throat and nose irritation among other inconveniences (1). „The particulate matter is able to penetrate deeply into the respiratory tract, creating health risks by increasing mortality from respiratory infections and diseases, lung cancer, and selected cardiovascular diseases“ (15:172). PM2.5 defines inhalable particles with a diameter of generally 2.5 micrometers and smaller, PM10 particles with a diameter of 10 micrometers and smaller, irritate exposed mucous such as the eyes and throat and PM2.5 particles travel all the way through the lungs into the alveoli. The World Health Organization (WHO) reports airborne particulate matter as a Group 1 carcinogen and as the biggest environmental risk to health, with responsibility for about one in every nine deaths annually(2).

India had three of the 20 urban areas with the worst air quality at the time of measurement (2011-15). Among mega-cities, Delhi had the highest levels of air pollution (Fig 1). Thirteen of the top twenty most polluted cities in the world, according a World Health Organization (WHO) report from 2013, are in India. This has led to fears for the health of children living in Asia's third largest economy (3) more so as most children walk or cycle to school and are exposed to air pollution (4).

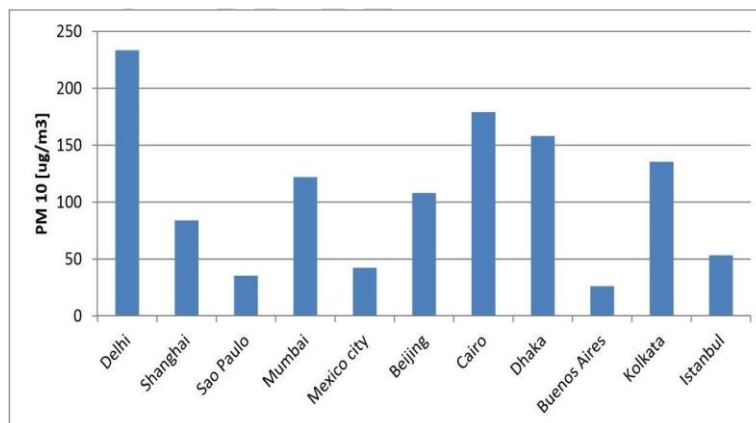


Fig. 1. Highest Levels of Air Pollution / Source: WHO

The present study is based on data collected on a date and time basis in select cities and towns in India where they have been compared to the worldwide scenario.

Data was collected from the AirVisual website which is Switzerland based and uses Big Data and Artificial Intelligence to provide real time data for a very large number of locations in the world.

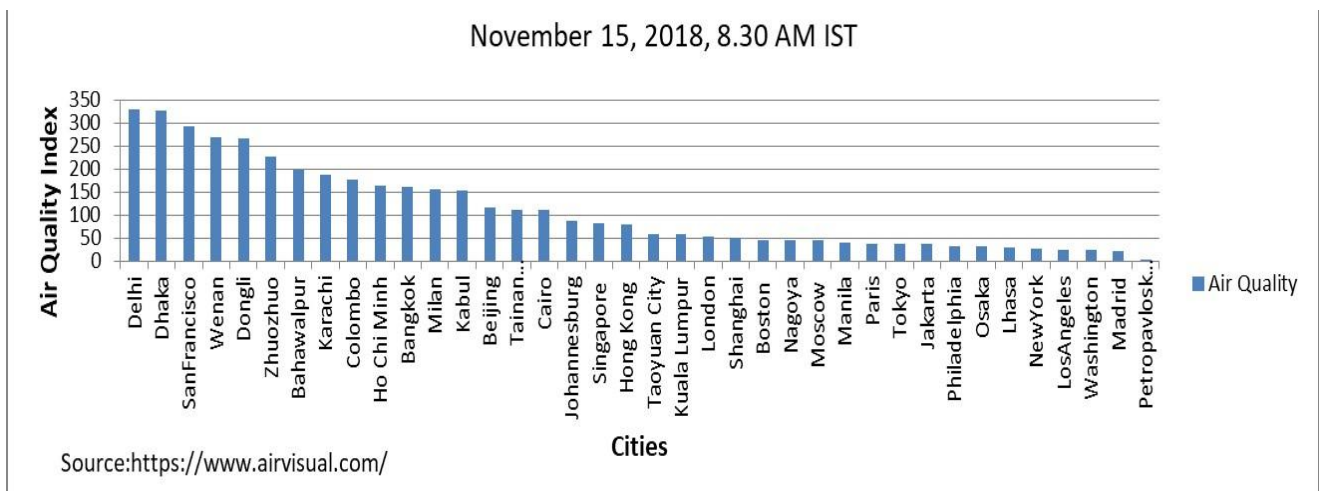


Fig. 2. Air Quality in Selected World Cities

"AQI, or Air Quality Index, is a system for translating sometimes confusing or unintuitive pollutant concentration measurements, into one easy-to-understand scale to clearly represent the health risk posed by air pollution. The index formula usually considers up to 6 main pollutants (PM2.5, PM10, carbon monoxide, sulfur dioxide, nitrogen dioxide and ground level ozone), and calculates the respective health risk (or AQI number) for each one. The overall AQI number at a given moment is dictated by the „riskiest“ pollutant, with the highest AQI number.

The index ranges from 0 to 500, where high index values indicate higher levels of air pollution and higher potential for adverse health effects. Any value larger than 300, for example, is considered to be hazardous, while an AQI value of 0-50, on the other hand, represents good air quality. " (5) Air quality ranges from Good, Moderate, Unhealthy for Sensitive groups, Unhealthy, Very Unhealthy, Hazardous on the 0 to 500 scale with better air quality in descending level of magnitude. While a value of 0-50 signifies „good“ air, a value of 51-100, indicates „moderate“ air quality which poses little health risk. "Sensitive groups like the sick, aged and children may experience mild adverse effects and should limit protracted outdoor exposure." A value of 151-200, is indicative of „unhealthy“ air quality, it may cause increased aggravation of the heart and lung issues. Sensitive groups are at high risk to experience adverse health effects of air pollution. A value of 201-300, specifies "Very Unhealthy" air quality and may cause increased aggravation of the heart and lung conditions. Sensitive groups are at high risk to experience adverse health effects of air pollution. Values in the range of 301-500+, are indicative of „hazardous“ air quality that is deemed toxic and pose serious risk to the heart and lungs. Everyone should avoid all outdoor exertion.

A glance at Figure 2 reveals that Indian cities are at the top of air pollution rankings in a worldwide context. The

intensity of the problem can be gauged from the fact that Delhi was almost at par with San Francisco which faced a severe hazard of smoke for about two weeks owing to wildfires in California highlands from November 8, 2018. Post that incident San Francisco has reverted back to a safe and healthy air condition; Indian cities, however, seem to be cyclically in the „Unhealthy air“ situation. Even Beijing which had earned notoriety for high levels of air pollution has reversed the situation by resorting to technology. In fact, China has harnessed the situation to its advantage by constructing towers that ingest the polluted air, filter it and release it back to the atmosphere, the carbon so collected in the towers is used to make "diamonds".

Figure 3 further reinforces the point that most Indian cities have unbearable and unhealthy levels of air pollution making the population vulnerable to various diseases. The sample has been collected Pan-India. Most of the cities figuring in this graph are large metropolises that attract migrants from rural and other urban areas. Also included are industrial towns besides many of the state capitals. The data is collected for a weekday - Thursday and for weekend - Sunday and it is found that though in most cases there is a slight dip in pollution levels on weekend compared to a weekday, pollution is high in certain cases even on weekends. Quite often they happen to be tourist places and weekend related tourist traffic could add to the woes of already existing air pollution. Quite interestingly, it is noticed that the difference between the air pollution levels of a weekday and weekend is remarkable in the case of Hyderabad and Chennai, both of which happen to be IT centres in addition to checking several other boxes. Thus, the multitudes of vehicles that throng the roads on weekdays to transport the IT employees are absent on weekends which perceptibly leads to a dip in the air pollution levels in these two metropolises at the weekend.

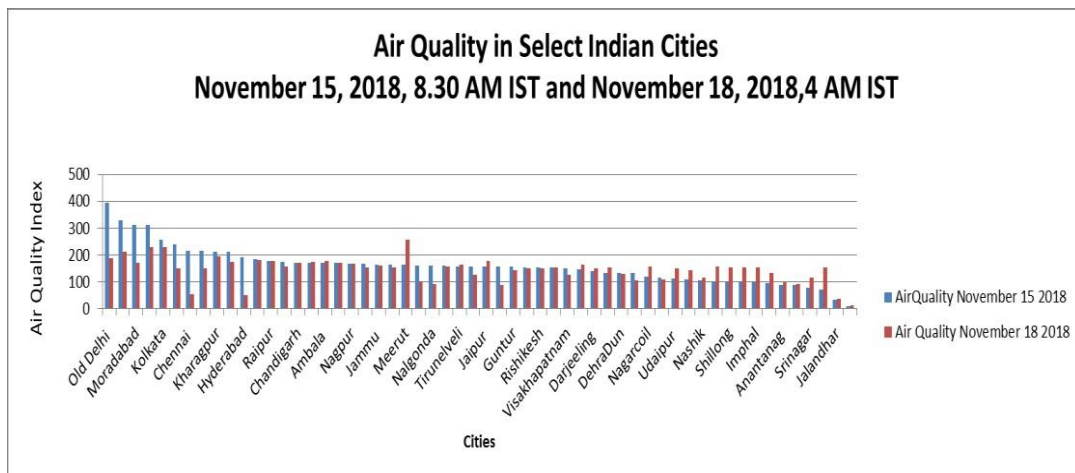


Fig. 3. Air Quality in Selected Indian Cities

Climaxing levels of air pollution continue throughout the day with little abatement (Figure 4). This is again an atypical phenomenon where very little ebbing of pollution levels is found during night times even in smaller towns like Nalgonda which is taken at Random for comparison. Thus, there is not only a spatial but also an almost perpetual temporal peaking of pollution causing severe challenges to the health and well-being of the residents of these cities. According to a study carried out in the context of Hyderabad, observations of residents in the IT hub of the city reveal that air pollution carries negative implications for the livability of the area. For them, their concern about air pollution besides other issues is closely intertwined with that of its negative effects on their health and wellbeing(6).

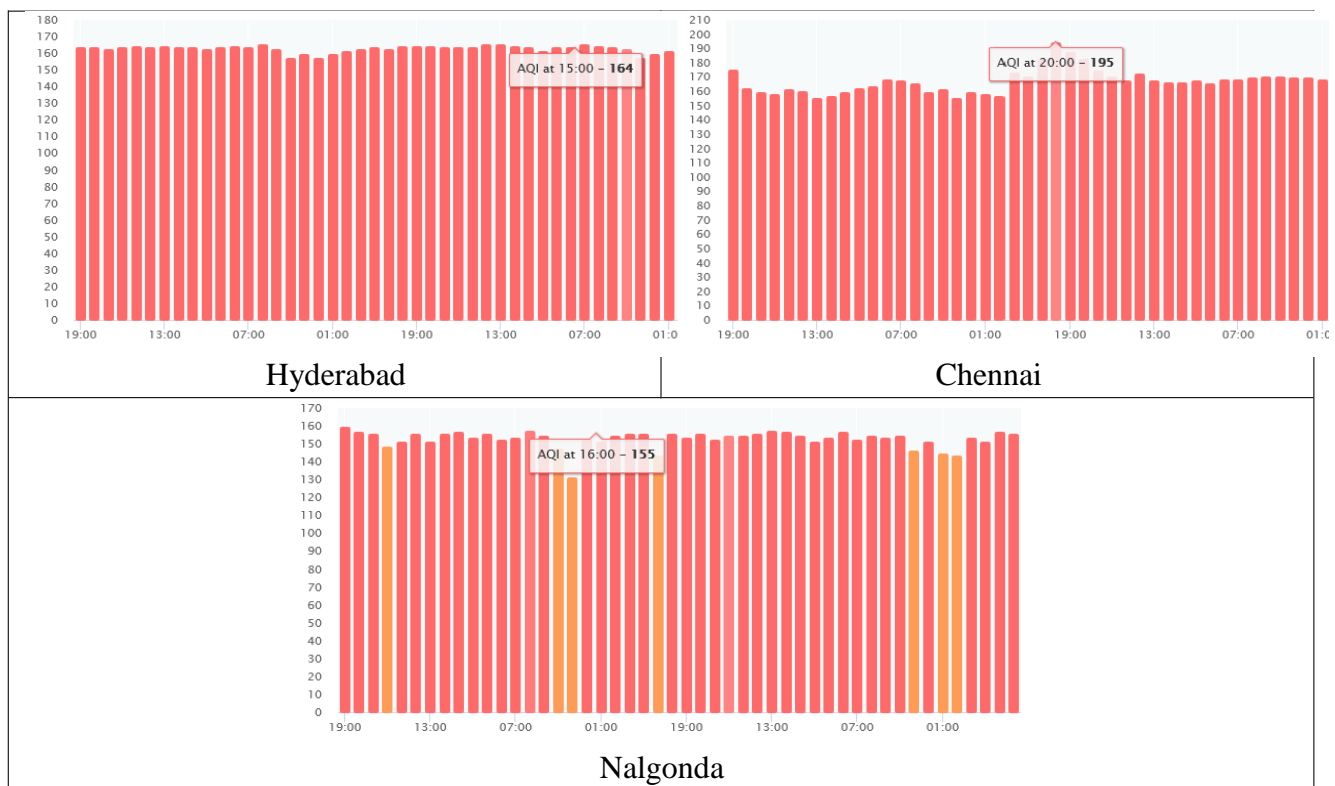


Fig. 4. Air Quality Index: 10 and 11.12.2018

It has been pointed out in the context of Hyderabad that air pollution among other factors poses ecological risks to the mega- cities and also a challenge to sustainable infrastructure (7 and 8). „The stationary sources of air pollution such as power plants, industrial activities, and residential and commercial buildings along with mobile sources such as vehicles which are poorly maintained and use poor fuel quality and inadequate traffic management is an emerging problem due to urban growth in developing countries. Air pollution in Asia causes as many as 519,000 premature deaths every

year“. (7) Due to unrestrained urbanization, environmental degradation is taking place very fast leading to air pollution among other challenges that it poses (8). In an index of countries“ environmental health from Yale and Columbia universities, India ranks a dismal 177th out of 180.

This does not just make life unpleasant for a lot of Indians. It kills them. Recent estimates put the annual death toll from breathing PM 2.5 alone at 1.2m-2.2m a year. The lifespan of Delhi-dwellers is shortened by more than ten years, says the University of Chicago“ (9). „Urban microclimate and

atmospheric pollution are intimately interwoven. As the warm polluted air rises, it may form what is called a 'dust dome' over a city and the pollutants are trapped closer to the ground surface. It has been even reported that uncomfortably high air temperatures during summer months can contribute to higher than- average death rates especially among older people" (10). It is said in the context of Pune, Hyderabad and Bengaluru which were once laidback pensioners" paradise and are now hustling IT centres that „ the dazzling growth of these cities has not just brought in dollars and malls, but also large-scale migration, traffic jams, pollution, creaking infrastructure and discontent" (11) The main culprit cited here is auto pollution. Vehicular pollution levels are rising above the permissible limits at all major traffic junctions (12) in Hyderabad. Further lack of adequate road infrastructure and massive increase in number of vehicles has resulted in massive traffic congestion at major traffic points along with increasing vehicular pollution within the city" (13).

The spatial expansion of cities renders increase in the average trip length, and excessive dependence on automobiles leads to traffic congestion, air pollution, rising greenhouse gas emissions, and poor public health. There is an increase in the incidence of urban health related issues because of the poor quality of air, drinking water, improper sanitation facilities, open defecation and inadequate solid waste management" (15:172).

Most of the cities of the developing countries are going through a phase of severe air pollution. Industries, unregulated transport by sometimes highly polluting diesel-fueled vehicles,

construction activity, indiscriminate burning of garbage, smoke from the crematoria, besides other factors are responsible for this. While awareness, precaution and regulatory protocols are definitely required to address this issue, yet an alternative approach like purifying the air in addition will go a long way in tackling the issue in its incipient stages, thus improving the overall situation.

Thoughtful action has to go into improving this situation, which impacts the vast majority of the Indian population which is increasingly living in towns and cities. It is not an unsurmountable problem as is seen from cases of other countries. The initiative has to come at an early date to subvert the ongoing damage to the most important asset of the people – which is their health.

Some of the measures suggested at the BRICS summit are „renewable/biofuels energy, energy efficiency, mobility and sustainable urban transport, reduction of the effects of climate change and pollution, sustainable production (clean technologies, eco-design) waste recycling and environmental sanitation, construction and sustainable urban infrastructure, social technologies, biodiversity and biomes, socio-biodiversity networks, and electric vehicles and/or hybrids" (14: 314). Policy-makers at international, national and city level are advised to promote cleaner transport, more efficient energy production and waste management (15). Awareness, precaution and proactive measures can help ameliorate the problematic situation.

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