

Indian AQI Analysis

Synopsis

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1.Objective of work

To analyze and predict the level of Air and Water Index level over the years from 1990 to 2015 to get a better understanding of the trends and analyze how major government policies have affected the Quality Index.

The project aims to achieve the following:

- (i) Inform public regarding overall status of air quality through a summation parameter that is easy to understand;
- (ii) Inform citizens about associated health impacts of air pollution exposure; and
- (iii) Rank cities/towns for prioritizing actions based on measure of AQI.

The overall objective of the project can be stated as under:

“To adopt/develop an Air Quality Index (AQI) based on national air quality standards, health impacts and monitoring program which represents perceivable air quality for general public in easy to understand terms and assist in data

Interpretation and decision making processes related to pollution mitigation measures.”

The project investigates the concentration of the pollutants sulphur dioxide (SO₂), nitrogen Dioxides (NO₂), particulate matter (PM₁₀) generated from various sources of industries over the ambient air Quality of the GIDA (Gorakhpur). The major pollutants as suggested by the Central pollution Control board (CPCB) in an industrial area are sulphur dioxide (SO₂), oxides of nitrogen (NO_x) and Particulate matter (PM₁₀).

2.Motivation

Air pollution due to anthropogenic sources, is a matter of concern in whole world. The urban areas may be viewed as dense sources of enormous anthropogenic emissions of pollutants, which can alter the atmospheric composition, chemistry and life cycles in it's down wind regimes, extending over several hundred kilometers (*Gupta et al., 2008*). Air Pollution is one of the serious problems faced by the people globally, especially in urban areas of developing countries, which is not only rapid growth of population but also industrialization (*Nagdene, 2004*).

Sulphur dioxide (SO₂), Nitrogen dioxide (NO₂) and RSPM are regarded as major air pollutants in India (*Agarwal and Singh, 2000*) India, a developing country, is one of the first ten Industrial countries of the world (*Sharma, 2007*).

Because of the enhanced anthropogenic activities (*Goyal and Sidhartha, 2003*) in India, air pollution problems have become a topic of intense debate at all platforms. According to a study released by World Economic Forum in Davos, India has the worst air pollution in the entire world, beating China, Pakistan, Nepal and Bangladesh. Of the total 132 countries whose environmental assets were surveyed, India ranked dead last in the 'Air (effects on human health)' ranking.

The relationship between environment and the development is one of the most burning issues of the present times. Developmental activities e.g. industrial transportation, constructional work etc cause degradation and drastic changes in every component of environment namely, hydrosphere, lithosphere, atmosphere and biosphere through pollution. Air pollution has emerged in the past few decades as the most crucial problem to mankind.

3.Target Specifications-

- i. To analyze the AQI of multiple cities all over India.
- ii. Developing a uniform AQI considering objectives, health impacts, air quality standards, existing and future monitoring scenario including parameters, method and frequency of measurements, and other relevant aspects.
- iii. Suggest qualitative description of air quality and associated likely health impacts for different AQI values.
- iv. Evaluate proposed AQI with data from a few major cities and towns.

4.Methodology

A number of methods are used to calculate AQI in different countries. Some of the common methods are listed below:

Oak Ridge Air Quality Index (ORAQI Method)-

The Oak Ridge National Air Quality Index (ORNAQI) can be considered for the relative ranking of an overall air quality status at different locations of the study area. AQI for each location in the study area has been estimated with the help of a mathematical equation developed by the Oak Ridge National Laboratory (ORNL), USA as given below:

$$AQI = [39.02 \sum X_i / X_s]^{0.967}$$

Where,

X_i = value of air quality parameters (RSPM, SO₂ and NO₂)

X_s = Standard and prescribed for Air quality parameters.

AQI then measured and compared relative ORAQI value given in Table I

TABLE I(Relative AQI and Scale)

Value	Description	Health Effects
0-25	Clean air	None, or minimal health effects
26-50	Light air pollution	Possible respiratory or cardiac effect for most sensitive individuals
51-75	Moderate air pollution	Increasing likelihood of respiratory and cardiovascular symptoms and illnesses
76-100	Heavy air pollution	Aggravation of heart or lung disease. Increased risk of death in children (heart and lung disease) increased effects in general population
>100	Severe air pollution	Serious aggravation of heart or lung disease, Increased risk of premature death. Serious risk of cardio respiratory symptoms in general population.

(Source: USEPA, 2014)

6.Tools required

I. Anaconda, IDE

II. Python 3.6

III. Libraries- numpy, matplotlib, pandas

IV. Data Sets

8. References

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- [6] Chelani A. B., Chalapati Rao C. V., Phadke K. M. and Hasan M. Z. (2002), Formation of an Air Quality Index for India. International Journal of Environmental Studies, 59: 331-34