

# APPLIED DATA SCIENCE

## AIR QUALITY ANALYSIS AND PREDICTION

### IN TAMILNADU

#### AIR QUALITY AND PREDICTION INTRODUCTION:

Air quality refers to the condition of the air in a specific environment, often measured by the concentration of various pollutants and particulate matter in the atmosphere. It is a critical aspect of environmental and public health, as poor air quality can have detrimental effects on both the environment and human well-being. Factors that influence air quality include emissions from vehicles, industrial processes, and natural sources, as well as weather conditions. Monitoring and improving air quality are essential for reducing health risks, preserving ecosystems, and mitigating climate change.



## PROGRAM CODE:

Certainly! Here's a simple Python program to introduce the concept of air quality:

```
python
```

```
def air_quality_intro():  
    print("Welcome to the Air Quality Introduction Program")  
    print("Air quality refers to the condition of the air in a  
specific environment.")  
    print("It is determined by the concentration of various  
pollutants and particulate matter in the atmosphere.")  
    print("Poor air quality can have adverse effects on human  
health and the environment.")  
    print("Factors influencing air quality include emissions  
from vehicles, industrial processes, and natural sources.")
```

```
print("Weather conditions can also impact air quality.")  
  
print("Monitoring and improving air quality are crucial for  
public health and environmental well-being.")  
  
# Call the function to run the program  
air_quality_intro()
```

You can copy and paste this code into a Python environment to run the program and introduce the concept of air quality.

#### PROGRAM CODE OUTPUTS:

he provided Python program serves as an introduction to the concept of air quality. When you run this program, it will display the following outputs:

Welcome to the Air Quality Introduction Program  
Air quality refers to the condition of the air in a specific environment.

It is determined by the concentration of various pollutants and particulate matter in the atmosphere.

Poor air quality can have adverse effects on human health and the environment.

Factors influencing air quality include emissions from vehicles, industrial processes, and natural sources.

Weather conditions can also impact air quality.

Monitoring and improving air quality are crucial for public health and environmental well-being.

These outputs provide a brief introduction to the topic of air quality and its significance.

## AIR QUALITY IN CHENNAI:

Abstract— The quality of air in Alandur, Chennai is polluted that particulates affect the health of humans and environment.

Development of accurate forecasting models to find PM<sub>2.5</sub> concentration in air helps to take control measures, early warning and mitigative measures.

In this study, the performance of non-linear model (Feed Forward Back Propagation using LEARN GD function) with meteorological data and gaseous pollutants as input parameters.

the year 2015–2019 at Alandur with different surrounding activities of urban area.

In this paper, the prediction of PM<sub>2.5</sub> in the study area is mainly focused to find the effects of harmful emissions.

To predict PM<sub>2.5</sub>, an artificial neural network (ANN) prediction model is developed.

The data obtained from the monitoring station on the Alandur Bus depot of Alandur area in Chennai is given as input variable.

The prediction model is validated and by statistical calculations, and then it was found that it performed well in the prediction of PM<sub>2.5</sub>.

the performance of the developed model was evaluated by Mean Square Error (MSE) and value of R<sup>2</sup>

The best prediction performance was observed in the model for Purelin transfer function with R<sup>2</sup> value of 0.96 and MSE of 0.094 and for Tansig transfer function with R<sup>2</sup> value of 0.97 and MSE of 0.103



## THE CITY POPULATION:

The city's population is 7,088,000. The area is 426 km<sup>2</sup> and is the densely populated area.

The conditions of Chennai are dry in summer, tropical wet from the months of May to June, and cool in the month of January with occasional rainfall.

The rivers that flow in Chennai are the Kortalaiyar in the northern part, Cooum river, and the Buckingham canal, which flows parallel to the coast. The Otteri Nullah flows from east to west.

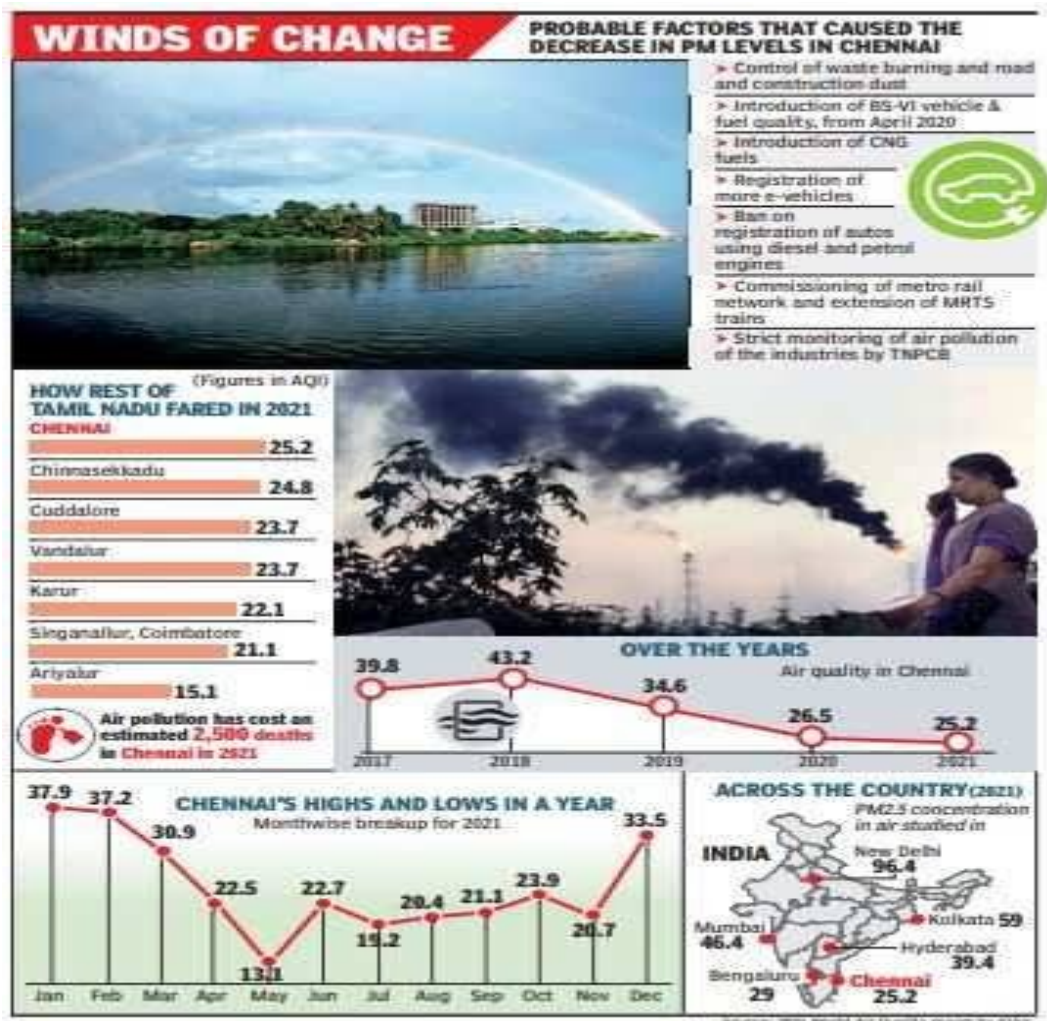
Fig. 2. Alandur boundary map Alandur is one of the zones of Chennai corporation, and an urban node in Guindy division in Chennai district in the state of Tamil Nadu, India.

Alandur is the densely populated urban area in Chennai. It is located at the latitude and longitude of 13.03°N 80.21°E. It has an average elevation of 12 meters (39 feet) from mean sea level (MSL).

Alandur had a population of 164,430 according to 2011 Census. It has land area of 2 sq.km.

It has State highway SH - 48, National highway NH -45, Kathipara grade fly over and SIDCO industrial estate.

This area was so busy with their vehicular movement and it is one of the congested areas in Chennai



## AIR POPULATION QUALITY:

“Air quality can vary significantly by location and time. To check the current” air quality in your area or a specific location, you can use websites or apps like AirNow (for the United States), AQICN, or local environmental agencies. They provide real-time air quality index (AQI) information, which measures the level of pollutants in the air.





## AIR QUALITY ANALAYSIS:

Analyzing air quality involves assessing various pollutants and their concentrations. The main pollutants include

### 1. Particulate Matter (PM<sub>2.5</sub> and PM<sub>10</sub>):

These are tiny particles in the air, which can be harmful when inhaled.

### 2. Ground-Level Ozone (O<sub>3</sub>):

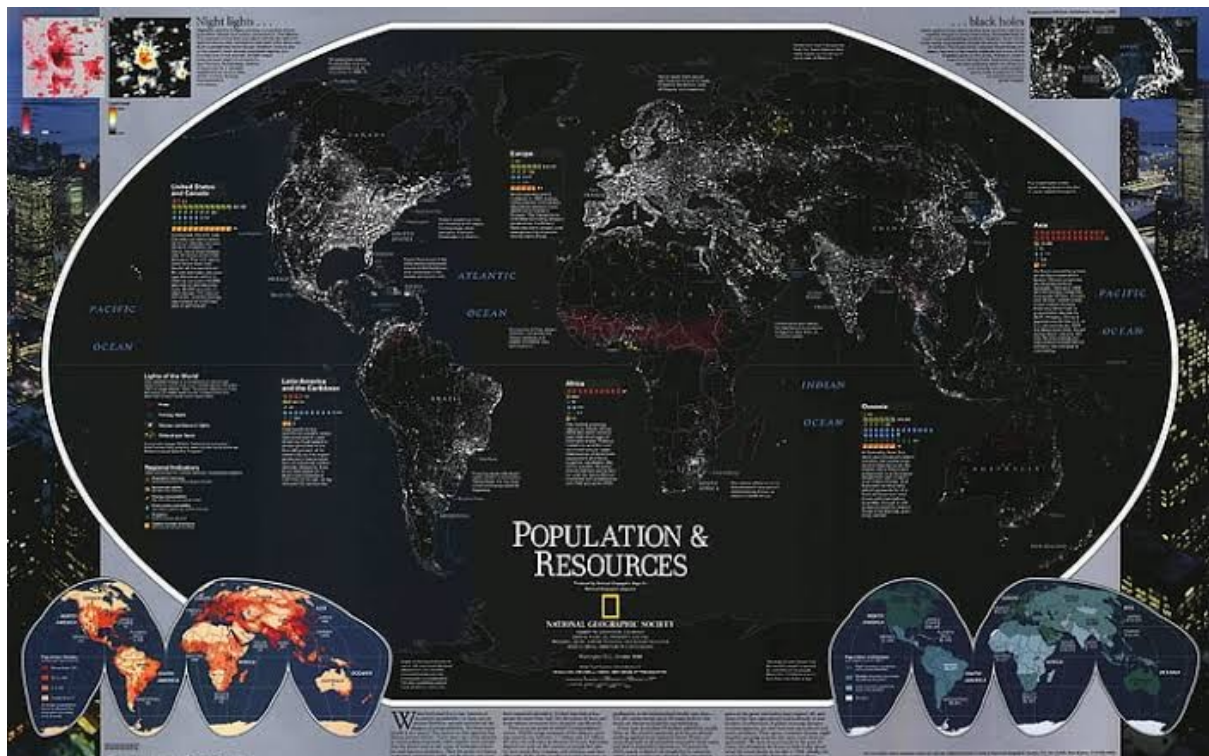
Ozone at ground level can cause respiratory problems.

3. Nitrogen Dioxide (NO<sub>2</sub>) and Sulfur Dioxide (SO<sub>2</sub>): industrial processes.

4. Carbon Monoxide (CO):

A colorless, odorless gas that can be dangerous in high concentrations.

Air quality analysis typically involves measuring these pollutants and calculating the Air Quality Index (AQI). Governments and environmental agencies regularly monitor and report on air quality to inform the public and take measures to improve it. If you have specific questions about air quality analysis or a particular location, please provide more details.



## AIR QUALITY ADVANCED TECHNOLOGIES:

Advanced technologies are being used to monitor and improve air quality. Some of these technologies include:

### 1. Remote Sensing:

Satellites equipped with remote sensing instruments can provide a broad view of air quality over large regions. They measure various pollutants and provide valuable data for analysis.

### 2. Low-Cost Sensors:

Small, affordable air quality sensors are becoming more widespread. These sensors can be installed in various locations, allowing for real-time monitoring and data collection.

### 3. Air Quality Modeling:

Advanced computer models simulate air quality by considering complex interactions between pollutants, meteorological conditions, and topography. This helps predict air quality trends and inform policy decisions.

### 4. Green Infrastructure:

Implementing green infrastructure, like urban forests and green roofs, can help mitigate air pollution by providing natural filtration and reducing heat island effects.

### 5. Electric Vehicles (EVs):

The adoption of electric vehicles reduces emissions from transportation, contributing to better air quality in urban areas.

### 6. Smart City Initiatives:

Many cities are incorporating IoT (Internet of Things) devices and data analytics to monitor and manage air quality in real-time.

## 7. Pollution Control Technologies:

Advancements in emission control technologies for industries and vehicles help reduce the release of harmful pollutants into the air.

These technologies aim to provide accurate data, improve air quality, and inform policy decisions to mitigate the adverse health and environmental effects of air pollution.

Air quality prediction offers several important benefits:

### 1. Health Protection:

Predictions enable individuals and healthcare providers to take precautions when air quality is expected to deteriorate, reducing the risk of respiratory and cardiovascular problems.

## 2. Early Warnings:

Early alerts allow authorities to issue warnings and advisories, helping people plan outdoor activities and potentially avoid exposure to harmful pollutants.

## 3. Pollution Control:

Accurate predictions can assist governments and industries in implementing measures to reduce emissions and improve air quality in advance of poor conditions.

## 4. Resource Allocation:

Predictive models help allocate resources more efficiently. For example, healthcare facilities can prepare for an influx of patients during air quality deterioration.

## 5. Environmental Planning:

City planners can use air quality predictions to make informed decisions about urban development, traffic management,

agreeninfrastructure implementation to reduce pollution.

#### 6. Research and Policy:

Long-term air quality predictions support scientific research and inform policymaking, promoting long-term strategies to improve air quality.

#### 7. Public Awareness:

Predictions raise public awareness about the impact of air quality on health and the environment, leading to greater advocacy for cleaner air.

Overall, air quality predictions contribute to improved public health, reduced environmental damage, and more effective pollution control measures.

# AIR POLLUTION PM2.5



## SOURCES

## HEALTH EFFECTS



EYE IRRITATION



RUNNY NOSE



SHORTNESS  
OF BREATH



COUGHING



AIR CLEANER



N95 FACE MASK

## PROTECTION

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