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EVALUTATION OF ATMOSPHERE POLLUTION USING AERMOD MODEL FOR PUNE CITY, INDIA

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Abstract

One of the most complex environmental issues is their pollution. Increasing traffic in cities, MIDC industry, adding large amounts of CO2, SO2 and NO2 to the atmosphere is the main reason for Pune city's growing industry, population, and environmental pollution. We are using AERMOD Software to study the elements present in the atmosphere and the amount of the increased element and the changed geographical position as per the rules of the government of Maharashtra. In the MIDC area of Pune, an air sample was taken using AQI (Air Quality Index) hardware. The information obtained from AQI was entered. Into AERMOD Software to determine additional pollution factors. The information provided by AQI will be used to try to reduce the pollution in that are the simulations showed that the meteorological and topographical conditions of Chakan, favor the dispersal of atmospheric pollutants, that vehicles significantly influence air quality in the region, and that mathematical modeling can be an effective tool for studying atmospheric dispersion in the region.

Keyword: Air pollution, Carbon emission, pollutant, AERMOD, dispersion.

1. INTRODUCTION

To save the earth, there is a big problem in the country currently facing the world, she said, increased pollution and temperature. Due to the increase in global temperature, ice on the continents is melting (Tapase et al. 2022). Due to this, lowering the temperature is one of the first goals of all countries. Prevention of atmospheric pollution, excess radiation from the sun, is necessary to reduce global temperature. The tension created in the world country and its transformation into war, due to the use of radiation in war, the temperature is rising, and the human life is in danger (Sabale and Jose 2021a).

Atmospheric pollution is a major environmental concern that affects the health and well-being of humans and the ecosystem. The sources of atmospheric

pollution include both natural and anthropogenic activities, such as transportation, power generation, and industrial processes (Sabale and Jose 2021b). Industrial activities are one of the major sources of air pollution, especially in regions where multiple factories and plants are located in close proximity. The pollutants released by these sources can have severe health impacts, including respiratory problems, cardiovascular diseases, and even cancer (Sabale and Jose 2023).

The Aermod software is a widely used modeling tool for evaluating the dispersion of pollutants in the atmosphere. The software considers various meteorological factors, such as wind speed, temperature, and humidity, and simulates the behavior of air pollutants in the atmosphere (Sabale et al. 2023b). The output of the Aermod software provides detailed information on the concentration and distribution of pollutants in a particular area, which can be used for effective management of air pollution. A recently published analysis of annual air quality trends in Pune by the Urban Emissions Air Pollution Knowledge (Sabale and Jose 2022).

By using AERMOD software, we will study the environment of Pune city and study the polluting factors in the environment and its effect and try to find out the future effect and take measures against it (Sabale et al. 2023a).

2. REVIEW OF LITERATURE

We studied various papers to develop our knowledge about armed software and AQI.

Name: Performance of AERMOD at different time scale (Jan 2018)

Author Name: Bin Zou- (Elsevier International research journal of engineering and technology)

This study aims to fill the void in the literature mentioned above and examines the performance of the AERMOD model at different time scales in a study area of Chakan in pune. It differs from previous studies in several aspects. First, the focus is on the performance of the model at different time scales. Second, we used not only point emission sources or mobile emission sources separately as model inputs, but also both point and mobile emission sources as model inputs in the simulations And third, this study covers a relatively large geographic area with a total of 586 point emission sources plus mobile emission sources along major roads, instead of just a few point emission sources that were typically used in some of the previous studies reported in the literature. In the sections that follow, we will describe the methodology in Section 2, present the results in Section 3, and provide some discussions and draw conclusions in Section 4.

AERMOD is applied in computation of pollutant dispersion in rural and urban, flat and complex terrain, leveled and elevated areas, and multiple sources (point, area, and volume) of emissions airman and aermet are two pre-processors of AERMOD. airman is used for topographic analysis of the area and aermet is used for analysis of meteorological data. meteorological data are received by aermet and then converted to samson format file, which is a rec-organizable format for this pre-processor. land surface param- eters for aermet are based on land use type including sur-face roughness, albedo, and Bowen ratio.

3. MATERIALS AND METHODS

The study area is located in an industrial zone where different sources of air pollution exist, such as factories, power plants, and transportation activities. The Aermod software was used to simulate the

dispersion of pollutants from these sources. The input data for the software includes the location and characteristics of the emission sources, meteorological data, and terrain data. The simulation was run for a period of ten years, from 2015 to 2022, to evaluate the trend of atmospheric pollution over time.

The output of the simulation includes the concentration and distribution of pollutants in the study area, which were analyzed to identify the major sources of air pollution. The trend of atmospheric pollution was evaluated by comparing the concentration of pollutants over the ten-year period. The effectiveness of the Aermod software in monitoring and managing atmospheric pollution was evaluated by comparing the simulation results with the actual measurements of air quality.

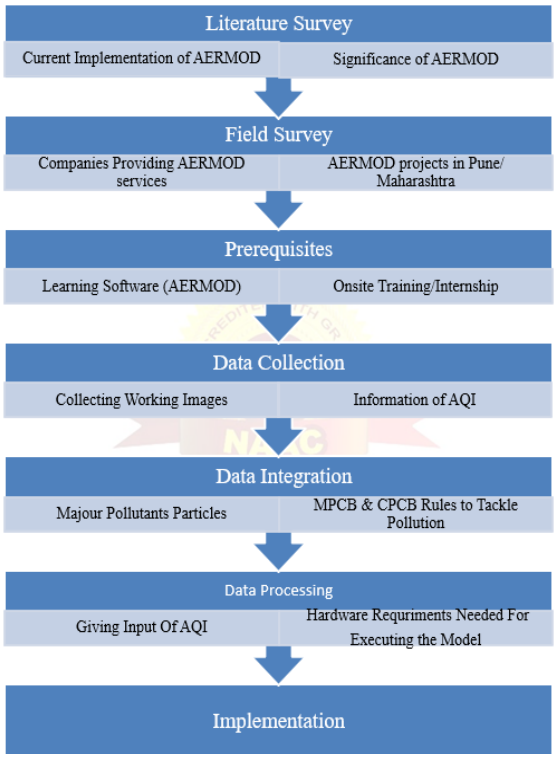

***Fig.1* AERMOD MODEL**

AERMOD is applied in computation of pollutant dispersion in rural and urban, flat and complex terrain, leveled and elevated areas, and multiple sources (point, area, and volume) of emissions AERMAP and AERMET are two pre-processors of AERMODE.

Table 1 Climatic characteristics of the studied area

NO	Metrological	Month	Level
1	Temperature	January	29’
2	Rainfall	September	189 mm
3	Wind	August	12.3 m/h
4	Humidity	December	93 /
5	Pressure	-	24 Atm

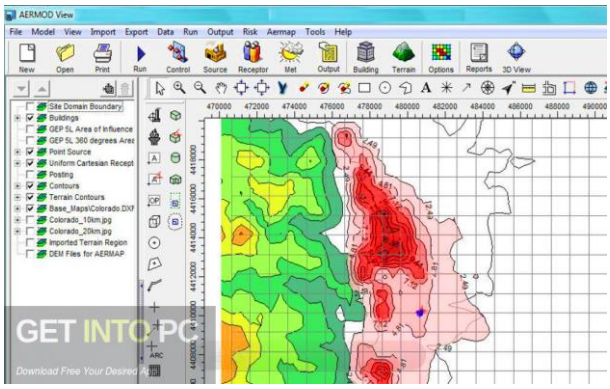

Fig.2 AERMODEL

Data Collection

Concentrations of pollutants in atmosphere are affected by various factors such as wind, temperature, vertical tempera- true profile, cloud, and humidity. Horizontal movements also influence on transporting pollutants in the direction of the pre- vailing wind.

4. PROBLEM STATEMENT

Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies

the natural characteristics of the atmosphere.

Household combustion devices, motor vehicles, industrial facilities and forest fires are common sources of air pollution. Pollutants of major public health concerns include particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulphur dioxide. Outdoor and indoor air pollution causes respiratory and other diseases and are important sources of morbidity and mortality.

5. OBJECTIVES

Creating awareness about environmental problems among people.
Undesrstand AERMOD input requirement and output.
Minimize the costs to city residents of improving the air quality.
Describe environmental pollution.

Scope of the Project .

1.Source characterization: This involves identifying the type and amount of pollutants emitted by the source, as well as the location and height of the emissions stack.

2.Meteorological data collection: AERMOD requires detailed meteorological data to simulate the dispersion of pollutants in the atmosphere. This data includes wind speed, wind direction, atmospheric stability, temperature, and humidity.

3. Model setup: Once the source and meteorological data have been collected, the model must be set up with input parameters such as terrain data, building heights, and receptor locations.

4. Model simulation: AERMOD uses a complex algorithm to simulate the dispersion of pollutants in the atmosphere based on the input parameters. The model produces estimates of pollutant concentrations at various receptor locations.

5. Model evaluation: The results of the model simulation must be evaluated to ensure that they are reasonable and consistent with real-world observations. This may involve comparing model predictions to actual measurements of pollutant concentrations or using statistical analysis to assess the accuracy of the model.

6. Research Methodology

AERMOD is a widely used air dispersion model that is used to estimate the concentration of air pollutants emitted from a variety of sources, such as industrial facilities, power plants, and transportation networks.

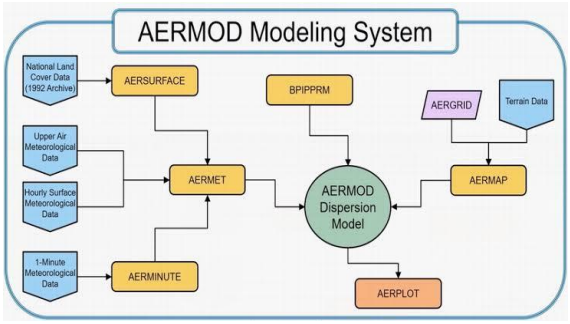

Fig.3 Process

7. Result:

The Data collected with the help of (IMD and MPCB) is given to AERMOD soft where as a following image is of that collected data.

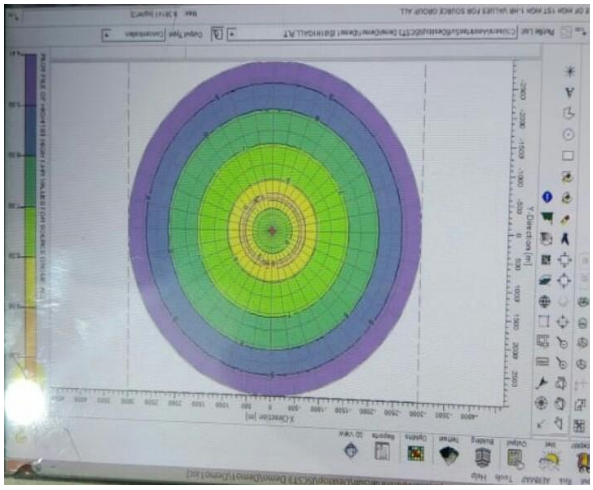

Fig.4 AERMOD Simulation

8. Conclusion

The simulations showed that the meteorological and topographical conditions of pune, favor the dispersal of atmospheric pollutants, that vehicles significantly influence air quality in the region, and that mathematical modeling can be an effective tool for studying atmospheric dispersion in the region.

Atmospheric pollution is a major environmental concern, and effective management of air quality

requires advanced tools and techniques. This study evaluated the evolution of atmospheric pollution.

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