Air Quality Analysis and Prediction in Tamil Nadu

Phase 1:

Abstract:

The project seeks to analyze and predict air quality in Tamil Nadu, India, focusing on key pollutants, including Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), and Respirable Suspended Particulate Matter (RSPM/PM10). It aims to identify pollution trends, locate high-risk areas, and develop predictive models. Through data visualization and public awareness efforts, the project intends to improve public health and inform policy decisions to combat air pollution in the region.

Problem Definition:

The problem statement entails the comprehensive analysis and prediction of air quality conditions in the Indian state of Tamil Nadu, with a specific focus on assessing levels of Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), and Respirable Suspended Particulate Matter/Particulate Matter 10 (RSPM/PM10). This initiative aims to discern long-term air pollution trends, pinpoint geographic regions experiencing heightened pollution, and establish predictive models to anticipate future air quality patterns. The primary objectives include enhancing public health, fostering awareness of air quality issues, and facilitating evidence-based policymaking to mitigate air pollution's adverse effects within the region.

Design Thinking:

1. Data Collection and Preparation:

- Gathering air quality data from monitoring stations across Tamil Nadu, ensuring data accuracy and consistency.
- Clean and preprocess the data to handle missing values and outliers.

2. Data Analysis:

- Employing statistical techniques to analyze historical air quality data, identifying trends and patterns.
- Using data visualization tools to create graphs and charts for better understanding of pollutant levels.

3. Spatial Analysis:

- Utilizing GIS (Geographic Information Systems) to map air quality data, identifying areas with high pollution concentrations.
- Spatial analysis helps pinpoint pollution hotspots.

4. Temporal Analysis:

- By analyzing how air quality varies over time, including daily, seasonal, and long-term trends.
- Identifying factors contributing to temporal variations.

5. Predictive Modeling:

- Developing machine learning models to predict future air quality based on historical data and external factors (e.g., weather conditions, industrial activities).
- These models serve as early warning systems.

6. Visualization :

- By creating user-friendly dashboards and reports to visualize air quality insights

7. Continuous Monitoring:

- Establishing a system for ongoing air quality monitoring and reporting to track the impact of interventions.
- By ensuring transparency in air quality management.
- Incorporate new data sources and adapt to changing conditions.