 **GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE-13**

**DEPARTMENT OF ECE**

**Comprehensive Analysis of Air Quality Data**

**in Tamil Nadu**

**TEAM MEMBERS**

**71772114135-Sandhiya CV**

**71772114140-Sindhuja R**

**Phase-1**: Problem Definition and Design Thinking(Assignment)

**Problem Statement:**

The project aims to analyze and visualize air quality data from monitoring stations in Tamil Nadu. The objective is to gain insights into air pollution trends, identify at=reas with high pollution levels, and develop a predictive model to estimate RSPM/PM10 levels based on SO2 and NO2 levels. This project involves defining objectives, designing the analysis approach, selecting visualization techniques and creating a predictive model using Python and relevant libraries.

**Objective:**

The primary aim of this project is to conduct an extensive analysis and visualization of air quality data collected from multiple monitoring stations situated across Tamil Nadu. This dataset comprises measurements of three critical air pollutants: Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), and Respirable Suspended Particulate Matter/Particulate Matter 10 (RSPM/PM10) levels, recorded in various urban and rural areas within the state. The project seeks to achieve the following objectives:

**Air Quality Analysis**: The primary objective is to analyze air quality trends within Tamil Nadu comprehensively. This involves studying variations in Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), and Respirable Suspended Particulate Matter/Particulate Matter 10 (RSPM/PM10) levels over time and across different locations.

**Pollution Hotspot Identification:** We aim to identify pollution hotspots, specific areas within Tamil Nadu with consistently high pollution levels. This objective is essential for targeted pollution mitigation efforts.

**Modelling:** Building a predictive model for RSPM/PM10 levels based on SO2 and NO2 levels is another crucial goal. This model will serve as a predictive tool for estimating air quality conditions.

**Analysis Approach:** Our approach to achieving these objectives involves a structured sequence of steps.

**Data Loading:** We began by collecting air quality data from multiple monitoring stations across Tamil Nadu. This dataset comprises historical records of SO2, NO2, and RSPM/PM10 levels, as well as time and location data.

**Data Preprocessing:** Rigorous data preprocessing was carried out to address missing values, outliers, and data inconsistencies. This step is essential for ensuring the quality and reliability of our subsequent analyses.

**Data Analysis:** We executed a comprehensive data analysis, encompassing exploratory data analysis (EDA) techniques to unveil patterns, correlations, and anomalies within the dataset. This analysis has been instrumental in understanding air quality trends.

**Data Visualization:** The careful selection of data visualization techniques, including line charts, heatmaps, and other visualization methods, has helped us effectively communicate air quality trends and pollution levels to diverse stakeholders.

**Visualization Selection:** We strategically selected visualization techniques to convey our findings effectively.

**Line Charts:** Line charts were used to visualize temporal trends in air quality parameters, providing a clear representation of how pollutant levels change over time.

**Heatmaps:** Heatmaps were employed to showcase spatial variations in air quality, enabling stakeholders to identify pollution hotspots across Tamil Nadu. As we continue this project, we recognize that it is an ongoing journey that embraces design thinking principles. We will remain adaptable and innovative, addressing evolving challenges in air quality management. Our commitment to creating a cleaner and healthier environment in Tamil Nadu

**Expected Deliverables:**

Upon project completion, the following deliverables are anticipated:

1. A comprehensive understanding of air quality patterns and pollution hotspots across Tamil Nadu.

2. Identification of high-priority areas for targeted pollution control measures.

3. Development of robust predictive models for RSPM/PM10 level estimation based on SO2 and NO2 concentrations.

4. Valuable insights to inform policy decisions and public awareness campaigns aimed at enhancing air quality within the region.

**Conclusion:**

In conclusion, this project aims to develop a model analysing the air quality of a particular region accurately. The steps outlined in this document provide a structured approach to tackle the problem, from data collection to deployment. By following this plan, we aim to commit to furthering our understanding of environmental issues and to help society by applying our knowledge to make a positive impact on the community and ultimately enhancing our academic practical journey toward a cleaner and healthier environment.