Air Quality Monitoring

Phase 1: Problem Definition and Design Thinking

In this initial phase of the project, we will establish a clear understanding of the problem statement and outline our approach to solving it. The project's primary objective is to set up IoT devices to measure air quality parameters and make this data publicly available for the purpose of raising awareness about air quality and its impact on public health. We will create a platform that provides real-time air quality information to the public. To achieve this, we will follow the principles of design thinking, focusing on the following key aspects:

Project Objectives:

Real-time Air Quality Monitoring: Develop a system that continuously measures air quality parameters such as particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), sulfur dioxide (SO2), ozone (O3), carbon monoxide (CO), and temperature and humidity in real-time.

Data Sharing: Establish a reliable mechanism for collecting, storing, and sharing the collected air quality data with the public in an easily understandable format.

Public Awareness: Utilize the collected data to inform and educate the public about the current air quality conditions in their area and the potential health risks associated with poor air quality.

Health Impact Assessment: Enable users to assess the potential health impacts of the observed air quality by providing relevant information and resources.

IoT Device Designs:

For effective air quality monitoring, we need to carefully plan the design and deployment of IoT devices (sensors) that will measure air quality parameters. Here are some key considerations:

Sensor Selection: Choose appropriate sensors for each parameter, considering accuracy, sensitivity, and cost-effectiveness. Common sensors include laser-based particulate matter sensors, electrochemical gas sensors, and environmental sensors for temperature and humidity.

Location: Strategically deploy sensors in areas with high population density, near pollution sources, and in various geographic locations to ensure comprehensive coverage.

Power Supply: Ensure that sensors have a stable power source, which may include batteries, solar panels, or a combination of both.

Data Transmission: Determine how sensor data will be transmitted to the data-sharing platform, considering factors like wireless protocols (e.g., Wi-Fi, LoRa, cellular), data encryption, and reliability.

Data Sharing Platform:

Designing an intuitive web-based platform is essential for presenting real-time air quality data to the public. Key aspects to consider:

User-Friendly Interface: Create a user-friendly and visually appealing interface that allows users to easily access air quality information in real-time, view historical data, and navigate through relevant educational content.

Data Visualization: Employ interactive and informative data visualization techniques such as maps, charts, and graphs to present air quality data in a comprehensible manner.

Alerts and Notifications: Implement a notification system to alert users about significant changes in air quality, health advisories, and recommendations.

Data Access: Provide options for users to download raw data for further analysis and research.

Integration Approach:

To seamlessly integrate the IoT devices with the data-sharing platform, we need to establish a robust data pipeline:

Data Collection: Set up a data collection mechanism that gathers information from IoT sensors in real-time.

Data Processing: Process the collected data to ensure accuracy, consistency, and relevance.

Data Storage: Store the data securely, ensuring that it is easily accessible and backed up.

Data Presentation: Develop APIs and data visualization components for the web-based platform to display real-time air quality information.