

# AQM-Air Quality Monitoring

## 1. Sensor Selection:

- Choose appropriate air quality sensors to measure key pollutants such as particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), ozone (O3), and volatile organic compounds (VOCs). Select sensors with the necessary accuracy and sensitivity.

## 2. IoT Device Deployment:

- Deploy IoT devices (e.g., Raspberry Pi, Arduino, or specialized air quality monitoring hardware) equipped with communication modules (e.g., Wi-Fi, LoRaWAN, or cellular) and power sources (e.g., solar or battery) near pollution sources, residential areas, and industrial zones.

## 3. Data Acquisition:

- Set up a data acquisition system to collect air quality data from the deployed IoT devices. This system can be centralized or distributed, depending on your project's scale.

## 4. Data Transmission:

- Transmit the collected air quality data securely to a central server or cloud platform using protocols like MQTT or HTTPS for real-time monitoring and analysis.

## 5. Data Storage:

- Store the air quality data in a database (SQL or NoSQL) with data retention policies in place to manage data history.

## 6. Data Processing:

- Implement data processing algorithms to clean, filter, and preprocess the raw air quality data. Calculate various air quality indices such as the Air Quality Index (AQI) to provide a standardized measure of air quality.

## 7. Real-time Monitoring:

- Develop a real-time monitoring dashboard that displays current air quality levels in different areas on a map or in a tabular format. Users should be able to view real-time data and trends.

## **8. Historical Analysis:**

- Create tools and visualizations for historical air quality data analysis. This can include charts, graphs, and comparisons between different time periods.

## **9. Alerts and Notifications:**

- Implement an alerting system to notify relevant authorities, residents, and stakeholders when air quality exceeds predefined thresholds. Notifications can be sent via email, SMS, or push notifications.

## **10. Geographic Information System (GIS) Integration:**

- Integrate GIS data to provide spatial context for air quality, helping to identify pollution sources and high-risk areas.

## **11. Machine Learning for Anomaly Detection:**

- Develop machine learning models for anomaly detection to identify unusual air quality events, such as pollution spikes or unexpected changes in pollutant levels.

## **12. User Access Control:**

- Implement user access controls to ensure that different stakeholders, including local authorities, residents, and researchers, have appropriate data access levels.

## **13. Privacy and Data Security:**

- Ensure data security and privacy compliance, especially if the system collects and stores sensitive information. Adhere to relevant data protection regulations.

## **14. Community Engagement:**

- Engage with the local community and authorities to share data, gather feedback, and collaborate on pollution reduction strategies.

## **15. Maintenance and Calibration:**

- Establish a maintenance plan to regularly calibrate and maintain the air quality sensors to ensure data accuracy and system reliability.

## **16. Reporting and Insights:**

- Generate comprehensive reports and insights from the collected air quality data. These insights can inform policy-making and pollution mitigation efforts.

## **17. Compliance with Regulations:**

- Ensure that your system complies with local air quality regulations and standards. Collaborate with relevant authorities to align with their requirements and objectives.

the successful implementation of your IoT-based Air Quality Monitoring System.