



International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206

Volume 9, Issue 4, April 2026



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

IoT-Based Air Pollution Monitoring System Using Drone with ESP32 Microcontroller

Srikanth B¹, Surendar SG², Muhammed Suhail ML³, Mohammed Raihanudeen R⁴,
Jayaprabha T⁵

Department of Computer Science and Engineering, Aalim Muhammed Salegh College of Engineering, Chennai,
Tamil Nadu, India¹

Department of Computer Science and Engineering, Aalim Muhammed Salegh College of Engineering, Chennai,
Tamil Nadu, India²

Department of Computer Science and Engineering, Aalim Muhammed Salegh College of Engineering, Chennai,
Tamil Nadu, India³

Department of Computer Science and Engineering, Aalim Muhammed Salegh College of Engineering, Chennai,
Tamil Nadu, India⁴

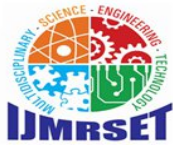
Department of Computer Science and Engineering, Aalim Muhammed Salegh College of Engineering, Chennai,
Tamil Nadu, India⁵

ABSTRACT: Air pollution has become a serious issue affecting both the environment and human health, especially in cities and industrial regions. Traditional air quality monitoring systems are costly, fixed in one location, and cannot cover large areas effectively. To address these limitations, this paper proposes an IoT-based air pollution monitoring system integrated with a drone for real-time and mobile monitoring. The system is built using an ESP32 microcontroller, which acts as the core processing unit. It is connected to an MQ-135 gas sensor to detect harmful gases such as CO₂, ammonia, benzene, and smoke, along with a DHT11 sensor to measure temperature and humidity. GPS and GSM modules are included to track location and enable remote data transmission. The collected data is processed and sent wirelessly to the ThingSpeak cloud platform, where it can be monitored and analyzed in real time. The system is programmed using the Arduino IDE. By mounting the sensors on a drone, the system can monitor air quality at different heights and in areas that are difficult to access. This overcomes the limitations of traditional stationary monitoring stations. The proposed solution is cost-effective, portable, and scalable, making it suitable for continuous environmental monitoring. It also provides timely alerts when pollution levels exceed safe limits. Experimental results show that the system is capable of reliable real-time data collection and cloud-based monitoring.

I. INTRODUCTION

Air pollution is one of the most serious global health risks today, with the World Health Organization reporting millions of premature deaths each year due to poor air quality. The problem is especially severe in urban and industrial areas, where pollutants such as carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and other harmful gases are commonly found. Traditional air quality monitoring systems depend on fixed ground stations, which are expensive to install and maintain. These systems can cost thousands of dollars and are limited because they only measure air quality at a single location.

With the advancement of technology, the Internet of Things (IoT) has opened new possibilities for environmental monitoring. IoT enables the use of low-cost sensors that can collect and transmit data in real time to cloud platforms, making monitoring more efficient and accessible. At the same time, drones (unmanned aerial vehicles) have become useful tools for mobile monitoring, as they can easily reach different locations and altitudes, including areas that are difficult or unsafe for humans to access.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

In this paper, we propose an integrated IoT-based drone system for air pollution monitoring. The system uses an ESP32 microcontroller, which offers powerful processing capabilities along with built-in Wi-Fi and Bluetooth. It is connected to sensors that measure gas levels, temperature, and humidity, along with GPS and GSM modules for location tracking and communication. All collected data is transmitted to the ThingSpeak cloud platform, where it can be monitored, analyzed, and used to generate alerts in real time.

II. PROBLEM STATEMENT

Existing air quality monitoring systems have several drawbacks that limit their effectiveness. Most systems rely on fixed monitoring stations, which are expensive to install and maintain. Because of their high cost, only a limited number of stations can be deployed, making it difficult to monitor large or densely populated areas effectively.

Another major limitation is that these stationary systems can only measure air quality at a single location. This makes it challenging to capture variations in pollution levels across different areas, especially in places like industrial zones, construction sites, or regions with uneven terrain. As a result, important changes in air quality may go unnoticed. In addition, many traditional systems do not provide easy access to real-time data or support remote monitoring. In some cases, data collection still involves manual processes, which are time-consuming, require significant human effort, and can expose personnel to harmful environmental conditions.

Furthermore, existing monitoring methods do not effectively measure pollution at different altitudes. This means that vertical variations in air quality, which are important for understanding how pollutants spread in the atmosphere, are often not captured.

Therefore, there is a clear need for a system that is portable, cost-effective, and capable of autonomous operation. Such a system should be able to monitor air quality in real time across different locations and altitudes, providing more accurate and comprehensive environmental data.

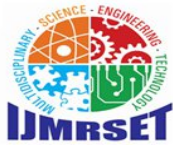
Objectives

- To design and develop a drone-mounted IoT-based air pollution monitoring system using the ESP32 microcontroller.
- To integrate sensors such as MQ-135 and DHT11 for measuring gas concentration, temperature, and humidity.
- To incorporate GPS and GSM modules for location tracking and remote communication.
- To collect environmental data and transmit it in real time to the ThingSpeak cloud platform.
- To enable real-time visualization and analysis of air quality data through cloud services.
- To implement an SMS-based alert system using GSM when pollution levels exceed safe limits.
- To provide location-based pollution data for effective geographic mapping of air quality.
- To demonstrate the effectiveness of drone-based mobile monitoring compared to fixed monitoring stations.
- To develop a lightweight and energy-efficient system suitable for drone integration.
- To ensure reliable wireless communication between the system and cloud platform.
- To enable continuous data logging and support historical data analysis.
- To design the system in a user-friendly manner for easy monitoring and interpretation.
- To improve the accuracy of sensor readings through proper calibration techniques.
- To evaluate the system's performance under different environmental conditions.
- To ensure scalability so that additional sensors or features can be added in the future.
- To reduce overall monitoring cost compared to traditional air quality monitoring systems.
- To promote environmental awareness by providing accessible and real-time pollution data.
- To explore future enhancements such as integrating AI/ML for pollution prediction and analysis.

III. LITERATURE SURVEY

Several researchers have explored IoT-based air quality monitoring systems and drone-assisted environmental sensing in recent years.

Sawane et al. (2025) introduced a system called Air-Guard, which uses an ESP32 microcontroller along with MOS sensors to monitor pollutants such as CO, NO₂, particulate matter, and VOCs. Their system supports real-time cloud



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

storage and includes an OLED display for local monitoring.

Rao and Bhavani (2025) developed a low-cost air pollution monitoring system using ESP32 and the MQTT protocol. Their system is connected to the Blynk mobile application, allowing users to monitor industrial gas levels and receive alerts directly on their smartphones.

Hura and Monastyrskii (2023) proposed a more comprehensive IoT-based system that integrates multiple sensors, including MQ135, CCS811, PMS5003, and BME280. This setup enables the detection of a wide range of pollutants and provides cloud-based monitoring capabilities.

Devi et al. (2025) designed an ESP32-based environmental monitoring system that combines MQ-135 and DHT11 sensors with machine learning techniques. Their system achieved high detection accuracy and significantly reduced costs compared to traditional monitoring solutions.

Surjit Singh et al. (2024) introduced a drone-based air quality monitoring system equipped with sensors such as PMS5003, DHT22, and MG811. The drone operates at an altitude of around 50 meters and transmits real-time data to an IoT cloud platform.

Nandhini et al. (2025) developed Envi-Drone, a modular IoT-enabled drone system using ESP32 with MQ-6, DHT11, and MQ-135 sensors. The system uses LoRa communication and Firebase cloud services for real-time monitoring in industrial environments.

Thongbai and Kaewprapha (2025) designed a drone-mounted sensor unit for monitoring air quality at different altitudes. Their study highlighted a strong relationship between CO₂ and SO₂ levels, showing the importance of altitude-based measurements.

Fadhil et al. (2023) implemented a LoRa-based drone sensor system for industrial gas monitoring. Their system demonstrated reliable long-range communication, with data transmission reaching up to 5 km in urban environments, and classified air quality using AQI standards.

Kalaivani et al. (2023) created an ESP32-based air monitoring system using MQ2 and DHT11 sensors. Their system integrates ThingSpeak, Google Sheets alerts, and GPS to provide real-time air quality classification and tracking.

Deekshath et al. (2018) presented an earlier IoT-based environmental monitoring system using Arduino UNO and ThingSpeak cloud, along with an Android application for accessing environmental parameters.

Ghosh et al. (2019) proposed an IoT architecture for UAV-based air quality monitoring using a combination of toxic gas sensors and AWS cloud services. Their system provided real-time data visualization through a graphical user interface.

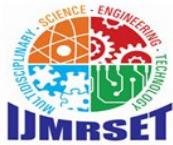
IV. EXISTING SYSTEM AND ITS DISADVANTAGES

Currently, air pollution monitoring is carried out using different types of systems, each with its own limitations.

Government-operated monitoring stations are widely used and provide highly accurate data. However, they are very expensive to install and maintain, often costing tens of thousands of dollars per unit. Due to this high cost, only a limited number of stations are deployed, which results in poor coverage across large areas. In addition, the data from these systems is not always available in real time.

Portable handheld devices offer a more affordable alternative, but they require manual operation. These devices can only measure air quality at ground level and cannot provide continuous or remote monitoring, making them less efficient for large-scale applications. Static IoT-based sensor networks are another approach that reduces cost and enables data collection over the internet. However, these systems are still fixed in one location and cannot monitor pollution at different heights or reach remote and inaccessible areas.

Disadvantages of Existing Systems:



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

- High installation and maintenance costs make large-scale deployment difficult
- Limited to fixed locations, resulting in poor spatial coverage
- Unable to provide real-time, continuous monitoring in all areas
- No support for altitude-based or 3D pollution mapping
- Delayed data reporting reduces timely decision-making
- Requires manual intervention for data collection and maintenance
- Cannot safely access hazardous, remote, or restricted areas
- Bulky and non-portable systems limit flexibility
- Difficult to scale due to high infrastructure requirements
- Lack of real-time public data accessibility and awareness
- Not well integrated with IoT and smart city technologies
- Limited capability for predictive analysis and smart alerts
- Susceptible to human errors during operation and maintenance

V. PROPOSED SYSTEM

The proposed system is designed as an IoT-based air pollution monitoring solution integrated with a drone for improved mobility and flexibility. At the core of the system is the ESP32 microcontroller, which acts as the main processing and communication unit. The ESP32 is connected to multiple sensors, including the MQ-135 gas sensor for detecting harmful gases such as carbon dioxide, ammonia, benzene, alcohol, and smoke, and the DHT11 sensor for measuring temperature and humidity. A GPS module is used to capture real-time location data (latitude and longitude), while a GSM module enables communication by sending SMS alerts and acting as a backup data transmission system.

All collected sensor data is processed by the ESP32 and transmitted through Wi-Fi to the ThingSpeak cloud platform. This allows users to monitor air quality in real time using graphs and dashboards. Whenever the pollution level exceeds predefined safe limits, the system automatically sends alert messages through the GSM module and also updates the cloud platform with notifications. By mounting the system on a quadcopter drone, it becomes possible to monitor air quality at different locations and altitudes. This makes the system more flexible and efficient compared to traditional fixed monitoring methods, especially in remote or hazardous environments.

Advantages of the Proposed System:

- Enables mobile monitoring across different locations and altitudes
- Provides real-time data collection and instant analysis
- Supports cloud-based visualization for easy remote access
- Cost-effective compared to traditional monitoring stations
- Uses GPS to provide location-based (geo-tagged) pollution data
- Helps in creating accurate pollution maps for better analysis
- Dual communication (Wi-Fi and GSM) ensures reliable data transmission
- Continues to operate even if one communication method fails
- Autonomous drone operation reduces human effort

VI. HARDWARE COMPONENTS

ESP32 Microcontroller

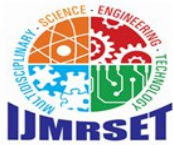
The ESP32 acts as the main controller of the system. It is responsible for collecting data from all the sensors, processing it, and transmitting it to the cloud. It features a powerful dual-core processor with built-in Wi-Fi and Bluetooth, making it well-suited for IoT applications. Its low power consumption allows easy connection with various sensors and modules.

MQ-135 Gas Sensor

The MQ-135 sensor is used to detect air quality by sensing harmful gases such as ammonia, nitrogen oxides, benzene, smoke, and carbon dioxide. It works based on a semiconductor sensing material and provides an analog output that varies depending on the concentration of gases present in the air. This makes it suitable for monitoring pollution levels.

1.1 DHT11 Temperature and Humidity Sensor

The DHT11 sensor is used to measure temperature and humidity in the environment. It provides digital output, making it easy to interface with the ESP32. Although it is a low-cost sensor, it is reliable for basic environmental monitoring.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

within moderate accuracy ranges.

GPS Module

The GPS module is used to determine the exact location of the system by providing latitude and longitude coordinates. This helps in tagging pollution data with location information, which is useful for mapping and analyzing air quality across different areas.

GSM Module

The GSM module enables communication through mobile networks. It is mainly used to send SMS alerts when pollution levels exceed safe limits. It also acts as a backup communication method in case Wi-Fi connectivity is not available, ensuring continuous data transmission.

Drone (Quadcopter)

The drone serves as the mobile platform for carrying the entire sensor system. A typical quadcopter uses four motors, electronic speed controllers (ESCs), and a flight controller to maintain stable flight. The sensors are mounted in a way that reduces interference from the propellers, allowing more accurate readings. This setup enables monitoring at different heights and locations.

1.2 Power Supply

The system is powered using a rechargeable LiPo battery, which supplies energy to both the drone and the sensor unit. A voltage regulator is used to provide stable voltage levels required by the ESP32 and other components, ensuring smooth and reliable operation.

VII. SOFTWARE AND PLATFORMS

Arduino IDE

The Arduino IDE is used as the main development environment for programming the ESP32 microcontroller. It provides a simple and user-friendly interface for writing, compiling, and uploading code. It supports C/C++ programming and offers a wide range of libraries that make it easy to work with sensors, Wi-Fi communication, and cloud platforms.

ESP32 Platform

To program the ESP32 using the Arduino IDE, the ESP32 board package is installed. This package includes the necessary drivers, board configurations, and libraries required to access ESP32-specific features such as Wi-Fi, Bluetooth, and GPIO control. It simplifies the development process and ensures smooth communication between hardware and software.

ThingSpeak Cloud Platform

ThingSpeak is an IoT cloud platform used for collecting, storing, and analyzing data in real time. The sensor data collected by the ESP32 is sent to ThingSpeak, where it is displayed using graphs and dashboards. The platform also supports data analysis and alert generation, allowing users to monitor pollution levels and receive notifications when thresholds are exceeded.

Communication Protocols

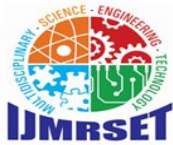
The system uses multiple communication methods to ensure reliable data transmission:

- Wi-Fi (IEEE 802.11 b/g/n) for primary data transmission to ThingSpeak
- GSM (2G/3G) for SMS alerts and backup communication
- GPS (NMEA protocol) for location data acquisition
- HTTP/HTTPS REST API for cloud server communication

System Modules and Explanation

Module 1 – Sensor Data Acquisition

In this module, the MQ-135 and DHT11 sensors are used to continuously monitor environmental conditions. The MQ-135 detects the concentration of harmful gases, while the DHT11 measures temperature and humidity. The ESP32



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

reads both analog and digital signals from these sensors at regular time intervals (typically every 15–30 seconds) to ensure continuous data collection.

Module 2 – GPS Location Tracking

The GPS module is responsible for identifying the exact location of the system. It receives signals from satellites and provides real-time data such as latitude, longitude, and altitude. This location information is attached to each sensor reading, allowing the data to be geo-tagged for accurate mapping and analysis.

Module 3 – Data Processing and Threshold Detection

In this stage, the ESP32 processes the raw data collected from the sensors. It converts the readings into meaningful units, such as parts per million (ppm) for gas concentration, degrees Celsius for temperature, and percentage for humidity. The processed data is then compared with predefined safety limits to determine whether the pollution level is safe or harmful.

Module 4 – Cloud Data Transmission

Once the data is processed, it is sent to the ThingSpeak cloud platform using Wi-Fi. The ESP32 transmits the data through HTTP requests, and each parameter is stored in a separate field on the ThingSpeak channel. This allows users to view the data in the form of graphs and dashboards in real time.

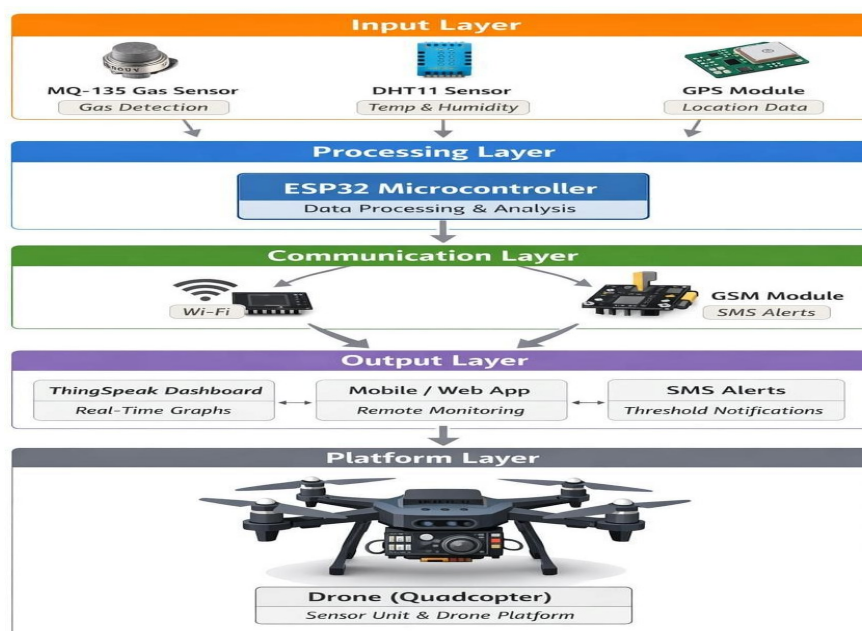
Module 5 – Alert and Notification System

If the pollution level exceeds the set threshold, the system automatically triggers an alert. The GSM module sends SMS notifications to predefined mobile numbers, ensuring that users are informed immediately. At the same time, the cloud platform can also generate alerts through additional services like email notifications.

Module 6 – Drone Flight and Monitoring

In this module, the drone acts as a mobile platform carrying the sensor system. It can be flown to different locations and altitudes based on monitoring requirements. The drone is controlled by an operator, while the sensor system works automatically in the background, collecting and transmitting data without interruption.

Block Diagram Description



The system block diagram shows the following flow:

Input Layer: MQ-135 Gas Sensor → ESP32; DHT11 Sensor → ESP32; GPS Module → ESP32

Processing Layer: ESP32 Microcontroller (data acquisition, processing, threshold comparison)



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Communication Layer: ESP32 → Wi-Fi → ThingSpeak Cloud Server; ESP32 → GSM Module → SMS Alerts

Output Layer: ThingSpeak Dashboard (real-time graphs, data logs); Mobile/Web Application (remote monitoring); SMS Alerts (threshold notifications)

Platform Layer: Drone (quadcopter carrying the entire sensor unit)

VIII. RESULTS AND DISCUSSION

The proposed drone-based IoT air pollution monitoring system was successfully tested to evaluate its performance in real-time data collection and transmission. The results show that the system is capable of monitoring environmental conditions effectively.

The MQ-135 gas sensor was able to detect changes in gas concentration across different environments, indicating its usefulness for air quality monitoring. The DHT11 sensor provided stable and consistent readings for temperature and humidity, which helped in understanding the overall environmental conditions.

The GPS module accurately recorded the location of each data point, making it possible to map pollution levels across different areas. This location-based data adds significant value for analysis and visualization.

All the collected data was successfully transmitted to the ThingSpeak cloud platform using Wi-Fi. The platform displayed the data in the form of real-time graphs, allowing easy monitoring and interpretation. In addition, the GSM module worked reliably by sending SMS alerts whenever pollution levels exceeded the predefined thresholds, ensuring timely notifications. The drone platform performed well in carrying the sensor unit and maintaining stable flight at different altitudes. It was able to hover at specific locations, enabling effective data collection from various heights and areas. Overall, the system demonstrated reliable performance in real-time monitoring, data transmission, and alert generation, proving its effectiveness as a mobile air quality monitoring solution.

IX. CONCLUSION AND FUTURE SCOPE

This paper presented the design and implementation of an IoT-based air pollution monitoring system mounted on a drone. The system integrates the ESP32 microcontroller with sensors such as MQ-135 and DHT11, along with GPS and GSM modules for location tracking and communication. The results show that the system is capable of monitoring air quality in real time, transmitting data to the ThingSpeak cloud platform for visualization, and sending SMS alerts when pollution levels exceed safe limits.

By using a drone as a mobile platform, the system overcomes the limitations of traditional fixed monitoring stations. It allows data collection from different locations and altitudes, making the monitoring process more flexible, efficient, and comprehensive. Overall, the proposed system proves to be a cost-effective and practical solution for modern air quality monitoring.

X. FUTURE SCOPE

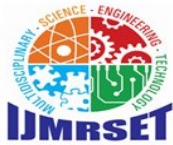
In the future, the system can be further improved by adding more advanced gas sensors such as MQ-7 for detecting carbon monoxide and MQ-2 for detecting smoke and LPG. The drone can also be upgraded with autonomous navigation capabilities, allowing it to follow pre-defined paths for systematic monitoring without manual control.

Additionally, machine learning algorithms can be integrated to analyze historical data and predict future pollution trends. More advanced cloud platforms such as Firebase or custom-built servers can be used to enhance data storage, visualization, and analytics capabilities.

These improvements can make the system more intelligent, accurate, and suitable for large-scale applications such as smart cities and industrial monitoring.

REFERENCES

[1] M. Sawane, S. Sakhare, K. Shevate, H. Khillari, Air-Guard: Smart Air Pollution Monitoring with MOS Sensors &



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

- ESP32, Int. Conf. Internet, Cyber Security and Information Systems (2025). DOI: 10.1109/icicis65613.2025.11371036
- [2] M.S. Rao, B. Bhavani, Air Pollution Monitoring System Using IOT, Int. J. Scientific Research in Engineering and Management (2025). DOI: 10.55041/ijsrem44493
- [3] V. Hura, L. Monastyrskii, IOT-based solution for detection of air quality using ESP32, Artificial Intelligence (2023). DOI: 10.15407/jai2023.03.086
- [4] R. Delshi Howsalya Devi et al., IoT Based Multi-Parameter Environmental Monitoring System using ESP32 for Real-Time Safety and Air Quality Assessment, Int. Conf. Intelligent Technologies for Sustainable Electric and Communications Systems (2025). DOI: 10.1109/iTechSECOM64750.2025.11307644
- [5] S. Surjit Singh et al., Real-Time Monitoring of Atmospheric Air Pollutants using Sensor Integrated UAV, Int. Conf. Electrical Electronics and Computing Technologies (2024). DOI: 10.1109/ICEECT61758.2024.10739167
- [6] J.M. Nandhini et al., Envi-Drone: A Modular IoT-Enabled Autonomous Drone for Industrial Air Quality Monitoring, Int. Conf. Advanced Communication Technology (2025). DOI: 10.1109/ICACT67549.2025.11351409
- [7] N. Thongbai, P. Kaewprapha, Design and Deployment of a Sensor Box for Altitude-Based Air Quality Monitoring, Int. Conf. Information Technology (2025). DOI: 10.1109/InCIT66780.2025.11276042
- [8] L. Angrisani et al., An Innovative Air Quality Monitoring System based on Drone and IoT Enabling Technologies, IEEE Int. Workshop Metrology for Agriculture and Forestry (2019). DOI: 10.1109/MetroAgriFor.2019.8909245
- [9] M. Fadhil, S. Gharghan, T. Saeed, LoRa Sensor Node Mounted on Drone for Monitoring Industrial Area Gas Pollution, Engineering and Technology Journal (2023). DOI: 10.30684/etj.2023.141453.1498
- [10] K. Kalaivani et al., Air Monitoring with Cloud and IoT, Int. Conf. Sustainable Computing and Smart Systems (2023). DOI: 10.1109/ICSCSS57650.2023.10169619
- [11] R. Deekshath et al., IOT Based Environmental Monitoring System using Arduino UNO and Thingspeak, (2018)
- [12] S. Ghosh et al., Development of an IOT based robust architecture for environmental monitoring using UAV, IEEE India Conference (2019). DOI: 10.1109/INDICON47234.2019.9028987
- [13] F.N. Abbas et al., Capable of Gas Sensor MQ-135 to Monitor the Air Quality with Arduino Uno, Int. J. Engineering Research and Technology (2020). DOI: 10.37624/ijert/13.10.2020.2955-2959
- [14] B. Samar Sarjerao, A. Prakasarao, A Low Cost Smart Pollution Measurement System Using REST API and ESP32, Int. Conf. for Convergence in Technology (2018). DOI: 10.1109/I2CT.2018.8529500
- [15] E.V. Vazquez-Carmona, J.I. Vasquez-Gomez, J. Herrera-Lozada, Environmental Monitoring using Embedded Systems on UAVs, IEEE Latin America Transactions (2019). DOI: 10.1109/TLA.2019.9082242



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com