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Envirosense: Iot-Based Environmental Monitoring System for Sustainable Resource Management

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Abstract. *Numerous factors, including population growth, automobile use, industrialisation, and urbanization have all contributed to rising pollution levels, which have a negative impact on people's health and wellbeing. The wireless sensor networks are the foundation of this project, which uses them to gather environmental data. We will create an IOT-based environmental monitoring system that uses Wi-Fi technology to monitor the air quality, soil moisture, climate changes, water quality, and temperature over a web server. Internet of Things and other recent innovations enable the transmission of vast and accurate amounts of environmental data. With this IOT project, we may use a computer or a mobile device to check the pollution level from anywhere. By using this device we can forecast to avoid future pollution and can send warning messages to the particular affected area or polluted area.*

Keywords: *Internet of things, Wi-Fi ,Cloud computing, Environment monitoring, Air quality monitoring, Humidity, Temperature, Noise detection, Water quality monitoring, Location sensing, Light sensing, Soil moisture detection.*

1. INTRODUCTION

Environmental degradation is a pressing global issue, posing significant threats to ecosystems and human health. The Internet of Things (IoT) has revolutionized environmental monitoring by providing real-time tools to track, analyze, and mitigate environmental degradation. IoT-based environmental monitoring systems use interconnected sensors, data analytics, and communication technologies to collect, transmit, and process vast amounts of environmental data. These systems capture real-time data, allowing for timely detection and response to changes. The collected data is processed, analyzed, and visualized on a centralized platform or cloud-based system, with advanced data analytics techniques like machine learning and artificial intelligence identifying patterns, correlations, and trends.IoT-based systems have numerous applications across sectors, including government regulation enforcement, industry compliance, and citizen engagement in environmental stewardship. By leveraging interconnected sensors, data analytics, and communication technologies, IoT-based systems have the potential to revolutionize environmental management, promote sustainable practices, and empower individuals and communities to actively contribute to environmental preservation.

2. OBJECTIVES

Real-time Monitoring: The primary objective of an IoT-based environmental monitoring system is to provide real-time and continuous monitoring of environmental parameters. This objective ensures timely detection of environmental degradation and enables prompt response and intervention.Data Collection and Analysis: The system should be capable of collecting large volumes of data from the deployed sensors and transmitting it to a centralized platform or cloud-based system. The collected data should then be processed, analyzed, and visualized using advanced data analytics techniques to identify patterns, correlations, and trends. Early Warning System: An important objective is to establish an early warning system for environmental degradation. By continuously monitoring environmental parameters, the system can detect abnormal or hazardous conditions and issue alerts or warnings in real-time. Identification of Pollution Sources: The system should aim to identify and locate sources of pollution or environmental degradation accurately. This objective assists in targeted interventions and the enforcement of environmental regulations.Decision Support and Policy Development: An objective of the system is

to provide decision-makers with accurate and timely information for effective decision-making and policy development. This objective supports sustainable resource management and environmental conservation.Citizen Engagement and Awareness: The system should aim to engage citizens and raise awareness about environmental degradation. This objective fosters a sense of environmental responsibility and encourages sustainable practices at the individual and community levels.Integration with Existing Environmental Management Systems: This integration ensures that the collected data and insights can be utilized for effective coordination, planning, and response in environmental management efforts.These objectives collectively aim to improve environmental monitoring, management, and conservation for a sustainable and healthier future.

3. METHODOLOGY

3.1 Existing Method: An outdated IoT-based environmental monitoring system that tracked environmental degradation only had a few sensors placed in a few strategic sites. These sensors were mostly employed to keep an eye on a few important variables, such water contamination, temperature, noise or air quality. For analysis and reporting, the data gathered by these sensors was sent to a centralized server or database. The system, however, had a number of drawbacks. First, the sensors' limited coverage left gaps in data collection and prevented the development of thorough environmental understandings. Additionally, the system's connectivity infrastructure was frequently faulty, which caused problems with data transmission and delays in real-time monitoring.

3.2 Proposed Method: The goal of the project is to create "EnviroSense," an Internet of Things-based system for monitoring the environment and managing resources sustainably. It entails setting up sensors to keep an eye on several environmental factors, including temperature, moisture in the soil, water quality, and air quality. Wirelessly transmitting the gathered data to a central server or cloud platform allows for its analysis utilising data analytics methods. Insights and visualisations are produced in real-time to support proactive environmental protection and decision-making. With the system, stakeholders may monitor environmental degradation, take action, encourage sustainable behaviour, and ensure effective management of natural resources.

3.3 Block Diagram:

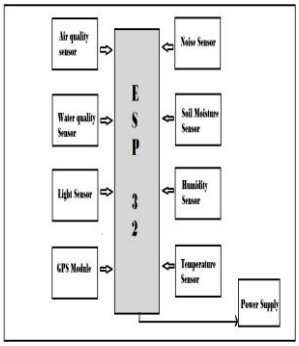

FIGURE1.

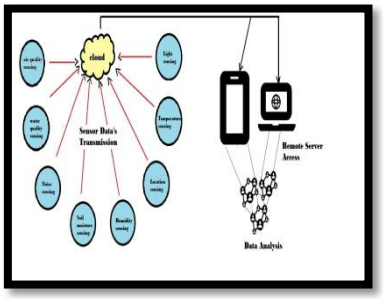

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FIGURE2.

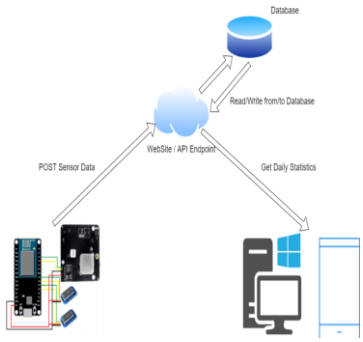

FIGURE3.

3.5 Flow Diagram Description: In order to monitor environmental factors including air quality, water quality, soil moisture, temperature, humidity, and noise levels, sensors are placed in certain locationsThe sensors wirelessly send data that is continuously collected to a central server or cloud platform The central server collects, manages, and stores the data that has been gathered, offering a strong foundation for data management.Data analytics algorithms examine the gathered data to discover significant patterns and insights.Interactive dashboards, maps, and charts are used to visually represent the analysed data to make it easier to understand.On the basis of the gathered data and analytical insights, the system evaluates the degree of environmental degradation in various regions.An early warning system finds unusual environmental conditions and sends out messages and alarms in real time.Collaboration is encouraged with local communities, government organisations, research institutes, and environmental organisations.

4. OUTPUT

TEMP	MQ6	MQ9	HUMIDITY	NOISE	PH	DUST
38	2	2	17	197	9	1.51
44	2	2	18	197	9	2.12
46	2	2	19	205	9	2.74
34	2	2	20	205	9	2.74
43	3	2	24	205	9	0.95
31	3	2	26	197	9	0.98
37	3	2	31	197	9	0.95
31	203	3	16	197	9	0.96
22	4	3	16	197	9	0.96
21	20	207	16	196	9	0.98
51	3	3	18	196	9	1.01

FIGURE4.

5. CONCLUSION

An effective tool for solving environmental issues is the IoT-Based Environmental Monitoring System for Tracking Environmental Degradation. This system makes use of IoT technology to enable real-time monitoring of several environmental indicators, giving important information about the degree of degradation. The project encourages cooperation, increases awareness, and supports evidence-based decision-making in order to advance sustainable development and conservation. The initiative gives stakeholders the ability to take proactive steps in environmental protection thanks to its early warning system and data analytics capabilities. This project helps create a greener and healthier environment for both the present and future generations by fusing technology, data analysis, and community interaction.

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