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## **Air Quality Monitoring System**

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Abstract: Air pollution is a critical global concern with significant impacts on human health and the environment. This paper presents the design and implementation of a real-time air quality monitoring system that measures key atmospheric pollutants such as  $CO_2$ , CO, PM2.5, temperature, and humidity. The system utilizes low-cost, high-sensitivity sensors interfaced with a microcontroller and transmits data via IoT-based platforms for real-time analysis and visualization. The proposed solution aims to provide accurate, accessible, and scalable monitoring to support environmental awareness and policy-making. Experimental results demonstrate the system's reliability and effectiveness in diverse urban environments. Urban air pollution has become a major environmental challenge, affecting public health, ecosystem balance, and quality of life. This paper proposes a low-cost, IoT-enabled air quality monitoring system designed to track and analyze key pollutants in real time, including particulate matter (PM2.5 and PM10), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), temperature, and humidity. The system integrates multiple environmental sensors with a microcontroller and employs wireless communication protocols to transmit data to a cloud-based platform for storage, analysis, and visualization. The data can be accessed remotely via a web or mobile application, allowing city authorities, researchers, and the public to monitor air quality trends dynamically. Experimental deployment in an urban setting demonstrates the system's reliability, scalability, and potential to support data-driven environmental policies and public awareness initiatives..

**Keywords:** Air Quality Monitoring, IoT, Environmental Sensors, PM2.5, Carbon Monoxide, Urban Pollution, Real-Time Data, Wireless Sensor Network, Smart City, Cloud Computing



