



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

**FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF COMPUTER ENGINEERING AND INFORMATICS**

**FINAL YEAR PROJECT REPORT
AIR POLLUTION MONITORING AND ALERT SYSTEM**

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**This Final Year Project Report submitted to the Department of
Computer Engineering and Informatics in a partial fulfillment of the
requirement for the award of the degree of Bachelor of Science
in Computer Engineering of Busitema University**

May, 2025

DECLARATION

We, **ASIIMWEELVIS** and **OBBO LIVINGSTONE** do hereby declare that this project report was done by us and has never been submitted to any Academic Institution of Higher Learning for an academic award.

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APPROVAL

This is to certify that this project report was carried out under our supervision. It is now ready for submission to the Board of Examiners of Busitema University with our due approval.

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DEDICATION

Wededicatethisreporttoourbelovedparentsfortheunrelentingfinancial,materialand emotional support towards our project and our excellent supervisors, Mr. Bwire John Bosco and Eng. Andima Moses for the technical guidance throughout the execution of this project.

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ABSTRACT

Pollution in industries and urban centers has to be controlled and maintained to recommended and safe levels. With technological advancements, various methods should be devised to enable monitoring and control of this levels to the globally safe standards.

Recently pollution control level has been left to the hands of the locals who are largely relying on the traditional methods which give no clue about the quantities detected. As a result, there is a rising need for support systems that detect and give correct precise values that keeps awareness among the population. Also with high levels of ignorance and corruption among various industrial officials, there is also great need for a remote control system that enables responsible bodies to monitor the emission levels in the various industries and enforce policies to ensure regulation within the safe range which justifies the relevance of the Air Pollution Monitoring and Alert System.

The air pollution monitoring and alert system is an IoT enabled air pollutant detection and alert system for remote monitoring and notification of the industrial staff when pollutant threshold values are exceeded. The system employs a sensor network that reads real time values of the pollutant gases in the surrounding to trigger alerts when emissions are high. The system also network enabled and linked to a web application to enable the authoritative bodies to remotely monitor the industrial performance in the regulation of the pollution to the recommended safe levels.

The system employs both a hardware system developed using Arduino with ESP32, gas sensors and an alarm module and software system developed using express.js, MySQL and react.js.

The hardware consists of an ESP32, gas sensor namely, MQ135, MQ2 DMSA501 PM2.5 which read the gas concentration levels to trigger the alarm system implemented with a buzzer for audio alerts and LEDs for visual alerts.

The software system is a web application consisting of a backend application developed using Express in the Node.js platform and MySQL database and a frontend application developed in React.js supported by the Vite framework.

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LIST OF ACRONYMS

IoT– Internet of Things

NEMA–National Environment Management Authority WHO -
World Health Organization

I/O– Input/Output

PM–Particulate Matter DC

– Direct Current

LED–Light Emitting Diode AQI

– Air Quality Index

EPA–Environmental Protection Agency GPRS

– General Packet Radio Service

IDE–Integrated Development Environment

USB – Universal Serial Bus

PWM–Pulse Width Modulation PC

– Personal Computer

LCD–Liquid Crystal Display R_0

– Reference Resistance

R_s – Sensor Resistance

LPO–Lipid Peroxidation

API–Application Programmer Interface

HTTP – Hyper-Text Transfer Protocol

HTML – Hyper-Text Markup Language

SOAP – Simple Object Access Protocol

REST – Representational State Transfer

ID - Identification

XSS – Cross-site Scripting

MVC–Model View Controller

CSRF–Cross-Site Request Forgery ORM

– Object Relational Model

UI – User Interface

UX–User Experience

CSS – Cascading Style Sheet

IA– InformationArchitecture

DOM–DocumentObjectModel

SPA – Single Page Application

VPS – Virtual Private Server

URL–UniversalResourceLocator