e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Issue:08/August-2020 Impact Factor- 5.354 www.irjmets.com

AIR POLLUTION MONITORING SYSTEM USING ARDUINO WITH MQ135 SENSOR

Anand Kanti[*1], Jagadish P M[*2], Prof Soumya[*3]

[*1,2] B.E Student, Department of Computer Science and Engineering PDA College of Engineering, Kalaburagi, Karnataka, India

[*3]Professor, Department of Computer Science and Engineering PDA College of Engineering, Kalaburagi, Karnataka, India

ABSTRACT

The pollution has increased with times by lot of factors like the increase in air population, increased vehicle use, industrialization and urbanization which results the pollution in nature which affects on human wellbeing. We propose an air quality monitoring system that allows us to monitor and check live air quality level in the area by our system. System uses MQ135 sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data. This keeps measuring air quality level and reports it. The sensors interact with arduino uno contains microcontroller (atmega 328) processes this data and transmits it over the application. This allows the owner of the device to monitor air pollution in different areas with the data and act against it. Also, owner can keep a watch on the air pollution near schools, hospitals gives measurements of air pollution concentrations, which then can analyzed interpreted and presented. By analysing the data allows us to assess how bad air pollution is from day to day.Air pollution is a big problem in the nature, asit costs more damage in evolution of human health , ecosystems and the climate. Quality of the air in city and urban areas is the most important factor that directly influences the incidence of diseases and decreases the quality of life.

I. INTRODUCTION

Air contamination can be characterized as nearness of moment particulars that bothers the working of common procedures and furthermore creates unfortunate wellbeing impacts. In another way contamination can influence the characteristic periodicity and furthermore can irritate the wellbeing of person. As modernization and automation is becoming in all respects widely Pollution is likewise getting presented everywhere way.

It has been seen that in mechanically creating or created nations human wellbeing get significantly influenced due to Air Pollution, where there is no framework to screen it or monitor it. In late explores it has been demonstrated that there is a high connection batten's climatic toxins and maladies like asthma and lung related ailments. Air Pollution is currently a noteworthy worry over the globe and WHO has built up specific rules to confine the cutoff points of specific gases like O3, NO2, and SO2. They show ideal unwavering quality and viable in estimating a wide scope of air toxins. Thinking about the evil impacts of Pollution on people, in 2012, one out of eight of all out worldwide passing's were brought about via air Pollution which was 7 million unexpected losses all around. These passing's were a consequence of various ailments, for example, ischemic coronary illness, interminable obstructive pneumonic sickness, stroke, lung malignant growth and intense lower respiratory diseases in youngsters

The system of ceaseless internet checking utilizes sensors to screen the numerical value, and afterward transfer to control focus by system. This method for information move incorporates wired and wireless frameworks. Despite the fact that framework is solid it is having weaknesses everywhere and dynamic range, for example, complex system cabling, costly and so forth. With widely creating correspondence advances, presently multi day's air Pollution checking framework is frequently planned in wireless mode. In any case, these modes are surprising expense in both establishment and support. Yet, on different handy cellular sensor systems have been quickly created during late decades and utilized on the huge systems at military, enterprises as well. In view of these focal points, it is currently being connected in

ecological observing .In request to actualize such framework single integrated chip micro-controller alongside exhibit of sensors, IOT devices are utilized.

To check the air quality in screen, wireless sensors plays an important role in gathering information of air quality framework is there to observe the concentration of the gases in the air with the iot system. The data will be shown in the web page.

Problem Statement

At first there is a air pollution everywhere by means of various factors. And this problem is growing like peak every year. This kind of environmental problems causes major problems in the future. Because of these kind of environmental problems we designed a system where it can it can detect the harmful gases in the air and it will show the gas percentage in ppm. It will help to take the precautions.

Existing System

In the earlier years, the contamination levels because of various ventures and urbanization have been rising significantly, making it urgent to have a trusted and innovatively propelled method for estimating and observing probably the most vital air components, including CO2, clean, and temperature, so as to have the capacity to monitor how a portion of the present progress acts, for example, woodlands cutting, expanded utilization of vehicles and other mechanical acts imperil our wellbeing as well as the earth.

In Zigbee Based Wireless Air Pollution Monitoring System, the proposed framework comprises of a Unit of Mobile-DAQ. The Mobile-DAQ unit that willincorporates a solitary chip microcontroller, air pollution sensors exhibit, and GPS Device. There is a Pollution-Server that is on top of the line individual computer application server with Internet network. The Mobile-DAQ unit assembles air toxins levels (CO, NO2, andSO2), and packs them in a casing with the GPS physic distribution, time, and date. Thus this is the reason to send the Pollution-Server by means of zig bee device.

Proposed System

The environmental parameters which are to be measured are introduced in layer 1. Disquisition of the characteristics and features of sensor devices is in layer 2. Layer three includes decision making on measured sensor data with the timing and space. Layer 4 is collecting the data and the layer 5 is sensing surrounding data.

The sensors are controlled through arduino uno which contains the micro controller and the driven data will be processed and analyzed by microcontroller. And now the data will be updated live on internet by wifi module which sends the data to cloud through internet. User can monitor the data on their smart phone as well as on their laptop.When we start the device all the sensors will start interfacing with arduino (Atmega 328). Now we need to send AT command in the serial port. Then the esp8266 will respond. Using hotspot, user can access internet browser on their smart phones or laptops. Web browser needs specific IP address. By providing IP address on browser, web page is displayed. Web page shows the monitoring results of the respected parameters also the parameters are shown in the LCD display.

A message will sent by library through IDE to lcd.. MQ 135 will send the sensed data. The gas sensor made the analog output voltage proportional to the concentration of polluting gases in Parts per Million (ppm).data will first sent to the lcd display and after it will sent to wifi model. The Wi-Fi module transfers the measured data valve to the server through internet. The Wi-Fi module is set to transfer measured data an application on a remote server called “Thing speak”. The online application provides global access to measured data via any device that has internet connection capabilities. Data collected from the sensor was converted into a string and used to update the information sent to the remote server.

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II. REQUIREMENT SPECIFICATION

Hardware specification:

ARDUINO UNO:

Fig 2.1 ARDUINO UNO

The Arduino Uno is a open source microcontroller board based on the 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, ATmega328 .It has 14 digital input/output pins, an ICSP header, and a reset button. It has everything which is needed for a micro controller; simply connect it to a computer with a USB cable or battery to get started. Instead, it features the Atmega328 programmed as a USB-to-serial converter. The Uno word describes in one of the Italian language and is named to mark the upcoming release of Arduino. It is latest version of usb based arduino board. This arduino board is programmed with arduino IDE.

Features of Arduino Uno:

- Microcontroller: ATmega328.
- Operating Voltage: 5V.
- Input Voltage: 7-12V. //recommended
- Input Voltage: 6-20V. //limitation
- Digital I/O Pins: 14 pins (from which 6 will be provide for PWM output)
- Analog Pins: 6.
- Direct Current per Input and Output Pin: 40 mA.
- Direct Current for 3.3V Pin: 50 mA

Basic Functions of Arduino Technology:

- The digital read pin will read the value of the given pin.
- Digital value is written by digital write pin.
- Pin mode pin is used to assign the pin to input output mode.
- Analog read pin read value and returns the value.
- Analog write pin will writes the value of the pin.

Advantages of Arduino Technology:

- It is cheap
- It is an open source hardware feature that permits users to develop their own kit.
- The arduino ide supports all the operating systems

And it is easier to implement

- The ide is open source it every libraries are free to use.

• beginner friendly user interface.

MQ-135 Gas sensor:

Fig 2.2 MQ-135 (Gas Sensor).

MQ135 sensor (Gas sensor): It is a air quality detecting sensor which detects the toxic gases like NH3, smoke, CO2, alcohol and benzene steam.

Character Configuration:

• Good sensitivity some kind of gases.

• High sensitivity to NH3, Sulphide and Benzene steam.

• Long life and low cost.

• Simple drive circuit.

Application:

• Domestic gas leakage detector.

• Industrial Combustible gas detector.

• Portable gas detector.

Features:

• Operating Voltage is +5V.

• Analog output voltage: 0Volt to +5Volt.

• Digital Output Voltage: 0V or 5V.

• Preheat duration 20 seconds.

• The Digital pin Sensitivity varied using the potentiometer.

LCD:

Fig 2. 3 16x2 LCD Display

*16x2 LCD display: It is used in the most embedded systems. The 16x2 LCD display contains 2 rows and 16 columns and it is less priced display compared to others.

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Wi-Fi ModuleESP8266:

Fig 2.4 Wi-Fi Module ESP8266.

The ESP8266 Wi-Fi Module contained SOC with integrated IP protocol stack that can give any microcontroller access to particular Wi-Fi network. It is capable of sending the data and it is capable of offloading we can easily connect to arduino device. The ESP8266 module is an less priced chip.

Software Requirement:

Here in this project we are using Arduino IDE it is a open source IDE developed by Arduino.cc it supports c++ embedded language. C++ is platform dependent language. Any language is said to be platform dependent whenever the program is being execute in the same operating system where that was developed and compiled but it don't execute on other operating system.

Fig 2.5 Arduino IDE Software.

The Arduino IDE is is supported by all operating systems (like Windows, mac OS, Linux)it is developed with java programming.

It originated from the IDE for the languages for interfacing with the devices and that includes a code editing with features such as text cutting and pasting, searching and replacing text, automatic indexing, braces matching, and syntax highlighting, and that provides a simple one click mechanisms for compiling and uploading programs to an arduino board. It also contains a message area, a text console, a toolbar with buttons and many common features which os required for an IDE.

Pollution Monitoring and Notification System Requirements Specification It is an open-source Arduino Software which helps in writing code and uploading it to the Arduino board. It supports all the operating systems. This software works with any of the a aforementioned Arduino boards. The programming language used to write codes is C and C++. The program written or the code written in IDE is known as sketch. Once the sketch is ready, it is compiled. And the code will be uploaded to arduino board kit.

III. MODELING AND ANALYSIS

The environmental parameters which are to be measured are introduced in layer 1. In layer 2 the Study of the featured sensor devices . Layer three includes decision making on measured sensor data with the

timing and space. Layer 4 is collecting the data and the layer 5 is sensing surrounding data. Then the data will be uploaded to cloud via internet. The proposed model of the system is shown in the figure 3.1 At first the environmental parameters are measured and then studying characteristic features of sensor device, decision making on sensor device and threshold value, Then data is collected in the server which is sent by wifi module which works at 3.3 volt. The data can be seen by user in the Smartphone (By entering IP address of the server in the browser or web address of the server) or in the lcd display.

Now the flow chart of the proposed system is shown in the figure 3.3 At first we have to load the libraries which are related to the sensor and defining the pins. In the next step collecting the data from sensor (MQ 135), processing the data and displaying data on LCD display. And now we have to send the data to server through internet which is done by ESP 8266 chip. When we need to send the data to server, we need to know the entered network credential is are correct or not if they are correct then the data will be sent to server if not we need to enter the correct values then the data will be sent to the server. In the last step the measured will be visualized online. And now the entire process repeats.

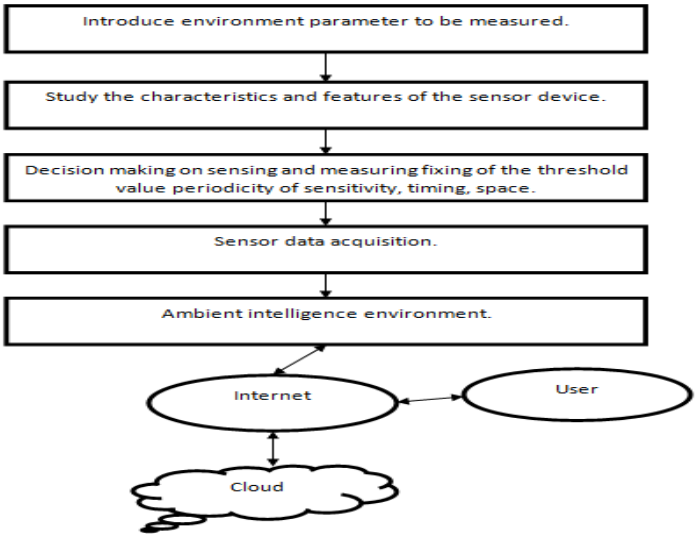

Fig 3.1 Model for proposed system

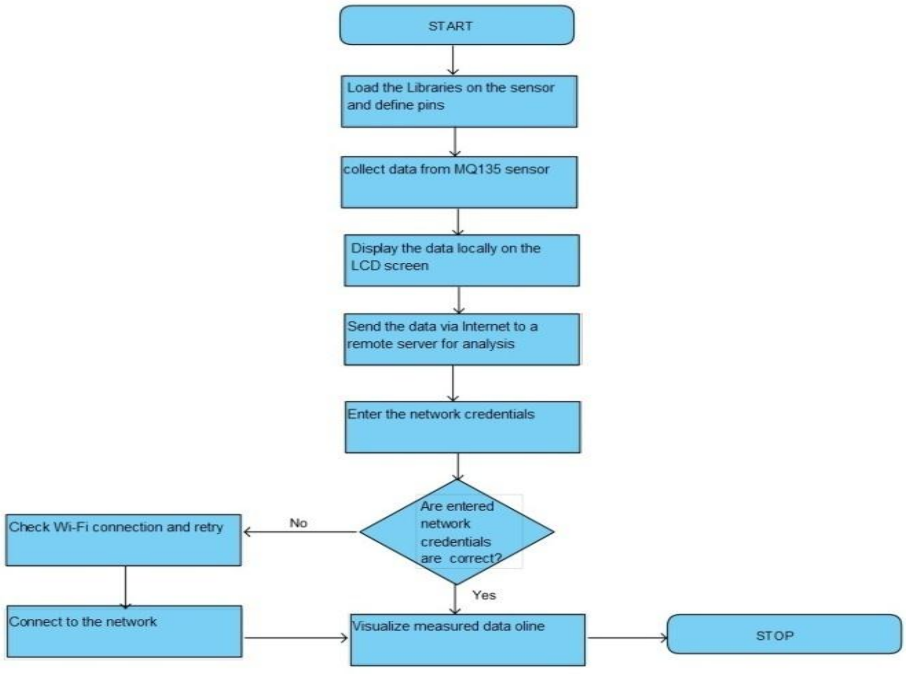

Fig 3.3 Flow Chart of the Proposed System

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IV. RESULTS AND DISCUSSION

MQ 135 Sensor taking air as input and analyses the gas particles: We have used the MQ 135 senor for detecting the harmful gasses air and the ESP8266 wifi module to send the data to webpage. When the power supply is given to arduino the sensor will turn on and it will send the data to arduino . ESP 8266 module will send the data to cloud through internet when it is connected to wifi.

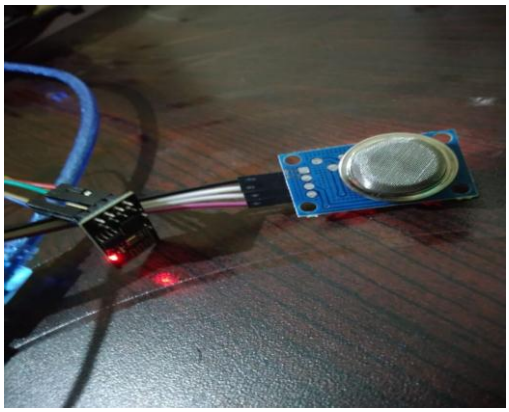

Fig-4.1: MQ 135 and ESP 8266 sensors

Connecting esp8266 to wifi and uploading data to cloud: To send the air quality data to thing speak we need to enter the correct network credential which are API key, wifi name, wifi password etc. in the program then we will upload the program to arduino. Now to connect esp8366 to wifi send the AT command in the serial port.If the network credentials are correct then it will show wifi connection is ok. If the network credentials wrong it will throw some errors.

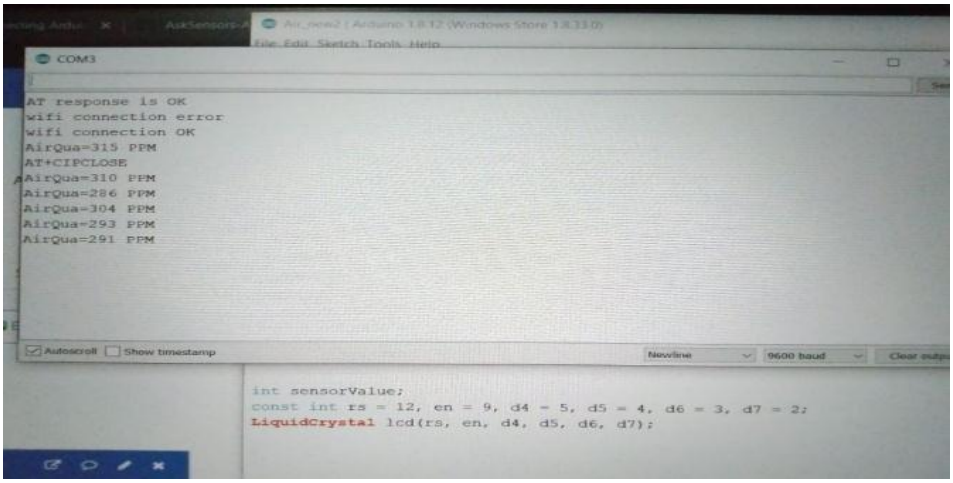

Fig-4.2 Serial Port

User can see the air quality in the lcd display or the live data can be seen in the thing speak website

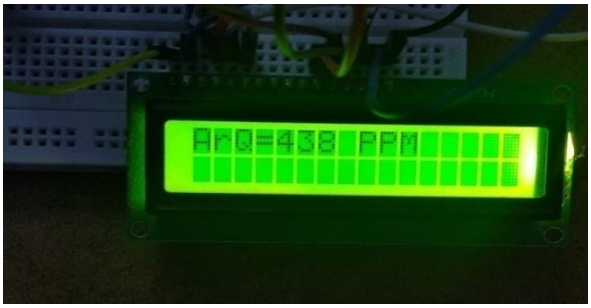

Fig 5.3 LCD display

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Data stored in the cloud**:** Air quality index data will be stored in the thing speak server. And the data can be extracted in three format which are xml,csv and json. By using these data sets we can analyze the data.

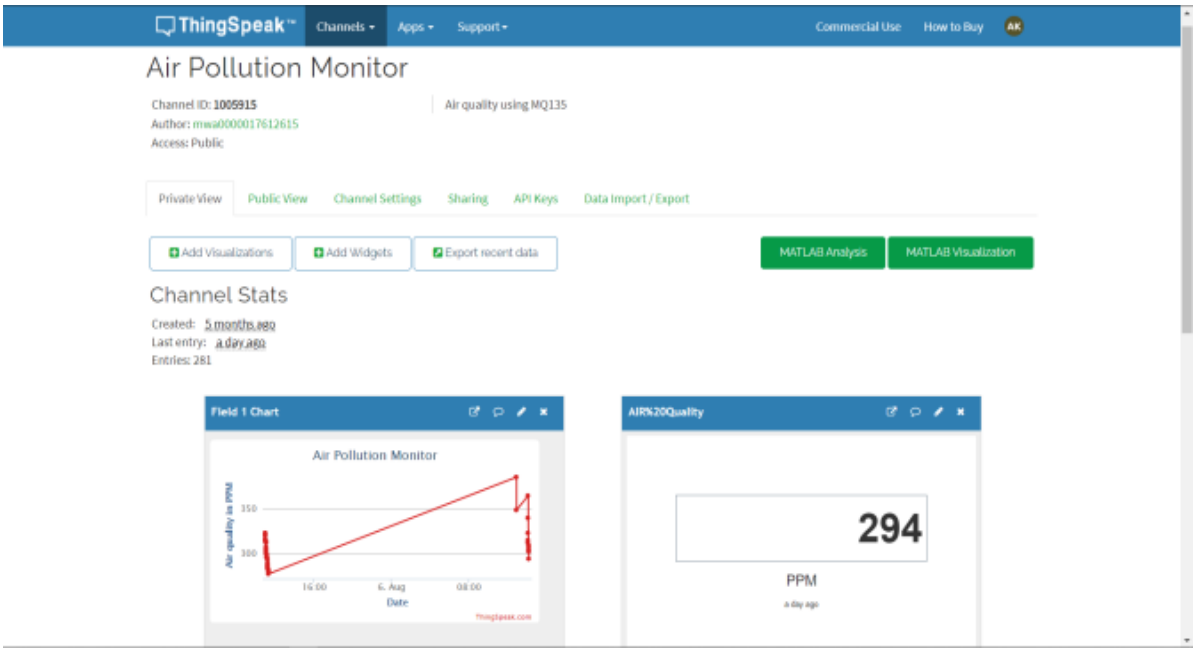

Fig 5.4 Thing speak web page

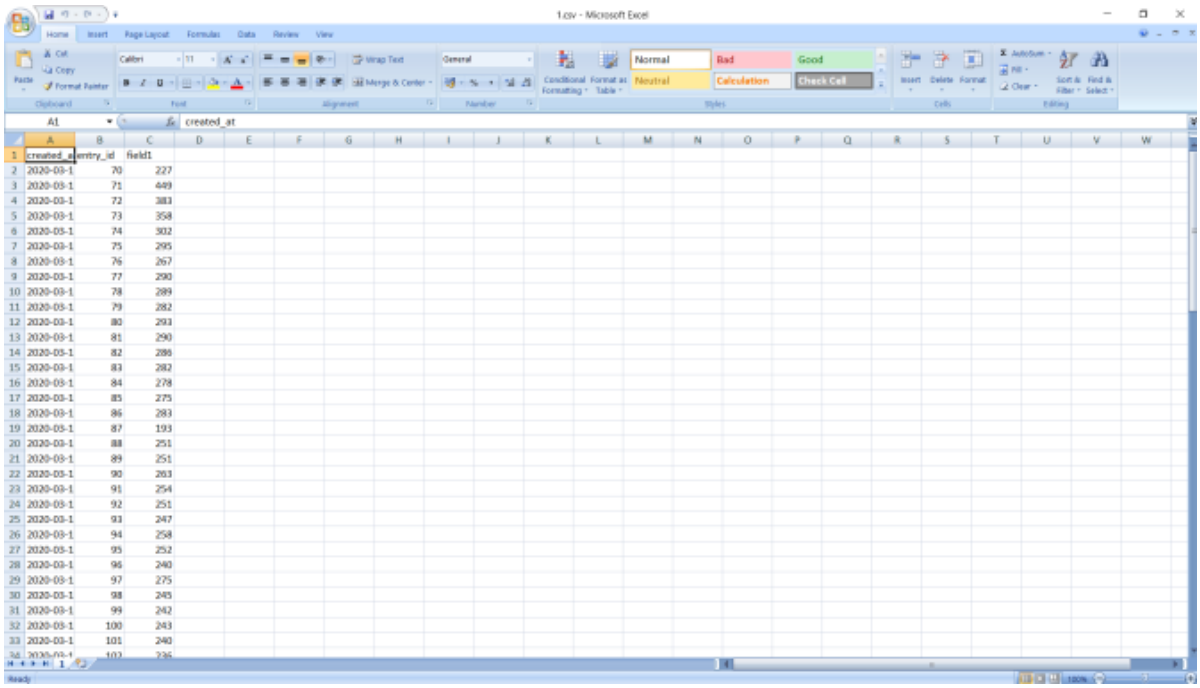

Fig 5.5: Data

V. CONCLUSION AND FUTURE SCOPE

The system to watch the air of environment using Arduino microcontroller, IOT Technology is proposed to enhance quality of air. With the utilization of IOT technology enhances the method of monitoring various aspects of environment like air quality monitoring issue proposed during this paper. Here the using of MQ135 gas sensor gives the sense of various sort of dangerous gas and Arduino is that the heart of this project. We implemented our system on the Arduino system monitor and the 16x2 LCD display by using the MQ135 sensor and the system displays the values that it received from the MQ135 sensor and will show the corresponding air quality rating as per the PPM value.

FUTURE SCOPE

This project can also be implemented using a WiFi module that displays the AQI on a web server continuously. The server can be accessed by everyone, anytime and it can keep them informed about the air quality of a particular location. We can also connect multiple Arduino's and display the AQI of multiple areas and compare them to find which area is more polluted and which one is cleaner. We can also use the GSM module to send messages to users when the air quality goes above a particular limit i.e. the citizens can be alerted if the AQI goes above 300 and the air quality turns bad. This can keep them well prepared. Additional sensors to measure temperature, pressure, humidity can be added. Since many air quality monitoring systems in Mumbai are not in operational condition, this project can be implemented for the benefit of the city. The project can also be implemented on a large scale by installing large LED screens across the city that displays the AQI and its corresponding category. I can also show warnings so that the citizens can take precautions when required.

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