## 1. Uniqueness of Invention

Because of the increased burden on public transportation like buses, we need a smart and portable management system which provides us with an efficient method to track the current location of a bus and help the stakeholders with efficient time management.

With the increase in pollution levels in the atmosphere, the air quality continues to deteriorate by the day. Even rural areas are affected by the overall increase in vehicle emissions, which is one of the major causes of the increase in pollution. So a system is needed where we can constantly monitor the surrounding pollution levels. Instead of an inert system, where it has to be fixed in a single place, a mobile system, which has more flexibility, is suggested.

The current existing methods only either track the bus location or just monitor the air pollution levels at a particular designated area separately. Which may not be that useful on its own. And even if the data is collected, it becomes useless if any precautionary measures are not taken based on the high-risk levels. So here, the mobile application comes into play.

We are currently making the sensors take real-time data by placing it on one of the public transport, here—the busses. Connecting the air pollution monitoring sensors to the GSM (Global System for Mobile Networking) module along with a GPS (Global Positioning System) sensor, we can view the real-time data of the current location of the bus along with the PM sensor received data. There would also be an AHT10 sensor which is used to measure temperature and humidity present in the air.

The PM (Particulate Matter) sensor takes in data on the present air-borne particles under 2.5 and 10 μm. It shows us the pollution levels in the atmosphere. It updates at rapid time intervals and the overall weekly collected data can also help us in taking measures for better air quality management.

This system is accurate and also cost-effective. It is a nice way to ensure overall efficiency. They also allow us to monitor the location and the direction of the bus, along with other metrics. We can use this not only on public transport but also on educational-wide transportation like school and college buses.

It helps the stakeholders for better time management, safety and on-time response in case of emergencies by viewing the graphical and locational data displayed on the android mobile application on their smartphones.

## 2. Concept/Objective

A bus-tracking app forms part of the entire system of a real time bus management and serves as a convenient access point when downloaded onto the phone of the users.

The bus-tracking app provides parents and authorities a map view of the current position of the bus with information of where the bus is currently located.

To begin with, a bus-tracking app uses modern GPS technology. Thus, a GPS device installed within a bus can transmit its location in real time, which can be displayed on a map.

As we could imagine, a situation where students travel on a daily basis forms an important segment of bus travel. When there is a sudden repair in the bus or the bus has diverged from the current route, it creates a dilemma for the passengers on the bus. They get confused whether to board another bus or to wait until the current bus gets repaired.

As mentioned above, the buses are installed with a GPS sensor that is connected to an app. The College management/College authorities (TRANSPORT INCHARGE) can track it from their respective places, meanwhile parents can track it on their mobile phones.

If there is any unplanned delay or a repair in the bus, this system also conveniently facilitates the driver in communicating directly with the college management and with the parents. Within the bus tracking application, we are adding another feature to monitor air pollution.

Nowadays, air pollution is one of the major risk factors which harms the environment. Several studies have shown the detrimental effects of air pollution on human health and wellbeing among all the air pollutants, particulate matter (PM) pollution is one of the particular concerns to worry about.

Particulate matter is classified into PM 2.5 and PM10, based upon their particle diameter. Existing networks of PM 2.5 and PM 10 monitors have shown that Particulate Matter concentrations have been increased. Due to their tiny size, they can penetrate deep into the lungs and mix with the blood stream. Which leads to cardiovascular and pulmonary diseases.

Here the main objective of our project is to increase time efficiency, safety and with air pollution monitoring we are trying to create awareness on personal health safety.

## 3. Potential areas of application

As we have collected information from our campus students and faculty, we came to know that the students are facing some difficulties in the daily operation of bus transport system, mainly that of buses and the movement of the vehicles is affected by the different uncertain conditions such as unexpected bus delays due to traffic congestion leads to waste of our valuable time.

The students and faculty who are travelling to college via urban routes, expose themselves to air pollution which could affect everyone's health. When we breathe in air pollutants, the dust particles and harmful gases can enter into our bloodstream and result in coughing, itchy eyes, respiratory disorders and lung diseases, which leads to hospitalisation. To overcome these problems, with our developed mobile air pollution monitoring and bus tracking system as a solution, we can keep track on the current status of the bus, monitoring the air pollution levels and updating the status of those to the nearest corresponding departments.

Both air pollution monitoring and bus tracking are already in existence, but in different domains. Here both the specified applications will be available in the same domain which is convenient to the user interface.

The people who travel through different cities can be the stakeholders of this application such as college students\faculty, travellers and job holders etc.

The end users of this application in the market will be many organisations such as educational institutions, hospitals, MNC companies and industries etc.

## 4. Market Potential

According to the information from educational institutions and the pollution control board, there is a huge demand for tracking of buses and knowing environmental conditions. The both global air quality monitoring and vehicle tracking system market size was valued at INR 1800 crores in 2021. It is projected to reach INR 6100 crores by 2030, growing at a CAGR of 13.9% during the forecast period (2022–2030).

As we know that the pollution of air is a never-ending process in the present generation, we must take some precautionary measures to minimise its adverse effect on people's health. We must collect data at different locations and at different time intervals and since our module is a mobile communicating device it is possible to collect data at different locations and at different time periods as the module is fixed to college buses.

We can also increase the scope of the project by placing the currently developed module on other modes of transportation. There is also a possibility to add other metrics like direction, speed, route mapping etc in the future.

The process of collecting data is a lengthy process and we cannot calculate data at every location at every time interval as it increases the burden.

Here, the stakeholders are the people who are living in urban areas, elderly and the people suffering from respiratory diseases like asthma, chronic obstructive pulmonary diseases etc. By the data collected by our module, the stakeholders can take precautionary measures to prevent any further damage to their health.

In the end, as long as there are processes related to development, which includes technology and machinery related work, it is clear that the global pollution won’t be coming down in the near future either. So, our product has much potential use in the future where health would become the top most priority in society.