

# ENVIRONMENTAL MONITORING OF AIR QUALITY USING SPACE TECHNOLOGY

Case Study: Using Google Earth Engine to monitor concentration levels of gaseous emissions in the atmosphere within Nairobi County



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## Introduction

The air in our atmosphere is mostly made up of two gases that are essential for life on Earth: nitrogen and oxygen. However, the air also contains smaller amounts of many other gases and particles comprising of Carbon monoxide, Sulphur dioxide, Nitrogen dioxide and airborne particles. Monitoring the quality of air is usually important in order to determine how clean or polluted the air in our atmosphere is.

## Problem statement

NO<sub>2</sub> is the main source of nitrate aerosols, which form an important fraction of the pollutants and, in the presence of ultraviolet light, of ozone. The major sources of anthropogenic emissions of NO<sub>2</sub> are combustion processes (heating, power generation, and engines in vehicles and ships). These emissions need to be monitored otherwise contribute to the adverse climate changes we are experiencing.

## Objectives

The main objective of this study is to demonstrate the use of Google Earth Engine and the existing free Earth Observation data (sentinel 5p) in monitoring the air quality in Nairobi county as the area of interest for years 2019, 2020 & 2021.

The specific objectives include;

- Assess the impact of Covid 19 within the county
- Monitor the concentration levels of Nitrogen dioxide within the area of interest

## Discussion

The results of this study demonstrated that Google Earth Engine is a good tool for obtaining Earth observation data for modelling environmental solutions such. This is quite evident with the products that were generated for this study which depicted a change in air quality for the three study years.

In 2019, the maximum NO<sub>2</sub> concentration levels attained was approximately  $8.125 \times 10^{-5}$  mol/m<sup>2</sup> in comparison to the year 2020 with approximately  $7.125 \times 10^{-5}$  mol/m<sup>2</sup> and 2021 had approximately  $9.375 \times 10^{-5}$  mol/m<sup>2</sup>. From these concentration levels, it is easy to deduce that the year 2020 had a little NO<sub>2</sub> emissions into the atmosphere as compared to the other study years, a fact that can only be tied to how Covid 19 impacted the operations of most locomotive machines that emit gases into the atmosphere.

## Conclusion

This study has depicted the use of space technology to monitor the air quality within the area of interest and generated supporting statistical information that could be used to inform the decision making process by policy makers.

