

# Comparative Time-Series Analysis of the Air Quality of Urban and Suburban Areas in the Philippines from 2020 to 2025

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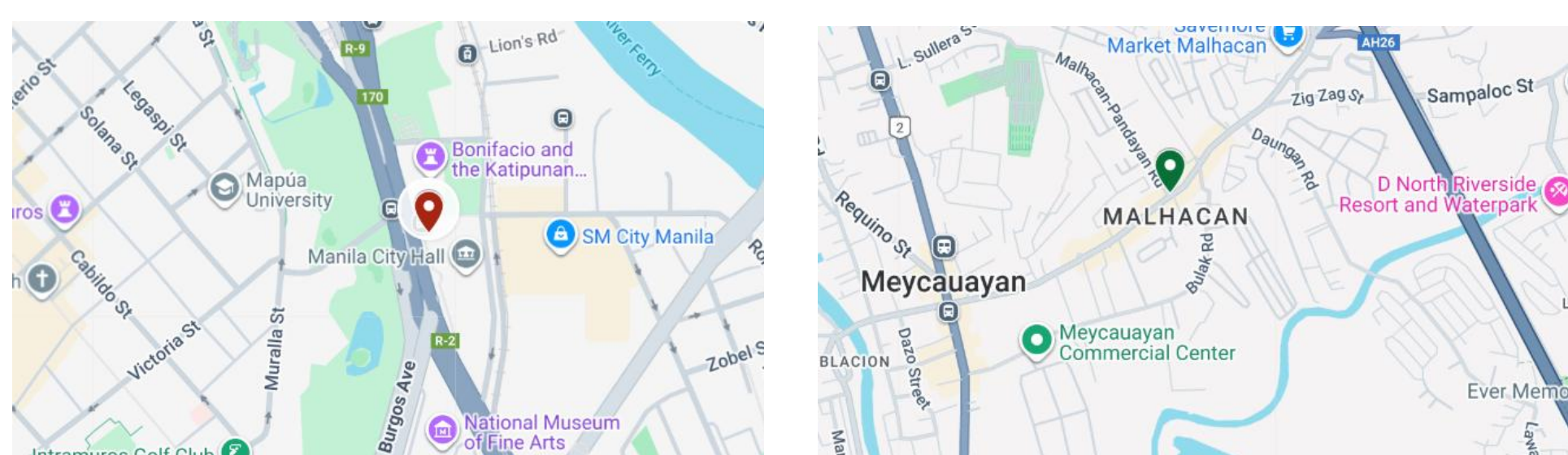
## INTRODUCTION & AIM

Air pollution is one of the major global concerns impacting the pillars of sustainability—economic, environmental, and social factors. With this, the continuous rise in population, industrialization, and energy consumption has caused environmental problems to rise over time, which has also caused to significantly affect the air quality and temperature in the country.

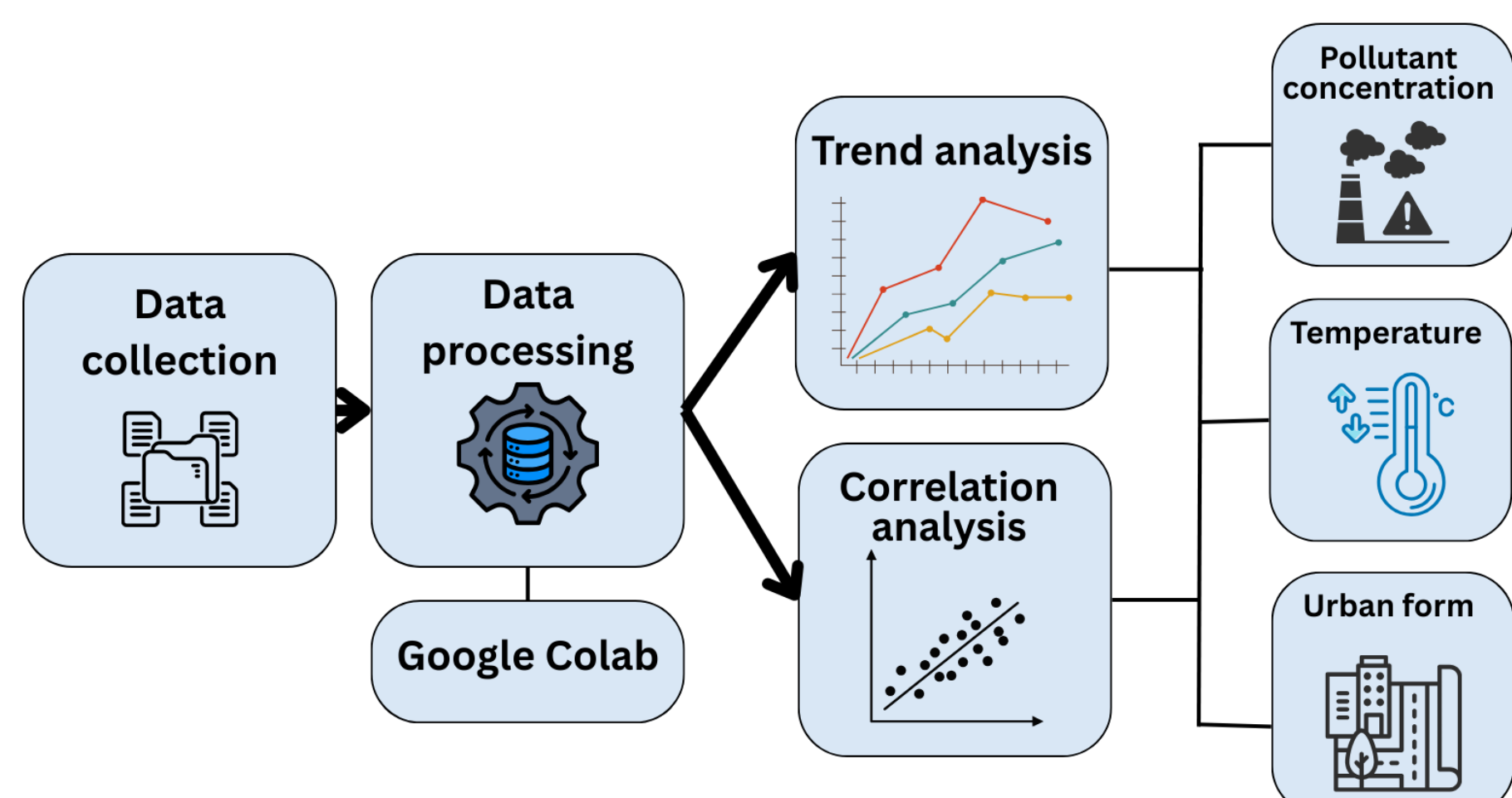
The aim of the study is to compare and analyze the pollutant concentration in relation to the urban form and the meteorological factors from 2020 to 2025.

## METHOD

The research was conducted in two areas in the Philippines with Manila and Bulacan represents the urban and suburban areas, respectively.



Two analytical methods were conducted: (1) a multivariate time-series analysis was performed to examine the trend of air pollutants in correlation with meteorological factors and urban morphology in these areas, and (2) a comparative analysis was performed to assess the similarities and differences of pollution concentrations across geographical areas



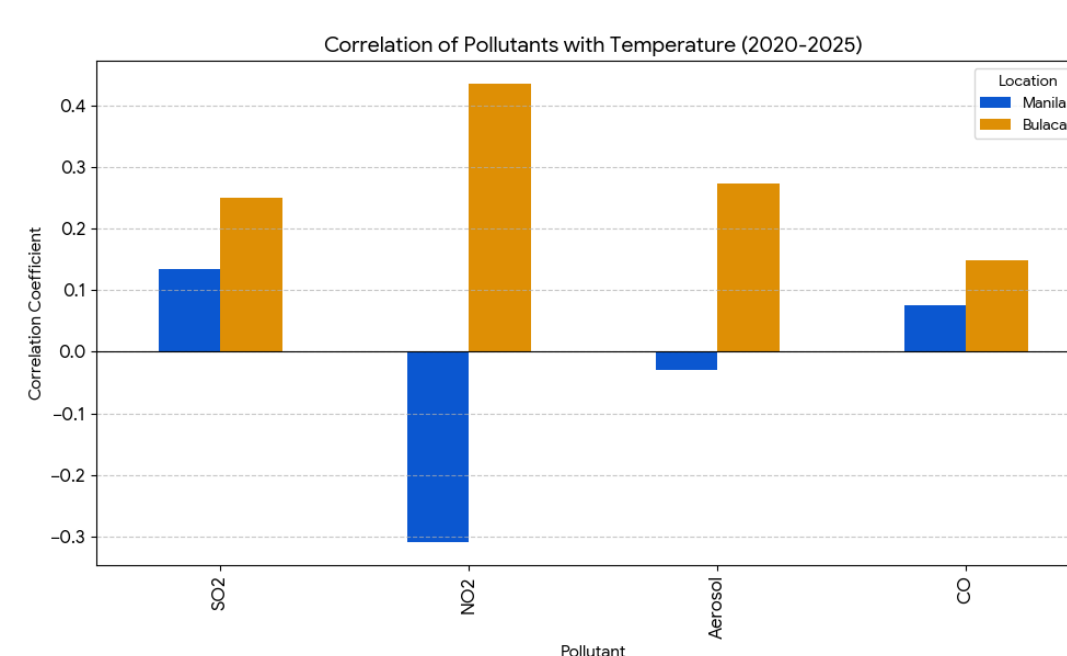
## RESULTS & DISCUSSION

The results showed that there is a significant difference between the  $\text{SO}_2$ ,  $\text{NO}_2$ , Aerosol Index but there is no significant difference between the CO levels as it has a similar levels for both Bulacan and Manila. However, the results also exhibited the strong correlation between the distribution patterns during the seasons between the two study sites.



The normalized trend also illustrates the increase in values during the months of March to May in every year. The spikes are also observed in the four pollutants. The lowest normalized values were observed during the lower temperatures during the year.

Moreover, relating it to the temperature,  $\text{NO}_2$  indicates a negative correlation with -0.31 in Manila but a positive correlation with 0.44 in Bulacan.



The aerosol levels in Manila shows no correlation and a weak tendency in Bulacan to increase the temperature. For the  $\text{SO}_2$  and CO levels, both areas displayed a weak positive correlation to the temperature.

## CONCLUSION

The CoVID-19 pandemic caused a shift in the pollutant concentration as this event has caused the limitations on the movement of the community. As the restrictions were fully lifted in 2023, the pollutants also went back to its typical values up to the present. The seasonal distribution patterns were also shown but the urban areas exhibited higher values than of those suburban area. With the dense urban form in Manila, data also shows that there is a relationship between the pollutant concentration and the urban morphology of the two areas.