DAILY CHANGES IN BLACK CARBON CONCENTRATIONS FOR URBAN MOBILITY IN ISTANBUL

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1. Objective

The data obtained from various sources before and after the pandemic and using multiple visualization programs were compared with the help of tables and maps.

2. Introduction

In this project, Black Carbon data were analyzed for the pandemic period and post-pandemic, using utilities such as Tropomi, ArcGIS, Surfer and Origin to evaluate the air pollution caused by mobility in Istanbul. Comparisons were made by creating various graphs, tables and maps on this subject.

3. Materials and Methods

Materials

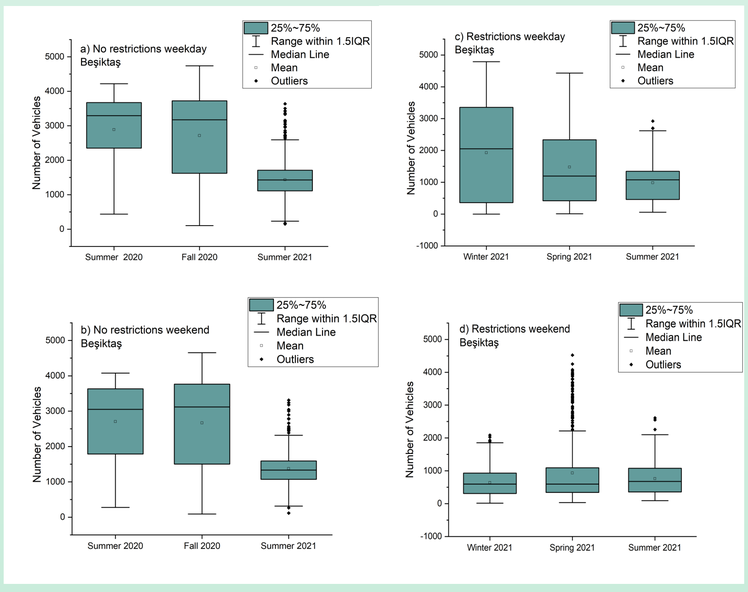
ScienceDirect, Clarivate Web of Science™, NASA, İSTANBUL BÜYÜKŞEHİR BELEDİYESİ

Methods

ORIGINPRO® The Ultimate Software for Graphing & Analysis, Surfer, ArcGIS, TROPOMI

4. Analytical Results

4.1 Box Chart Graphic

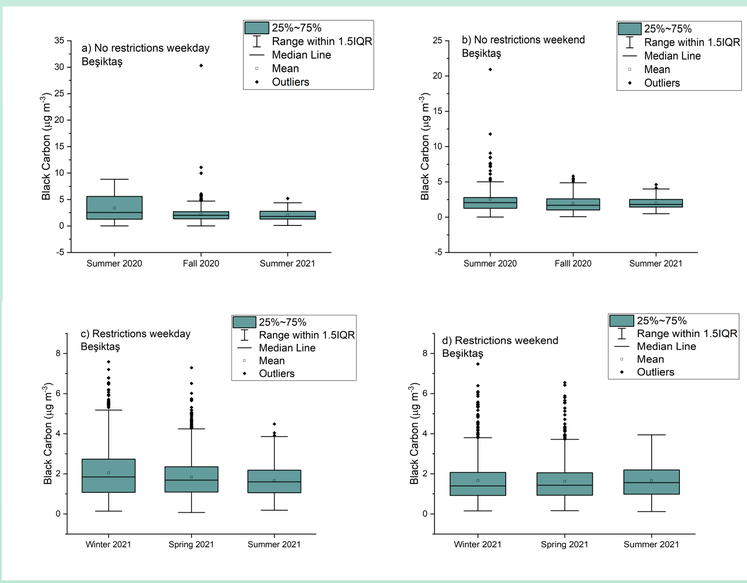


Vehicle Mobility

When Graphs A and C were compared, it was shown that the number of cars on non-restricted weekdays was significantly larger than on restricted weekdays.

This result was also corroborated by a comparison of Graph B and Graph D.

When comparing weekday and weekend statistics, while there was no significant difference in the number of cars during non-restricted times, there was a substantial difference in the number of vehicles during restricted times.

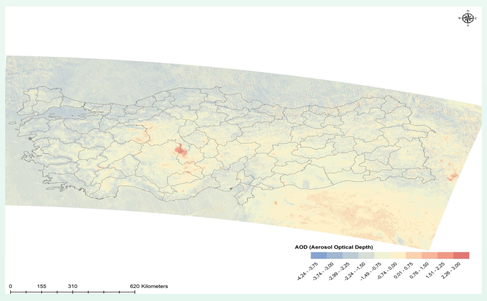


Black Carbon

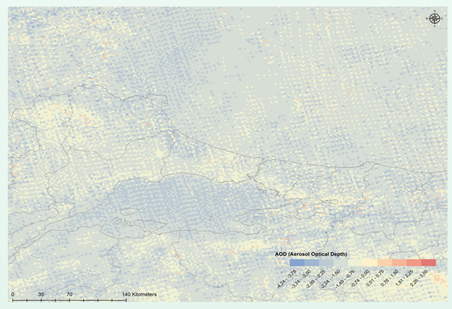
Black Carbon concentrations were found to be lower on days when restrictions were imposed than on days when they were not.

The concentrations of black carbon on weekdays were found to be greater than on weekends.

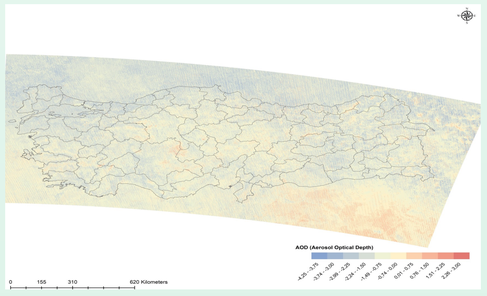
4.2 Tropomi



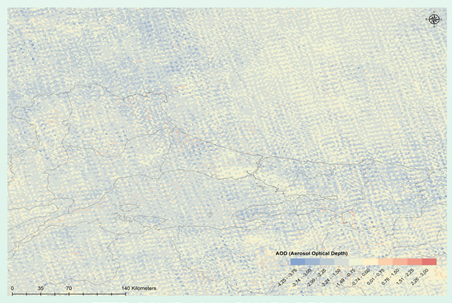
COVID-19 TURKEY
(20-27 August 2020)



COVID-19 MARMARA REGION
(20-27 August 2020)



AFTER COVID-19 TURKEY
(3-10 May 2021)

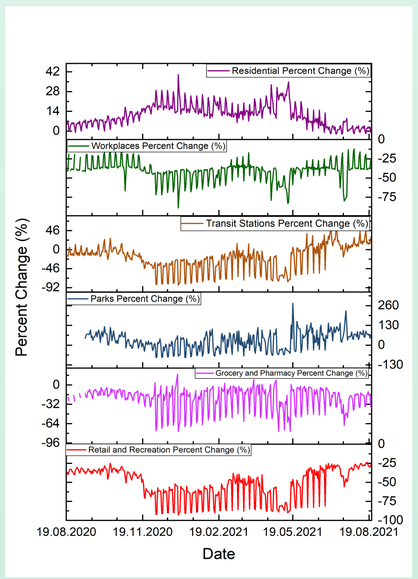


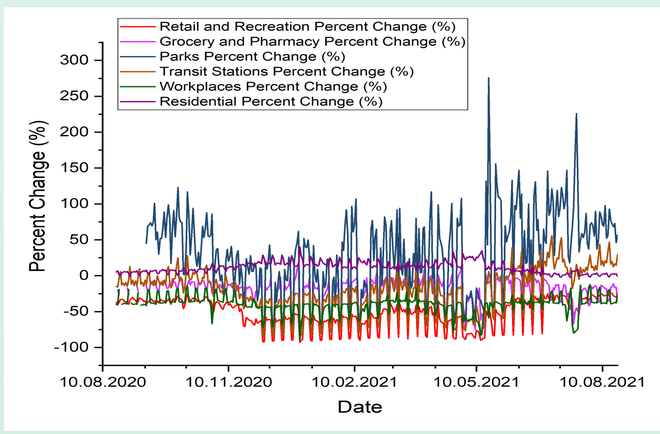
AFTER COVID-19 MARMARA REGION
(3-10 May 2021)

NASA provided the Aerosol Optical Depth data. The R programming language was used to analyze the data. Then, using ArcGIS Map, data for Turkey and the Marmara Region were visualized.

There was no discernible variation in the data between the four maps shown from the left side. As a result, it was determined that Tropomi should not be used to evaluate Black Carbon.

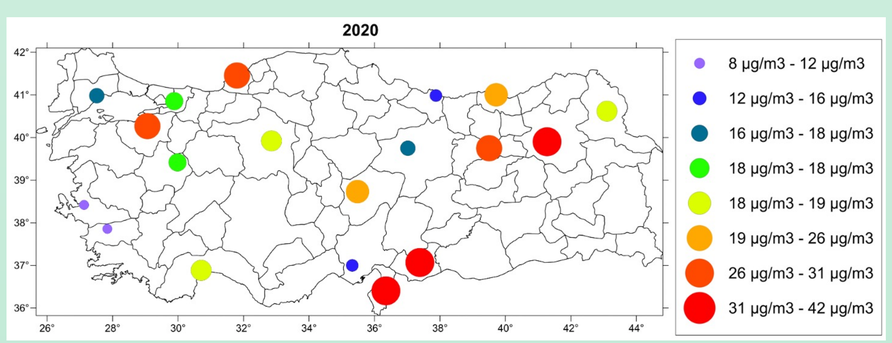
4.3 Mobility

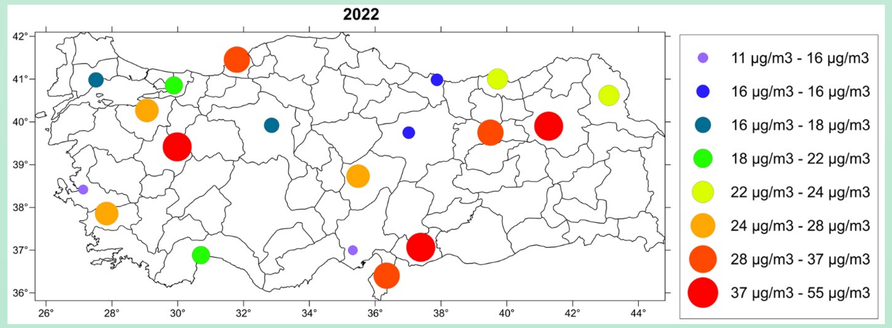




The percentage changes in the variables Retail and Recreation, Grocery and Pharmacy, Parks, Transit Station, Workplaces, and Residential were used to construct two graphs for Mobility.
The highest increase was seen in parking areas, whereas the largest decline was shown in both Retail and Workplace, according to the two graphs.

4.4 Turkey Regional $PM_{2.5}$ Values Before & After Covid-19





The Surfer program was used to build two separate Turkey maps for 2020 and 2022, utilizing $PM_{2.5}$ data from the Ministry of Environment, Urbanization, and Climate Change.

$PM_{2.5}$ data at the beginning of the epidemic, in 2020, showed lower concentrations than those towards the end of the pandemic.

5. Discussion and Conclusion

As a result, Black Carbon and PM2.5 values, which were mostly observed during the pandemic period, were found to be lower than during the post-pandemic period, as seen in the graphics and maps created with data obtained from the Ministry and IMM, with the exception of the maps created using Tropomi data. The conclusion was reached that evaluating tropomy data for Black Carbon was inappropriate. The limits imposed during the pandemic period resulted in a reduction in transportation and air pollution indicators.

6. References

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3. http://sim.csb.gov.tr/SERVICES/airquality