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GIS Based Carbon Dioxide Concentration Research in ITU Campus, Istanbul –Turkey



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Carbon dioxide is a colorless, odorless gas. It is produced both naturally and through human activities, such as burning gasoline, coal, oil, and wood. In the indoor environment, people exhale CO₂, which contributes to CO₂ levels in the air.

Aim of the study

The level of CO₂ indoors depends upon:


- the number of people present
- how long an area has been occupied
- the size of the room or area
- the amount of outdoor fresh air entering the area
- **the outdoor concentration**

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Aim of the study

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In this study, the carbon dioxide (CO₂) and carbon monoxide (CO) level in the main campus at Istanbul Technical University, referred as ITU, were selected as the subject of the study. GIS based distribution maps were realized using daily measured parameters in the campus.

Aim of the study

Daily measurements were stored in excel file which are used as attribute data in GIS. Data of ITU 's main campus are used as basic spatial data and different maps are created related to the measurements and analysis.

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Aim of the study

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ITU is an international technical university located in Istanbul, Turkey, established in 1773. It is one of the world's oldest universities dedicated to engineering sciences. Now, the university has five different campuses in the heart of Istanbul with thirteen faculties and six research institutes with about 30K people including students and staff.

Study Area

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Study Area

At the 80's, the neighborhood of the ITU main campus was totally covered with the forestry areas and small buildings which were converted to skyscrapers later on. The area now is housing many national and international companies in these huge skyscrapers at the northern part adjacent with a road of high traffic intensity.

Study Area

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Study Area

The other parts of the campus are either surrounded by squatter's house or roads which can be classified as heavy traffic. As the indoor air quality is directly dependent to outdoor gas component, the study has been focused to find out the distribution of Carbon monoxide and Carbon dioxide levels in and around the campus.

Study Area

2



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Study Area

- CO₂ five CO - CO₂ measurement series
- CO₂ different days
- CO₂ delta Ohm
- CO₂ 30 selected measurement points

Measurements

- CO₂ student social center
- CO₂ student dormitories
- CO₂ kindergarten, elementary-high schools
- CO₂ areas with dense trees
- CO₂ main entrances to the campus

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Measurements

CO₂ similar atmospheric condition

CO₂ ~ 1015 milibar

CO₂ 12 °C - 17 °C

CO₂ light windy on 2 days, one measurement on Sunday

Measurements

	Day 1	Day 2	Day 3	Day 4	Day 5	Average
Average	408	389	391	387	408	396

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Measurements

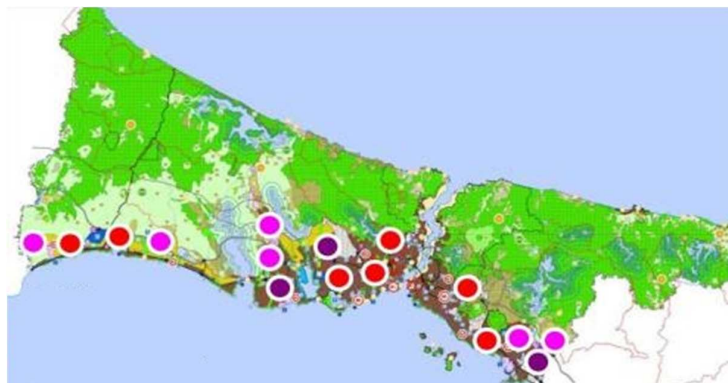
Istanbul houses more than 850 number of industries mainly distributed to the south of ITU main campus.

This means that north wind brings fresh or clean air to the city and ITU campus, and south winds will take the contaminated air from those industrial zones.

So the wind direction plays an important role for fresh air at parts of the city.

GIS Analysis

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GIS Analysis

Northern part of the campus is adjacent to a very dense traffic. 6 of 7 entrances to the campus is from on this road.

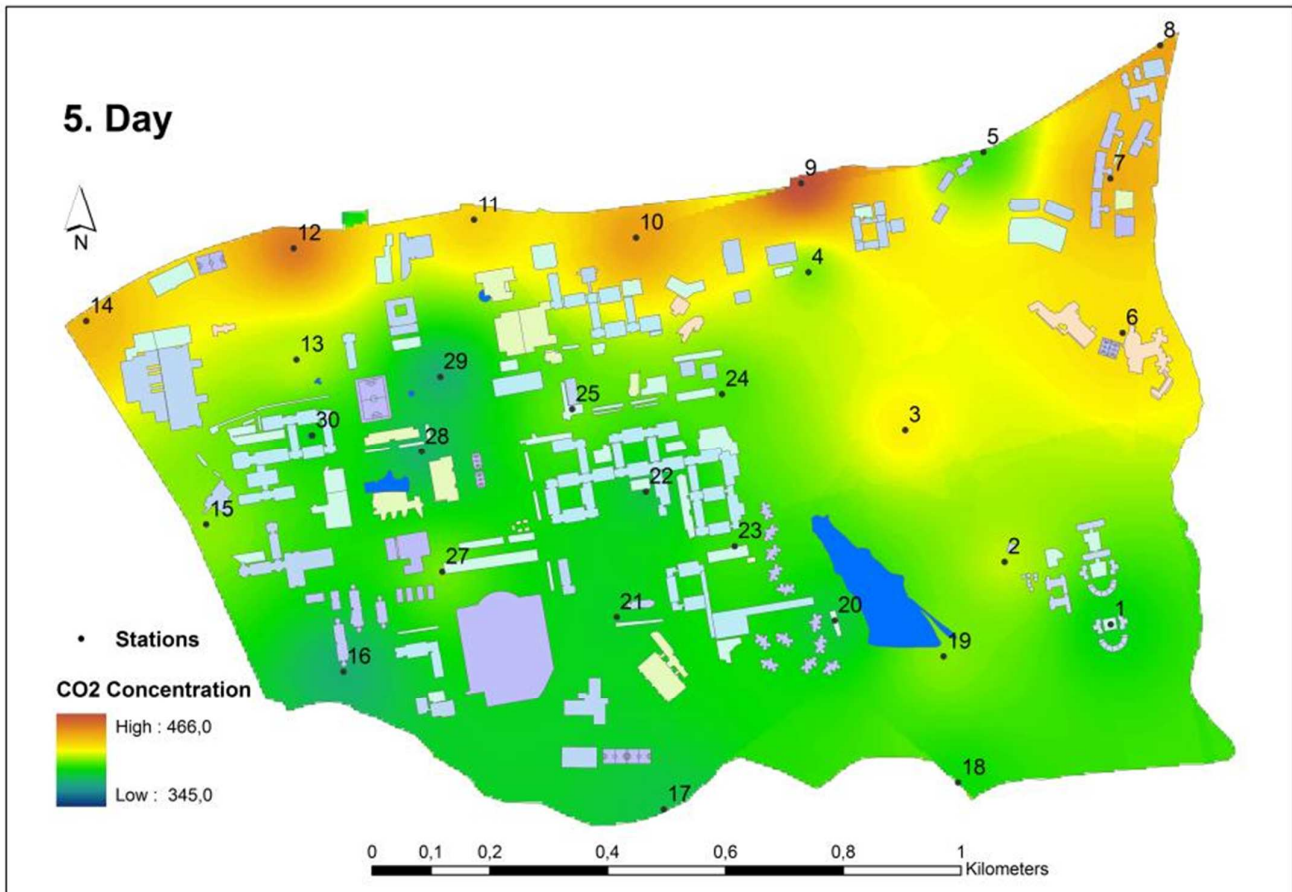


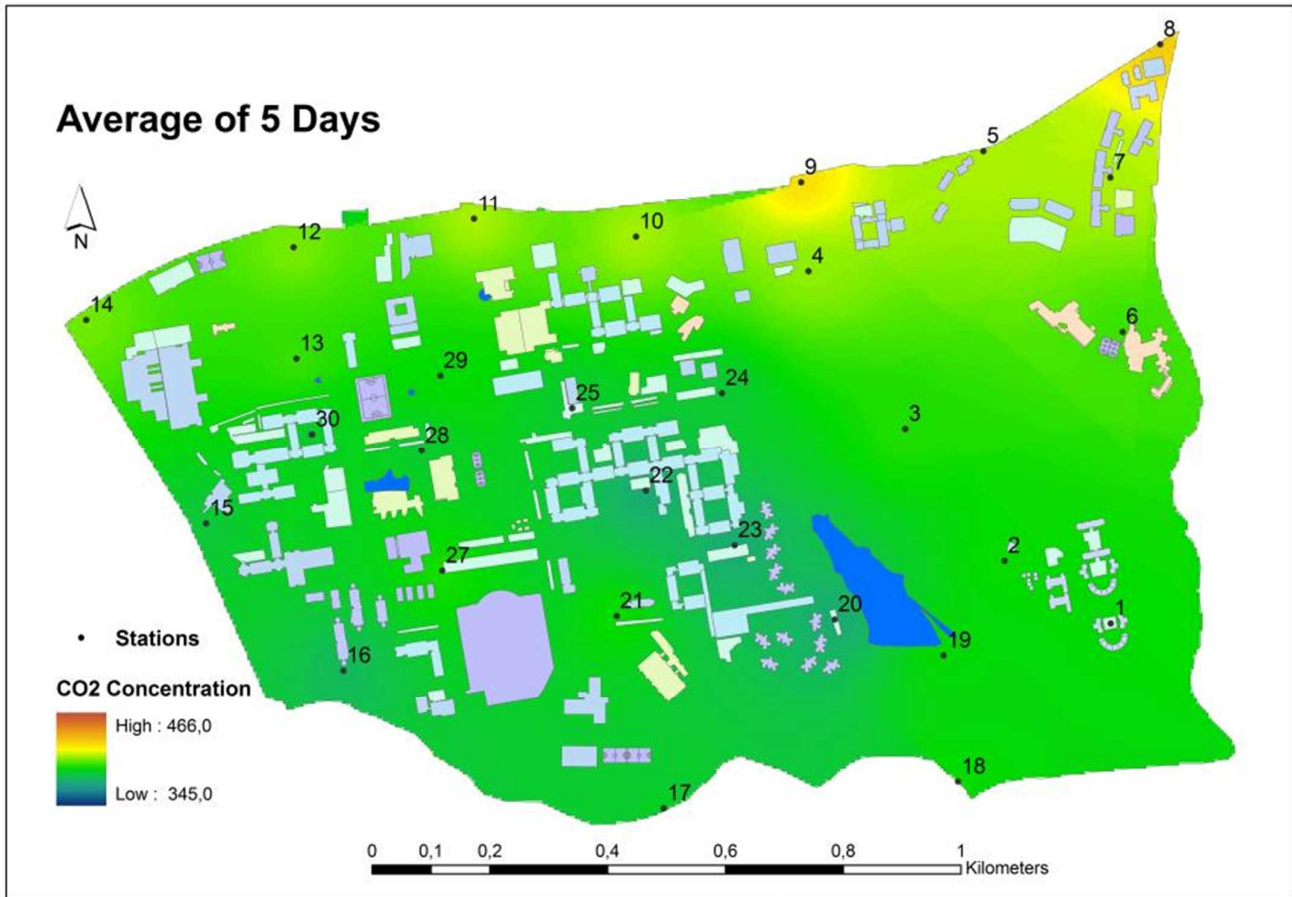
GIS Analysis

There is also a wooded area with a pond in the campus, where the lower CO₂ concentration has been expected

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GIS Analysis





- Daily campus averages varies between 389 ppm and 408 ppm.
- Point averages have instead a wider variation cycles between 377 ppm and 428 ppm.
- Highest average concentration has been captured at point 8. This point is one of the main entrance of the university.
- A CO concentration of 2 ppm on one day has been discovered at point 14, which is also one of the main entrance to the University.

Conclusions

- CO2 concentration distribution is generally decreasing from north to south.

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Thanks..

Any questions ???????

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