

Project title: In Search of Clear Skies

Team members: Benjamin Kidston, Chu Nguyen Kien, Gauri Gupta, Michelle Carvalho

Project outline: Where are the best and worst locations for air quality in Canada? Our goal is to provide a leaflet heat map of the most recent air quality data recorded at stations throughout Canada. Then, provide insight on some of the contributing factors: Proximity to greenspaces, and proximity to power and chemical plants, which may or may not decrease local air quality. These hypotheses can then be tested with statistical models.

Dashboard Visualizations

- Heat map of air quality throughout Canada
 - User interaction - date/select provinces to zoom/select
 - Layers of
 - Parks locations, Power/Chemical plants locations
- Correlate air quality to:
 - User can select which element to view
 - Greenspace ~ Proximity to parks - geoapify
 - Proximity to power/chemical plants
 - Weather effects? TBD
- Statistical significance/models of correlations (AQI - Air Quality Index)
 - Scattergrams, box plots (identifying outliers?)

Tools:

API - Geoapify, waqi

Database - Postgres - SQL database (Static - Parks + Power plants)(Dynamic - ?)

Language - Python, SQL, HTML, JavaScript

Library - Pandas, Flask, D3, Leaflet, OpenLayers

Visualization - JS, HTML/CSS

Rough breakdown of tasks

Benjamin -> JS Data collection + sorting of air quality, JS heatmap of air quality, (initial HTML to work js scripts with), Html, CSS file

Chu -> visualization of

Gauri -> presentation introduction, README file

Michelle -> JS Data collection + sorting of parks and power plants, Python-Flask powered API, PostgreSQL DB,, JS overlay and controls of parks/power stations

Timeline

Thursday Feb 16 - Javascripts for pulling data, initial HTML to start off

Data Sources

Air Quality

<https://utorvirdatap-hwb2609.slack.com/archives/C04PBNNCMQT/p1676336014749349>

<https://aqicn.org/map/canada/>

<https://www.breezometer.com/air-quality-map/air-quality/canada/toronto>

[https://www.aqi.in/ca/dashboard/canada/ontario/toronto#:~:text=1.,25%20\(MODERATE\)%20AQI%20now.](https://www.aqi.in/ca/dashboard/canada/ontario/toronto#:~:text=1.,25%20(MODERATE)%20AQI%20now.)

Complimentary/correlating data/visualization ideas:

- Data source options:
 - <https://aqicn.org/api/> (AQI)
 - <https://weathersource.com/products/onpoint-api/> or <https://openweathermap.org/api>
 - <https://parks.canada.ca/>
 - <https://geohub.lio.gov.on.ca/datasets/municipal-park/explore?location=50.580480%2C-84.745000%2C4.85>
 - <https://www.geoapify.com/places-api>
 - <https://datasets.wri.org/dataset/globalpowerplantdatabase> (power plant datasets, global)

<https://waqi.info/#/c/35.35/-92.933/4.6z>

JS Library (options):

<https://kinsta.com/blog/javascript-libraries/>

Pics

Support The Following Pollutants

Pollutant	Scientific name	Unit of Measurement
PM10	10 µm Particle Pollutant	µg/m3
PM2.5	2.5 µm Particle Pollutant	µg/m3
O3	Ozone	ppb
CO	Carbon Monoxide	ppb
SO2	Sulfur Dioxide	ppb
NO2	Nitrogen Dioxide	ppb



Real-time US EPA Air Quality Index for particulate (PM_{2.5}) air matter.

Thu, Jun 17, 2021, 11:30 AM



Moderate

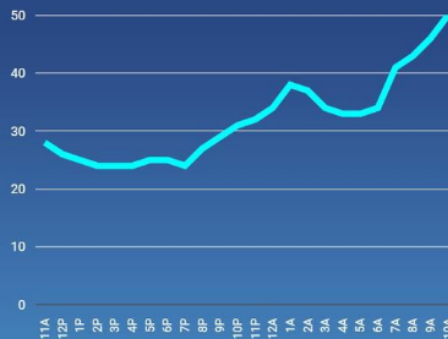
Unusually sensitive individuals (people with lung and heart disease) may be affected.

Air Quality Index

- | | | |
|--------------------------------|---------|-----|
| Good | 0-50 | (i) |
| Moderate | 51-100 | (i) |
| Unhealthy for Sensitive Groups | 101-150 | (i) |
| Unhealthy | 151-200 | (i) |
| Very Unhealthy | 201-300 | (i) |
| Very Hazardous | 301-500 | (i) |

Past 24 Hours

Wed, 6/16/21, 11:00 AM to Thu, 6/17/21, 10:00 AM

☒ Day ☐ Week ☐ Month ☐ Year

NE O.PL OFFICE

 78%

Temp	21.7	°C
RH	30.9	%
CO2	521.3	ppm
TVOCs	84.2	ppb
Dust	7.2	µg/m ³

Boardroom SE

 74.6%

Temp	21.7	°C
RH	30.9	%
CO2	521.3	ppm
TVOCs	84.2	ppb
Dust	7.2	µg/m ³

CEO's Office

 81.7%

Temp	22.3	°C
RH	30.6	%
CO2	681.0	ppm
TVOCs	534.7	ppb
Dust	11.0	µg/m ³

SW Office Space

 82.1%

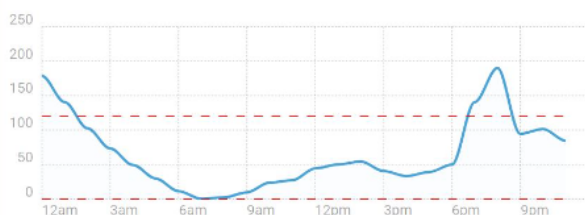
Temp	21.1	°C
RH	24.1	%
CO2	560.7	ppm
TVOCs	88.2	ppb
Dust	6.4	µg/m ³

Boardroom SE

05/03/2020



Chemicals



Volatile organic compounds (VOCs), are often found in cleaning products, and new furniture, carpets, and paints. High levels of VOCs can cause headaches, irritation, drowsiness, and eventually, asthma or cancer.

CURRENT CHEMICALS

84.2 ppb

THRESHOLDS

MIN:	0
MAX:	120

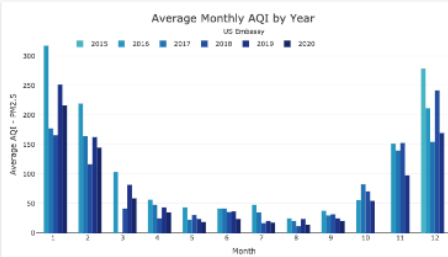
INSIGHTS

AVERAGE:	65.4 ppb
MIN:	0.1 ppb
MAX:	190 ppb
TIME EXCEEDED::	16.7 %

- Yearly
- Monthly
- Daily
- FAQ's
- About

Yearly Comparison

Select station: US Embassy Select pollutant: PM2.5 [UPDATE](#)

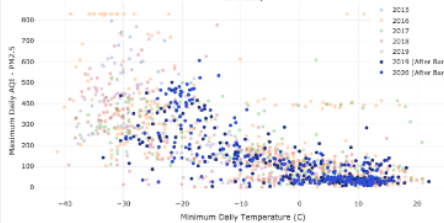


Max AQI (since July 2019)

606 on 2020-01-25

Min AQI (since July 2016)

AQI & Temperature Comparison



Avg AQI (Since July 2014)

66

Rough notes/ideas

- Interaction based on user selection of (time? Province?)
- Layers of - traffic usage (waze?), bike paths/usage, geojson of parks/natural reserves, wildfires (that's mostly US), power plants, chemical plants
- Summary visuals
 - Worst/best 5 cities for AQI
- Compare rural vs urban
- What time of day is the AQI worst/best
 - Consider clustering markers
- Contributions to Air Quality?

Which particulates are most harmful to air quality? In other words, which particulates are associated with the worst AQI levels?

In contrast, what are some features that may be associated with optimal AQI levels? For instance, proximity to forests, frequency of solar powered homes, and low level of traffic. By finding features that are correlated with better air quality perhaps I can improve AQI through subsidizing these activities/natural solutions.

Rather than correlation, can we investigate causation of poor AQI?

How is agricultural and food production associated with AQI? Merging farming/agricultural datasets could provide useful insights to this question.

For Urban (top three populated states) : Rural (less populated) :

For each of those states/provinces , we'll study the evolution of the yearly AQI of several pollutants, namely : o3, co, so2, pm2.5 and we'll try to give an answer to two questions :

Is the air now cleaner or more polluted compared to what it was in the past ?

Which states are cleaner, the rural or the urbans ?

Pollutant Statistics¶

pollutant	Average	Count	Min	Max	Sum
0	pm25				
1	pm10				
2	no2				
3	o3				
4	so2				
5	co				

Heatmap average AQI by Pollutants Provinces / GTA

What is to be added in a ppt and readme (overlapping content?!?)

readme to have only methodology?

give some literature on pm,so,co ? add in both ppt and readme ?

Final data sources

- <https://datasets.wri.org/dataset/globalpowerplantdatabase> (power plant datasets, global)
- <https://www.geoapify.com/places-api> (parks data)
- <https://aqicn.org/map/canada/>
- <https://github.com/ermiasgelaye/Google-Health-Search-Project>

Globally we are showing the AQI in Canada.. Then we focus on southern Ontario.. Parks and power plants

To give summary statistics on first page for southern ontario then which pollutant is contributing.