



AIR QUALITY CHANGES DURING THE SPRING 2020 PUBLIC HEALTH EMERGENCY

Work to inform the CASA project *“Impacts of Reduced Transportation on Air Quality in Alberta Associated with COVID-19”*

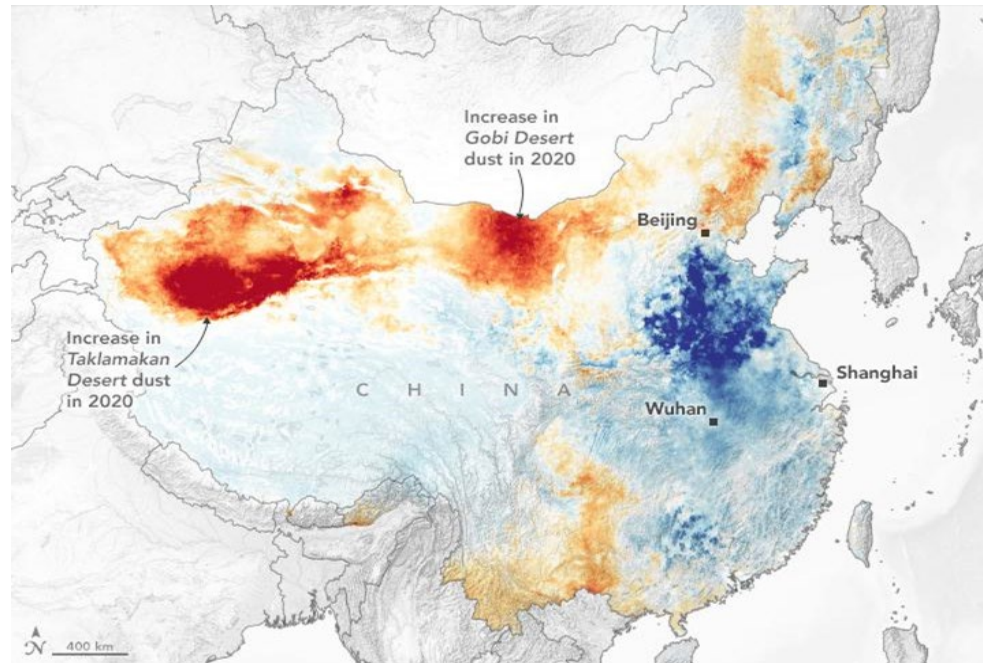
Yayne-abeba Aklilu
Oct 27, 2022

Alberta

MARCH 2020

Policies to reduce the spread of COVID-19 in most areas of the world required reduced population mobility

There was a great deal of scientific interest on how this reduced mobility also affected atmospheric concentration of pollutants



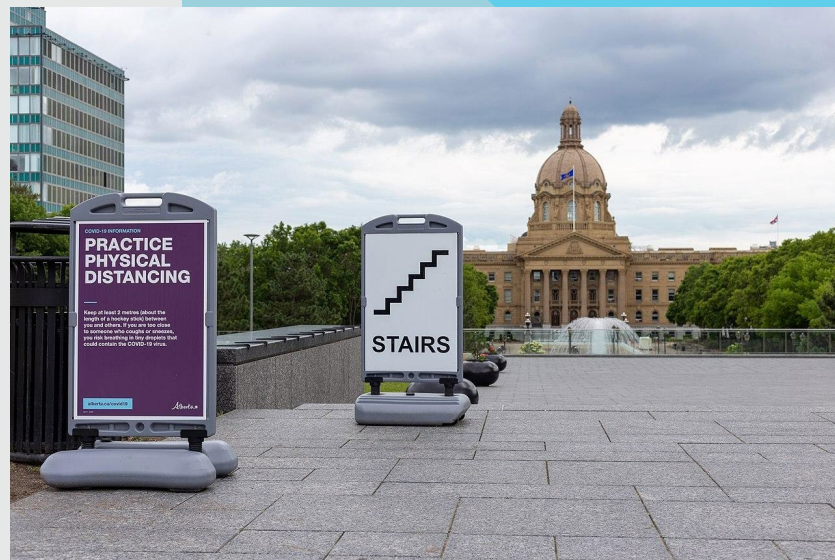
<https://www.nasa.gov/feature/esnt/2021/nasa-helps-map-impact-of-covid-19-lockdowns-on-harmful-air-pollution>

IN ALBERTA

Public health emergency was declared on March 17, 2020. This included:

- Closure of schools and daycares,
- The restriction of gatherings, and
- Working from home when possible.

These actions were in place to reduce the spread of COVID-19; they were also expected to temporarily decrease the concentrations of air pollutants due to reduced road traffic in Alberta's urban centers.



By Mack Male from Edmonton, AB, Canada - Practice physical distancing, CC BY-SA 2.0, <https://commons.wikimedia.org/w/index.php?curid=105982347>

CHANGES IN Air Quality

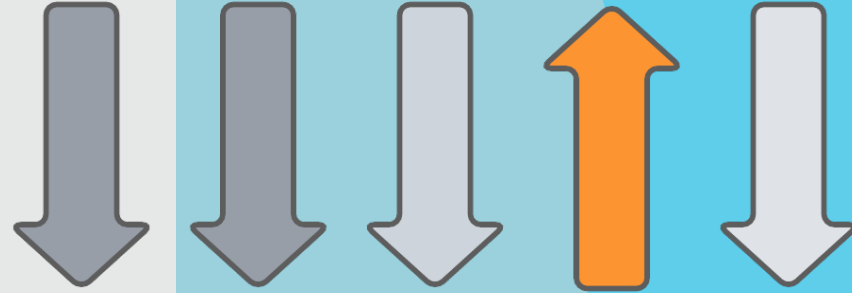
Path to evaluate changes :

- compare traffic volume in the spring 2020 with historical data
- compare select air pollutant levels in the spring 2020 with historical data

Comparison data:

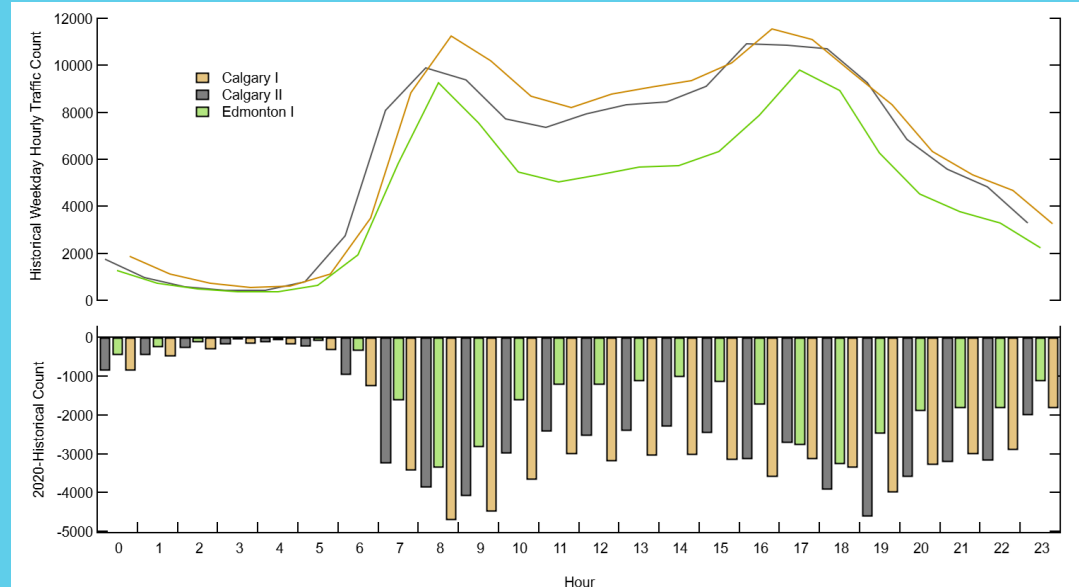
- Weekdays only
- Time of year → March 16-April 24 (spring)
- Historical data → 2015 and 2019 (spring data only)
- Urban centres
 - Focused on Calgary and Edmonton
 - Comparison for [other urban centers](#)

Note: Specific dates of study and methods of comparison are identified in the [CASA project final report](#)



CHANGES IN TRAFFIC

- Typical traffic volume peaks
 - During the morning and afternoon commuter periods
- In spring 2020
 - Traffic volume was lower for much of the day
 - Traffic volume decreased the most during commuter periods



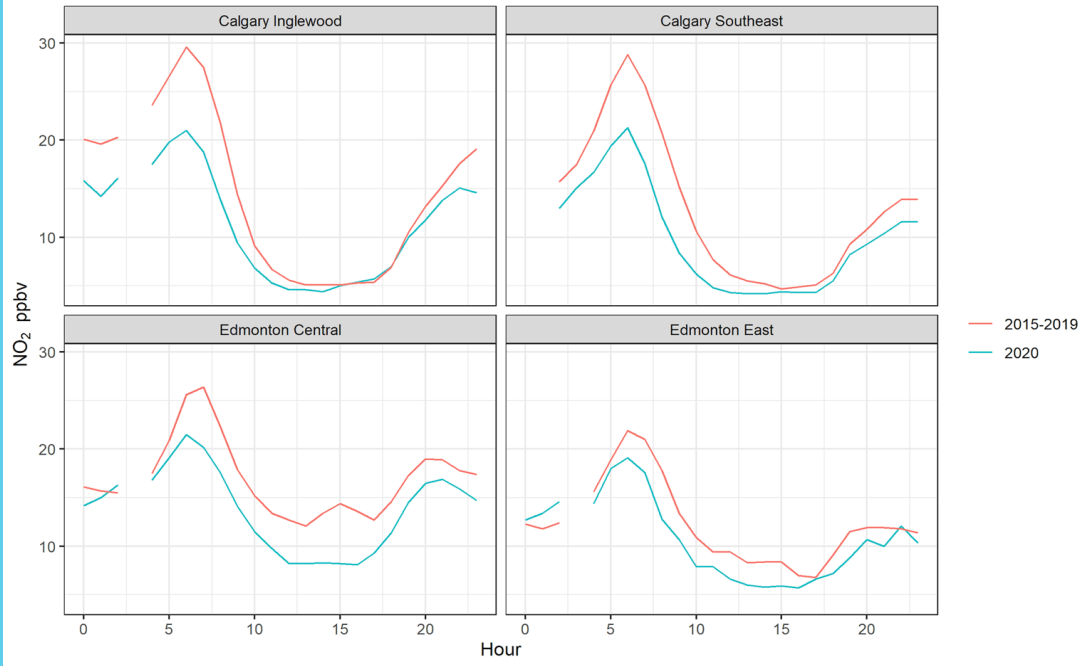
Ambient Air pollutant levels

- There is a complex relationship between emissions and level of pollutants in the air.
- Other factors are also at play
 - Meteorology (dispersion/accumulation)
 - Atmospheric reactions (transformation)
 - Deposition (removal)
- Pollutants associated with traffic
 - Tend to be higher during the morning commute due largely to limited dispersion (accumulation) at this time of day



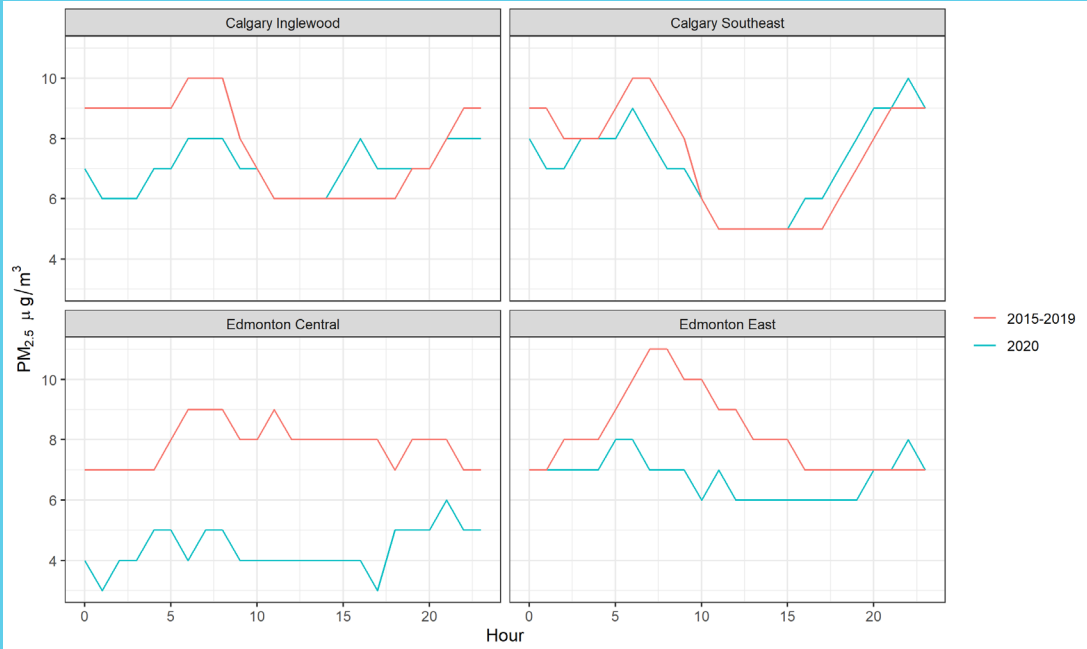
Ambient Air pollutant levels

- In spring 2020
 - An overall decrease in NO₂ concentrations was observed for most hours in Edmonton and Calgary with the largest change observed for the morning



Ambient Air pollutant levels

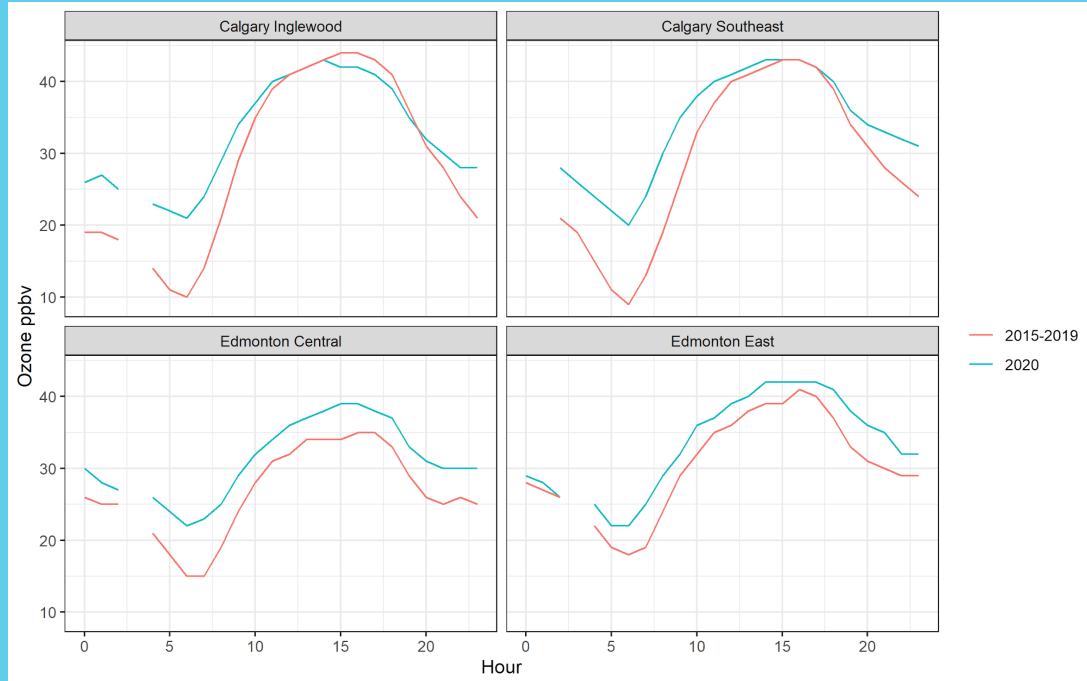
- In spring 2020
 - The results for PM_{2.5} were not as pronounced as NO₂ and at times mixed but a some decrease was noted
 - The decrease observed in Edmonton Central is most likely the result of overall trend for that site



Ambient Air pollutant levels

- In spring 2020
 - Ozone is formed in the atmosphere through atmospheric chemical reactions. Concentrations in the spring of 2020 increased likely due to reduced levels of “destructive” oxides of nitrogen*.
 - The largest increase was observed during the morning commuter period.
 - Note: this is also the period with the largest NO₂ reduction

*Oxides of nitrogen includes NO and NO₂. Combustion is a source of NO which is quickly converted to NO₂ in the atmosphere.

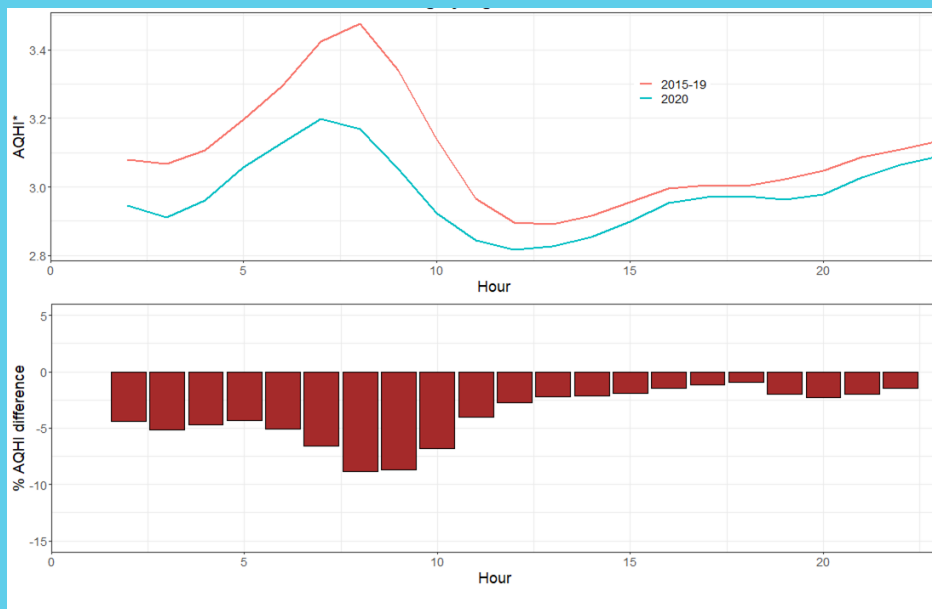


SO WHAT ?

- Translating changes
 - The various changes in individual pollutants were translated into a single index for ease in understanding the observed changes
 - The Air Quality Health Index (AQHI*) was calculated using three pollutants
 - NO₂, PM_{2.5} and Ozone
 - In Alberta the index can have additional parameters
- In spring 2020
 - AQHI* was up to ~10% lower

The Air Quality Health Index is a tool designed to help the public understand what the quality of the air around means to their health.

Classification: Protected A



Calgary Inglewood AQHI values*

The relationship between emissions and ambient air pollutant levels is complex. Here, traffic volumes were used as a general indicator of actual traffic-related emissions levels. During periods of reduced traffic volume, air quality improved, most notably in the morning commuter period. This observation is consistent with pandemic-related air quality observations in many jurisdictions across the world.