Covid19 Lockdowns

Using VHR Satellite imagery to quantify impact

Lockdown → Economic activity → Pollution

Our hypothesis is that economic activity causes pollution.Successful lockdowns have led to decrease in economic activity & pollution

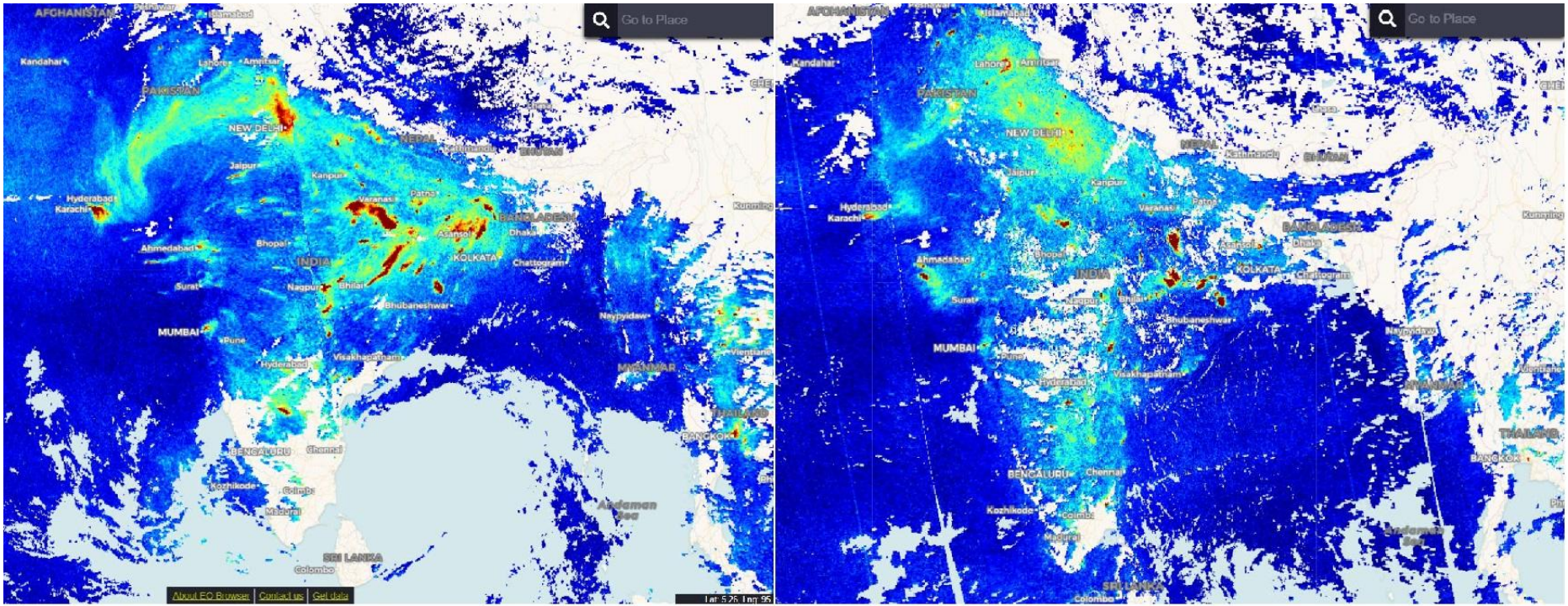
Retail sales/Economic activity can be construed from the number of cars parked in parking lots or streets near busy market places.

However vehicular traffic also leads to high NO2 levels.

We first use Sentinel-5P data to plot NO2 levels to identify any anomalies (spikes or other sudden changes) This is then collaborated with VHR imagery

This approach basically saves costs, because we are first using Sentinel-5P data to confirm our hypothesis & then using VHR imagery to collaborate our findings.

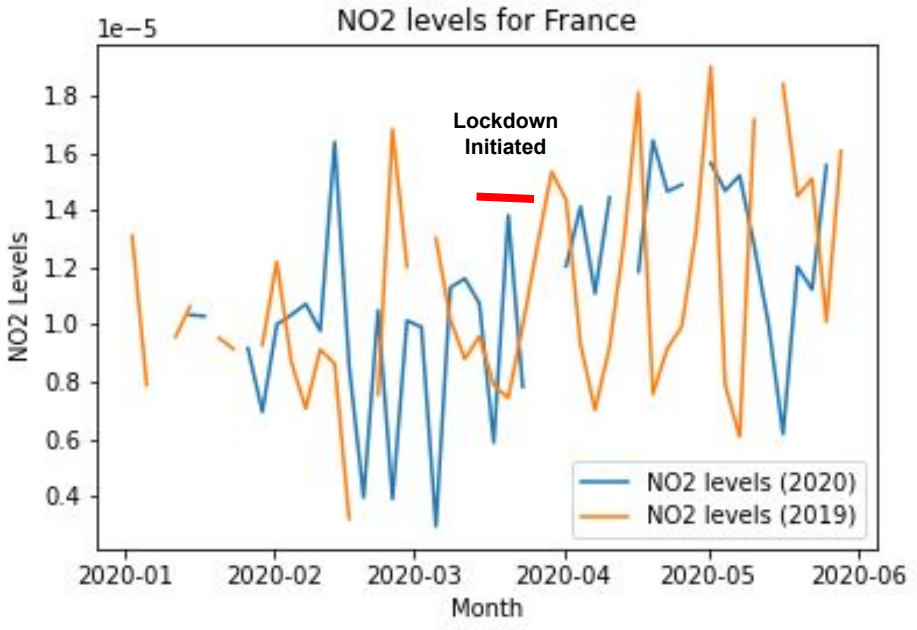
Lockdowns initiated by countries has led to a halt in economic activity
Burning of fossil fuels (vehicles, factories etc.) lead to emission of NO2.
So a drop in NO2 levels is an indicator of fall in economic activity



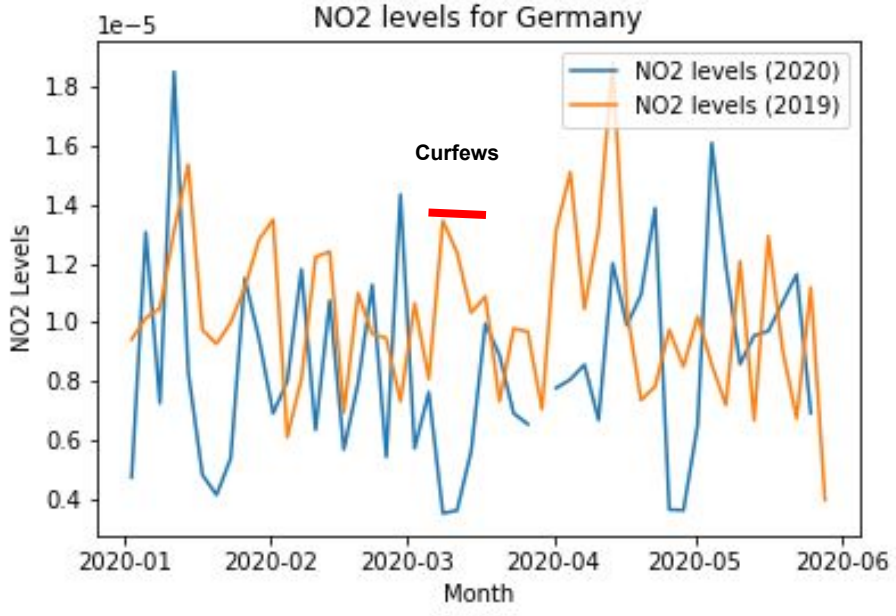
April 30th 2019 **April 30th 2020**

Indian sub-continent NO2 levels visualised using EO-Browser

NO2 levels over sample European countries/territories



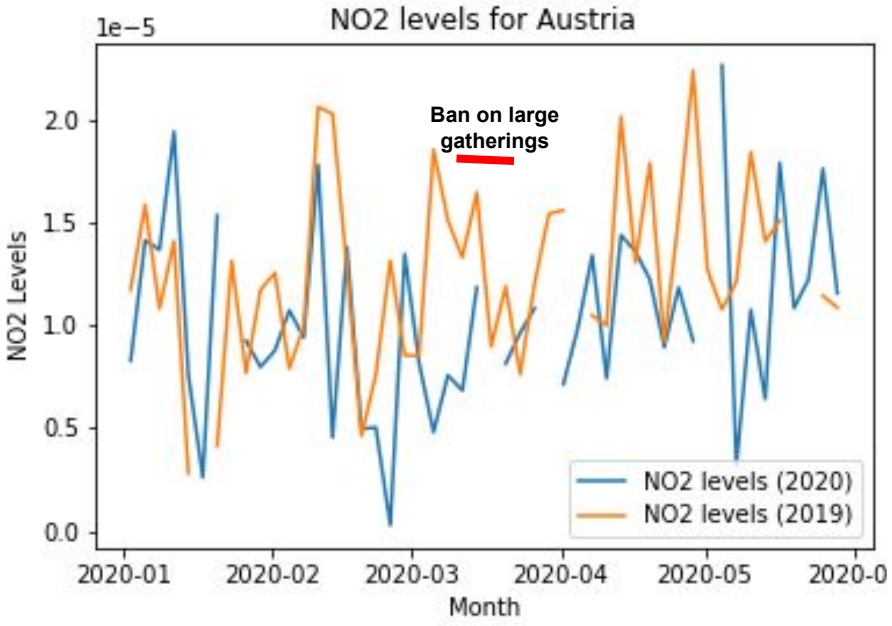
13th March - Closure of Non-essential services
16th March - Mandatory home confinements

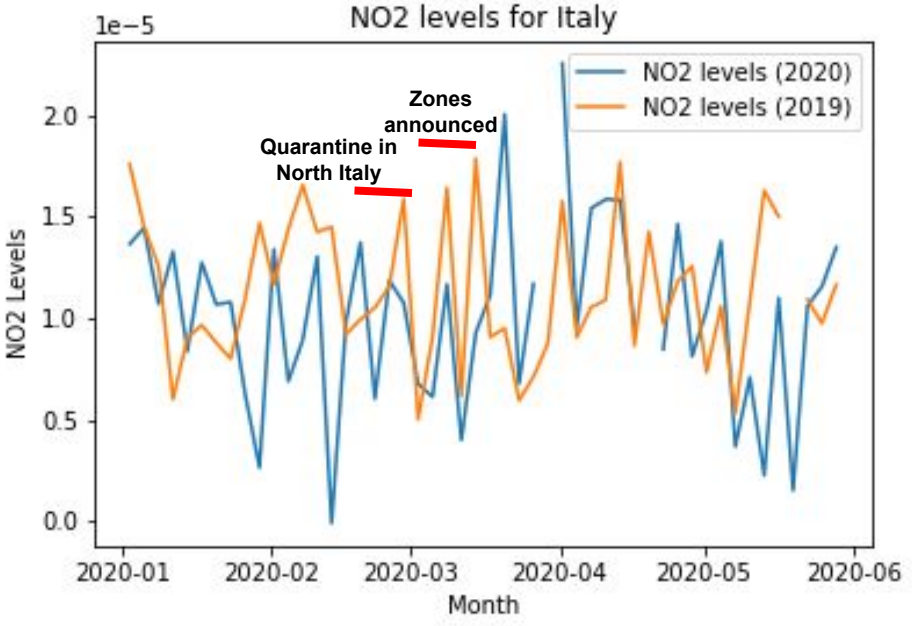


13th March - Schools closed
22nd March - Curfew imposed in 6 states

Created using EOx-JupyterHub & xcube
National response to Covid-19 - Wiki entry

Graphs are affected by missing values. But it's easy to identify countries which were able to implement stricter quarantines vs those who couldn't! Germany vs Italy



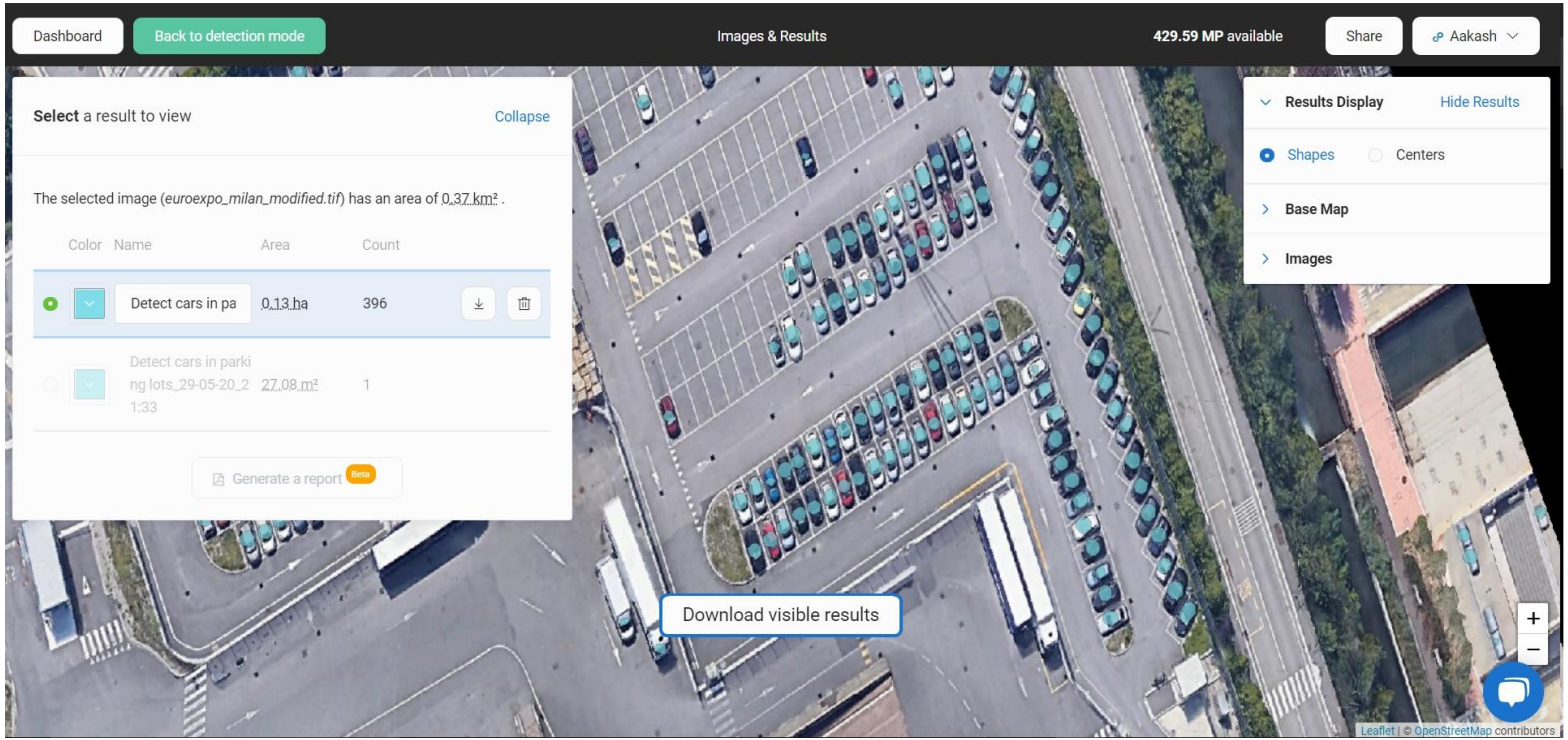


15th-17th March - Ban on public gatherings

31st Jan - Appointment of Commissioner for Covid response
22nd Feb - Quarantine of northern Italy
1st March - Zones declared

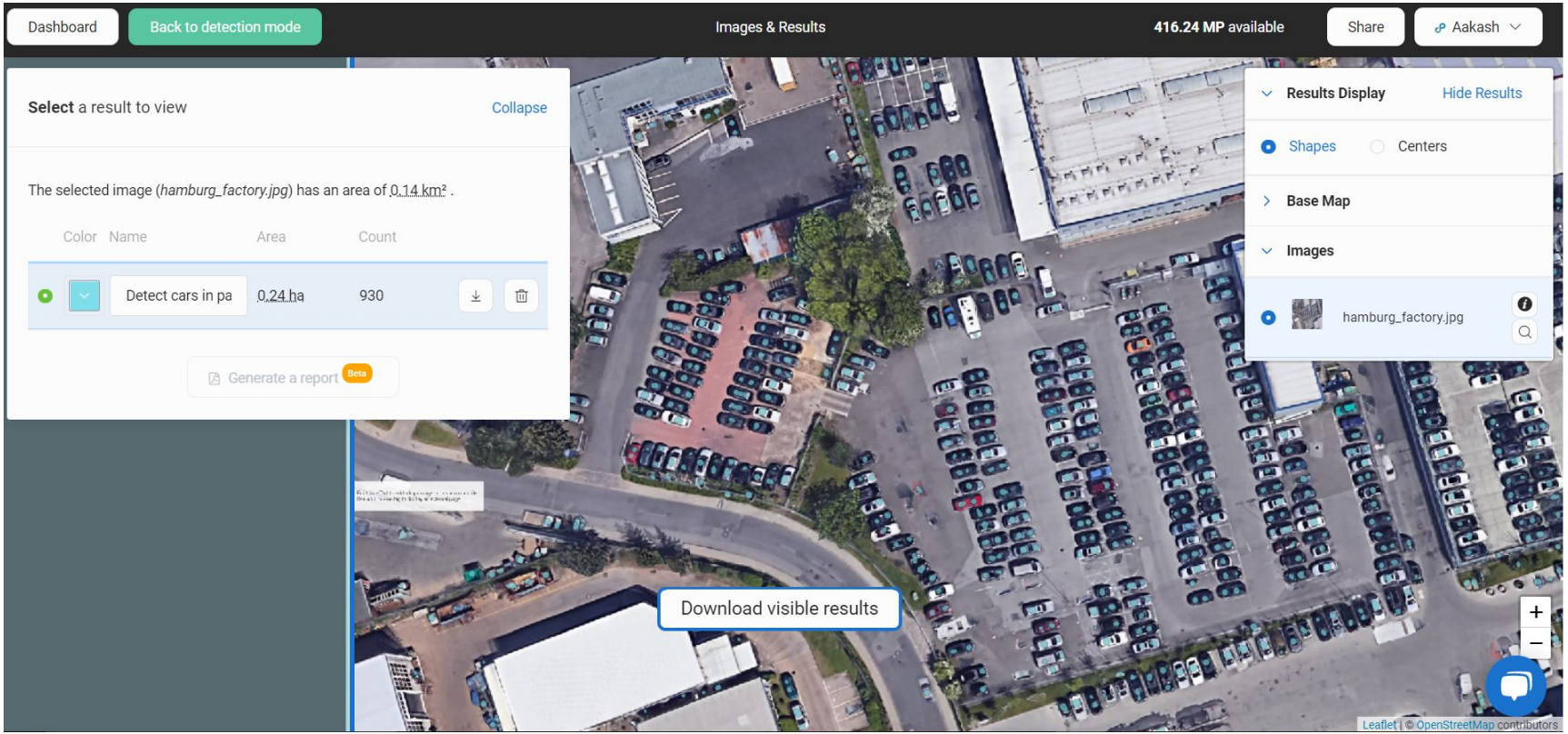
Created using EOx-JupyterHub & xcube
National response to Covid-19 - Wiki entry

Using Picterra to detect vehicles



Milan (Italy) expo – parking lot image, Source: Google Earth Pro

We are using off-the shelf detector algorithms to identify vehicles in VHR images
Count of vehicles shows if economic activity is taking place.



Factory parking lot, Hamburg Germany (Italy) Source: Google Earth Pro

Assumptions & Limitations

- Availability of data – VHR imagery as well as NO2 sensor data
- As is observed (via the line plots) some data is missing. This is seen as gaps in the line plots
- We are basing our hypothesis on causation. Economic activity leads to pollution. So absence of pollution is equivalent to less activity. And therefore seen as a success of lockdown measures
- NO2 values are calculated using the attached python script. Please check the attached jupyter notebook
- Vehicle detection is done on sample images and snapshots attached (for ref.)