How the COVID-19 pandemic has affected both air quality and single use plastic waste

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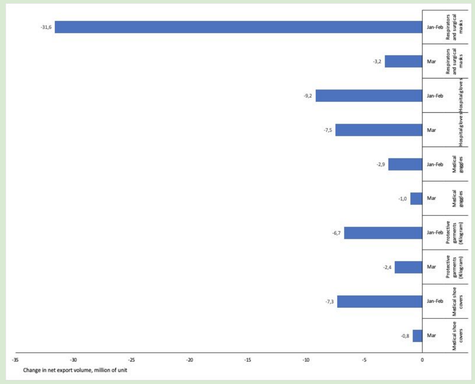
Background

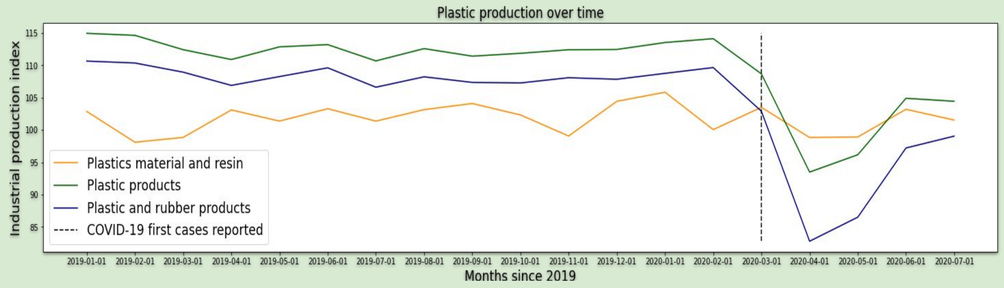
The COVID-19 pandemic has had severe repercussions not only on how people lead their day-to-day life, but also on the environment. On the one hand, newspapers and the media stress the reduction in air pollution and how the pandemic benefitted urban areas, typically surrounded by clouds of smoke. On the other hand, the restrictions imposed and the days in lockdown increased the consumption of plastic exponentially: people order more groceries and deliveries and, mostly, make large use of disposable plastic-based personal protection equipment (PPE). We intended to see if the data backed up these claims.

COVID-19 and plastic waste

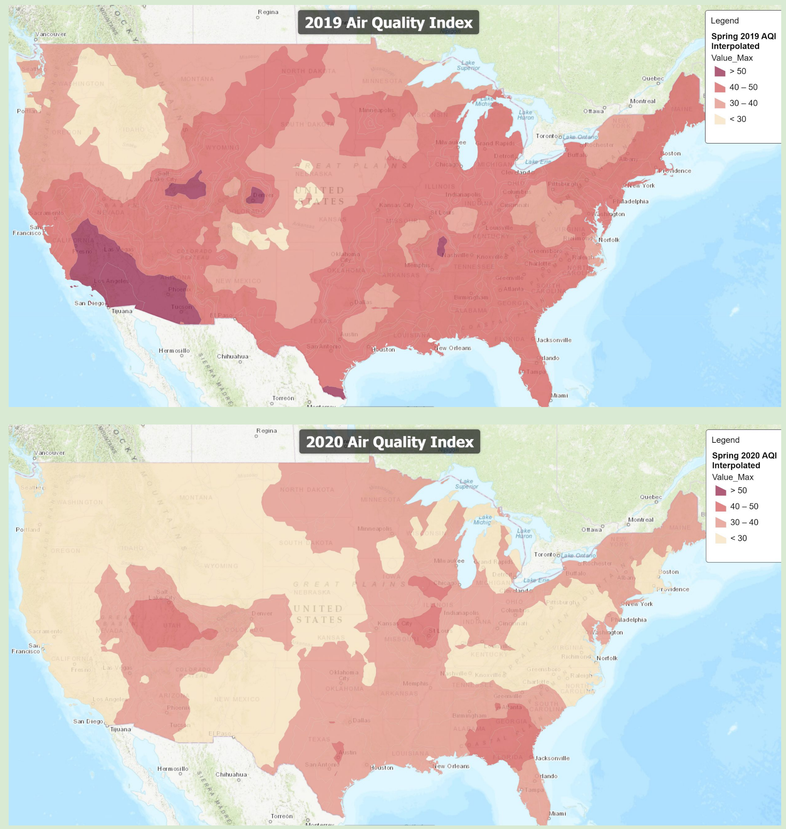
Exploratory data analysis showed a drop in plastic production following the onset of COVID-19 in the US. A paired t-test for the difference between years gave a p-value of 0.001, evidence of a drop in plastic production from 2019 to 2020 over comparable months. However, in the same period the US experienced negative net exports for all PPE material, offsetting the reduction in manufacturing.



Data from UN Comtrade accessed via World Integrated Trade Solution (WITS)



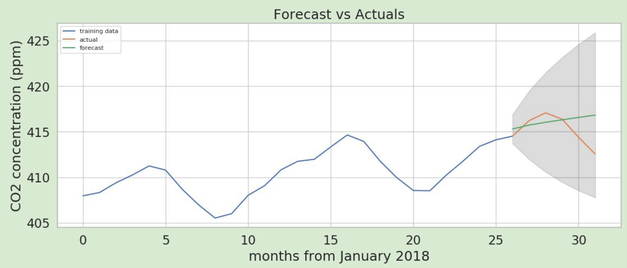
Data from the Federal Reserve Bank of St. Louis Plastic Manufacturing Dataset



Data taken from United States Environmental Protection Agency Air Quality Tracker Dataset

COVID-19 and CO2 emissions

CO2 in the atmosphere has increased through the years, reflecting increased emissions. To test whether the pandemic caused a reduction in CO2 we trained an ARIMA(1,1,1) model on CO2 data from January 2018 to February 2020 and forecasted the emissions from March until September 2020. We found no evidence of a causal reduction in CO2.



	coef	std err	z	P>|z|
const	0.0889	0.398	0.223	0.823
ar.L1.D.average	0.3314	0.176	1.883	0.060
ma.L1.D.average	0.8927	0.111	8.021	0.000

Monthly data on CO2 from NASA carbon emissions

COVID-19 and air quality

We found a significant difference between air quality index in spring 2019 and spring 2020. A one sample t-test on the difference between the two means produces a p-value <0.0001, which indicates a clear change in ground-level ozone, particle pollution (both PM2.5 and PM10), carbon monoxide, sulfur dioxide, and nitrogen dioxide.

Take home message

In this project we shed light on the impacts of COVID-19 on the environment to evaluate the bold claims made by some media outlets on the increase in plastic use and improvements in air quality.

Short term: the COVID-19 pandemic led to a reduction in business activity and movement in the US. Following lockdowns, the US saw a reduction in plastic production and improvements in local air quality.

Looking ahead: CO2 concentrations, the main reason why the planet is warming and climate change is upon us, have not followed this trend. In addition, PPE imports have grown exponentially, offsetting the gains due to lower manufacturing of plastics and contributing to an economic recession worse than the 2008 one.