



Covid-19 pandemic, its impact on air quality and possible long-run effect on environment.

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ABSTRACT Covid-19 pandemic has hit transport sector severely as due to lockdown measures most population stayed at home. By comparing levels of NO₂ across various UK cities and number of flights leaving UK, I was able to confirm the short-term decline in emissions. Then I try to explain the importance of improving air quality. Finally, I describe possible long-run effects the pandemic can have on environment.

KEYWORDS

Covid-19
GHG emissions
Air quality
Regulation

INTRODUCTION

Global warming along with climate change have become the most urgent environmental problems of our time. It is true that throughout the history, the Earth’s climate has changed multiple times, with cycles of “ice age” and retreats taking place (NASA, 2019). However, current warming trend is quite unique as it has, most likely, resulted from the human activity. It has been shown that production and usage of non-renewable energy is highly correlated with GHG emissions (Mittnik et al., 2010). Empirical research also suggests that up to 90% of global CO₂ emissions come from usage of fossil fuels for generating electricity, heating and cooling or for transport (Greiner et al., 2012).

However, the Covid-19 pandemic has changed the world as we know it. Lockdown measures compelled most of the population to stay in their homes and work from home whenever possible. Only essential services remained open and mostly included activities around food and medication - thus, the patterns of energy consumption should have drastically shifted. Many international borders were closed, hence reducing transport. The financial and economic consequences of such measures are likely to be dire. Still, such actions should cause a significant reduction in GHG emissions and therefore, improve the air quality around the globe.

In this essay, I am going to explore whether the air quality improved as a result of Covid-19 pandemic and try to discuss possible long run impact on the environment.

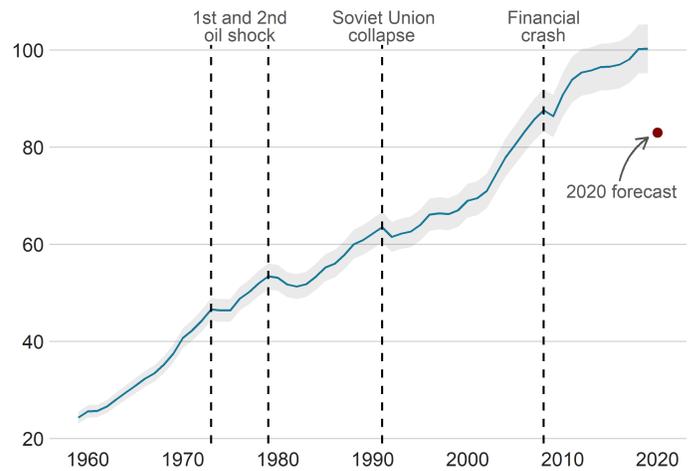
EMISSIONS DECLINE IN THE SHORT RUN

Figure 1 shows how the global daily fossil emissions changed over the last 60 years. It is clear that events affecting global economy can have huge environmental consequences. Covid-19 pandemic being a worldwide problem is thus expected to have an impact on global GHG emissions. Given the lack of real time CO₂ data I have decided to follow Le Quéré et al. (2020) who estimated potential Covid-19 short run impact on GHG emissions. Authors emphasised that striking decline in CO₂ that can be observed in Figure 1

is about to happen right after the imposition of lockdown measures. Please, note that the increase in emissions from residential buildings seems to offset the decline in a very limited way as can be seen in Figure 5. Whenever the easing happens, international borders will reopen and people will commute more – causing the global daily emissions to rebound.

Carbon dioxide emissions, 1960-present

Global daily fossil CO₂ emissions measured in Mt CO₂ per day



Source: Global Carbon Project

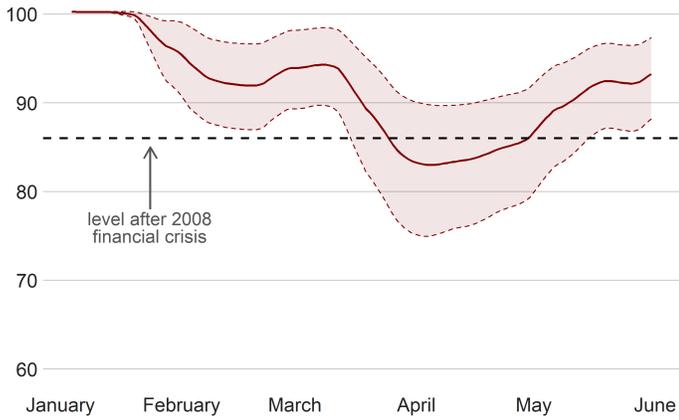
Figure 1 Annual mean daily emissions in the period 1960–2019 (the blue line) updated from the Global Carbon Project (2019) with uncertainty of ±5% (grey ribbon). Daily emissions up to end of April 2020 (the red dot) as predicted by Le Quéré et al. (2020).

Figure 2 presents the predicted effect in a greater detail. We can observe that from mid-March when the lockdown measures were introduced daily emissions plummeted reaching in April 2020 level lower than after the 2008 financial crisis. As previously stated, we

would expect the transport sector should have been struck the most by the lockdown. That is why, in my further analysis I have used NO₂ measurements from across various UK cities and a number of flights across UK to see whether emissions from transport, in fact, declined.

Global carbon dioxide emissions in 2020

Estimated daily CO₂ emissions measured in Mt CO₂ per day



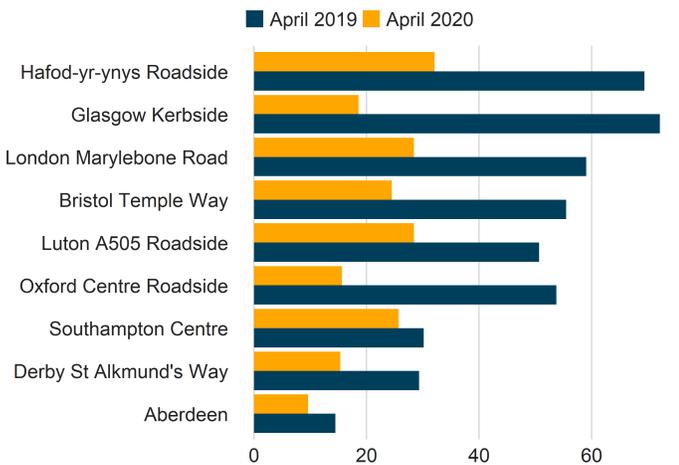
Source: Global Carbon Project

Figure 2 Daily predicted CO₂ emissions in 2020 (red line) based on confinement index (CI) as described by Le Quéré et al. (2020). Uncertainty interval (red ribbon) is based on Le Quéré et al. (2020) estimates.

Nitrogen dioxide being a byproduct of burning fuel by cars makes a good estimator for the amount of road traffic. When comparing average NO₂ level for April 2020 with April 2019 (Figure 3), we can see that the emissions dropped drastically across UK cities. Even though, I am using a sample of UK cities, the same results can be observed around the world as people were confined to their homes and compelled to limit their movement to minimum.

Air pollution: April 2020 compared with April 2019

Average NO₂ emissions measured in µg/m³



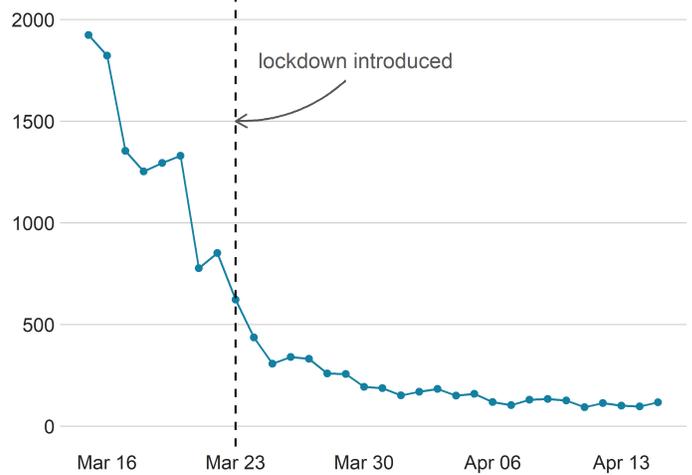
Source: Department for Environment Food & Rural Affairs (Defra)

Figure 3 Monthly average NO₂ readings in April 2019 and 2020 based on Department of Environment Food & Rural Affairs (Defra) data measured in micrograms per cubic metre.

In Figure 4 we can observe a decline in number of flights across UK from 10 biggest airports. Clearly, after the lockdown was introduced planes were grounded and thus, the number of flights in April was nearly 20 times lower than in mid-March. A smaller number of flights resulted in a lower fossil emissions emitted by planes and clearer sky as for some time there were no condensation trails visible.

Drop in flights number across UK due to Covid-19

Tracked departures from UK 10 biggest airports



Source: flightradar24.com

Figure 4 Number of departures tracked from 10 biggest UK airports: Heathrow, Gatwick, Manchester, Stansted, Luton, Edinburgh, Glasgow, Birmingham, Bristol and Belfast International Airports. Data based on flight tracking website flightradar24.com.

Emissions from both surface transport and aviation seem to have declined as a result of the pandemic.

BUT WHY IS IT IMPORTANT?

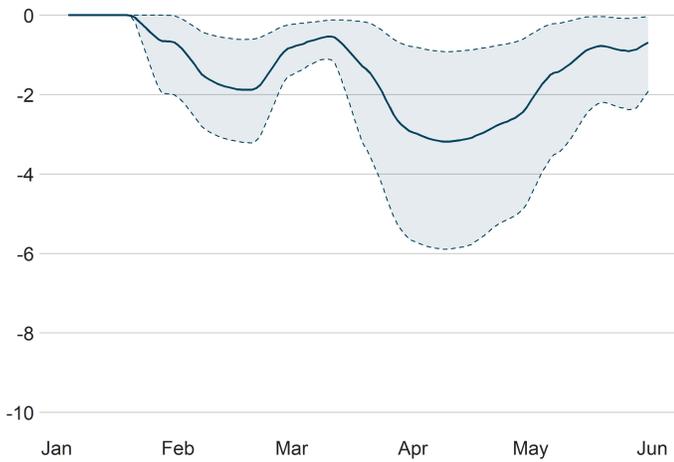
As the environmentalists keep telling us, the less fossil emissions the better - but why? One of the reasons was already mentioned in the introduction, there is an existing evidence suggesting that the current warming trend that we can observe is a result of human activity. When fossil fuels are burned CO₂ and other greenhouse gases are released trapping heat in the atmosphere – thus, contributing to the global warming and climate change.

The other reason is that climate change increases the amount of pollen and allergen produced by plants, mould proliferation and concentration of particulate matter near ground level. This in turn, increases the risk of asthma, rhinosinusitis and other respiratory tract infections (D’Amato et al., 2014). Similarly, it has been shown that a long-term exposure to high levels of NO₂, often from increased road traffic, is linked to lung and cardiovascular diseases resulting in increased hospital admissions and mortality (Kurt et al., 2016).

One might think that the number of Covid-19 cases and corresponding mortality rate depends only on the density of population. The more people in one area, the more likely it is for the virus to spread and reap its bloody harvest. Interestingly, recent research suggests that it might not be entirely true. Travaglio et al. (2020) in still unpublished paper provide evidence that the poor air quality markers are positively associated with increased number of Covid-19 pandemic related deaths in England after adjusting for density of population.

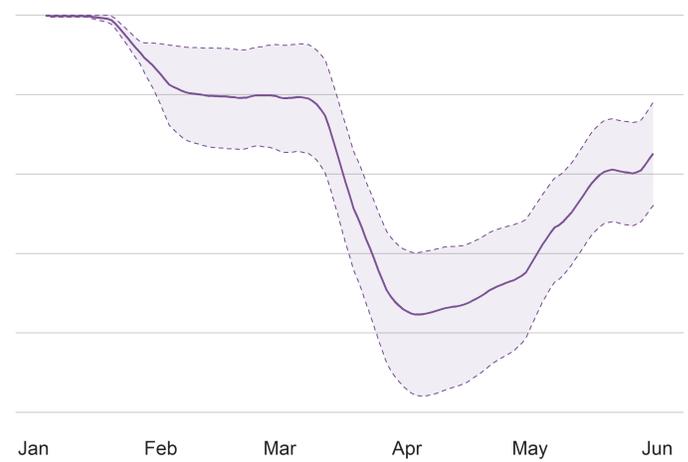
Emissions from power industry in 2020

Global daily fossil CO₂ emissions measured in Mt CO₂ per day



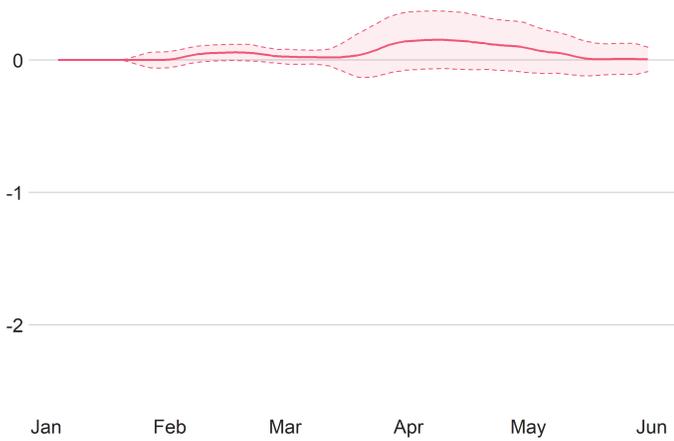
Emissions from surface transport in 2020

Global daily fossil CO₂ emissions measured in Mt CO₂ per day



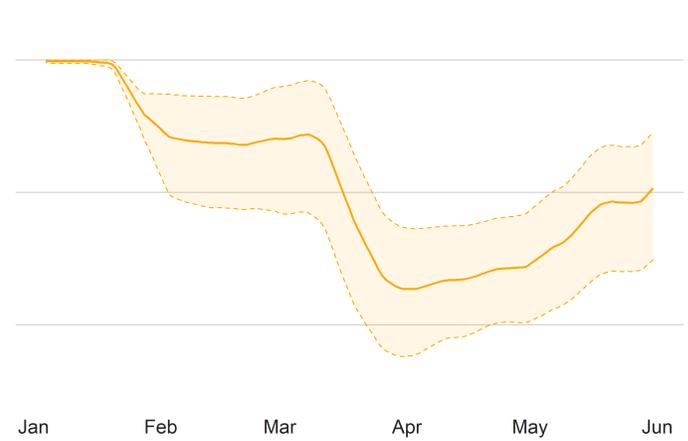
Emissions from residential buildings in 2020

Global daily fossil CO₂ emissions measured in Mt CO₂ per day



Emissions from aviation industry in 2020

Global daily fossil CO₂ emissions measured in Mt CO₂ per day



Source: Global Carbon Project

Figure 5 Change in global daily CO₂ emissions by sector. Uncertainty represents the full range of Le Quéré et al. (2020) estimates. Change is relative to annual mean daily emissions from corresponding sectors in 2019. Note that the ranges on y-axis differ in upper and lower panels.

POSSIBLE LONG RUN EFFECTS

As we have seen so far, the Covid-19 pandemic has most likely caused the GHG emissions to drop quite drastically during weeks following the lockdown decision. There is however a very important question that needs to be answered. What will happen when the economy fully reopens?

Based on Le Quéré et al. (2020) predictions the CO₂ emissions are on track to reach the pre-pandemic levels soon. In Figure 5 we can observe that disaggregated emissions from energy, surface transport and aviation sectors have all decreased in April but are now on an increasing path as the countries start to implement their “lockdown easing” policies. In fact, we have observed a similar situation in the past. As shown in Figure 1 after each worldwide event that caused a decline in emissions, there happened a severe increase in GHG emissions in the following years. Most recently, the 2008 financial crisis has resulted in 1.4% decrease in global CO₂

emissions in 2009 followed by 5.9% increase in 2010. Given the economic slowdown caused by Covid-19 pandemic, world leaders are going to try to stimulate economic growth. Their actions are most likely to have a long-lasting impact on the air quality though – therefore, they need to be made with a great caution. What we ideally want to avoid is a boost of economy that is going to replace health crisis with yet another one – amplified air pollution.

How to stimulate the economy in a way that does not ramp up fossil fuel production? The obvious answer is to invest in new technologies and services that will supply the world with cleaner and more efficient green energy. But will it be enough? Before the Covid-19 pandemic richest countries were already investing billions of dollars to make the transition to low carbon economy – yet the global daily emissions were increasing every year. Availability of green energy infrastructure alone does not ensure that transition will take place as it is often an economic decision. In other words, the transition is possible when there exists a proper infrastructure and technology – but also it needs to be profitable for firms to switch to renewable energy resources. Making investments takes care of the technological advancements but there has to exist an external driver for the transition.

This is where the Covid-19 pandemic can prove itself useful as it has shown without a shadow of doubt that governments are able to take urgent and radical actions in order to contain crisis. This whole situation is an example of a vicious circle: us consistently decreasing biodiversity and air quality and still, whenever the crisis presents itself we try so hard to fight it we make environment even worse off as shown in [Figure 1](#). This is precisely why, people need to finally understand that their health is undeniably linked to the air quality. People actually need to want the change to happen believing that cleaner air is going to be beneficial for them in a long-run.

CONCLUSION

Unless we all understand that the “Spaceship Earth” as described by [Boulding \(1966\)](#) is real and start acting now to save our planet, both the environmental and economic changes will be irreversible. In order to mitigate the climate change, the collective response being both effective and economically efficient needs to take place. Thus, when boosting our economy today we need to consider tomorrow. In order for countries to stimulate their economies and achieve long-term sustainable growth, our leaders need to take the environment into consideration when making their decisions. Logic dictates that the long-term investments bad for the environment are not a perfect solution to short-term economic downturn. Given the restrictions on travel and gatherings are challenging, by steadily adjusting our behaviour to more sustainable we might be able to turn the Covid-19 to our advantage from the environmental point of view. That is why, I am being optimistic about the future. Covid-19 pandemic along with raising climate change awareness might be the driver needed for the transition to finally happen.

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