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Environmental Pollution 263 (2020) 114466

Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

COVID-19 as a factor influencing air pollution?

Keywords:
Sars virus
Mortality
Epidemy
Public health
Air pollutants

To the Editor: At the end of 2019, the first cases of pneumonia associated with coronavirus (COVID-19) were reported in Wuhan, China (Huang et al., 2020). Thereafter, the number of infected people increased rapidly and, a month later, the outbreak turned into a national crisis, with infected individuals diagnosed all over the country (CDC, 2020; Chan et al., 2020; World Health Organization, 2020a; 2020b). Chinese authorities shut down transportation and travel in and out of Wuhan. They also curtailed and reduced local business travel, closed down schools, colleges and universities in order to reduce the spread of the disease and established numerous quarantines (Wilder-Smith and Freedman, 2020). The maps in Fig. 1 show the nitrogen dioxide (NO_2) concentrations, resulting primarily from the burning of fossil fuels (He et al., 2020a,b), prior to and following the quarantine, with a massive reduction observed in concentrations after the corona virus outbreak (NASA, 2020). The data were collected by the Tropospheric Monitoring Instruments (TROPOMI) on-board ESA's Sentinel-5 satellite. A related sensor, the Ozone Monitoring Instrument (OMI) on-board NASA's Aura satellite, recorded similar atmospheric changes. NO_2 is a common tracer of air pollution/industrial activity, associated with morbidity and mortality (He et al., 2020a,b). NASA scientists have commented that the reduction in NO_2 pollution was first apparent near Wuhan, but spread across the rest of the country, and eventually worldwide (NASA, 2020). In Central China, NO_2 emissions were reduced by as much as 30% (NASA, 2020). CO_2 emissions, another common tracer of air pollution (Hanaoka and Masui, 2019), decreased by 25% in China and by 6% worldwide (CarbonBrief, 2020). Air pollution is responsible for many deaths and increased incidences of respiratory disease (Brauer, 2010). According to the World Health Organization, 4.6 million individuals die annually from diseases and illnesses directly related to poor air quality (Cohen et al., 2017). Poor air quality is responsible for more deaths each year than motor vehicle accidents (European Environment Agency, 2005). The impact of air pollution is a global problem and includes developed countries, such as the European nations where 193,000 people died in 2012 from airborne particulate matter (Ortiz et al., 2017). Air pollution associated deaths include but are not limited to aggravated asthma, bronchitis, emphysema, lung and heart diseases, and respiratory allergies (Brauer, 2010). China, where the COVID-19 epidemic started, is also a country severely affected by air pollution (He et al., 2020a,b) Air pollution in China was responsible for 4000 preventable deaths each day i.e. 1.6 million fatalities in 2016 (Rohde and Muller, 2015; Wang et al., 2012). Several models predict mortality due to air pollution (Hoek et al., 2013), with an increase of all-cause mortality ranging from 0.13% per 10μg/m^3 of NO_2 per day (He et al., 2020a,b) to 2% per 10μg/m^3 of NO_2 on a 5 day period (Chiusolo et al., 2011), or a global hazard ratio of 1.052 (95 confidence intervals 1.045 to 1.059) per increase of 8.1 ppb in NO_2 (Crouse et al., 2015). In a hypothetical scenario in which the impact of air pollution on mortality was underestimated using the aforementioned models, and in which we considered a time period of two months with a decrease in NO_2 air pollution in China, macabre predictions could postulate a 6% reduction in mortality due to air pollution (i.e. around 100 000 life's saved, just in China). Similar calculations could be applied to other countries. At the time of writing this, there are 3,158 reported deaths from COVID-19 in China and 4,607 worldwide. Considering the huge decrease in air pollution following the quarantine (China's CO_2 emissions decreased by a quarter), the COVID-19 pandemic might paradoxically have decreased the total number of deaths during this period, by drastically decreasing the number of fatalities due to air pollution. Moreover, in addition to the reduced number of deaths due to air pollution, the reduction in air pollution itself could also have positive benefits in reducing preventable non communicable diseases (Chen and Bloom, 2019; Neira et al., 2018).

https://doi.org/10.1016/j.envpol.2020.114466
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Please cite this article as: Dutheil, F et al., COVID-19 as a factor influencing air pollution?, Environmental Pollution, https://doi.org/10.1016/j.envpol.2020.114466

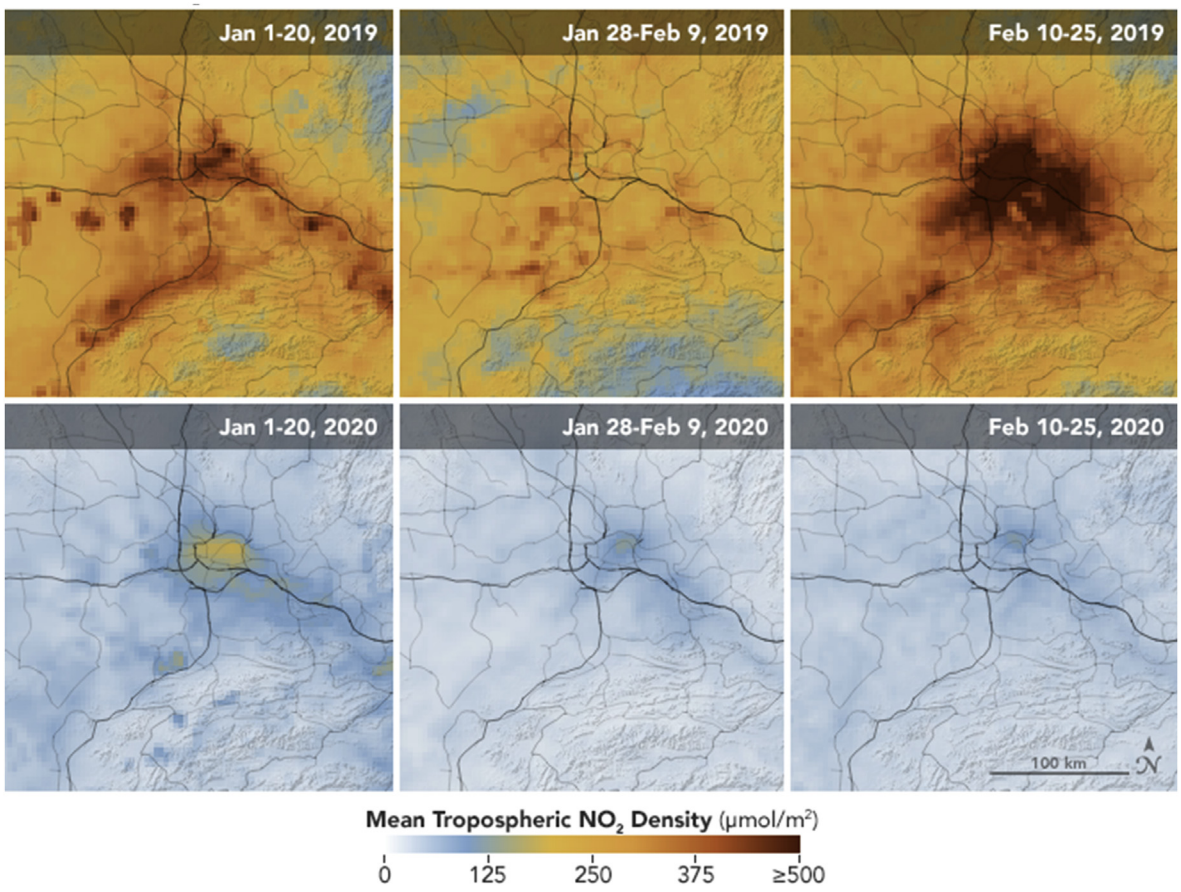

Fig. 1. Sequence of airborne NO_2 concentrations measured with the TROPOMI sensor on-board ESA's Sentinel-5 satellite before and after the COVID-19 pandemic. (Satellite images from (NASA, 2020)).

Declaration of competing interest

The authors of this work declare no conflict of interest.

CRediT authorship contribution statement

Frédéric Dutheil: Conceptualization, Writing - original draft, Writing - review & editing. **Julien S. Baker:** Writing - original draft, Writing - review & editing. **Valentin Navel:** Conceptualization, Writing - original draft, Writing - review & editing.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.envpol.2020.114466.

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Please cite this article as: Dutheil, F et al., COVID-19 as a factor influencing air pollution?, Environmental Pollution, https://doi.org/10.1016/j.envpol.2020.114466

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5 March 2020
Available online 9 April 2020

This paper has been recommended for acceptance by Admir Créso

Please cite this article as: Dutheil, F et al., COVID-19 as a factor influencing air pollution?, Environmental Pollution, https://doi.org/10.1016/j.envpol.2020.114466