



Leibniz Institute for
Tropospheric Research

Leipzig, 29 June 2020

Corona lockdown:

The local air quality is always a result of emissions, chemical processes and air pollutant transport

Hartmut Herrmann, Alfred Wiedensohler, Dominik van Pinxteren, Ulla Wandinger, Ina Tegen und
Andreas Macke

Leibniz Institute for Tropospheric Research(TROPOS)
Permoserstr. 15, 04318 Leipzig, Germany

The COVID-19 pandemic has been taken as an opportunity to search for impacts of reduced atmospheric pollutant emissions during the lockdown and whether air quality accordingly improved based on reduced emissions.

As discussed in the media often a clear connection between reduced emissions and better air quality was not identified. It was then, at times, concluded, that poor air quality could not have been caused by car traffic emissions. This is rather a fictitious debate driven by certain interests as could be seen most recently in a debate in the German Bundestag on 18 June 2020, where not only lobby associations and political parties were involved, but also self-proclaimed experts. ^(1 2 3 4 5 6 7)

The Leibniz Institute for Tropospheric Research because of its proven scientific expertise in the fields of Chemistry and Physics of the Atmosphere, remote sensing and the atmospheric modelling takes a stand on air pollution at times of SARS-CoV-2 as follows:

- (1) In general, problems of air quality in Germany, Europe and worldwide are real and a major threat for human health, ecosystem integrity as well as climate. ^(8 9 10)
- (2) Particulate matter and nitrogen oxides are key components of air pollution in Germany. For their emissions the transport sector is largely responsible through exhaust gases as direct engine emission as well as through particles not directly stemming from the engine such as brake and tyre wear. ^(11 12 13 14)
- (3) Due to overlapping effects the situation of the local air pollution at times did not significantly improve during the Corona lockdown: On the one hand, some of the local emissions - but not all of them - had declined in the course of the lockdown (see also point (4)). On the other hand, the long-range atmospheric transport had brought

polluted air masses to Germany specifically during the lockdown. For instance, forest and land fire in Eastern Europe during the dry and warm high-pressure weather conditions in March and April had led to the increase of smoke particulates in Central Europe. As a result, the local reduction of the emissions had been offset or even overcompensated. All things considered, long-range transport can lead to higher or lower local loads. The impact of marine or arctic air masses, corresponding to cleaner air masses can reduce observed regional air pollution. Meteorological influences are constantly possible when describing the relation between emissions and imissions; they are further considered when assessing the local air quality.

Rain, increased wind speed and a strong vertical mixing contribute to the air quality improvement whereas particles and trace gases can accumulate significantly when there are dryness and inverse weather conditions (at a lower boundary layer) - as it was the case in spring 2020. Consequently, according to statements of the German Meteorological Service the months March and April 2020 due to high-pressure weather conditions were markedly dry and sunny compared to the long-term average which favoured the accumulation of air pollutants. Depending on the weather conditions the same extent of emissions per area unit can lead to different concentrations of local air pollutants. ^(15 16 17 18 19 20 21 22 23 24 25 26)

- (4) The Corona lockdown had reduced emissions of some major sources such as the private transport, others in turn had not been affected at all. Wood heating, energy production, animal husbandry as well as agriculture and especially the treatment of the heavily desiccated soil in spring played a further role and substantially contributed to the regional and local exposure. ^(27 28 29 30 31 32)
- (5) Despite major achievements in air quality improvement in both Germany and the EU within the last 65 years the process of improving the air quality is far from being completed and have not yet come to a desirable end. ^(33 34 35 36 37 38 39)
- (6) Germany is a leader in combating air pollution in synergy with science, political committees and the economy. Its expert knowledge in the fields of air pollution control and atmospheric research not only had established an internationally renowned economic sector, but also an important economic asset including lots of job positions in environmental technology. ^(40 41)
- (7) To effectively protect sensitive groups in our society drastic economic and political measures have been taken in this Corona crisis. For the time after the crisis, considerations on how an even better health care of the society could be achieved are decisive. These policies should economically and ecologically be balanced, in order to serve as a model for other parts of the world. ^(42 43)

Conclusion:

Reduced emissions had not automatically led to lower emissions in times of the COVID-19 lockdown as the pollutant concentration within the air had been affected by diverse complex factors as described above. Criticising the whole concept of air pollution control and its thresholds because of the effects which can be explained by overlapping effects is not relevant for and without a sound scientific basis.

When it comes to the effects of changed emissions interacting with other factors during the lockdown specifically, TROPOS elaborated a larger multidisciplinary study. Bringing together data from particulate matter of diverse both national and international measuring stations in urban and rural areas with emission values and the description of the atmospheric transport, the causes for increased or reduced local air pollution are to be scientifically proven. The investigations are integrated within a study on atmospheric changes during and after the COVID-19 lockdown through the European Research Infrastructure for the observation of Aerosol, Clouds and Trace Gases (ACTRIS) where Germany is contributing through TROPOS.

Poor air quality can seriously damage human health and be dangerous especially for humans with underlying medical conditions. Not only can pollutants result in a premature death (mortality), but also cause health restrictions (morbidity). This loss of good health is not negligible. The Corona crisis had led to some reducing emissions in the short term, particularly driven by reduced traffic. However, more efforts at a local, national as well as international level in the medium and long term are needed to not only maintain the level of preventive health care of the population, but to also further improve it.

Authors:

Prof. Dr. Hartmut Herrmann, <https://www.tropos.de/en/institute/about-us/employees/hartmut-herrmann>

Prof. Dr. Alfred Wiedensohler, <https://www.tropos.de/en/institute/about-us/employees/alfred-wiedensohler>

Dr. Dominik van Pinxteren, <https://www.tropos.de/en/institute/about-us/employees/dominik-van-pinxteren>

Dr. Ulla Wandinger, <https://www.tropos.de/en/institute/about-us/employees/ulla-wandinger>

Prof. Dr. Ina Tegen, <https://www.tropos.de/en/institute/about-us/employees/ina-tegen>

und Prof. Dr. Andreas Macke, <https://www.tropos.de/en/institute/about-us/employees/andreas-macke>

References:

- ¹ Deutschlandfunk: Corona-Shutdown sorgt für niedrigere Abgaswerte > https://www.deutschlandfunk.de/luftverschmutzung-corona-shutdown-sorgt-fuer-niedrigere.697.de.html?dram:article_id=476212
- ² MDR: Streit um Feinstaub-Werte: Sind es doch nicht die Autos? > <https://www.mdr.de/nachrichten/politik/gesellschaft/luftwerte-feinstaub-stickoxide-corona-krise-verkehr-100.html>
- ³ LVZ: „Überschrittene Feinstaub-Grenzwerte sind in verkehrsarmen Corona-Zeiten grotesk“ > <https://www.lvz.de/Region/Mitteldeutschland/Verkehrsexperte-Uberschrittene-Feinstaub-Grenzwerte-sind-in-verkehrsarmen-Corona-Zeiten-natuerlich-grotesk>
- ⁴ ARD-Kontraste: Corona und die Umwelt > <https://www.rbb-online.de/kontraste/archiv/kontraste-vom-07-05-2020/mythen-halbwahrheiten-und-mittendrin-verkehrsminister-scheuer.html>
- ⁵ Bundestag: AfD stellt sich gegen Diesel-Fahrverbote in Innenstädten > <https://www.bundestag.de/dokumente/textarchiv/2020/kw25-de-diesel-fahrverbote-698656>
- ⁶ AfDKompakt: Gleiche Luftqualität bei weniger Verkehr zeigt Sinnlosigkeit der Fahrverbote > <https://afdkompakt.de/2020/05/24/gleiche-luftqualitaet-bei-weniger-verkehr-zeigt-sinnlosigkeit-der-fahrverbote/>
- ⁷ Die Wiedertäufer: Corona = weniger Verkehr = bessere Luft? So einfach ist die Rechnung nicht > <https://wiedertaeufer.ms/corona-weniger-verkehr-bessere-luft-so-einfach-ist-die-rechnung-nicht/>
- ⁸ WHO: Air pollution: <https://www.who.int/health-topics/air-pollution>
- ⁹ EEA: Air pollution is the biggest environmental health risk in Europe: <https://www.eea.europa.eu/themes/air>
- ¹⁰ UBA: Luft: <https://www.umweltbundesamt.de/themen/luft>
- ¹¹ Leopoldina: Ad-hoc-Stellungnahme „Saubere Luft“ (April 2019) > https://www.leopoldina.org/uploads/tx_leopublication/Leo_Stellungnahme_SaubereLuft_2019_Web.pdf
- ¹² UBA: Quellen der Luftschadstoffe > <https://www.umweltbundesamt.de/themen/luft/emissionen-von-luftschadstoffen/quellen-der-luftschadstoffe>
- ¹³ Science of The Total Environment: COVID-19: Impact by and on the Environment > <https://www.sciencedirect.com/journal/science-of-the-total-environment/special-issue/104GQG451CB>
- ¹⁴ SPIEGEL: Stickstoffoxid-Belastung in Großstädten - Corona-Effekt beweist Wirksamkeit von Fahrverboten > <https://www.spiegel.de/wissenschaft/mensch/corona-effekt-beweist-wirksamkeit-von-fahrverboten-a-fc833dab-4303-42ad-ac0a-8be175a79ea3>
- ¹⁵ ZEIT: Ist die Luft wegen Corona jetzt besser? > <https://www.zeit.de/wissen/umwelt/2020-04/luftqualitaet-europa-verbesserung-schadstoffwerte-lockdown-coronavirus/komplettansicht>
- ¹⁶ MZ: Trotz Corona-Lockdown - Warum die Luft in Sachsen-Anhalt schmutzig bleibt > <https://www.mz-web.de/sachsen-anhalt/trotz-corona-lockdown-warum-die-luft-in-sachsen-anhalt-schmutzig-bleibt-36782682>
- ¹⁷ MDR: Saubere Luft in Thüringen während Corona > <https://www.mdr.de/thueringen/corona-lockdown-luftqualitaet-verbessert-100.html>
- ¹⁸ RBB: Stickstoffdioxidwerte in Berlin: Die Luft ist besser – das muss aber nicht am Lockdown liegen > https://www.rbb24.de/panorama/thema/2020/coronavirus/beitraege_neu/2020/04/lockdown-saubere-luft-stickstoff.html
- ¹⁹ HLNUG: Sauberere Luft durch Corona > <https://www.hlnug.de/presse/pressemitteilung/sauberere-luft-durch-corona>
- ²⁰ Web.de: Darum liefern die Messstationen trotz Coronakrise keine geringeren Feinstaubwerte > <https://web.de/magazine/panorama/coronakrise-liefern-messstationen-geringeren-feinstaubwerte-34640240>
- ²¹ Umweltbundesamt Österreich: Corona und die Auswirkungen auf die Luftqualität > <https://www.umweltbundesamt.at/news200504>
- ²² The Guardian: Coronavirus UK lockdown causes big drop in air pollution > <https://www.theguardian.com/environment/2020/mar/27/coronavirus-uk-lockdown-big-drop-air-pollution>

-
- ²³ University of York: New study reveals York's air quality improves by 30 per cent during lockdown > <https://www.york.ac.uk/news-and-events/news/2020/research/air-quality-improves-york-lockdown/>
- ²⁴ Twitter: Lockdown NO2 evolution in Valencia Region > <https://twitter.com/CeamFundacion/status/1257674931195740160?s=20>
- ²⁵ DWD: Ein sehr sonniger, milder März mit etwas zu wenig Niederschlag > https://www.dwd.de/DE/presse/pressemitteilungen/DE/2020/20200330_deutschlandwetter_maerz2020.pdf?blob=publicationFile&v=3
- ²⁶ DWD: Sonnigster und dritttrockenster April seit Messbeginn in Deutschland > https://www.dwd.de/DE/presse/pressemitteilungen/DE/2020/20200429_deutschlandwetter_april2020.pdf?blob=publicationFile&v=2
- ²⁷ King's College London: Mixed pollution results for London during lockdown > <https://www.kcl.ac.uk/news/mixed-pollution-results-london-during-lockdown>
- ²⁸ The University of Manchester: Traffic pollution drops in lockdown – but other risks to air quality increase > <https://www.manchester.ac.uk/discover/news/traffic-pollution-drops-in-lockdown--but-other-risks-to-air-quality-increase-reveal-manchester-researchers/>
- ²⁹ London: Pollution surge caused by garden bonfires during coronavirus lockdown > <https://londonnewsonline.co.uk/pollution-surge-caused-by-garden-bonfires-during-coronavirus-lockdown/>
- ³⁰ NOAA: NOAA exploring impact of COVID-19 response on the environment > <https://research.noaa.gov/article/ArtMID/587/ArticleID/2617/NOAA-exploring-impact-of-coronavirus-response-on-the-environment>
- ³¹ NOAA: NOAA's Polar-Orbiting Satellites See Drop in U.S. Air Pollution > <https://www.nesdis.noaa.gov/content/noaa%E2%80%99s-polar-orbiting-satellites-see-drop-us-air-pollution>
- ³² CHMI: Pokles dopravy a změna mobility během nouzového stavu > <https://chmibrno.org/blog/2020/05/17/pokles-dopravy-a-zmena-mobility-behem-nouzoveho-stavu/>
- ³³ EEA: „Unequal exposure and unequal impacts: social vulnerability to air pollution, noise and extreme temperatures in Europe“ > <https://www.eea.europa.eu/de/articles/wie-wirken-sich-umweltgefahren-in>
- ³⁴ EEA Report No 10/2019: Air quality in Europe > <https://www.eea.europa.eu/publications/air-quality-in-europe-2019>
- ³⁵ Bundesregierung: Deutsche Nachhaltigkeitsstrategie (Aktualisierung 2018) > <https://www.bundesregierung.de/breg-de/themen/nachhaltigkeitspolitik/eine-strategie-begleitet-uns/die-deutsche-nachhaltigkeitsstrategie>
- ³⁶ UBA: Entwicklung der Luftqualität in Deutschland > <https://www.umweltbundesamt.de/themen/luft/daten-karten/entwicklung-der-luftqualitaet#entwicklung-der-luftqualitat-in-deutschland>
- ³⁷ UBA: Luftqualität 2019 > <https://www.umweltbundesamt.de/publikationen/luftqualitaet-2019>
- ³⁸ RBB: Mobilitätsanalyse mit Handydaten - Wie der Lockdown-Effekt verpufft > https://www.rbb24.de/panorama/thema/2020/coronavirus/beitraege_neu/2020/04/ostern-mobilitaet-lockdown-disziplin.html
- ³⁹ EU-Kommission: Staaten tun nicht genug gegen Luftverschmutzung: https://www.deutschlandfunk.de/fortschrittsbericht-eu-kommission-staaten-tun-nicht-genug.1939.de.html?drn:news_id=1145210
- ⁴⁰ BMU: Masterplan Umwelttechnologien > <https://www.bmu.de/themen/wirtschaft-produkte-ressourcen-tourismus/wirtschaft-und-umwelt/umwelttechnologien/masterplan-umwelttechnologien/>
- ⁴¹ BMU: GreenTech made in Germany 2018 - Umwelttechnik-Atlas für Deutschland > https://www.bmu.de/fileadmin/Daten_BMU/Pool/Broschueren/greentech_2018_bf.pdf
- ⁴² Leibniz-Gemeinschaft: Auswirkungen auf Gesellschaft und Wirtschaft > <https://www.leibniz-gemeinschaft.de/forschung/corona-forschung.html>
- ⁴³ Leibniz-Gemeinschaft: Corona-Krise - Krisen einer globalisierten Welt > <https://www.leibniz-krisen.de/aktuelles/corona-pandemie-eine-krise-der-globalisierten-welt/thema-corona-krise.html>