For our Environment

Umwelt Bundesamt

50th TFIAM meeting

Effects of the COVID-19 pandemic on air quality in Germany

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Section II 4.1 „General Aspects of Air Quality Control“

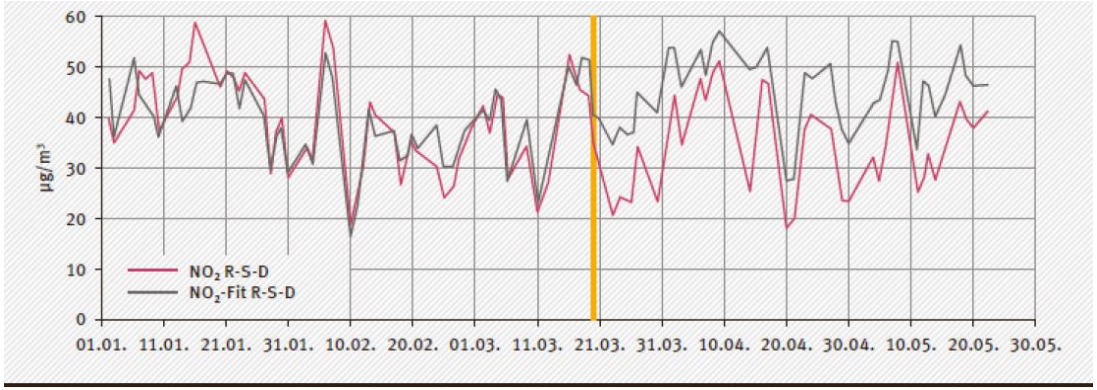
- **Overview of lockdown measures**
- **Meteorological conditions**
- **Effects of the COVID-19 pandemic on**
  - NO_2 concentrations
  - PM_{10} concentrations
- **Germany's green recovery package**
- **Conclusions**

Overview of lockdown measures

- First lockdown from 23 March to 19 April 2020
- Second lockdown from 16 December 2020
- Closure of schools, kindergardens, non-essential shops, restaurants, pubs and nationwide ban on public events
- Effects of the lockdown measures on emission related activities:
  - **Industry:** Decrease in production in many branches
  - **Road transport:** traffic volumes declined significantly during the first lockdown period:
    - Berlin: -20-30 % (passenger cars and LDVs),
    - In other federal states: -30-50 %
  - Increased **indoor air pollution**

Meteorological conditions

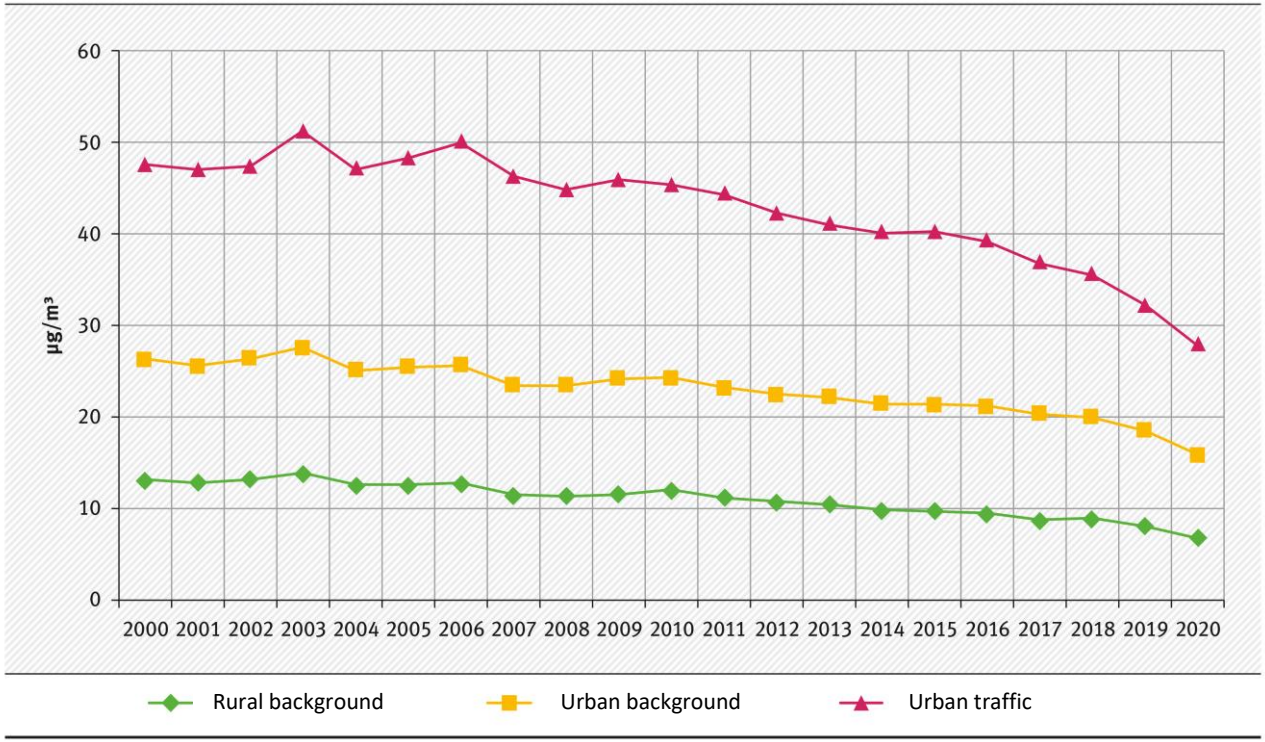
- Weather conditions before the lockdown in spring 2020: windy and much precipitation
- Weather conditions during the lockdown (23-19 March 2020): high pressure weather conditions, little wind and vertical air exchange
- **In order to evaluate the effects of lockdown measures on air quality meteorological influences need to be factored out.**



Source: German Meteorological Service 2020, https://www.dwd.de/DE/Home/_functions/aktuelles/2020/20200717_hintergrundbericht_gaw.html

Development of NO_2 concentrations

Development of annual mean NO_2 values
in different air pollution regimes, time frame 2000-2020

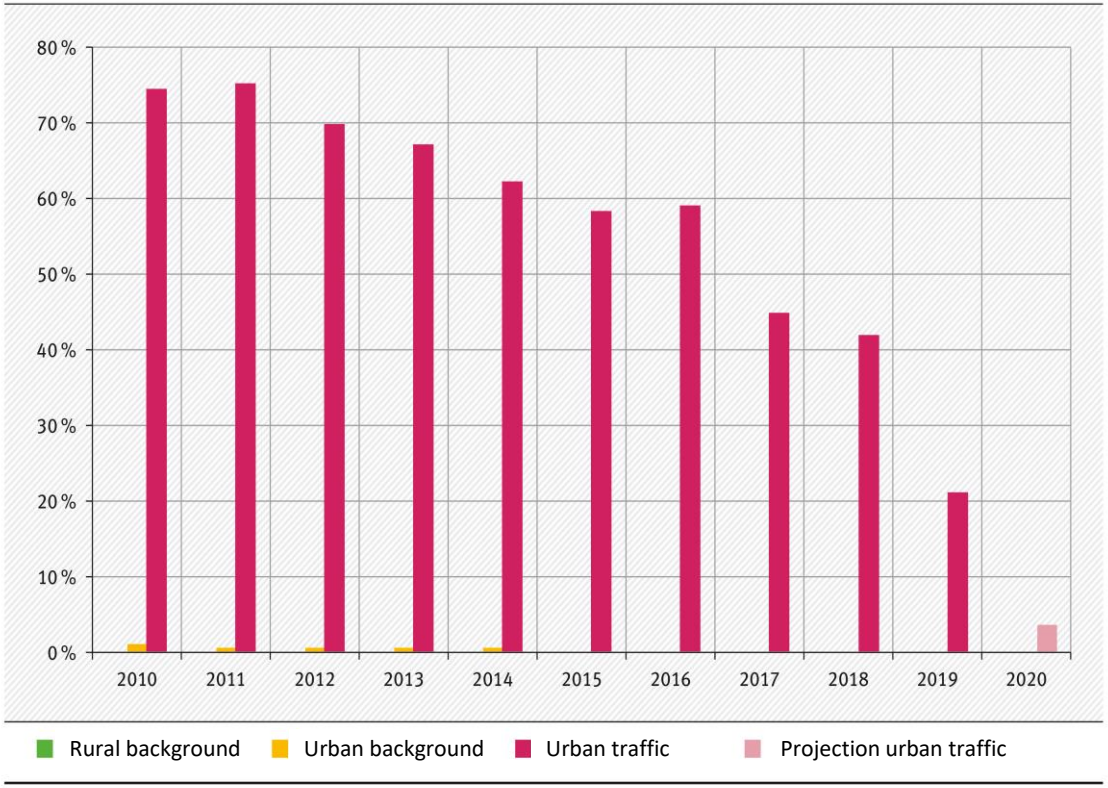


Source: UBA 2021

- There is a significant decrease of NO_2 levels throughout Germany, especially in recent years.
- Average NO_2 concentration at urban traffic air monitoring stations is now well below 40 µg/m³.

Exceedances of NO_2 annual limit value

Percentage share of air monitoring stations exceeding the NO_2 limit value for the annual mean
In the corresponding pollution regime, time frame 2010-2020



Source: UBA 2021

- In 2020 about 3-4 % of all measuring stations located near road traffic exceeded the annual mean limit value of 40 µg/m³ compared to 21 % in 2019.
- Results of a preliminary evaluation of measurement data collected by the federal states and the German Environment Agency at 400 measuring sites.

Effects of national and local clean air measures

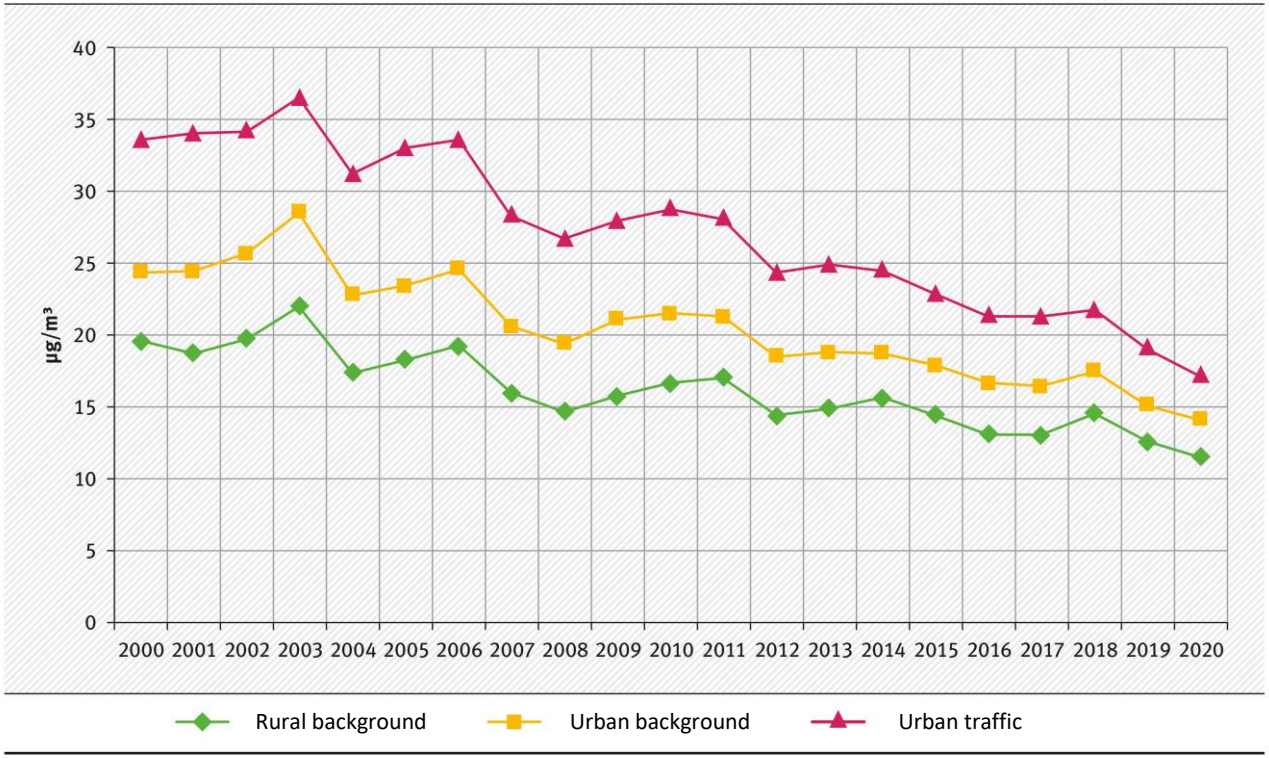
- Modelling shows that software updates and fleet renewal resulted in a significant reduction of around 3 µg/m^3 in 2020.
- In addition, mean NO_2 concentrations at measuring stations located close to road traffic fell by a further microgram on avergage due to local measures such as speed limits and driving bans as well as the use of cleaner busses.

Effects of measures to contain the COVID-19 pandemic on NO_2 levels

- NO_2 concentrations measured at urban stations near road traffic decreased during the first lockdown in spring 2020 by an average of 20-30 %. This is shown by evaluations in which meteorological influences were factored out.
- Depending on the particular decrease of traffic and the meteorological background conditions, the decline varied greatly from region to region.
- Since the traffic decrease due to the lockdown was mainly limited to a period of 4 weeks (23 April to 19 March), the effect on the annual mean NO_2 values is small (about 1 µg/m^3).

Development of PM10 concentrations

Development of the annual PM10 values
in different air pollution regimes, time frame 2000-2020

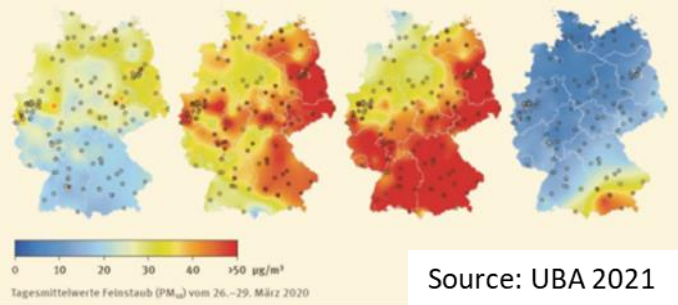


Source: UBA 2021

- PM10 pollution continues to decline throughout Germany.
- No exceedances of the PM10 limit value for the annual mean (40 µg/m³)
- About 4% of the all measuring stations failed to comply with the WHO recommendation (20 µg/m³).

Effects of measures to contain the COVID-19 pandemic on PM10 levels

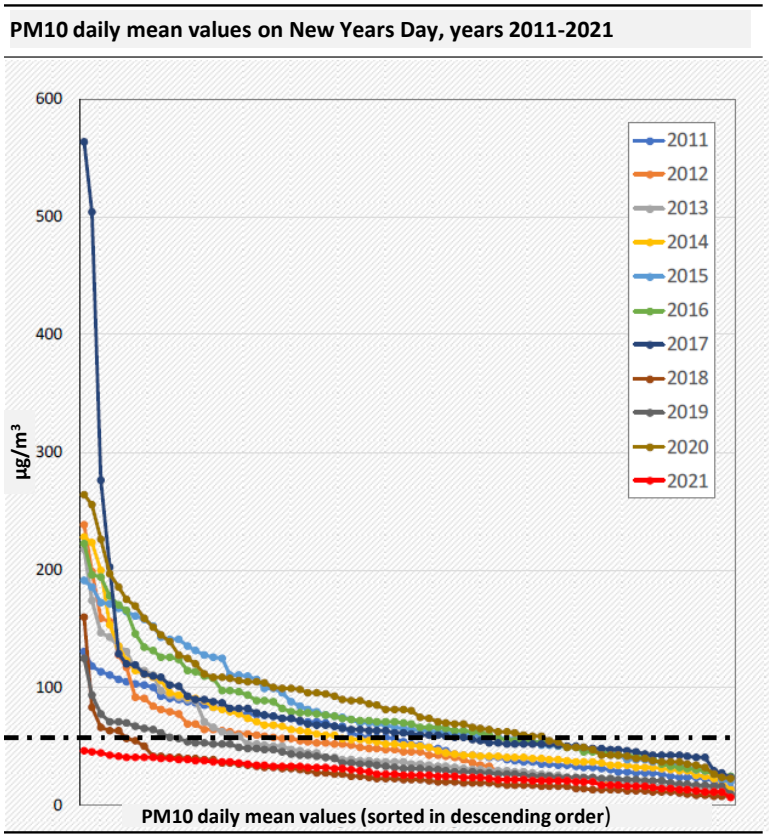
- Modelling shows that measures to contain the COVID-19 pandemic had only a minor impact on particulate matter concentrations, given that the contribution of emissions from road traffic to particulate matter pollution is much smaller than for NO_2.
- The low particulate matter load in 2020 can be linked to a mild and wet winter.
- Due to a Saharan dust event during the lockdown, no positive effect on PM concentrations could be observed.



Source: UBA 2021

Effects of measures to contain the COVID-19 pandemic on PM10 levels

- The second lockdown included a nationwide ban on gatherings on New Year's Eve and New Year's Day and a ban on the sale of fireworks.
- Due to this ban of private fireworks PM10 concentrations on New Year‘s Day 2021 have been much lower than in previous years.



Source: UBA 2021

Germany‘s green recovery package

- Germany launched a 130 billion € COVID-19 recovery package. Part of this recovery package is a 50 billion € fund to finance climate mitigation measures and environmentally friendly technologies.

- Interesting UBA publications:
  - The Green New Consensus: Study Shows Broad Consensus on Green Recovery Programmes and Structural Reforms: https://www.umweltbundesamt.de/publikationen/the-green-new-consensus-study-shows-broad-consensus.
  - Social impact of the COVID-19 pandemic in Germany and possible consequences for environmental policy: https://www.umweltbundesamt.de/publikationen/social-impact-of-the-covid-19-pandemic-in-germany

Conclusions

NO_2

- The lockdown in spring 2020 had significant positive effects on NO_2 levels in Germany, however, these are only short-term effects.
- There is only little effect on annual mean NO_2 values.
- Bad dispersion conditions partly compensated emission reductions.
- The lockdown has shown that road traffic is a significant source of NO_2 pollution and less traffic results in lower NO_2 concentrations
- Targeted measures to reduce pollution in cities – mostly in the transport sector – are the main drivers for the decrease in NO_2 concentrations that can be observed since the past few years.

PM10

- The lockdown in spring 2020 had hardly any effect on PM concentrations, as road traffic is not a dominant source for PM.
- New Year‘s Day 2021 without high peak concentrations caused by fireworks

Thank you for your attention!

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https://www.umweltbundesamt.de/publikationen/luftqualitaet-2020