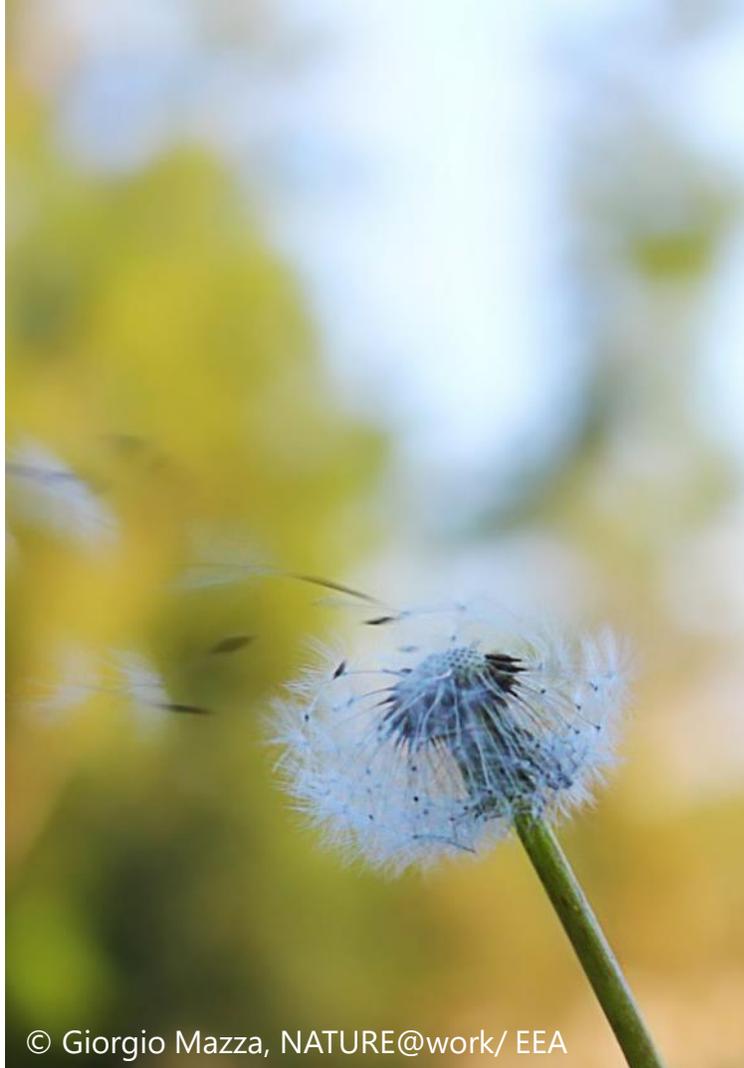


Impacts des mesures de confinement pendant la crise sanitaire sur la qualité de l'air en Europe



Outline



© Giorgio Mazza, NATURE@work/ EEA

- The lockdown measures to stop the spread of the COVID-19
- Reductions in air pollutants concentrations based on data: qualitative analysis
- Disentangling the meteorological effect: quantitative analysis
- Impact of the recovery: qualitative analysis
- Conclusions, lessons learned and steps forward

Lockdown measures impacted economic activities and their emissions

Reductions in activity and emissions from



Transport: mainly **road** transport and **aviation**. To a lesser extent, international shipping

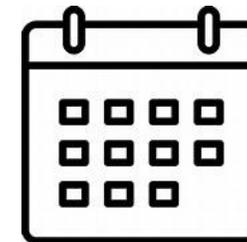


Industry: especially non-critical activities

Probably **no changes** in activity and emissions from



Agriculture



Measures implemented around **mid-March 2020**

Probable **increase** in the emissions from

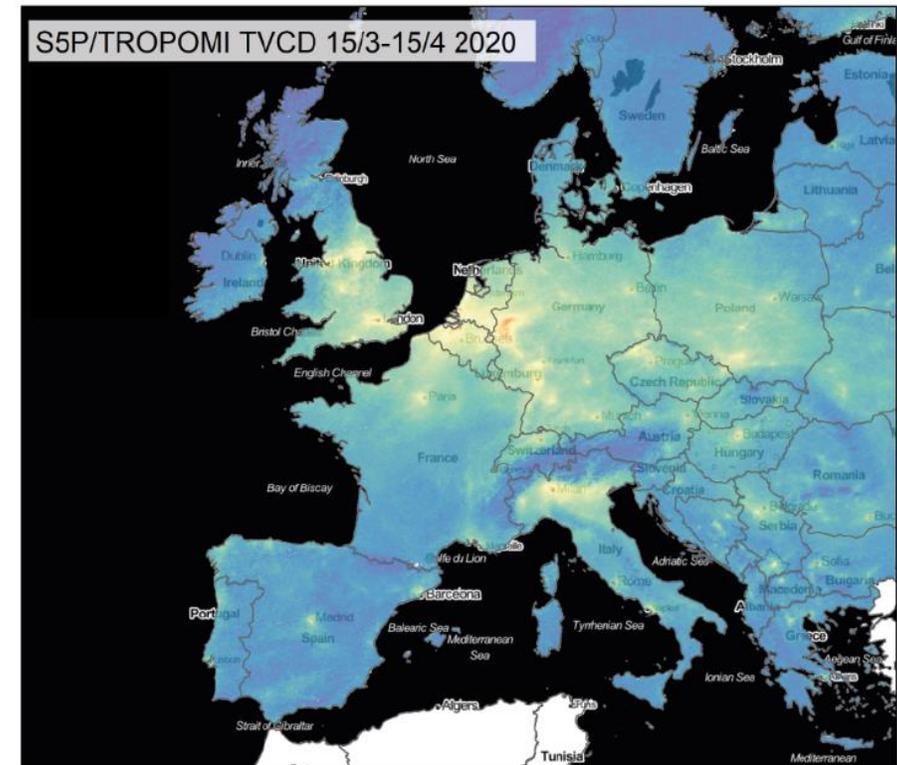
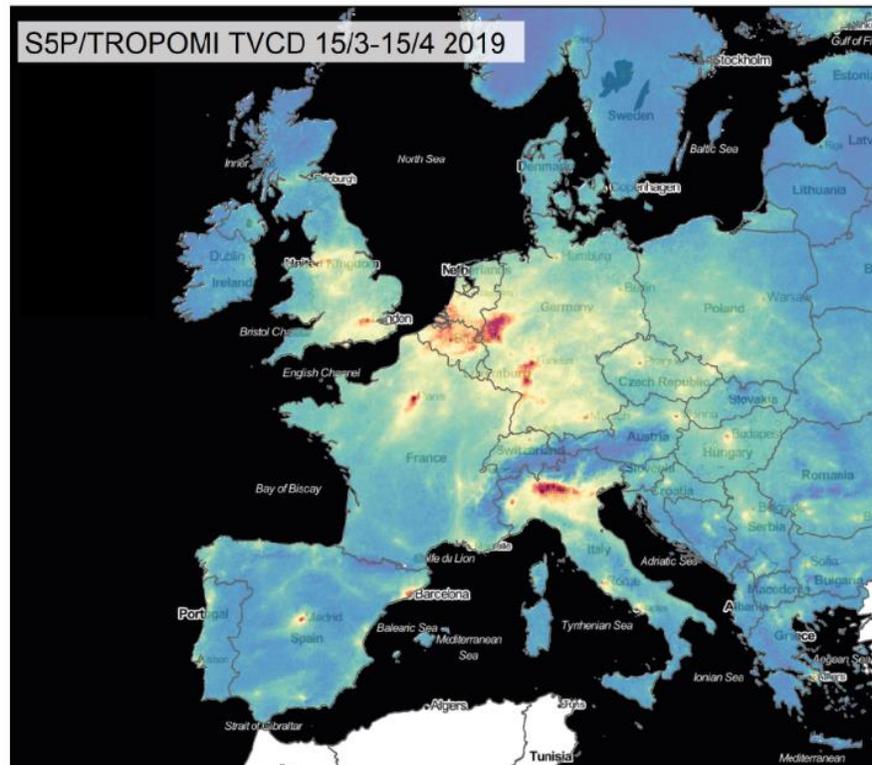


Residential heating



Measures **differed** across Europe

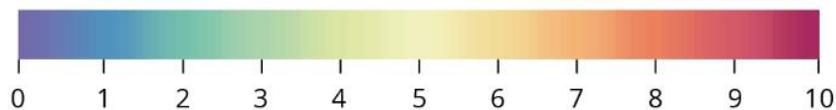
First indications of reductions in air pollutants concentrations



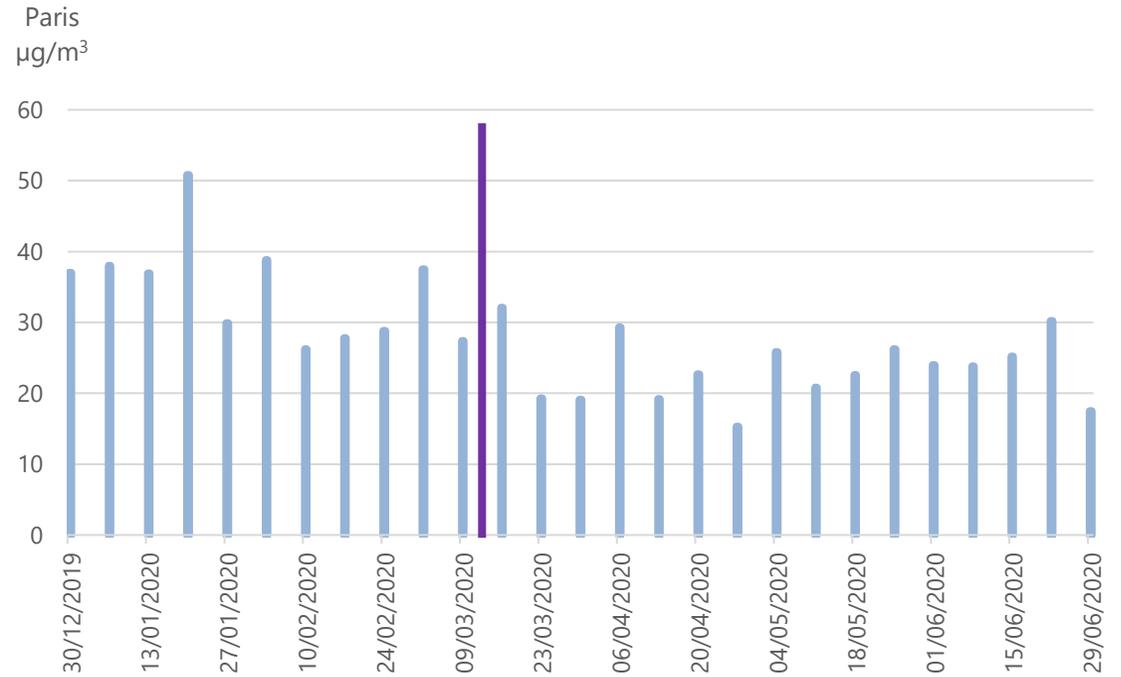
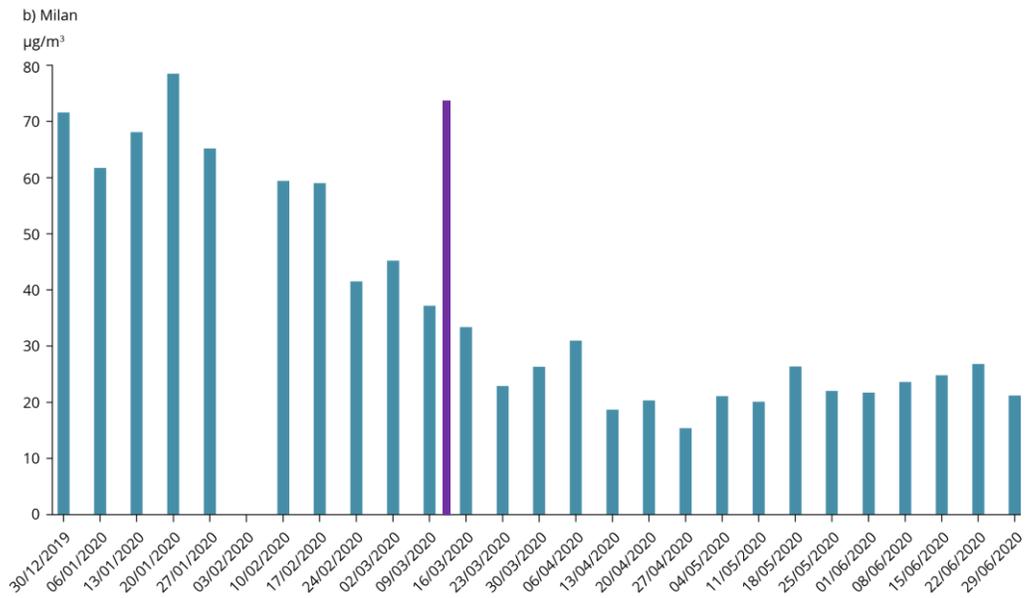
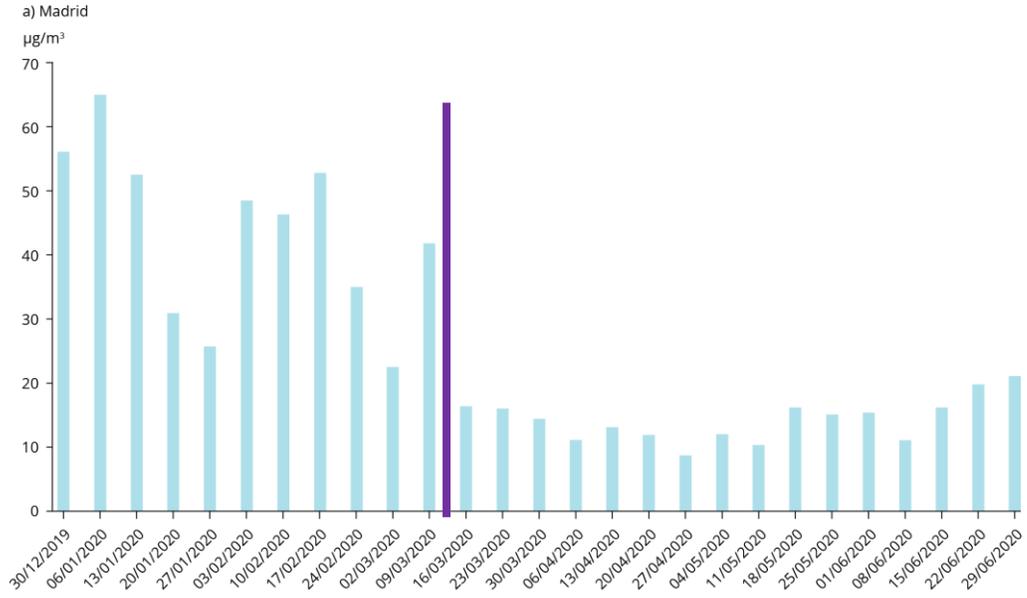
Reference data: © NILU - Norwegian Institute for Air Research. Contains modified Copernicus Sentinel data (2020), processed by NILU. Basemap © OpenStreetMap contributors and map tiles by Stamen Design, under CC BY 3.0.

Average NO₂ pollution level (Tropospheric Vertical Column Density, TVCD) from Sentinel-5Precursor/Tropospheric Monitoring Instrument (S5P/TROPOMI) for the period 15 March/15 April 2019 (left panel) and the same period 2020 (right panel)

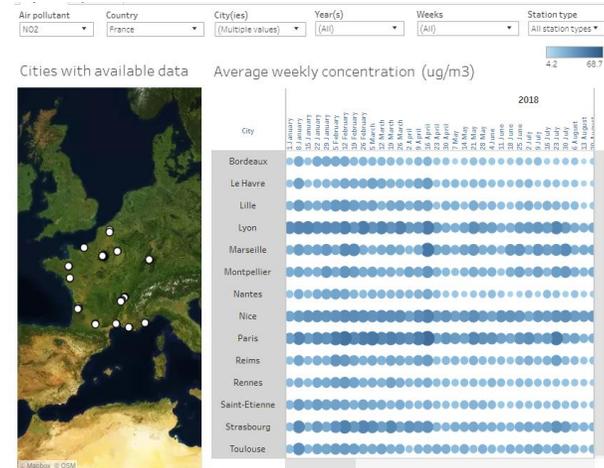
Peta-molecules/cm²



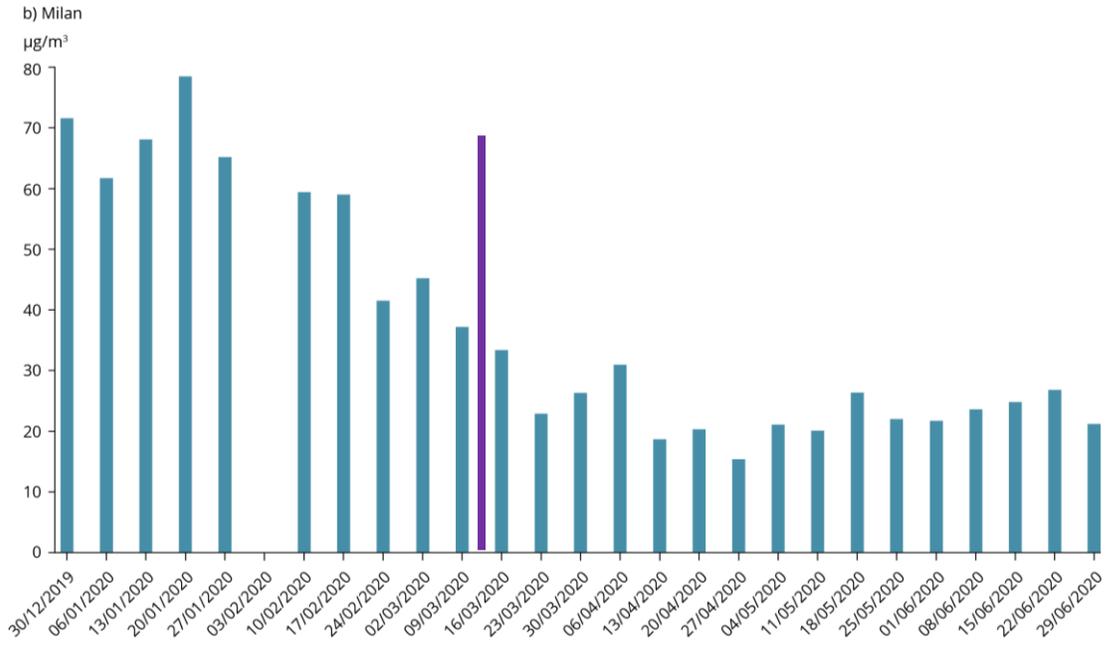
Qualitative changes in air pollutant concentrations: NO₂



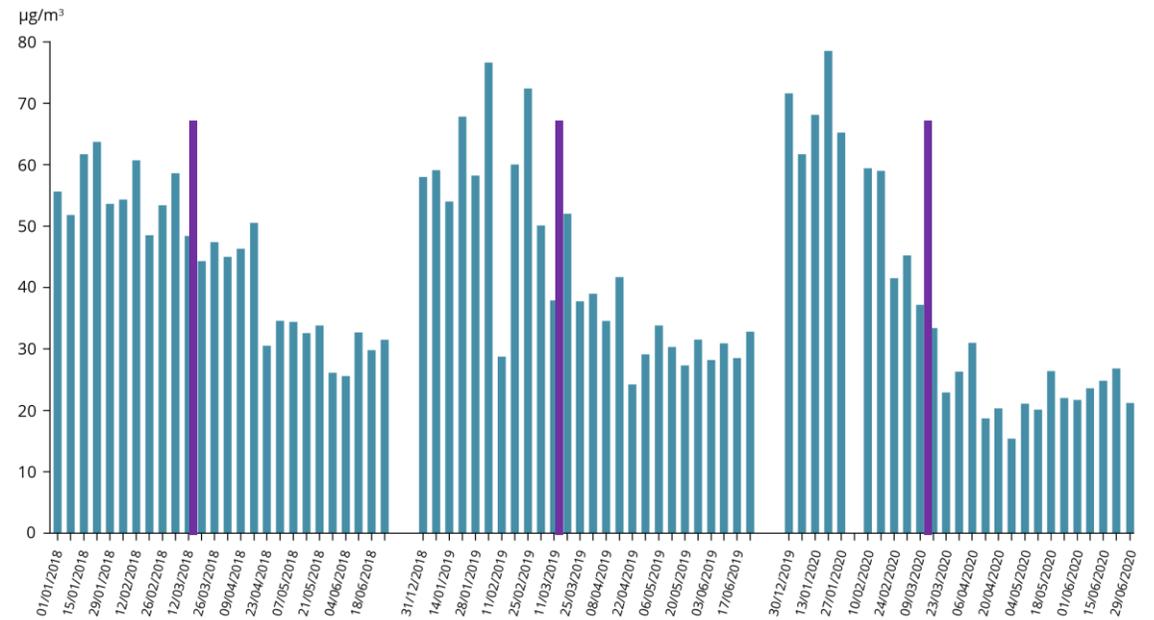
Source: EEA, [Air quality and COVID-19](#)



Qualitative changes in air pollutant concentrations: Milan, NO₂



Source: EEA, [Air quality and COVID-19](#)



Impact of changes in emissions and meteorology

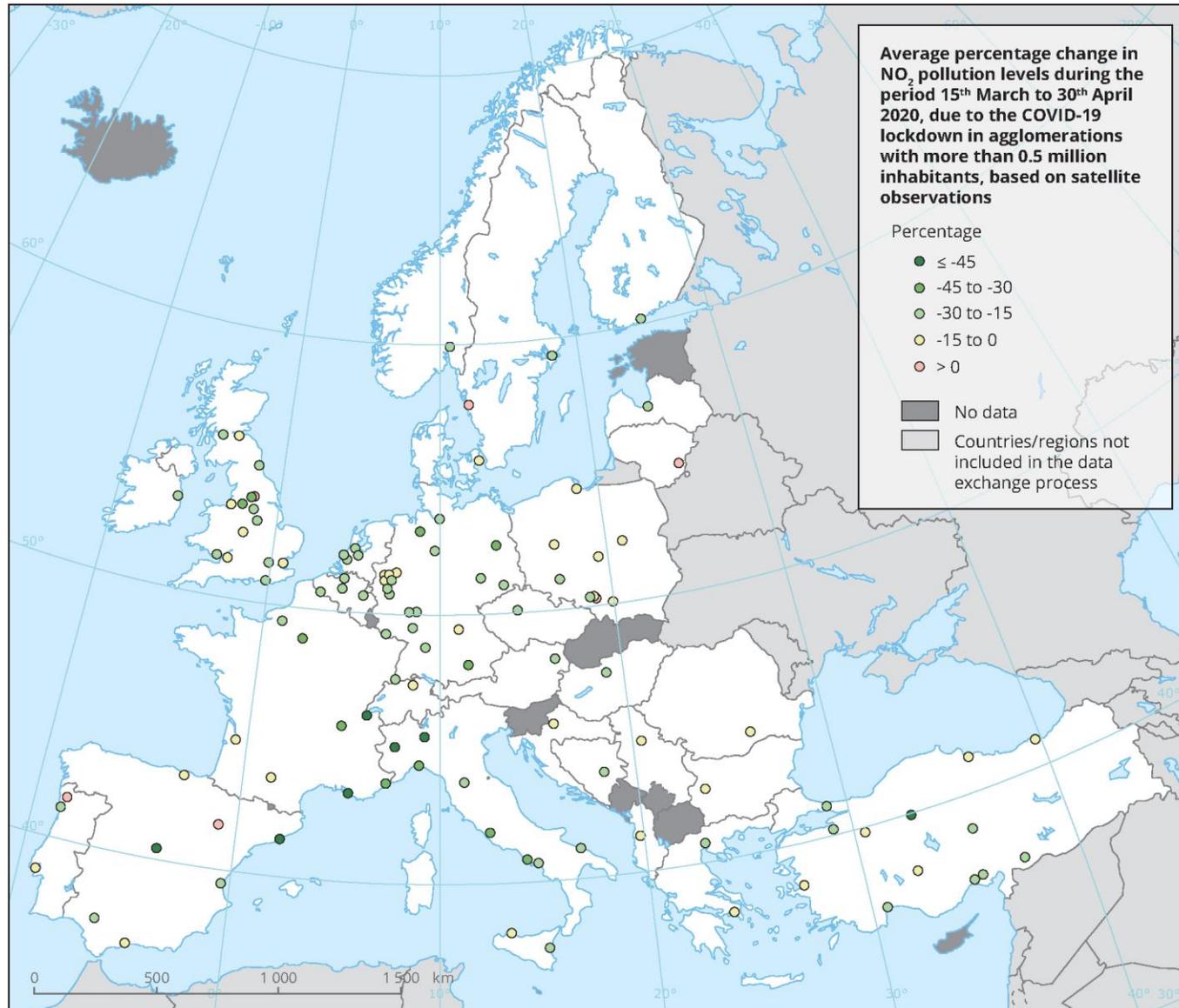
- Need to disentangle changes due to **emissions** from changes due to **meteorology**
- Analysis in the forthcoming *Air quality in Europe – 2020 report*, performed together with the Copernicus Atmospheric Monitoring Service (**CAMS**) and the European Topic Centre on Air pollution, transport, noise and industrial pollution (**ECT/ATNI**)
- **Satellite** derived concentrations and **machine-learning**
- **Up-to-date data** and a generalised additive model (**GAM**)
 - Observed 2020 concentrations minus “Business-as-usual” 2020 concentrations
- Differences in concentrations from CAMS **chemical transport models** using
 - A “lockdown” emission inventory and a “Business-as-usual” emission inventory



European Environment Agency
European Topic Centre on Air pollution,
transport, noise and industrial pollution



NO₂ relative change, satellite data



Reference data: ©ESRI

TROPOMI satellite 2020 observations + machine learning to simulate 2020 without lockdown (BAU)

Average percentage change in NO₂ concentrations (obs. – simulated BAU)

Cities > 500 000 inhabitants

15 March – 30 April 2020

General reductions in NO₂

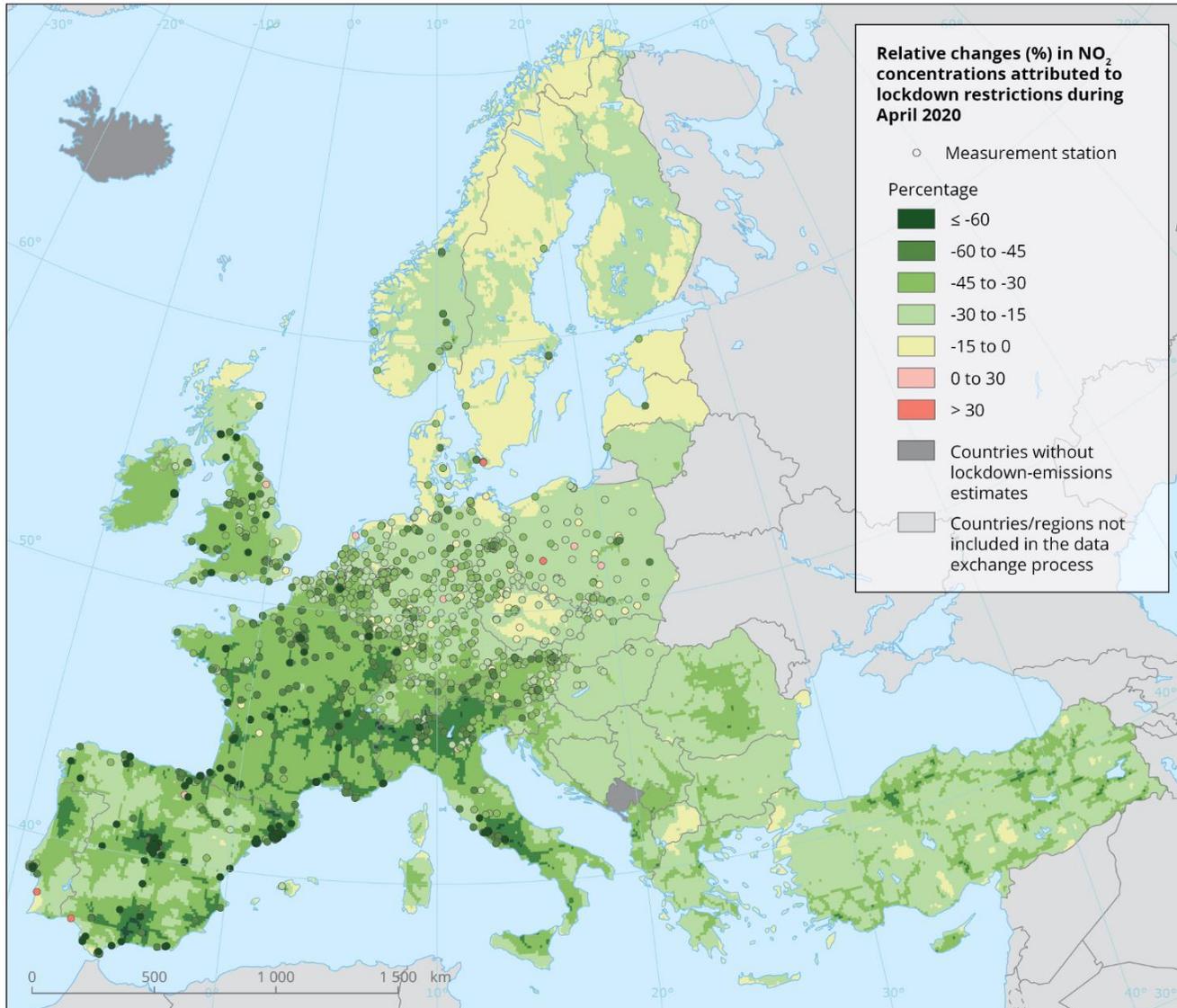
Reductions in NO₂ concentrations of **more than 45 %** in

- Spain (**Barcelona** and **Madrid**),
- Italy (**Milan** and **Turin**)
- France (**Marseille**),
- Switzerland (**Geneva**) and
- Turkey (**Ankara**)

European Environment Agency



NO₂ relative change, UTD data and CTMs



Reference data: ©ESRI

UTD monitoring data + generalised additive model to predict 2020 BAU concentrations (dots)

Chemical transport models with BAU emissions and lockdown emissions (colour background)

April 2020

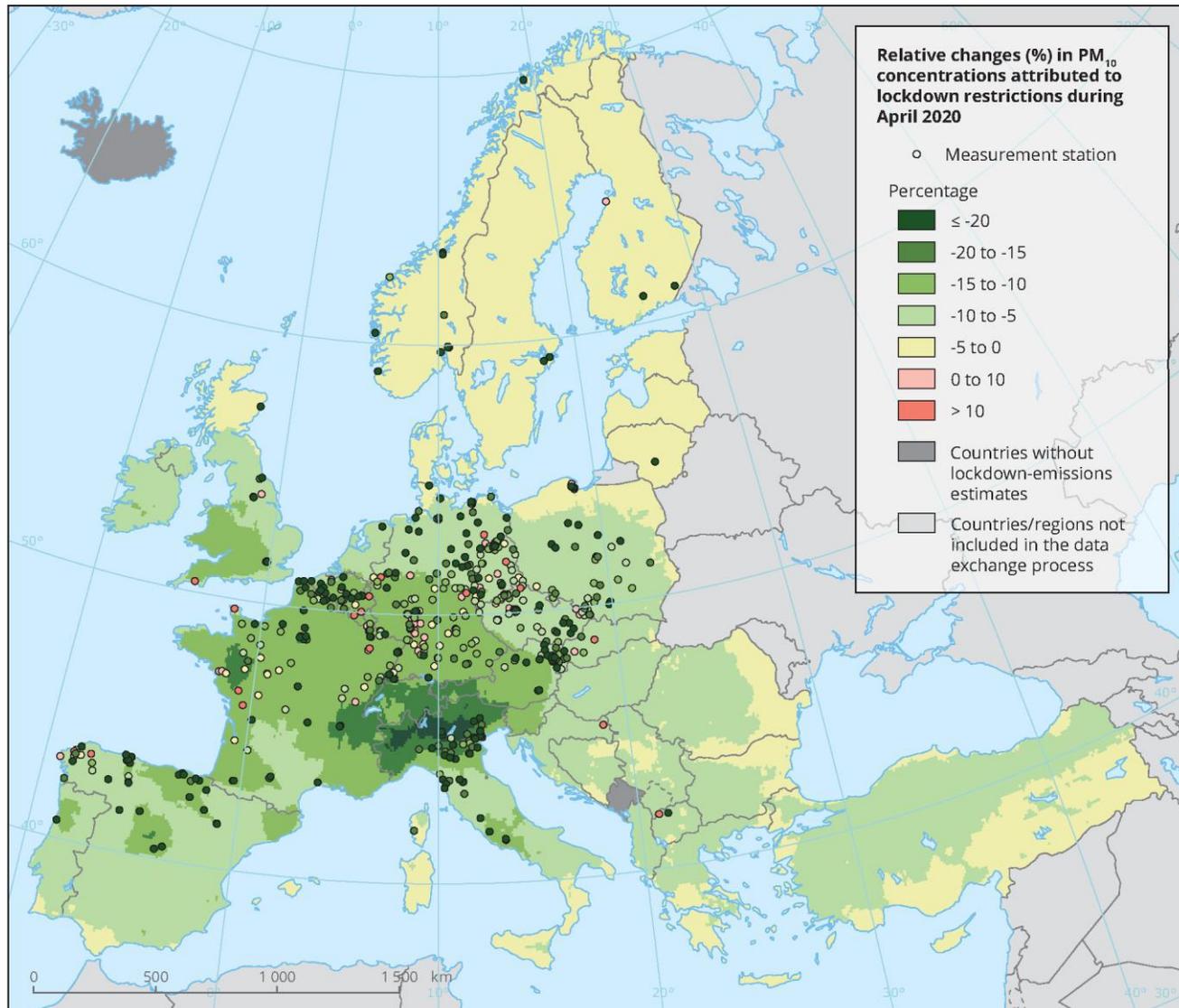
In **general**, **reduction** of concentrations; with differences across countries and cities and within cities

Reductions in NO₂ stations (**up to 70 % at traffic stations** in Spain and Italy)

Highest total reductions in Spain, France, Italy, Portugal

Reductions in **background** NO₂ concentrations of **up to 60 %** (Spain, Italy and France)

PM₁₀ relative change, UTD data and CTMs



Reference data: ©ESRI

UTD data + generalised additive model

Chemical transport models with BAU emissions and lockdown emissions

April 2020

Smaller reductions in PM₁₀. Differences across countries, cities and within cities

Up to 35 % in traffic stations, in Spain and Italy. High reductions also in France and Norway

Highest total reductions in Spain, Norway, Italy, Austria

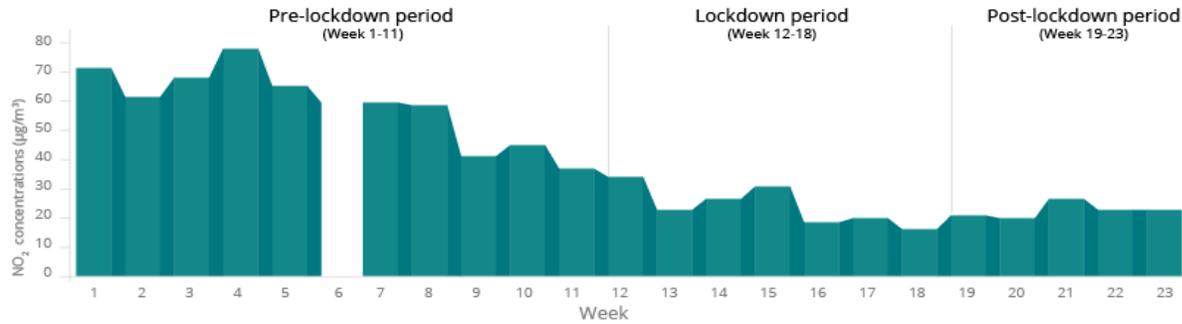
Reductions in **background** PM₁₀ concentrations of **up to 20 %** (Italy and France)

Post-lockdown recovery: qualitative assessment

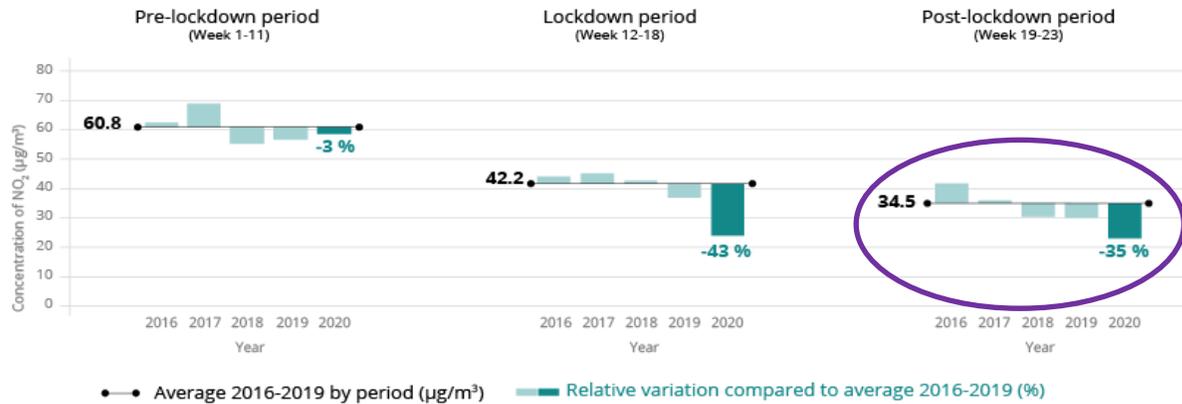
Source: EEA, [Air quality and COVID-19](#)

MILAN

Weekly mean NO₂ concentrations, January-June (weeks 1-23), 2020

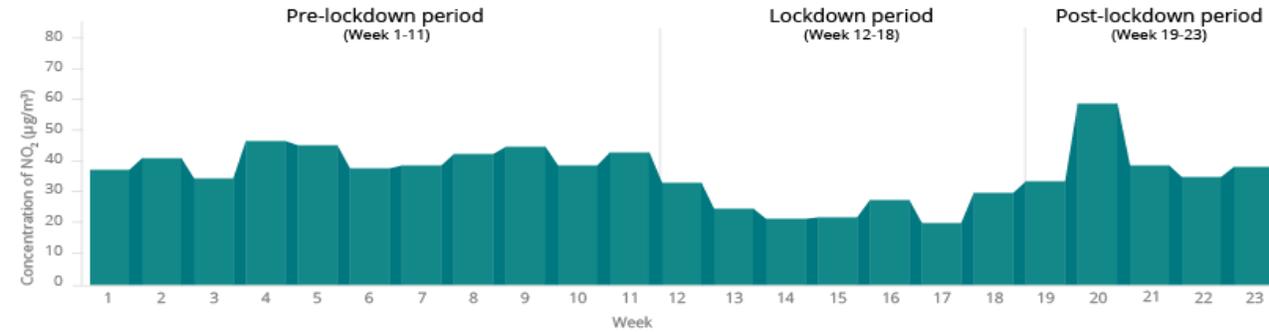


Average weekly mean NO₂ concentrations by period, showing relative variation compared to 2016-2019 average

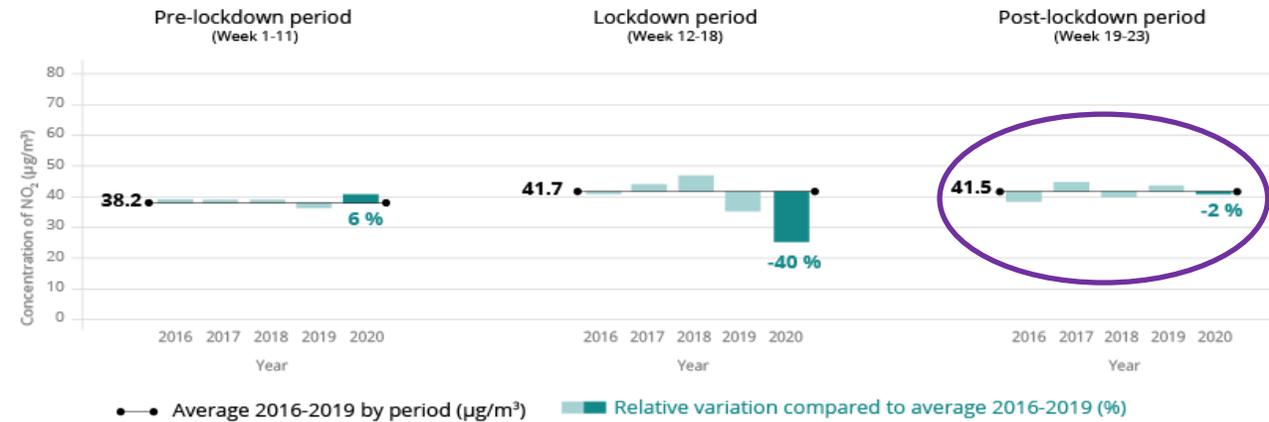


Athens

Weekly mean NO₂ concentrations, January-June (weeks 1-23), 2020



Average weekly mean NO₂ concentrations by period, showing relative variation compared to 2016-2019 average



SOME CONCLUSIONS



- The lockdowns brought reductions in air emissions, mainly from road transport and aviation. Differences in countries
- Consequent reductions in air pollutants concentrations, with robust conclusions from different data and tools
- Differences in the changes, with reductions of NO₂ traffic levels up to 70 %
- Lower reductions in PM₁₀, with maxima in traffic levels of 35 %.
- Increases in the recovery, not always reaching pre-pandemic values
- Possible effect of air pollution on vulnerability and susceptibility to COVID-19; possible role of the air pollution in spreading the SARS-CoV-2 coronavirus, especially indoors
- Further research is needed



Lessons learned and future steps

- Immediate effect on NO₂. More complex mechanisms of PM
- Impact on noise levels and greenhouse gases emissions
- Increased public awareness on air pollution
- Risks of the recovery: increases start to show up after relaxation of lockdown measures
- Need of long-term measures to achieve permanent reductions in air pollutants concentrations
- Innovative solutions for mobility; promotion of safe public transport, walking and cycling; teleworking.



- Follow up of the work by EEA in 2021 to include ozone, PM_{2.5} and extend to all 2020

Merci pour votre attention!!

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