

Evrin Ozturk, 21 September 2020
EGVIA Online Workshop: Air quality in Europe-
a closer look at the impact of Covid-19 lockdown and the
related travel restrictions on NO₂ and particle emissions

Impact of Covid-19 lockdown period on air quality across Europe based on situ-monitoring data

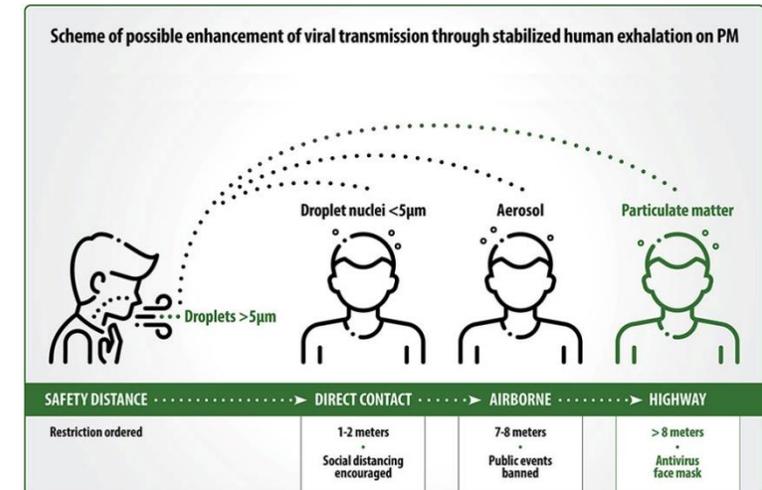
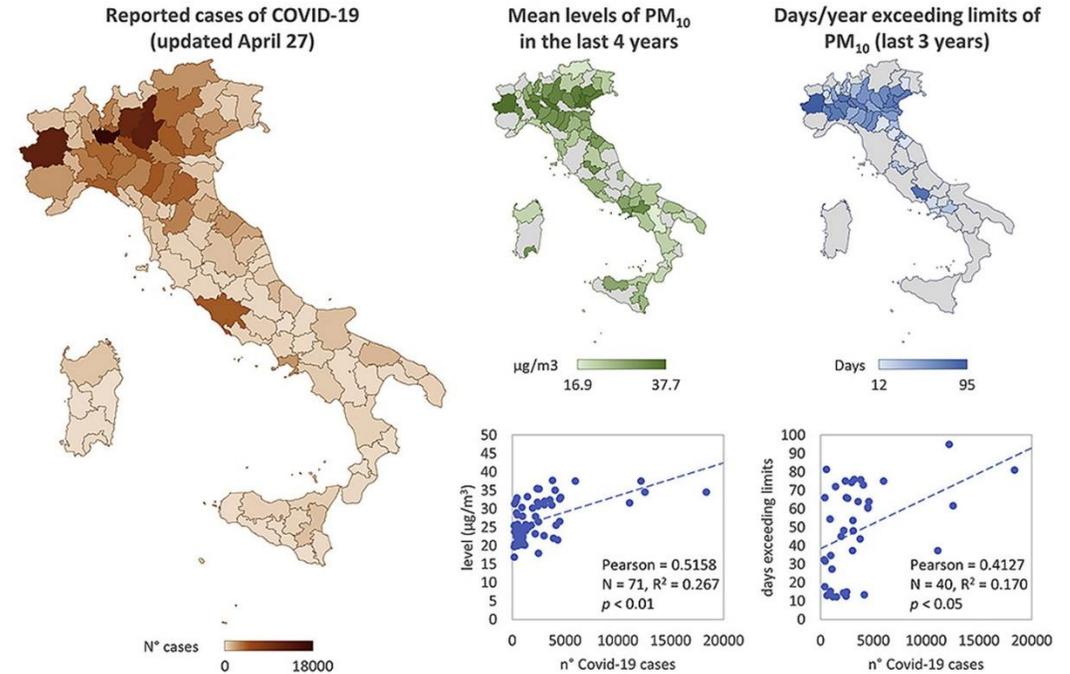
Impacts of COVID-19 lockdown and related measures

- sudden decrease in economic activities, particularly from road transport, aviation and international shipping
- reduction in emissions of air pollutants
 - especially in the road transport sector
 - transport of goods and their associated emissions were little affected
 - industrial emissions also dropped in different regions in Europe, although with more localized effects
- reduction in concentrations of air pollutants

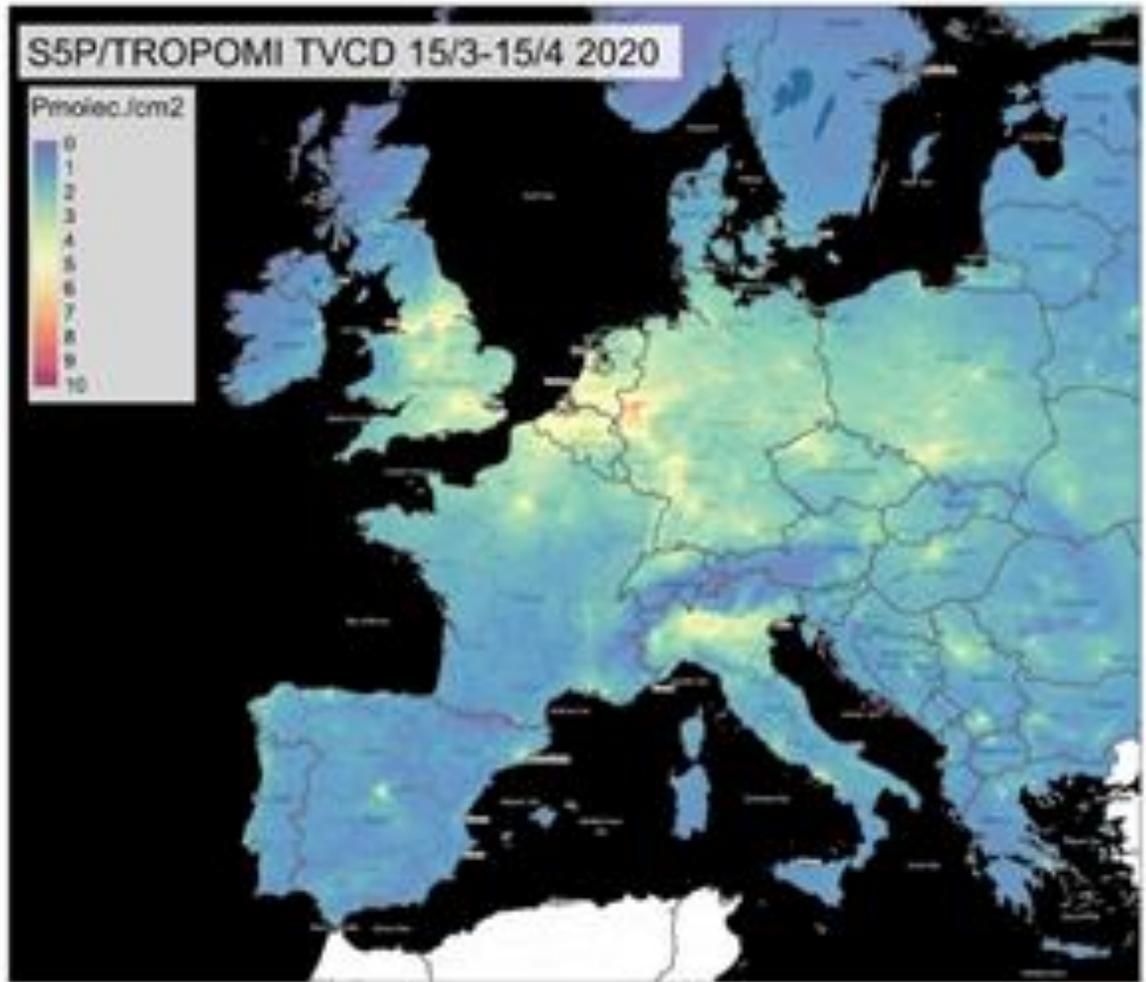
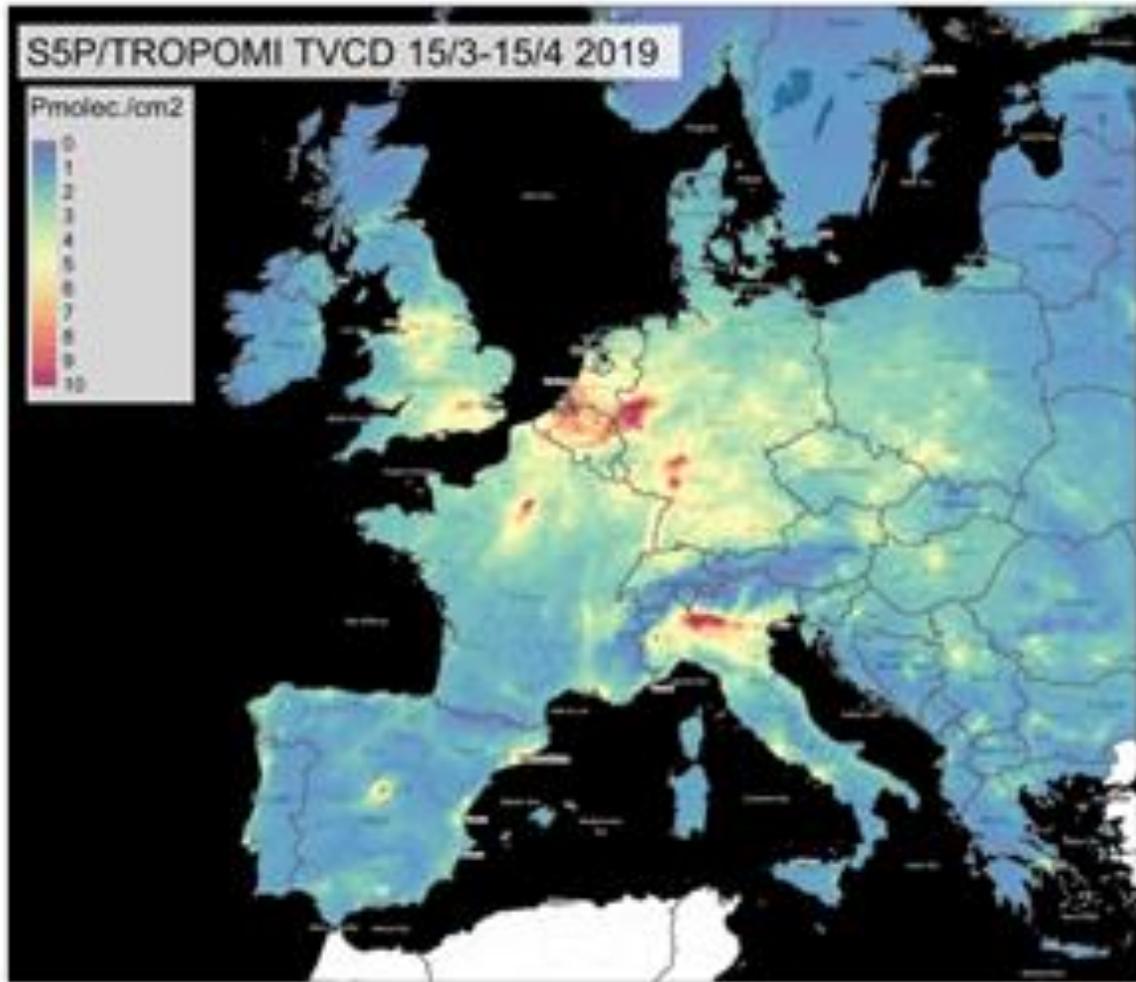


Further links between air pollution and Covid-19

- long-term exposure to air pollution might effect on
 - human vulnerability
 - susceptibility
- the possible role of air pollution in spreading the coronavirus



Average NO2 pollution level from Sentinel-5P/TROPOMI



EEA air quality data and Covid-19



ARTICLE

Air quality and COVID-19

The lockdown and related measures implemented by many European countries to stop the spread of COVID-19 have led to a sudden decrease in economic activities, including a drop in road transport in many cities. To assess how this has affected concentrations of air pollution, the EEA has developed a viewer that tracks the weekly and monthly average concentrations of nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}).

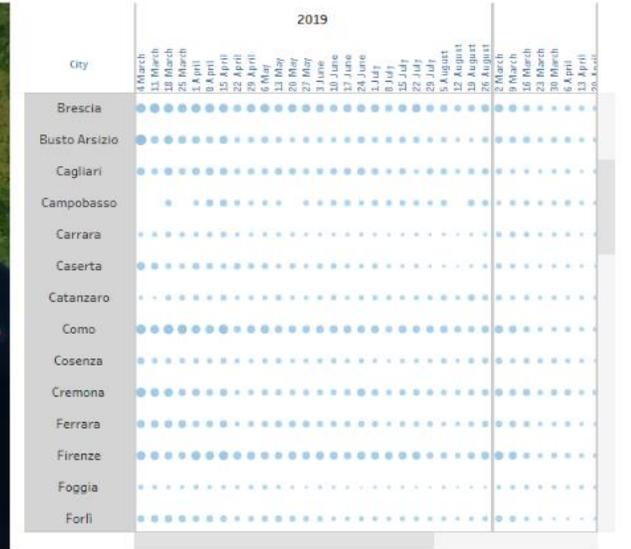
Published 04 Apr 2020 — Last modified 12 Aug 2020 — 2 min read — Photo: © Photo by Rahbek Media on Unsplash

- weekly and monthly avg. concent. of NO₂ and PM (both PM₁₀ and PM_{2.5})
- article with an online tool in April

By week | By month

Air pollutant: NO₂ Country: Italy City(ies): (All) Year(s): (Multiple values) Weeks: (Multiple values) Station type: All station types

Cities with available data Average weekly concentration (ug/m³) 0.0 273.6



Average concentration (ug/m³) and % change compared with previous week

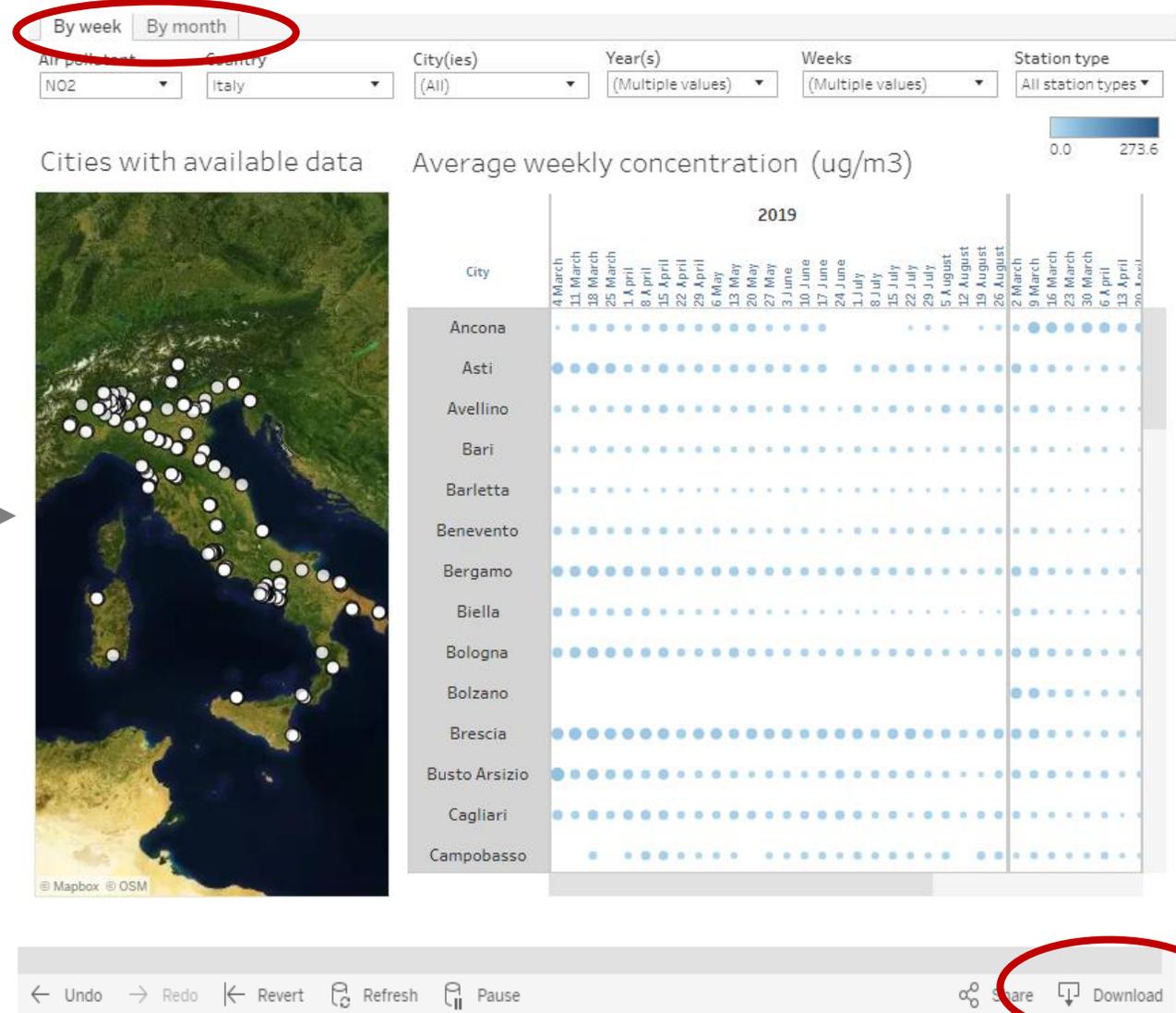
City	2019														
	4 March	11 March	18 March	25 March	1 April	8 April	15 April	22 April	29 April	6 May	13 May	20 May	27 May	3 June	10 June
Ancona	6.7	17.7	20.1	20.2	15.2	20.4	21.2	19.3	19.5	23.7	23.7	23.5	15.6	15.0	19.2
Asti	41.9	31.4	40.8	34.5	22.3	21.9	26.8	19.3	24.0	20.8	22.0	22.1	23.5	21.5	21.2
Avellino	17.0	15.7	17.0	15.0	18.5	20.6	23.8	17.0	15.6	18.0	15.0	19.1	12.0	20.3	15.3
Beri	15.8	12.7	15.6	14.4	13.0	14.5	15.3	10.8	13.4	14.1	12.5	13.7	10.4	14.2	15.3
Barletta	16.4	11.9	11.7	10.7	8.7	7.4	9.0	8.2	7.3	8.4	7.8	6.6	5.9	9.5	10.5
Benevento	22.8	19.5	22.2	16.7	18.4	18.5	19.0	14.7	13.5	15.5	13.9	12.6	10.6	14.3	14.6

EEA air quality data and Covid-19: the viewer

2016, 2017, 2018
Historical data

UTD data
2019, 2020

Hourly data
aggregated
into daily averages



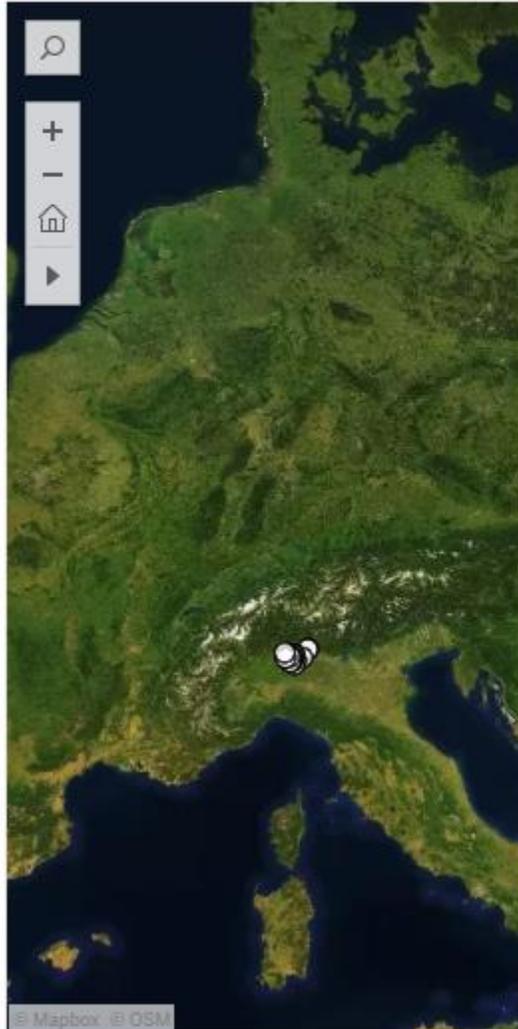
EEA air quality and Covid-19 viewer

- Weekly and monthly averages for NO₂ and PM (both PM₁₀ and PM_{2.5})
- Aggregated at city level, as defined in Eurostat
- Some preliminary results, focusing on NO₂ and PM
- Possible effect of meteorology not taken into account
- In 2020, week 9 starts on 24/2; week 12, on 16/3; week 18, on 27 April.

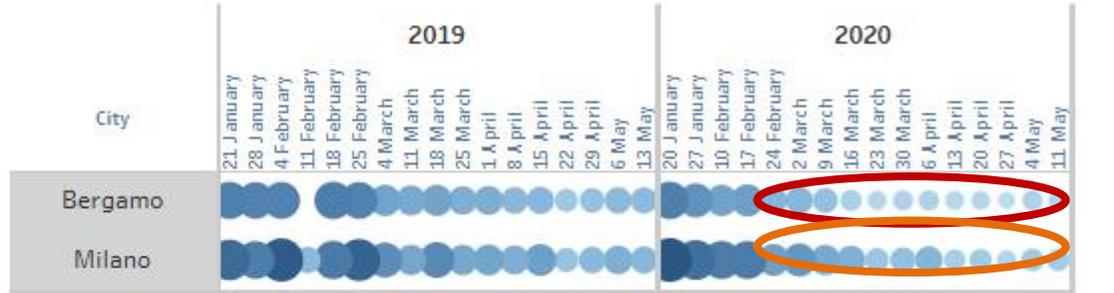
Examples: Bergamo and Milano (IT), NO₂, viewer

Air pollutant: NO₂ Country: Italy City(ies): (Multiple values) Year(s): (Multiple values) Weeks: (Multiple values) Station type: All station types

Cities with available data



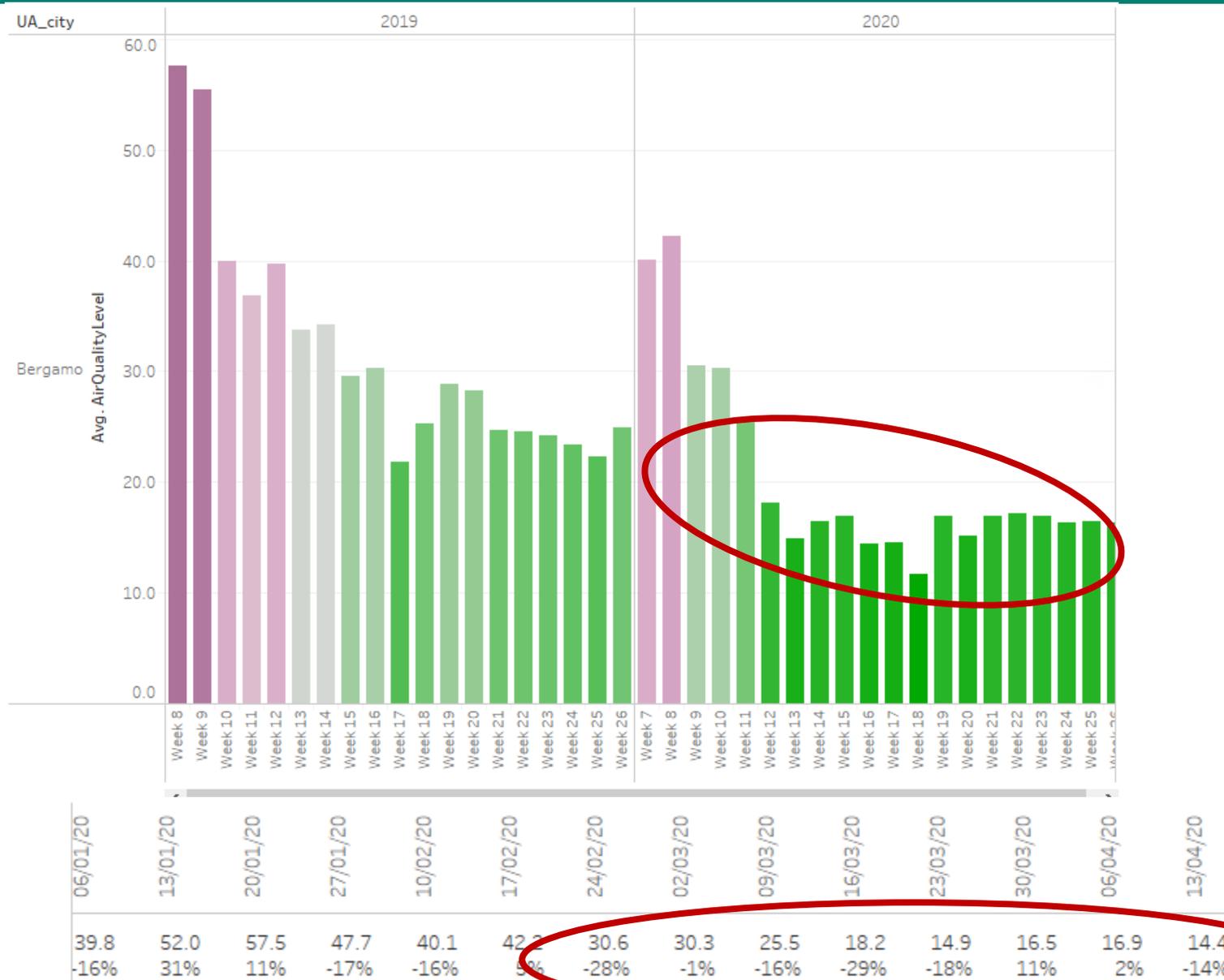
Average weekly concentration (ug/m³)



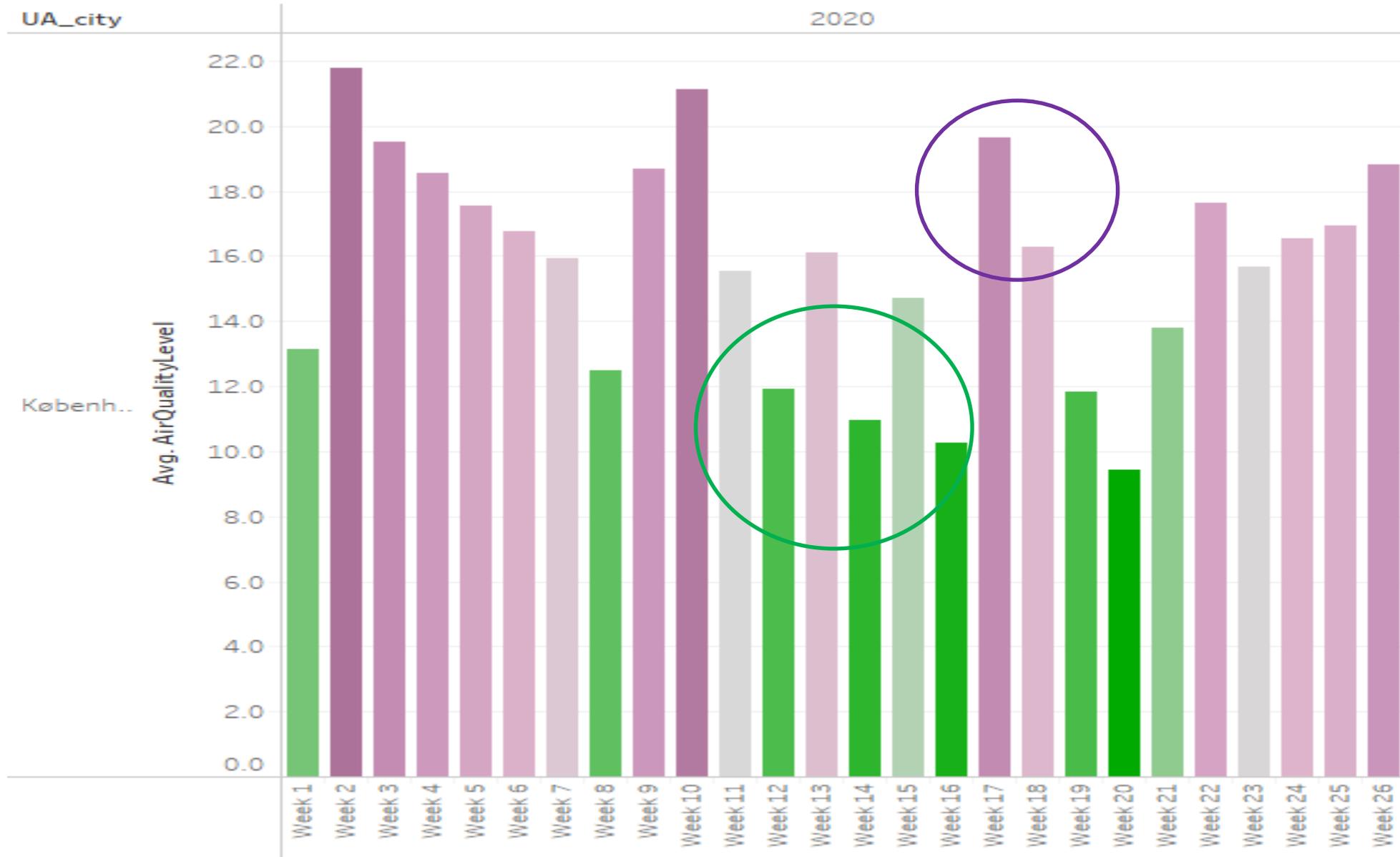
Average concentration (ug/m³) and % change compared with previous week

City	2020														
	20 January	27 January	10 February	17 February	24 February	2 March	9 March	16 March	23 March	30 March	6 April	13 April	20 April	27 April	4 May
Bergamo	57.5	47.7	40.1	42.2	30.6	30.3	25.5	18.2	14.9	16.5	16.9	14.4	14.5	11.7	16.9
		-17%	-16%	5%	-28%	-1%	-16%	-29%	-18%	11%	2%	-14%	1%	-20%	45%
Milano	78.5	65.2	59.4	59.0	41.5	45.2	37.2	33.4	22.9	26.3	31.0	18.7	20.3	15.4	21.1
		-17%	-9%	-1%	-30%	9%	-18%	-10%	-32%	15%	18%	-40%	8%	-24%	37%

Bergamo (IT): NO₂ weekly averages, 2019-2020



Copenhagen (DK): weekly values, 2020



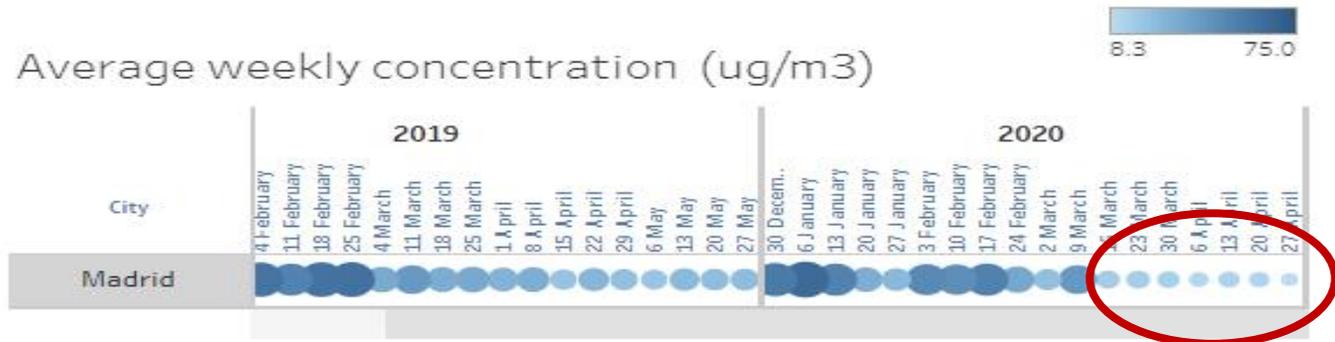
Madrid (ES): NO₂, viewer

Air pollutant: NO₂ | Country: Spain | City(ies): Madrid | Year(s): (Multiple values) | Month(s): (Multiple values) | Station type: All station types

Cities with available data



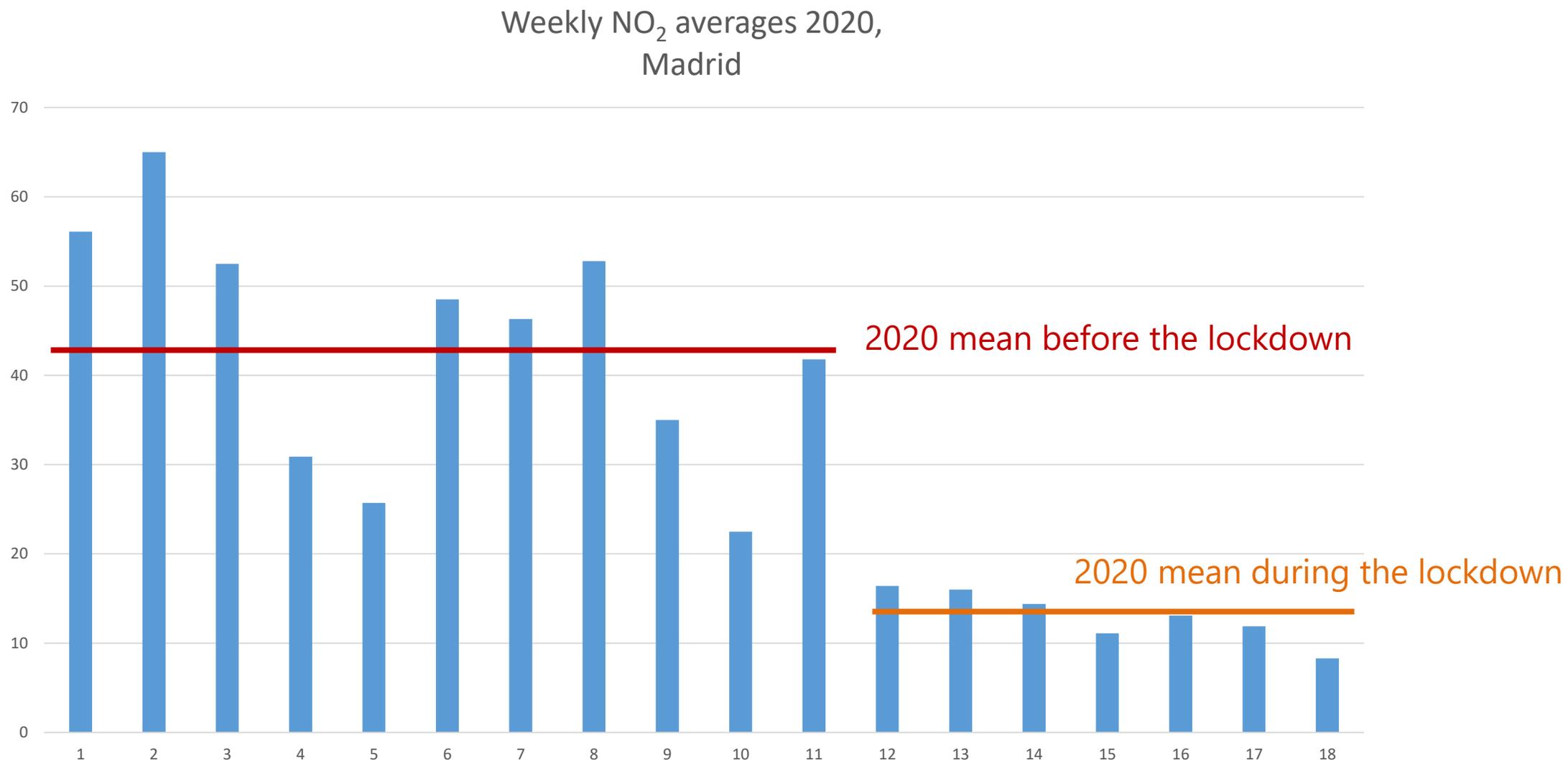
Average weekly concentration (ug/m³)



Average concentration (ug/m³) and % change compared with previous week

City	2020														
	20 January	27 January	3 February	10 February	17 February	24 February	2 March	9 March	15 March	22 March	29 March	5 April	12 April	19 April	27 April
Madrid	30.9	25.7	48.5	46.3	52.8	35.0	22.5	41.8	16.4	16.0	14.4	11.1	13.1	11.9	8.3
	-41%	-17%	89%	-5%	14%	-34%	-36%	86%	-61%	-3%	-10%	-23%	18%	-9%	-30%

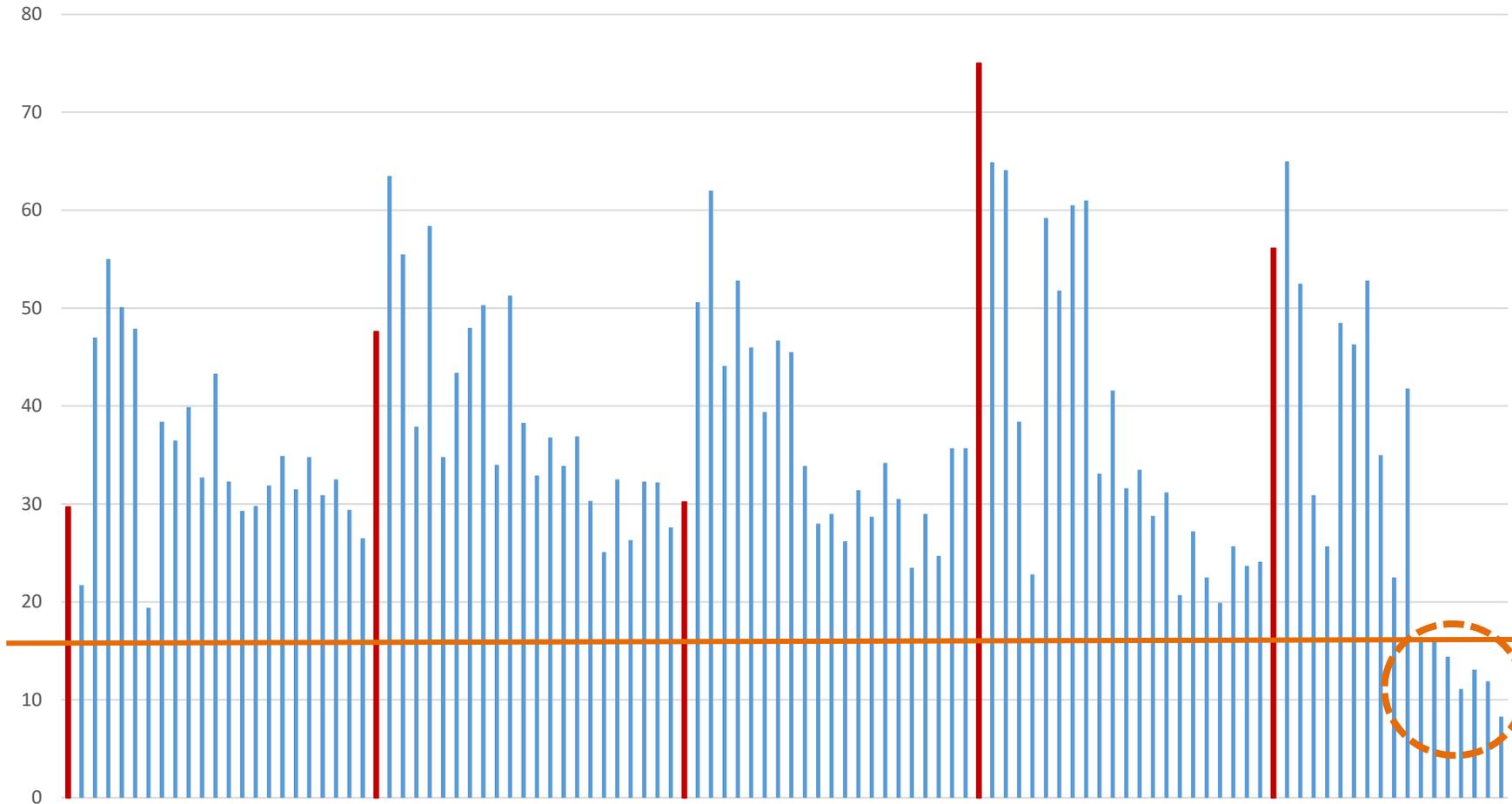
Madrid (ES): NO₂, weekly values, 2020



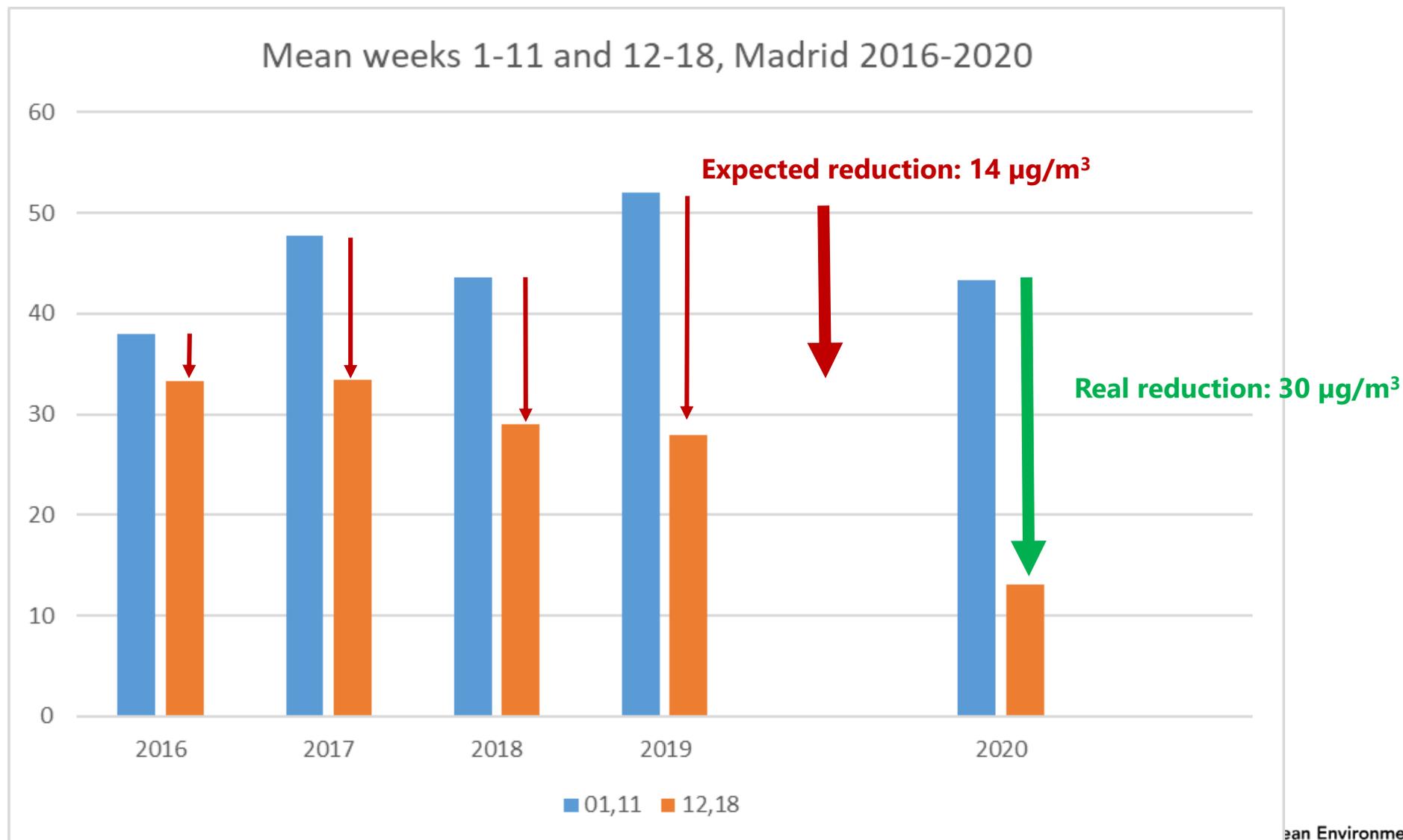
Madrid (ES): NO₂, weekly values, 2016-2020

Weekly NO₂ averages Jan-May 2016-2020, Madrid

2020 Week 12 average



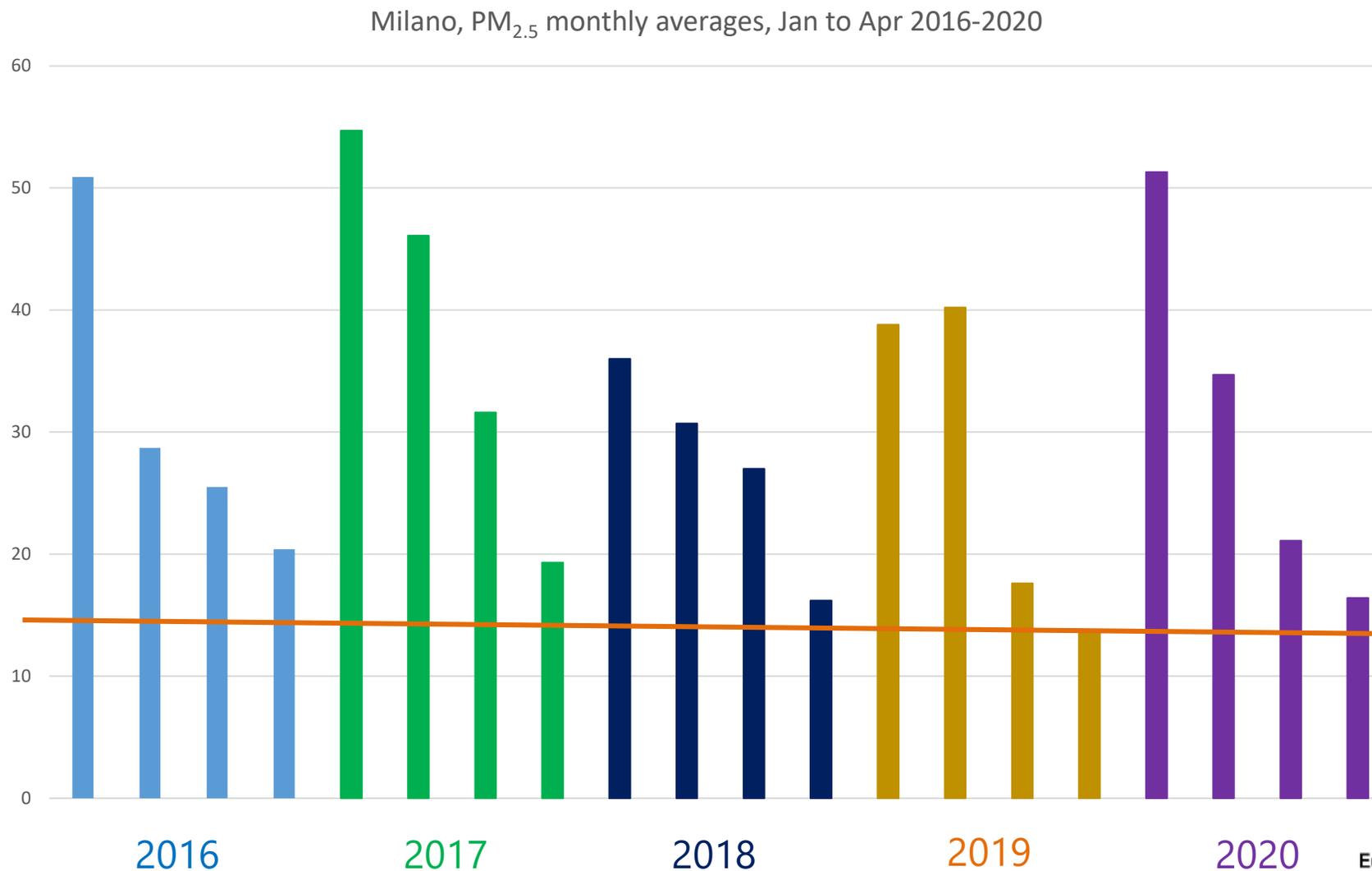
Madrid (ES): NO₂, 1-11, 12-18 weekly means, 2016-2020



PM_{2.5}: mixed situation

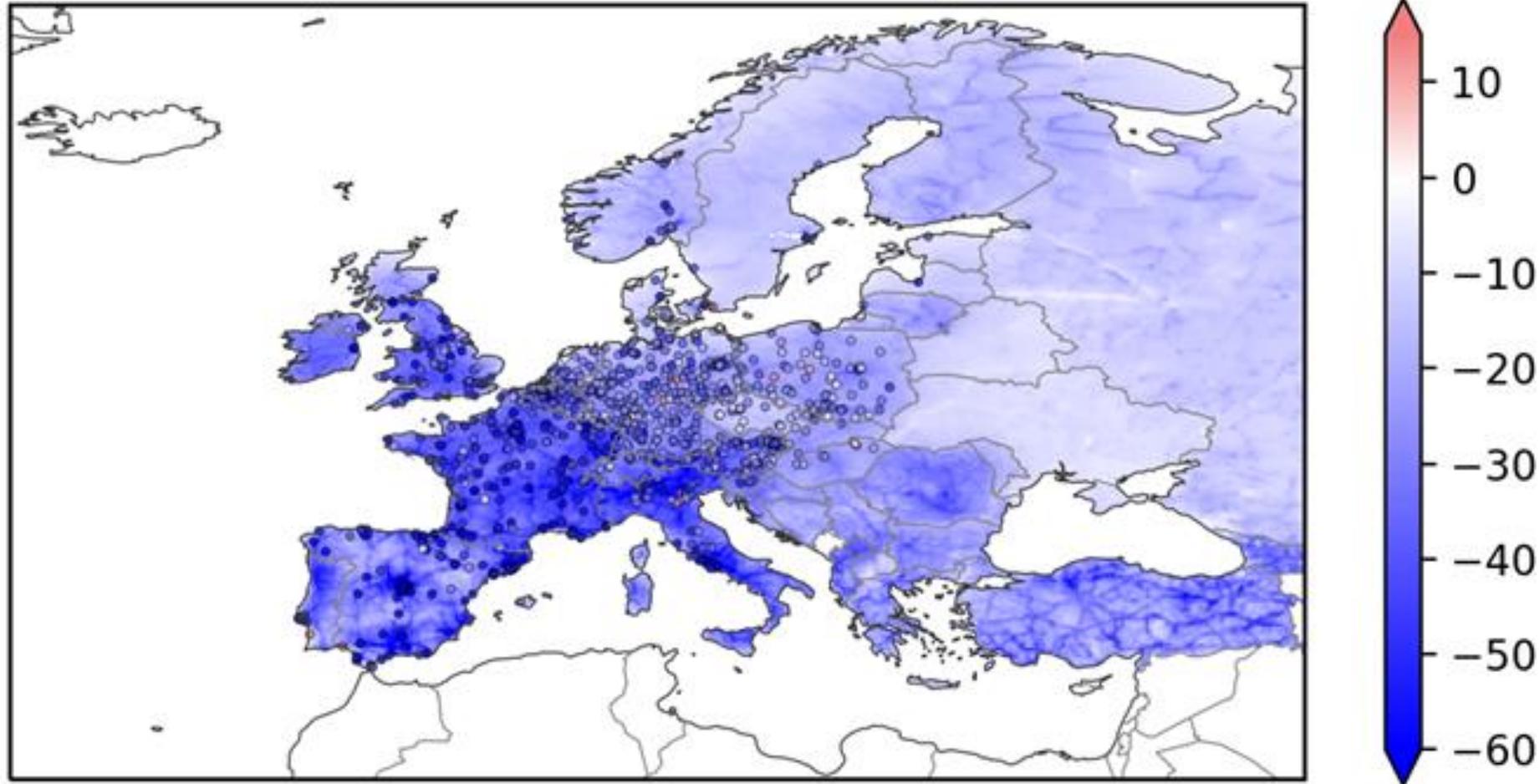


PM_{2.5}: mixed situation

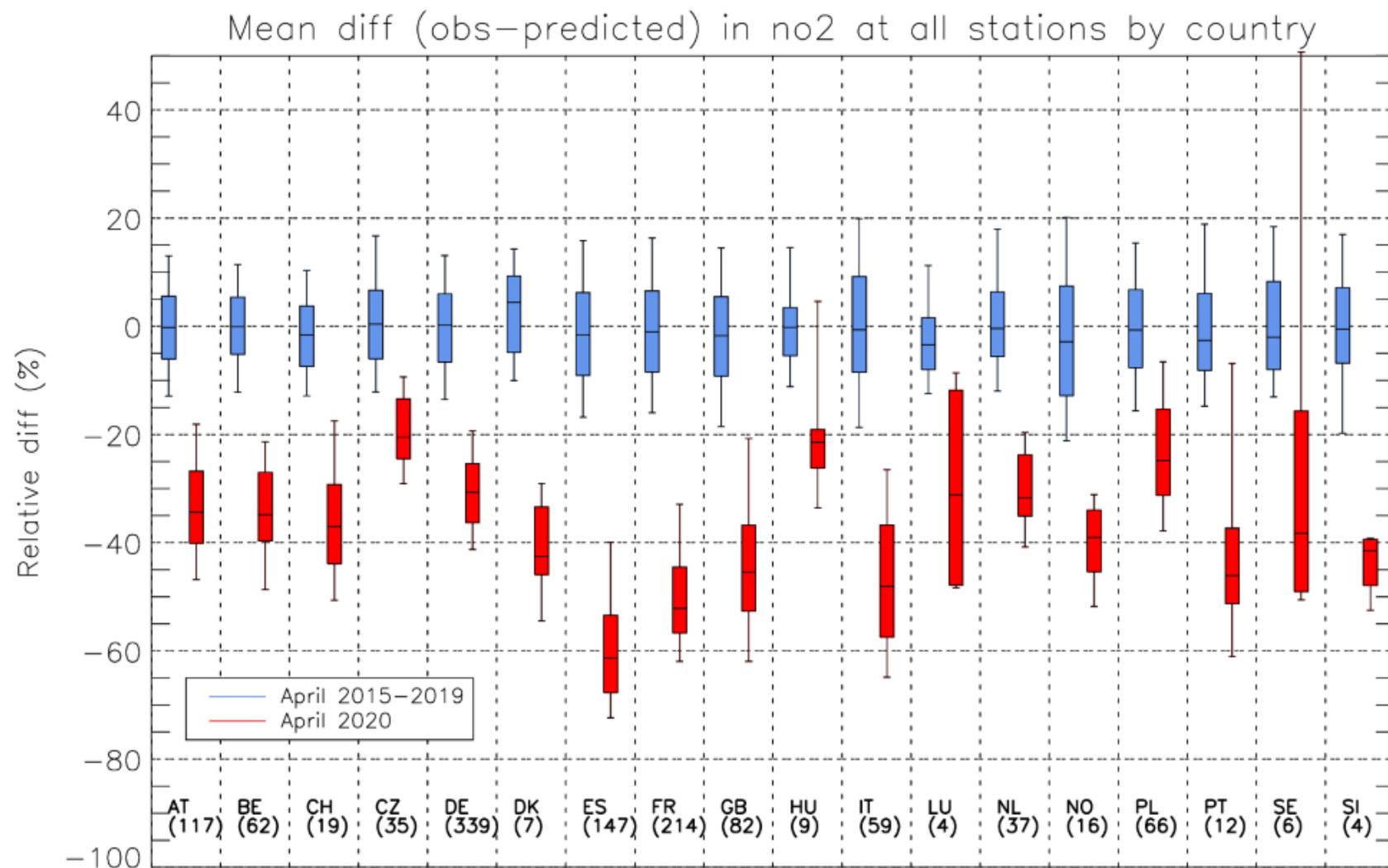


GAM model results in Europe

NO₂ concentration mean difference, ENSEMBLE (relative diff. in %)
Lockdown scenario minus Reference
(2020-04-01 to 2020-04-30)



GAM model results at country level



Conclusion

- large decreases particularly in NO₂ concentrations at traffic stations in Spain and Italy (70%) and at background stations in France (60%)
- concentrations of PM₁₀ also fell across Europe, although less than for NO₂
- greatest reductions of PM₁₀ concentrations are at traffic stations in cities in Spain (40%) and Italy (35%) and at background stations (up to 20%) in average
- increase in PM₁₀ concentrations in a limited number of sites, showing that PM₁₀ concentrations are influenced by other drivers than road traffic.

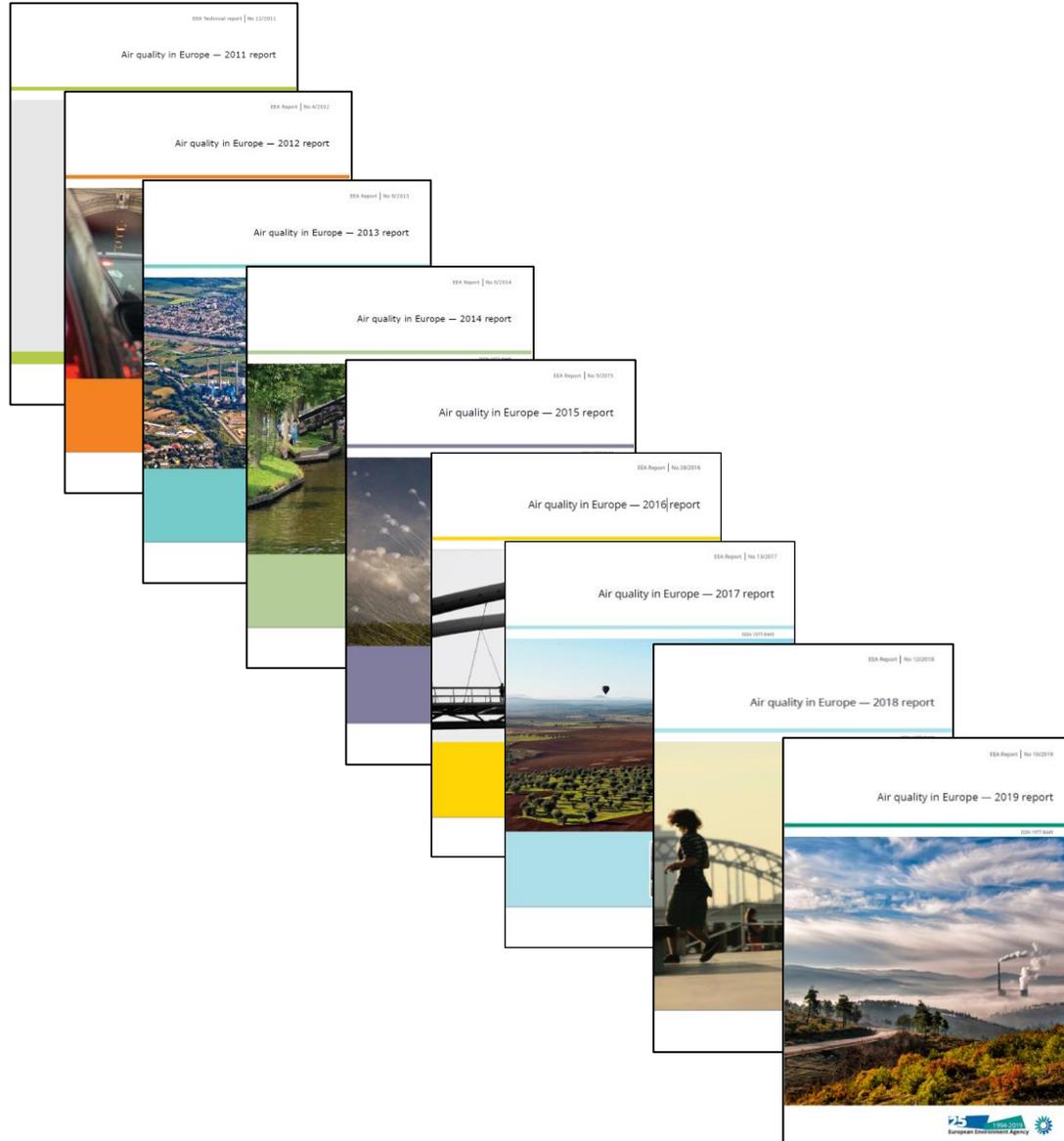


Take-home messages

- All estimates show that NO₂ concentrations were considerably reduced across Europe in April 2020, independently of the meteorological conditions. The estimated relative reductions in NO₂ concentrations varied considerably within cities and across countries.
- The assessment of changes in PM₁₀ concentrations due to the lockdown is more uncertain than for NO₂ concentrations.
- PM concentrations vary, not only with meteorology and emissions of primary PM, but also with emissions from natural sources, which are difficult to predict and are highly variable from one year to another, and emissions of precursor gases from different sources.
- Even as emissions of primary PM from traffic fell, emissions from residential heating may have increased as people remained at home.
- It is likely that agriculture emissions of primary PM and NH₃ were not affected by the lockdown, while industrial emissions may have fallen in some countries.



The *Air quality in Europe* report 2020



COMING SOON

**with a special chapter on
Covid-19 lockdown effects on
air quality**

Thanks for your attention!!

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