

Impact of COVID-19 on air quality in Catalonia

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http://mediambient.gencat.cat/web/.content/home/ambits_dactuacio/atmosfera/qualitat_de_laire/avaluacio/qa_avaluacio_balancos_infornes/2021-Informe-COVID-QualitatAire.cast.pdf

1. Introduction

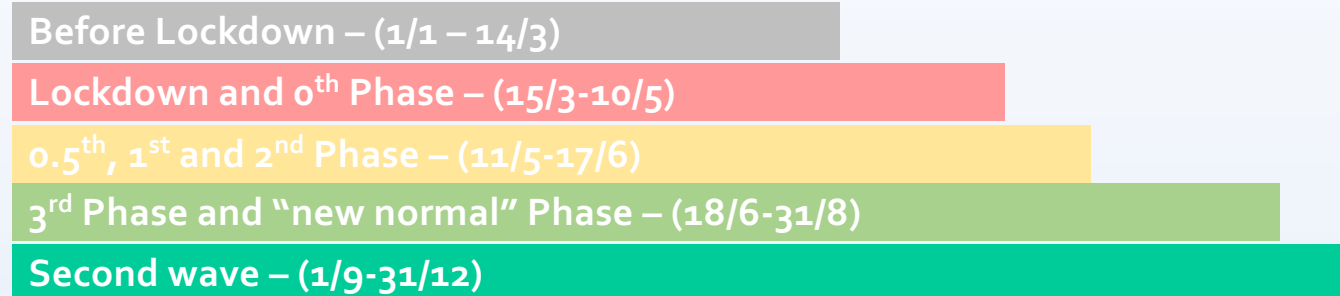
How decreased mobility/emissions associated with COVID-19 affects air quality levels?



1. Introduction

To study immissions behavior we compare data of NO₂ and PM₁₀ from January to December of two different periods: the averages from **2015-2019** and **2020**.

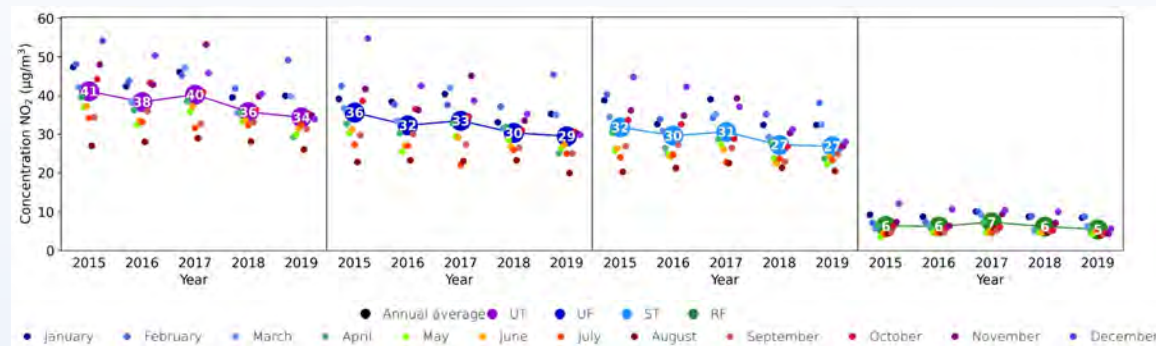
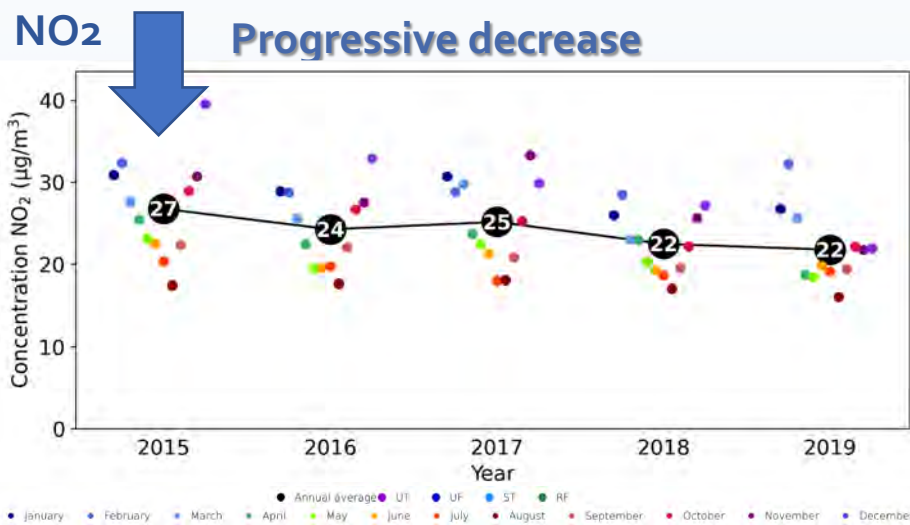
Each period has been subdivided into 5 phases:

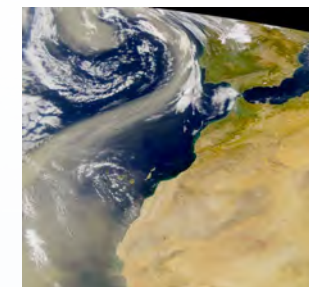




2. Air quality evolution 2015 -2019 - Catalonia

The measures implemented by the Administrations to improve air quality has made the trend in recent years positive both NO₂ and PM₁₀.

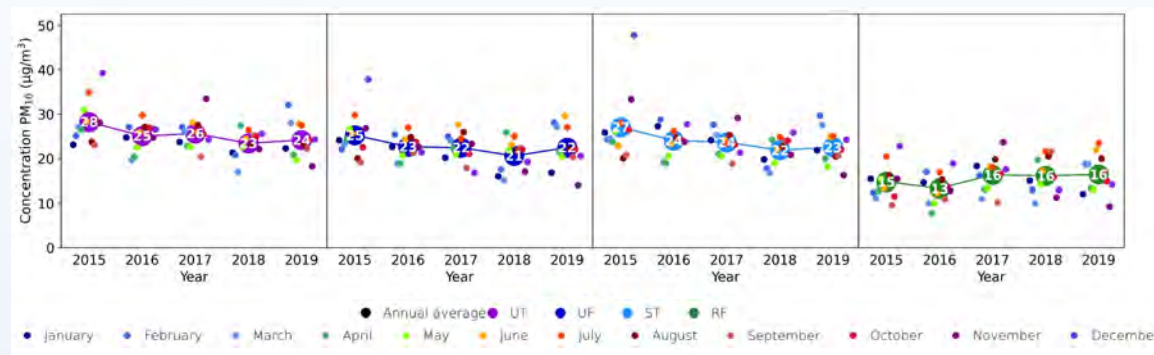
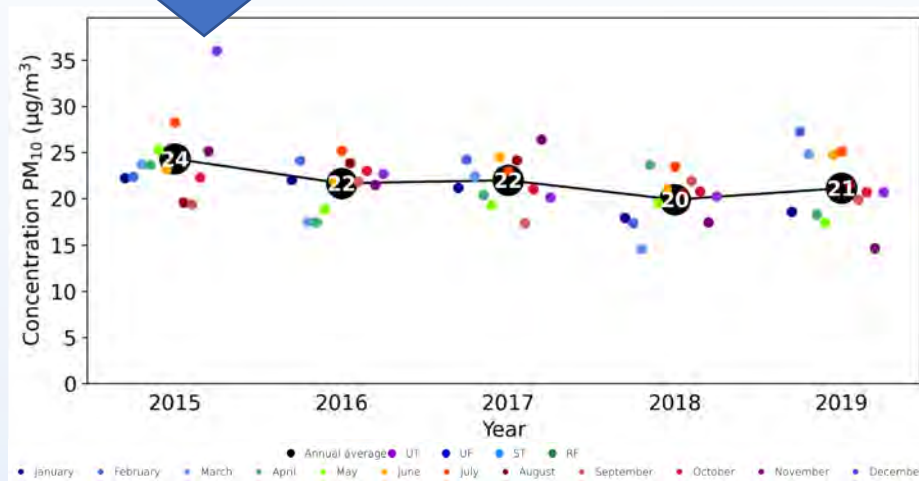




2. Air quality evolution 2015 -2019 - Catalonia

African dust intrusions: a source of PM that adds to the wide variety of anthropogenic emission sources that may bias the outcome of the study.

PM₁₀ ↓ **Minor decrease**



UT

UF

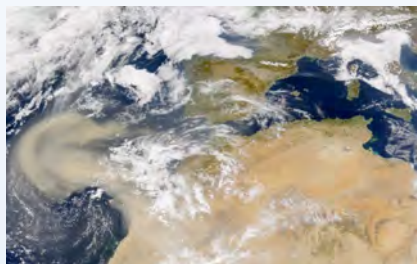
ST

RF

Covid-19 impact on air quality 2020 - Meteorological conditions and African dust intrusions



In general, 2020 has been a warm year with considerable meteorological variability, which has favored good dispersion and cleaning conditions for atmospheric pollutants.



During 2020, there have been a similar number of natural episodes of cross-border contributions of particles than in the same period of the average set 2015-2019.

Covid-19 impact on air quality 2020 - Meteorological conditions and African dust intrusions

The variations of NO₂ and PM₁₀ levels measured during **2020** will not only be caused by differences in emissions due to the COVID-19 effect, but it must be taken into account that a fraction of the variation in immissions will be caused by:

- **the trend shown in the last years**
- **differences in meteorological conditions**
- **African dust intrusions**



Covid-19 impact on air quality 2020 - Impact Covid-19 on different environmental vector

Some
indicators

Environmental vector	Period	Variation 2020-2019
Exports	April Summer	40%↓ 6-12%↓
Imports	March-May	42%↓
Port merchandise	May	36%↓
Tourism	August	69%↓
Flights	April August	95%↓ 45%↓

Environmental vector	Period	Variation 2020-2019
Mobility in public transport	Lockdown	94%↓ 40-60%↓
Road traffic	Lockdown June-October	85%↓ 20%↓
Fuel use	2nd trimester	36%↓



<http://economia.gencat.cat/ca/ambits-actuacio/economia-catalana/conjuntura-economica/indicadors-economics-i-socials/index.html>

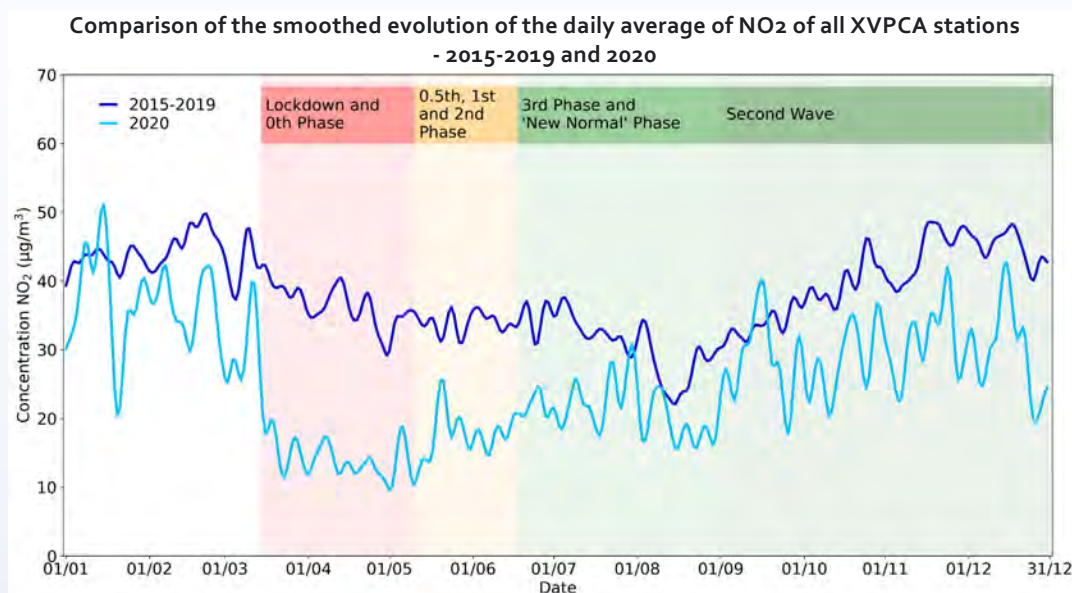


Covid-19 impact on air quality 2020

Analysis from 4 points of view:

- General evolution of the measured concentrations
- Variation of the weekly evolution
- Quantification of the variation in contamination at measuring stations
- Quantification of the variation of atmospheric pollution in Catalonia

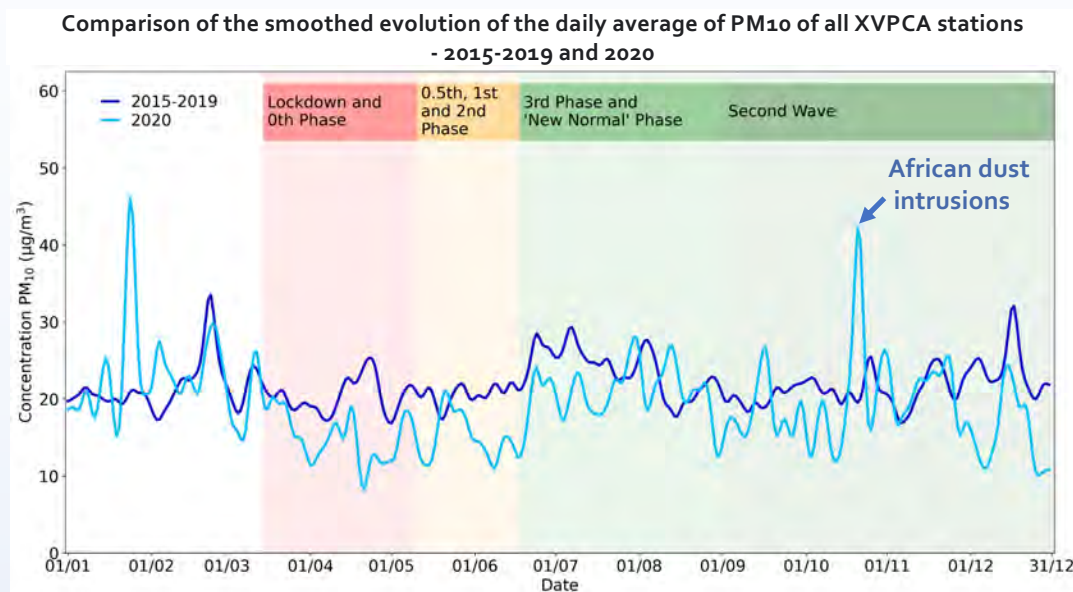
Covid-19 impact on air quality 2020 - Air quality 2020 – Catalonia (NO₂)



Smoothed evolution of the daily average of NO₂ of all the XVPCA stations during the period 2015-2019 (dark blue) and 2020 (light blue). In bars The colors indicate the different phases.

- **NO₂ reduction in all XVPCA stations** during the hardest confinement. More important in **traffic** stations, reaching **61%**.
- As mobility recovers, the differences from the usual situation gradually decrease **without reaching pre-pandemic levels**.
- Usually the minimum values are registered in the months of June to August. In 2020 they have been registered from **March to May**.

Covid-19 impact on air quality 2020 - Air quality 2020 – Catalonia (PM₁₀)

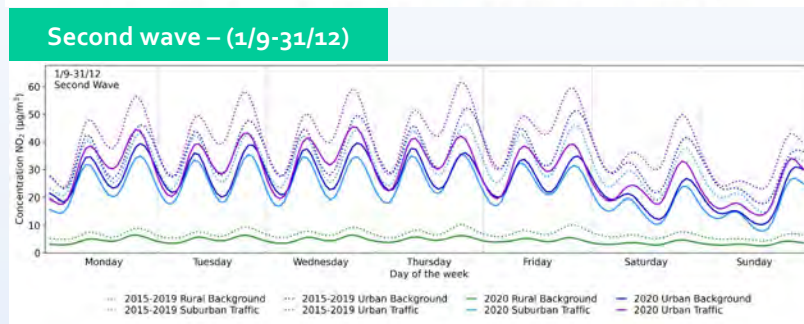
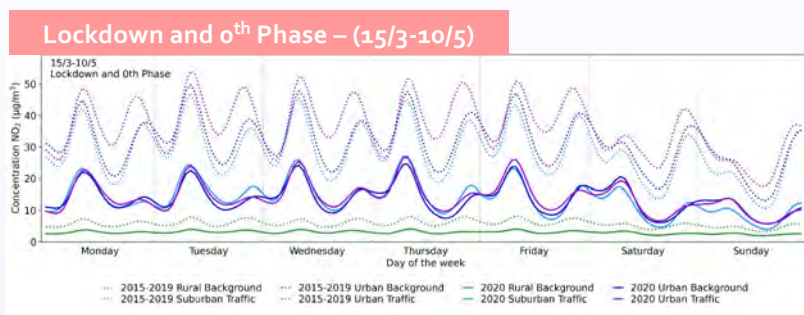


Smoothed evolution of the daily average of PM₁₀ of all the XVPCA stations during the period 2015-2019 (dark blue) and 2020 (light blue). In bars The colors indicate the different phases.

- The **reduction** of **PM₁₀** levels is **not as important as** that of **NO₂**. The **decline** after the declaration of the state of alarm is **slow**, reaching a minimum in early May.
- As mobility recovers, the differences from the usual situation gradually decrease and between the end of June and the end of August levels **recovers reaching pre-pandemic levels**.
- The difference between station typology is less clear.

Covid-19 impact on air quality 2020 - Air quality 2020 – Catalonia (NO₂)

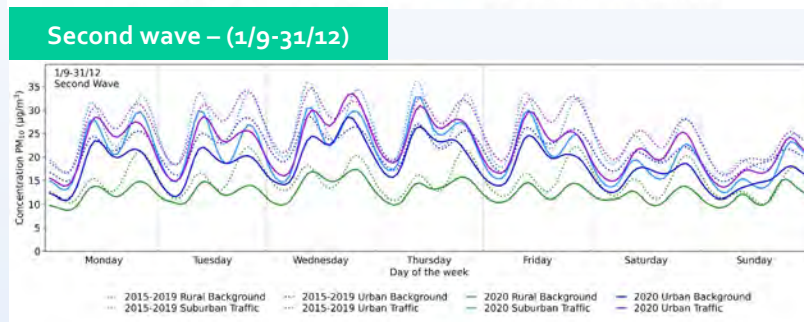
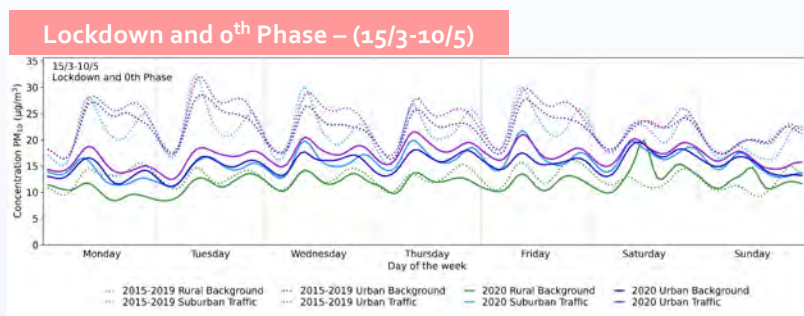
Smoothed weekly evolution of the hourly average of NO₂ -
 2015-2019 and 2020



- **Change in the usual NO₂ profile** during 2020.
- **Lockdown and 0th Phase:**
 - Lowering of the concentration and in the height of the peaks in all types of stations.
 - Elimination of differences between types of stations.
- **Second wave:**
 - Recovery of habitual hourly profiles. Some decrease in the height of the peaks.
 - Restrictive mobility measures on weekends are reflected in slightly wider differences between the periods compared.

Covid-19 impact on air quality 2020 - Air quality 2020 – Catalonia (PM₁₀)

Smoothed weekly evolution of the hourly average of PM₁₀
 - 2015-2019 and 2020



- Lockdown and 0th Phase:**
 - General drop in levels** and the magnitude of the peaks of PM₁₀, which has made urban traffic, urban background and suburban stations **approach the values of rural background stations**, and show differences of a few µg/m³.
- Second wave:**
 - Recovery of habitual hourly profiles. Levels are moderately maintained lower than the 2015-2019 trend.

Covid-19 impact on air quality 2020 - Air quality 2020 – Catalonia (NO₂)

Weekly concentration by station

ZCA	Estación	Mes y semana - 2020																																																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1	Badalona	31	45	47	26	30	43	34	41	38	28	32	16	15	15	19	13	20	13	18	14	23	15	14	16	18	20	16	21	15	21	23	19	16	14	15	30	25	33	24	26	27	29	31	26	22	40	30	35	32	33	43	29
	Barcelona (Ciutadella)	35	40	45	28	43	44	28	29	30	22	30	12	11	12	17	10	17	11	18	12	32	17	12	12	16	20	14	19	15	20	18	16	14	15	19	26	33	24	22	22	28	28	19	34	35	25	29	28	41	23		
	Barcelona (Eixample)	41	56	54	43	55	55	42	50	42	33	44	20	16	19	24	16	19	14	24	16	34	26	23	26	31	35	33	28	31	35	37	31	28	24	24	35	40	47	34	35	37	33	48	43	35	54	32	54	32			
	Barcelona (Gràcia - Sant Gervasi)	44	54	50	37	48	51	39	50	41	29	48	20	19	20	25	18	22	13	22	16	32	24	19	21	24	31	26	29	23	31	31	26	24	22	30	41	48	28	31	26	33	40	40	31	47	43	40	32	29	51	33	
	Barcelona (Observatori Fabra)	9	10	8	6	5	9	11	11	13	9	7	10	6	5	5	4	5	4	5	4	8	7	6	6	7	10	9	11	6	9	11	7	9	8	6	7	7	12	8	9	8	7	9	9	10	8	10	8	15	7		
	Barcelona (Paisu Reu)	30	38	35	21	35	34	29	37	27	15	32	14	13	12	14	11	15	8	13	9	17	14	11	11	11	11	17	12	17	10	19	20	17	16	11	9	16	24	13	15	17	12	10	24	18	29	25	24	17	16	34	19
	Barcelona (Potenciu)	34	48	33	30	47	40	38	44	38	20	37	14	16	15	17	12	19	18	15	30	22	18	13	23	25	16	23	21	27	26	25	21	19	21	25	30	38	29	31	30	33	35	36	23	44	39	48	31	31	48	36	
	Barcelona (Sants)	31	43	41	31	43	45	30	38	31	21	34	18	14	16	19	12	15	9	16	20	24	12	13	17	21	17	22	14	22	24	18	17	14	13	19	23	31	19	22	24	25	33	29	24	37	34	28	24	24	41	24	
	Barcelona (Vall d'Hebron)	29	47	25	20	37	32	27	37	25	20	37	17	12	14	27	12	18	12	17	9	18	13	12	15	17	21	16	21	13	22	26	18	19	16	18	21	16	33	18	22	26	23	27	27	22	35	29	27	21	19	36	33
	El Prat de Llobregat (CEM Saguer)	27	46	40	28	40	37	30	35	29	23	30	23	17	14	17	14	16	14	18	13	18	15	15	16	17	17	14	20	17	21	25	17	16	15	15	22	23	27	22	24	32	30	29	22	28	32	30	29	26	37	23	
	El Prat de Llobregat (Jardins de la Pla)	23	36	37	30	43	40	32	36	30	23	30	22	16	15	17	14	16	13	18	13	16	14	13	16	18	19	14	20	17	19	24	15	15	13	15	23	27	33	24	26	23	31	33	33	25	32	34	33	31	28	37	28
	Gavà	17	19	20	19	21	18	17	15	15	11	14	11	9	8	5	8	6	5	7	8	8	8	7	8	9	7	10	6	8	13	7	9	8	7	8	11	11	9	10	15	10	14	13	13	12	15	12	22	12			
	Hospitalet de Llobregat	34	45	44	34	47	43	40	30	32	33	18	12	12	16	15	14	11	17	11	22	16	14	15	18	20	17	23	15	21	25	20	18	15	14	21	25	29	19	23	24	27	36	32	25	37	34	33	25	25	43	25	
	Sant Adrià de Besòs	33	47	21	29	42	44	33	43	38	30	34	16	17	14	21	13	19	11	17	14	26	17	16	19	22	23	15	23	19	25	26	21	22	19	20	28	27	32	22	28	27	33	30	25	27	1	36	32	32	36	40	38
	Sant Vicenç dels Horts (c. Ribot)	28	38	40	28	38	32	32	33	29	31	17	18	13	15	14	10	16	10	14	16	15	14	13	15	19	18	13	21	16	20	18	20	17	14	21	25	28	23	28	29	32	33	24	30	33	36	31	28	44	39		
	Sant Vicenç dels Horts (c. Albas)	28	38	40	28	38	32	32	31	34	30	30	18	19	12	14	15	16	13	18	11	16	14	13	13	13	14	11	17	15	17	14	18	15	13	18	20	24	24	1	1	1	27	21	29	30	35	31	28	44	39		
	Santa Coloma de Gramenet	28	42	46	28	39	43	32	41	34	27	33	19	17	13	17	13	10	12	17	12	25	15	15	16	16	21	15	20	18	23	25	18	17	17	23	23	33	23	27	26	32	30	36	32	37	33	31	28	40	27		
	Viladecans	23	38	34	26	34	30	26	26	26	16	11	11	9	5	10	10	7	12	9	10	10	10	11	10	12	10	12	10	15	13	14	16	11	11	9	11	12	13	12	14	16	15	14	16	23	24	21	15	32	19		

Relative variation between weekly concentration

ZCA	Estación	Mes y semana - 2020																																																					
		1				2				3				4				5				6				7				8				9				10				11				12									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
1	Badalona	-23	3	0	-45	-18	5	-33	5	-19	-39	-32	-56	-29	50	54	-39	-58	-46	-56	-33	-48	-25	-47	-46	-22	-48	-23	-52	-15	-20	-38	-44	-25	-16	-1	-27	-30	-24	-29	-12	-48	-13	-16	-27	-34	-34	-16	-32	-55					
	Barcelona (Ciutadella)	-15	-2	-7	-30	7	13	-26	-16	-30	-48	-60	-72	-46	-54	-71	-47	-67	-53	-67	-10	-48	-70	-25	-58	-32	-66	-47	-11	-39	-41	-31	-36	-52	-47	-34	-11	-9	-36	-25	-41	-39	-33	-31	-48	-21	-23	-18	-38	-34	-13	-43	-56		
	Barcelona (Eixample)	-16	15	5	-20	8	3	-32	-18	-25	-39	-33	-40	-46	-50	-50	-73	-56	-72	-71	-40	-54	-61	-54	-47	-37	-43	-28	-38	-29	-29	-19	-45	-45	-28	-16	-16	-38	-39	-37	-33	-27	-31	-10	-26	-16	-44	-37	-6	-43	-50				
	Barcelona (Gràcia - Sant Gervasi)	-8	-7	-3	-28	-1	2	-37	-16	-24	-46	-19	-56	-63	-59	-48	-49	-55	-48	-33	-49	-60	-57	-53	-33	-50	-38	-48	-29	-32	-32	-25	-48	-49	-29	-1	-6	-45	-34	-28	-32	-30	-22	-32	-14	-24	-22	-44	-44	-14	-39	-25			
	Barcelona (Observatori Fabra)	-8	-7	-3	-28	-1	2	-37	-16	-24	-46	-19	-56	-63	-59	-48	-49	-55	-48	-33	-49	-60	-57	-53	-33	-50	-38	-48	-29	-32	-32	-25	-48	-49	-29	-1	-6	-45	-34	-28	-32	-30	-22	-32	-14	-24	-22	-44	-44	-14	-39	-25			
	Barcelona (Paisu Reu)	0	25	-1	-36	11	5	-30	-1	-28	-51	-20	-44	-68	-57	-54	-50	-50	-57	-74	-38	-53	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Barcelona (Potenciu)	-22	3	7	-39	-2	5	-33	-17	-20	-46	-26	-59	-42	-61	-57	-60	-63	-55	-60	-18	-40	-56	-48	-46	-28	-57	-34	-35	-22	-18	-10	-16	-38	-25	-15	-13	-1	-25	-21	-32	-26	-23	-14	-32	-5	-21	-20	-41	-36	-15	-34	-43		
	Barcelona (Sant)	-18	10	-3	-18	21	10	-34	-11	-21	-42	-20	-48	-41	-51	-41	-47	-33	-48	-46	-40	-49	-58	-55	-41	-26	-40	-13	-47	-10	-9	-14	0	-43	-46	-26	-18	-5	-39	-32	-33	-22	-25	-23	-6	-21	-7	-45	-43	-6	-45	-46			
	Barcelona (Vall d'Hebron)	7	25	-25	-35	-6	3	-36	-3	-29	-41	-47	-42	-61	-51	-44	-64	-38	-52	-41	-87	-50	-57	-44	-24	-46	-19	-48	-16	8	-13	2	-38	-20	-24	7	-29	-25	-30	-27	-31	-23	-25	-5	-18	-16	-44	-43	-3	-38	-58				
	El Prat de Llobregat (CEM Saguer)	23	6	-32	3	2	-31	-24	-22	-42	-25	-38	-53	-57	-51	-50	-48	-54	-43	-56	-38	-45	-42	-42	-27	-28	-36	-22	-4	-32	-28	-45	-45	-23	-25	-24	-3	-24	-30	-25	-16	-18	-42	-32	-29	-25	-6	-35	-10	-35	-10	-35			
El Prat de Llobregat (Aeródromo de la Pau)	-31	-4	-7	-31	8	6	-33	-18	-32	-39	-34	-39	-52	-53	-50	-62	-49	-55	-45	-54	-44	-48	-56	-42	-36	-33	-55	-31	-38	-30	-14	-37	-32	-51	-44	-17	-11	-4	-29	-25	-32	-28	-16	-19	-34	-19	-15	-28	-28	-41	-16	-23	-44		
Gavà	0	3	-4	-6	-30	2	-15	-23	-5	-32	26	-49	-45	-61	-54	-43	-57	-36	-41	-30	-33	-48	-48	-25	-34	-56	-5	-26	-3	20	-27	2	-21	-40	-32	-14	-21	-33	-27	-30	-35	-1	-7	-28	-11	-16	-32	-34	3	-33	-55				
Hospital de Llobregat	-15	10	0	-16	33	11	-32	-12	-25	-45	-20	-50	-67	-62	-53	-73	-51	-63	-67	-47	-56	-52	-40	-25	-34	-50	-20	-25	-45	-15	-31	-34	-12	-43	-44	-25	-20	-23	-45	-35	-41	-35	-14	-32	-22	-29	-45	-48	-10	-46	-10	-38			
Sant Adrià de Besòs	-28	-1	4	-13	-4	-36	-24	-34	-25	-39	-25	-57	-51	-41	-48	-62	-43	-51	-56	-28	-39	-57	-41	-41	-20	-56	-39	-57	-41	-23	-12	-39	-3	-33	-34	-10	-25	-38	-25	-34	-17	-33	-21	-40	-21	-32	-38	-38	-30	-19	-34	-45			
Sant Joan de Vilatorrada (R. de Ebro)	-14	1	9	-31	-2	-4	-30	-12	-47	-17	-47	-56	-68	-63	-58	-44	-42	-46	-39	-50	-40	-34	-27	-50	-4	-28	-39	-50	-41	-17	-14	-12	-11	-35	-4	8	9	-10	-4	-12	-5	-8	-27	-22	-11	-45	-23	-19	-48						

Covid-19 impact on air quality 2020 - Air quality 2020 – Catalonia (PM10)

Weekly concentration by station

ZCA	Estación	Mes y semana - 2020																																																				
		1				2				3				4				5				6				7				8				9				10				11				12								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
1	Barcelona (Eixample)	19	24	25	54	25	32	26	28	38	21	27	23	17	16	19	20	12	14	23	14	29	25	19	19	18	25	27	23	24	28	23	31	24	20	19	18	28	17	18	23	16	41	27	23	27	29	26	15	15	30	15	12	
	Barcelona (Gràcia - Sant Gervasi)	19	21	20	50	21	30	26	28	36	22	25	23	19	16	18	20	11	14	21	15	25	20	17	17	17	20	22	20	22	28	21	19	17	18	27	19	19	20	15	37	20	23	26	21	15	12	25	16	12				
	Barcelona (Passeig de la Reina)	19	18	17	29	14	22	16	19	32	14	19	19	13	12	14	16	11	8	16	11	21	15	13	13	13	23	19	20	17	20	23	17	25	18	16	12	13	21	13	14	15	10	27	15	16	16	18	17	9	8	7		
	Barcelona (Poblenou)	17	24	27	56	26	33	27	30	42	22	20	25	20	17	18	20	12	14	21	14	25	22	16	18	18	27	25	28	24	26	30	22	30	25	23	20	19	30	20	21	24	16	41	32	24	30	34	28	16	16	30	19	17
	Barcelona (Observatori Fabra)	12	11	10	47	10	19	14	15	25	11	18	17	13	11	15	13	8	10	13	10	15	14	11	11	12	17	16	18	15	16	20	14	22	15	14	10	11	19	10	11	13	11	22	14	11	13	14	12	6	7	12	6	7
	Barcelona (Vall d'Hebron)	14	14	13	47	10	24	19	21	32	12	22	19	14	10	14	14	8	8	15	8	16	14	11	9	10	21	16	18	15	17	21	16	24	15	14	12	11	8	29	17	15	15	16	14	8	6	17	5	5				
	Hospital de Llobregat	16	17	19	44	25	33	28	30	41	20	27	24	19	14	16	13	14	21	13	25	19	17	16	17	34	23	25	21	23	29	22	30	24	20	18	17	28	18	21	21	30	27	21	25	28	32	14	14	29	16	12		
	Sant Adrià de Besòs	17	23	25	46	24	30	26	28	36	20	25	22	18	14	17	16	14	15	20	12	22	16	13	13	15	28	17	24	18	23	16	23	16	17	15	16	24	16	18	20	16	37	26	24	26	29	26	18	16	28	17	16	
	Sant Vicenç dels Horts	20	25	32	41	27	31	29	32	39	18	30	25	20	12	16	15	11	11	19	11	19	19	16	14	13	15	23	20	24	16	22	27	16	25	20	19	20	29	19	19	23	25	22	42	30	26	35	32	30	22	18	35	23
2	Granollers	31	32	37	41	31	38	38	35	41	21	35	22	21	19	21	19	15	16	21	15	26	21	17	16	16	26	21	25	22	25	30	23	27	22	21	20	21	32	19	23	23	19	36	29	21	31	29	24	20	30	25	14	
	Montcada i Reixac	18	24	30	36	23	29	24	26	35	17	27	19	16	12	16	17	10	12	20	13	21	20	14	14	16	29	21	24	20	23	28	20	27	22	21	20	17	27	20	30	21	18	36	27	21	28	30	25	20	16	30	17	13
	Montcada i Reixac (Can Sant Joan)	17	23	26	37	21	27	32	24	32	17	24	19	16	12	15	16	14	12	19	11	22	19	18	18	20	33	24	27	24	28	33	25	33	25	24	21	21	32	22	21	23	20	42	34	32	39	25	23	18	41	23	6	
	Rubi	14	16	21	33	17	24	21	22	31	13	24	19	14	11	16	15	9	12	18	11	21	18	14	13	15	24	20	23	18	23	27	16	27	19	17	16	15	24	16	16	13	31	23	14	23	25	21	15	12	24	13	6	
	Terrassa	17	18	20	26	21	27	24	25	24	21	28	18	16	12	17	17	12	12	19	12	20	20	19	15	16	25	25	26	23	25	31	21	28	22	21	19	17	28	19	20	17	35	26	22	25	28	22	16	12	23	15	8	
	Sabadell	25	27	28	41	23	31	26	28	36	17	28	21	19	16	21	22	15	15	23	15	33	22	19	17	20	27	24	27	23	25	25	28	24	23	22	20	30	21	21	23	24	41	31	26	30	31	24	22	19	31	21	17	
	Santa Bernèta de Moode	22	26	31	39	24	34	26	29	40	20	26	21	19	13	17	16	11	15	21	15	26	24	17	16	17	26	19	25	20	25	29	21	27	19	18	16	17	27	16	20	20	17	35	28	21	27	30	25	22	18	31	13	13

Relative variation between weekly concentration

ZCA	Estación	Mes y semana - 2020																																																				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
1	Barcelona (Eixample)	-19	13	6	155	18	44	-7	-16	44	-22	-2	-10	-28	-38	-30	-36	-36	-37	-21	51	2	-10	-37	-36	-49	-3	-27	-21	-24	-14	-5	-13	30	-3	-25	-22	-17	7	-37	-37	-13	-38	32	12	6	-1	-1	15	-12	-38	5	-38	-49
	Barcelona (Gràcia - Sant Gervasi)	-15	9	-7	183	8	44	-11	-14	52	-6	7	8	-18	-32	-25	-23	-43	-32	-16	42	-8	-17	-32	-34	-45	-13	-91	-17	-24	-13	-6	-4	29	5	20	23	-6	7	-17	-12	-13	-38	29	4	6	-12	6	1	-30	-42	29	35	-44
	Barcelona (Passeig Reina)	16	37	5	77	-10	39	-16	-20	57	-29	-2	19	26	-35	-30	-26	-54	-45	-21	40	-1	-22	-33	-40	-45	-2	-29	-16	-23	-5	-10	-18	27	-11	-26	35	-19	5	-30	-26	-15	-43	6	-9	15	30	-10	6	-44	54	19	-45	52
	Barcelona (Poblenou)	-27	9	8	159	13	36	-6	-19	43	-20	3	-11	-25	-33	-32	-36	-59	-37	-25	51	-24	-25	-50	-49	-28	-4	-24	-28	-24	-10	-17	-23	14	-16	-13	24	-7	12	-24	-31	-10	-38	53	37	16	16	24	25	-16	-31	-6	-20	-41
	Barcelona (Observatori Fabra)	10	-2	-11	440	37	29	-10	-38	-11	-38	-9	-12	-37	-22	-29	-24	-37	-45	-28	-28	32	-2	-36	-37	-36	-45	-52	-21	-13	-25	19	-40	37	-8	-28	-40	-21	-19	-43	-37	-14	-56	59	15	19	13	34	33	-34	-38	-43	-21	-
	Barcelona (Vall d'Hebron)	-18	-4	-34	-152	-7	-25	-40	-20	-48	-11	-3	-28	-51	-34	-43	-49	-41	-30	34	-30	-34	-35	-30	-43	-23	-46	-28	-37	-24	-19	-26	20	-10	-31	-25	-30	5	-43	-36	-48	-57	19	-23	-14	-28	-13	-11	-25	-15	-42	-54	-79	
	Hospital de Llobregat	-35	-35	-33	109	9	83	7	1	105	-14	6	10	-11	-33	-15	-33	-51	-29	-14	43	12	-16	-26	-32	-47	8	-26	-14	-21	5	2	-4	40	8	-13	-14	-8	-16	-25	-11	-11	-34	42	17	3	13	6	30	-48	-42	6	38	57
	Sant Adrià de Besòs	-27	1	10	119	4	40	9	-20	42	-21	-4	-10	-20	-38	-29	-36	-46	-30	51	9	-33	-52	-50	53	4	-48	-24	-30	-15	-20	-32	4	-25	30	37	-27	5	-30	-26	-16	-36	32	7	-7	-5	2	39	-42	-16	30	-46		
	Sant Vicenç dels Horts	-19	-4	-1	46	-2	37	-12	-21	37	-39	3	-9	-22	-20	-30	-43	-59	-49	-29	27	-23	-32	-46	-47	-20	16	39	-17	-40	-14	-9	-27	17	-13	-25	-20	9	15	31	16	-7	-21	33	11	4	19	14	1	-39	-41	6	-15	52
2	Granollers	4	17	14	36	3	50	13	16	52	-26	-25	-11	-12	-30	-13	-28	-44	-20	6	37	2	-8	-31	-36	-40	4	-26	-3	-28	-7	-4	-8	25	-13	-15	-11	4	26	-6	-15	-9	-26	3	7	-19	-6	-17	-20	-32	-36	-30	57	
	Montcada i Reixac	-29	-10	1	41	-10	37	-17	-29	-30	-12	-22	-34	-51	-41	-51	-56	-42	31	57	-24	-25	-51	-46	-30	-19	-40	-27	-33	-23	-16	-28	22	-16	-19	-18	-23	4	-29	-25	-21	-30	22	12	-10	-7	-2	-11	-40	-44	-16	-37		
	Montcada i Reixac (Can San Joan)	-14	12	16	63	5	29	-12	-22	-38	-19	6	-6	-35	-15	-29	-36	-42	-30	57	2	-12	-21	-19	30	19	-4	-1	-2	3	26	30	18	64	32	4	29	8	3	10	-7	74	59	40	35	40	-10	-12	-21	60	-1			
	Rubí	-20	-6	-5	79	-1	36	-12	-32	-33	-16	3	-1	-27	-43	-14	-35	-61	-30	15	48	-11	-12	-39	-45	-30	14	-34	16	34	-7	-3	33	21	-33	-26	21	7	25	30	-26	37	27	5	20	-4	8	0	37	-46	38	45	-37	
	Terrassa	-8	-6	-7	74	-1	36	-12	-33	-25	-6	28	11	-20	-37	-10	-31	-50	-36	30	47	-10	-13	-30	-38	-43	-10	-17	-4	-20	-10	-6	-30	-26	5	-342	-33	-36	21	59	-26	-14	-33	19	17	19	-4	-8	0	-37	-43	-44	-29	-61
	Sabadell	2	15	11	67	-7	34	-6	-26	42	-32	9	-4	-16	-28	-7	-15	-45	-25	0	30	-9	-3	-22	-29	29	6	-24	-6	-15	-9	-7	-15	17	-6	-13	-36	-16	7	23	-13	-5	-15	34	30	29	7	11	6	-17	-24	-12	25	31
	Santa Perpetua de Mogoda	-13	-5	-5	50	-7	57	-12	-31	33	-9	1	-7	-39	-20	-26	-46	-31	-11	40	21	5	-30	-34	-37	1	-40	-14	-26	1	-1	-1	26	19	-36	-16	1	34	-17	-16	31	17	13	-10	-2	-4	-35	-43	-30	40	-13			

Covid-19 impact on air quality 2020 - Air quality 2020 – Catalonia (NO₂ i PM₁₀)

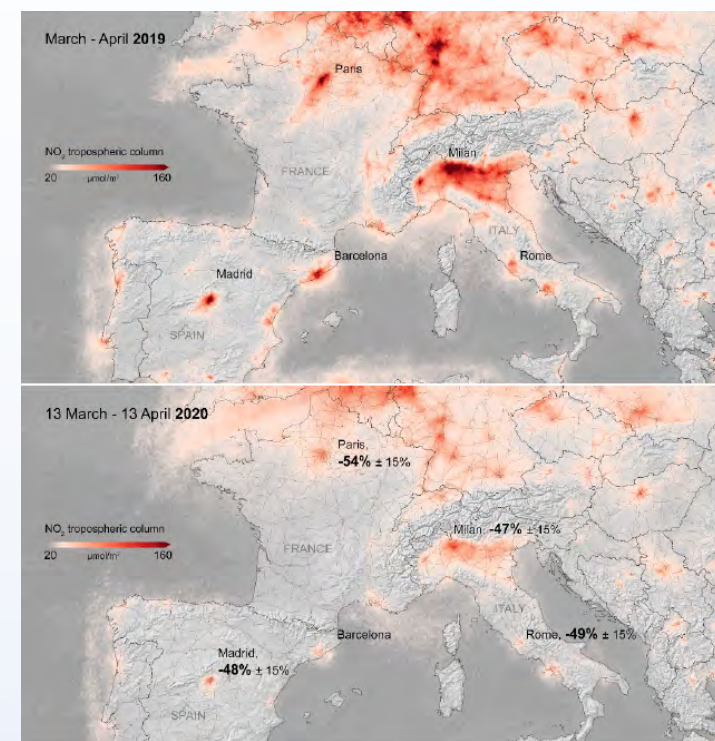
Phases	Average NO ₂ concentration in all XVPCA stations (µg/m ³)		Average PM ₁₀ concentration in all XVPCA stations (µg/m ³)	
	2015-2019	2020	2015-2019	2020
Before Lockdown – (1/1 – 14/3)	29,4	24,2	21,9	23,6
Lockdown and 0 th Phase – (15/3-10/5)	23,7	10,4	20,9	15,3
0.5 th , 1 st and 2 nd Phase – (11/5-17/6)	20,4	11,1	20,6	14,9
3 rd Phase and “new normal” Phase – (18/6-31/8)	18,6	13,1	24,8	20,9
Second wave – (1/9-31/12)	26,3	19,3	22,4	19,0

Covid-19 impact on air quality 2020 - Air quality 2020 – Europe

Variation in pollutant concentrations has been a **phenomenon set throughout Europe**.

- Measurements show a **clear decrease** in this pollutant between the periods of March-April 2019 and March 13-April 13 2020, **between 45% and 55%**, in large European cities such as Rome, Milan, Paris or Madrid, results similar to those obtained in Catalonia.
- In the report it's analyzed the NO₂ and PM₁₀ data measured in the networks of different European cities in 2018, 2019 and 2020 . There is a **clear decrease in NO₂ concentrations**, and more **oscillating of PM₁₀** during the months of hard confinement. With the passage of time, progressively ascending without reaching, in many of the cases, at previous levels of the pandemic.

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Source: European Space Agency-Copernicus Sentinel-5P satellit. Measurement of the tropospheric NO₂ column. Relative percentage difference of the measurements taken between the two maps in various European cities.

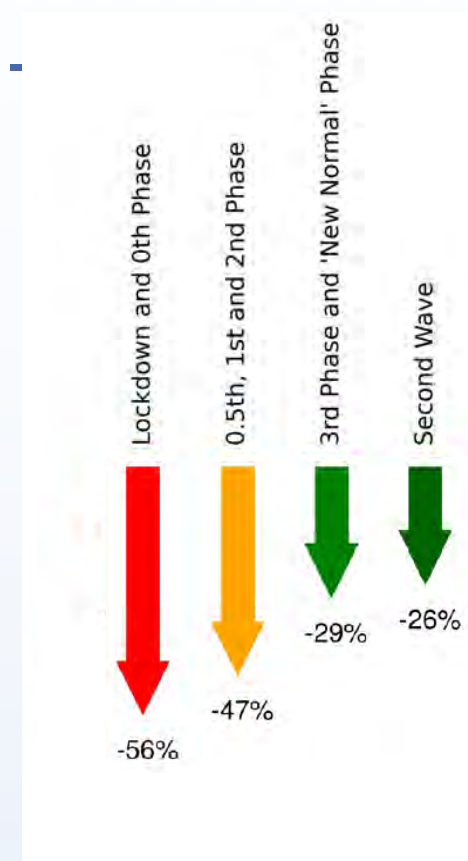
Covid-19 impact on air quality 2020 - Conclusions and reflexions

- The combination of **good dispersion** conditions and (above all) a **large reduction** in polluting **emissions** has allowed levels of two of the main air pollutants, NO₂ and PM₁₀, **decreased** in general throughout Catalonia.

Covid-19 impact on air quality 2020 - Conclusions (NO₂)

Nitrogen dioxide, since its emission sources are linked to transport, is which has presented a more abrupt reduction, and it can be highlighted:

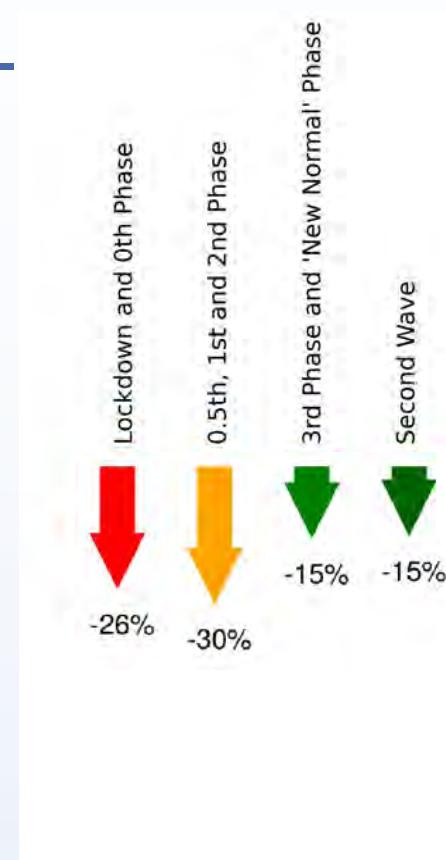
- A **greater impact on traffic stations**, with direct emissions of transport. The **reductions** have reached **61%** in urban traffic stations, followed by urban background, with influence of urban traffic, with an **average decreases of 57%**.
- During the **lockdown and phase 0**, the urban traffic, urban background and suburban traffic stations have had a **similar behavior** in terms of the weekly evolutions of hourly average profile. **Elimination of differences between types** of stations.
- A **rise in concentrations** is observed when advancing the phase and progressing towards the new normal.



Covid-19 impact on air quality 2020 - Conclusions (PM₁₀)

PM₁₀ have shown fewer differences due to its multiple natural and anthropogenic sources. Despite everything can be highlighted:

- An **unequal affectation according to the phase**. Variations are sustained between **10 and 30%**.
- A **similar effect** depending on the zone. Urban traffic, urban background and suburban traffic stations show only slight differences.
- Special mention should be made of the rural stations, in which there is only 6% decrease during "phase o" due to increased influence of dust intrusions in height detectable at Montsec station.



Covid-19 impact on air quality 2020 - Reflexions

Regarding contamination, the confinement and the process of de-confinement has been a **large-scale experiment** to observe a **great improvement in the quality of the air we breathe** and its progressive deterioration until reaching values similar to those of past years.



How can you **guarantee health security** on the move and in the world of work and, but at the same time, **ensure** that contamination **levels do not exceed the limits legal**?

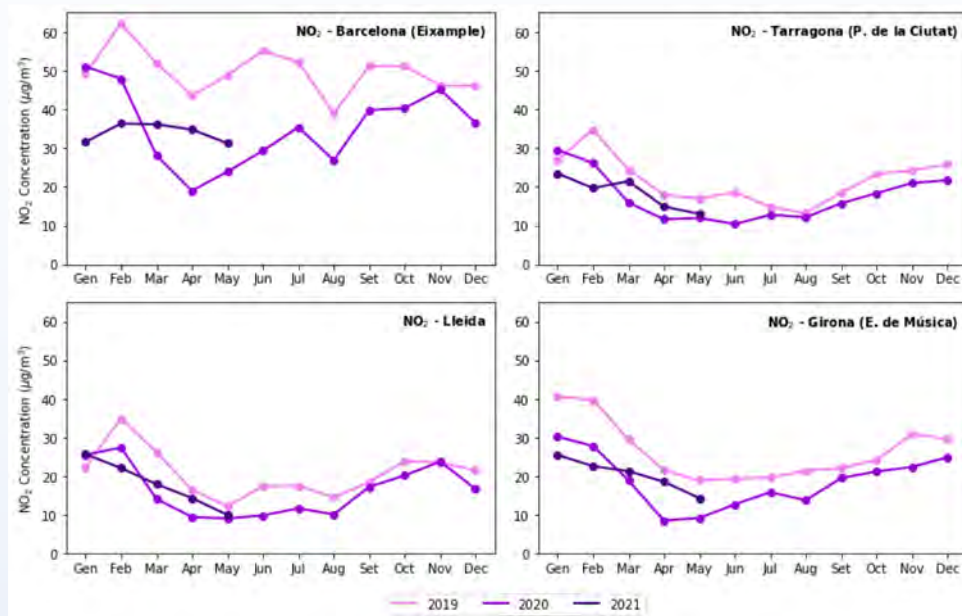


Covid-19 impact on air quality 2020 - Reflexions

- ✓ The focus should be on **restoring the trust of users in the public transport** as a fast and safe means, with the necessary measures to reduce the concentration of people at peak times.
- ✓ A second point is the **promotion of active mobility**, both on foot and by bicycle, with the creation of urban and interurban roads for this purpose, and the **promotion of local commerce** that avoids unnecessary trips with private transport.
- ✓ The **teleworking** option has proven viable and fully **operational in many sectors**. It is, therefore, an opportunity to also advance in flexibility labor and, consequently, to **reduce forced mobility** and increase demand of public transport.

Current situation 2021 -Catalonia

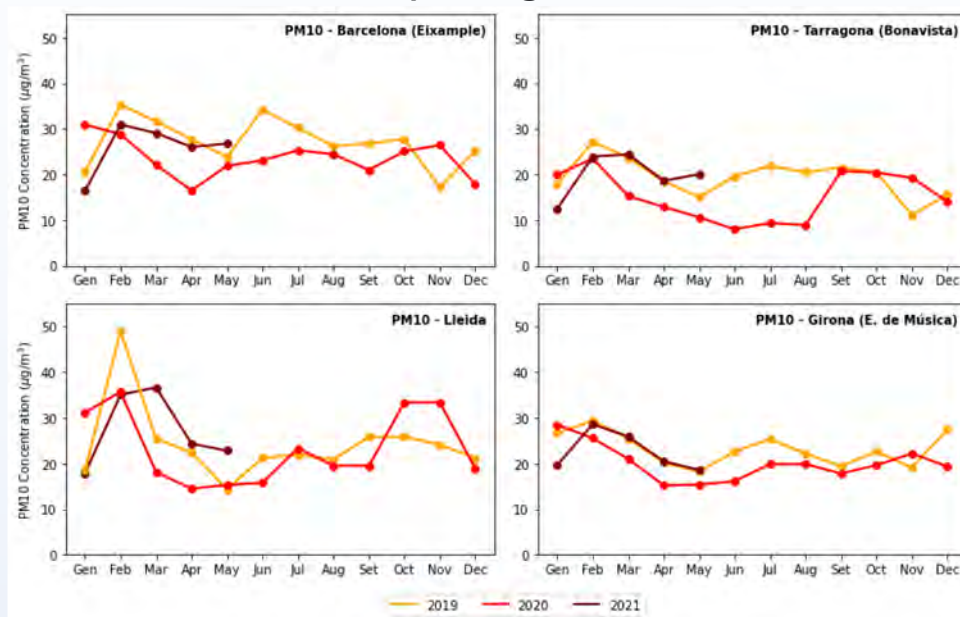
Evolution of the monthly average of NO₂ (2019,2020,2021)



- Before lockdown phase (1/1-14/3):
NO₂ levels in 2021 are lower than 2019 and 2020 levels.
- Lockdown and oth phase (15/3-10/5):
NO₂ levels in 2021 are higher than 2020 levels but lower than 2019 levels.

Current situation 2021 -Catalonia

Evolution of the monthly average of PM10 (2019, 2020, 2021)



- Before lockdown phase (1/1-14/3):
NO₂ levels in 2021 are lower than 2019 and 2020 levels.
- Lockdown and oth phase (15/3-10/5):
NO₂ levels in 2021 are higher than 2020 levels and similar or higher than 2019 levels.

Thanks for your attention!

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