Agenzia nazionale per le nuove tecnologie,
l'energia e lo sviluppo economico sostenibile

The pandemic crisis and lockdown in Italy: what lessons to draw?

LCS-RNet, november, 13, 2020

Gabriele Zanini

Lockdown: a great involuntary experiment .

Project PULVIRUS

What we try to understand:

- the controversial link between air pollution and the spread of the pandemic;
- the physical-chemical-biological interactions between fine particles and viruses;
- the effects of the "lockdown" on air pollution and greenhouse gases.

Settori	Proxy e disponibilità	Emissioni 2019	Tendenziale 2020	Variazione settoriale
Energy production	Gas Naturale SNAM termoelettrico (n-2)	53,797	-7.9%	-8.2%
	Carbone MISE (n-3)	16,908	-15.0%	
	Altri carboni MISE (n-3)	4,872	-9.4%	
	Olio termoelettrico MISE (n-1)	15,271	-1.0%	
	Fuggitive - Consumi totali gas SNAM (n-2)	6,956	-9.6%	
	Altro - Produzione termoelettrica TERNA	735	-5.9%	
Industry	Gas naturale SNAM industria (n-2)	31,723	-9.2%	-7.5%
	Olio combustione MISE (n-1)	11,464	-1.0%	
	Carbone MISE (n-3)	1,073	-15.0%	
	Altri carboni MISE (n-3)	6,223	-9.4%	
	Altro - Produzione industriale ISTAT (n-2)	1,475	-8.0%	
Transport	Benzina MISE (n-1)	22,765	-15.4%	-13.3%
	Gasolio trasporti MISE (n-1)	65,007	-12.6%	
	Gpl trasporti MISE (n-1)	5,026	-14.7%	
	Gas naturale SNAM usi domestici (n-2)	2,025	-8.3%	
	Altri trasporti - Gasolio Marina MISE (n-1)	3,983	-2.6%	
	Altri Trasporti -Carboturbo MISE (n-1)	2,418	-29.8%	
	Altri Trasporti -Pipelines SNAM totale immesso (n-2)	810	-9.6%	
	Altri Trasporti - MISE (n-1)	1,905	-13.2%	
Heating	Gas naturale SNAM usi domestici (n-2)	56,373	-8.3%	-6.0%
	Gasolio riscaldamento MISE (n-1)	14,681	-1.3%	
	Altro - Gpl combustione MISE (n-1)	10,611	*0.0%*	
Industrial processes and solvents	Cemento Federbeton (n-3)	7,695	0.0%	-1.9%
	Acciaio Federacciai (n-2)	1,362	-9.4%	
	FGAS - Inventario emissioni	18,887	*0.0%*	
	Altro - Produzione industriale ISTAT (n-2)	6,522	-8.0%	
Agricoltura	*Emissioni agricoltura ritenute costanti*	30,273	*0.0%*	0.0%
Gestione rifiuti	Inventario emissioni	16,688	*0.0%*	0.0%
Totale		**417,527**	-7.5%	
PIL ISTAT	n-1		**-14.3%**	

Nota: n rappresenta il mese corrente

Reduction of emissions compared to:

- **first quarter 2019 about 24%**
- **first semester 2019 about 13%**

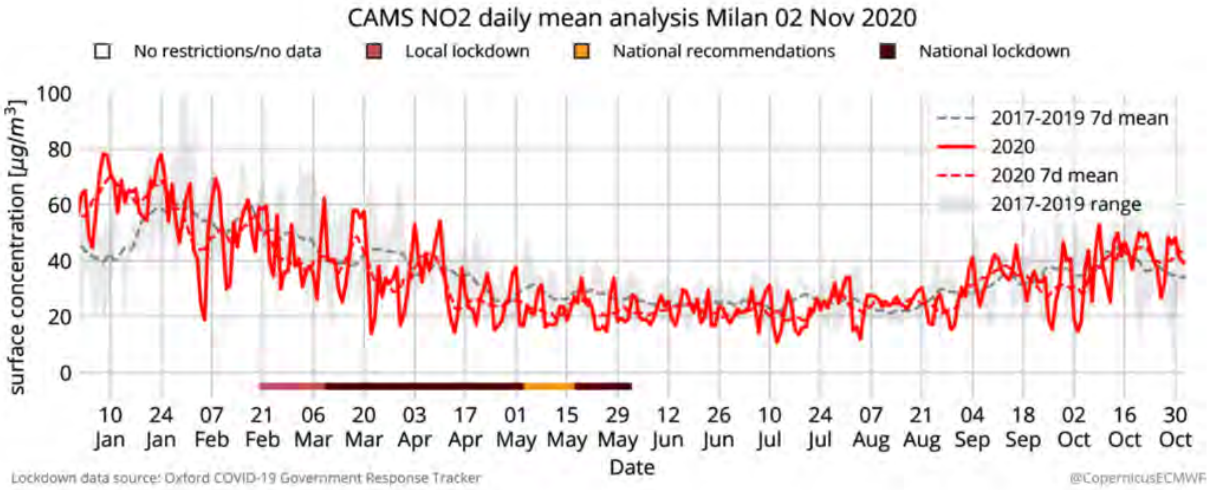
The percentage of reduction 7.5% is estimated on annual basis (2020).

Timeseries of CAMS daily air quality analyses

City : Milan, Parameter : Nitrogen dioxide

European Air Quality information in support of the COVID-19 crisis

https://atmosphere.copernicus.eu/european-air-quality-information-support-covid-19-crisis



ENEA

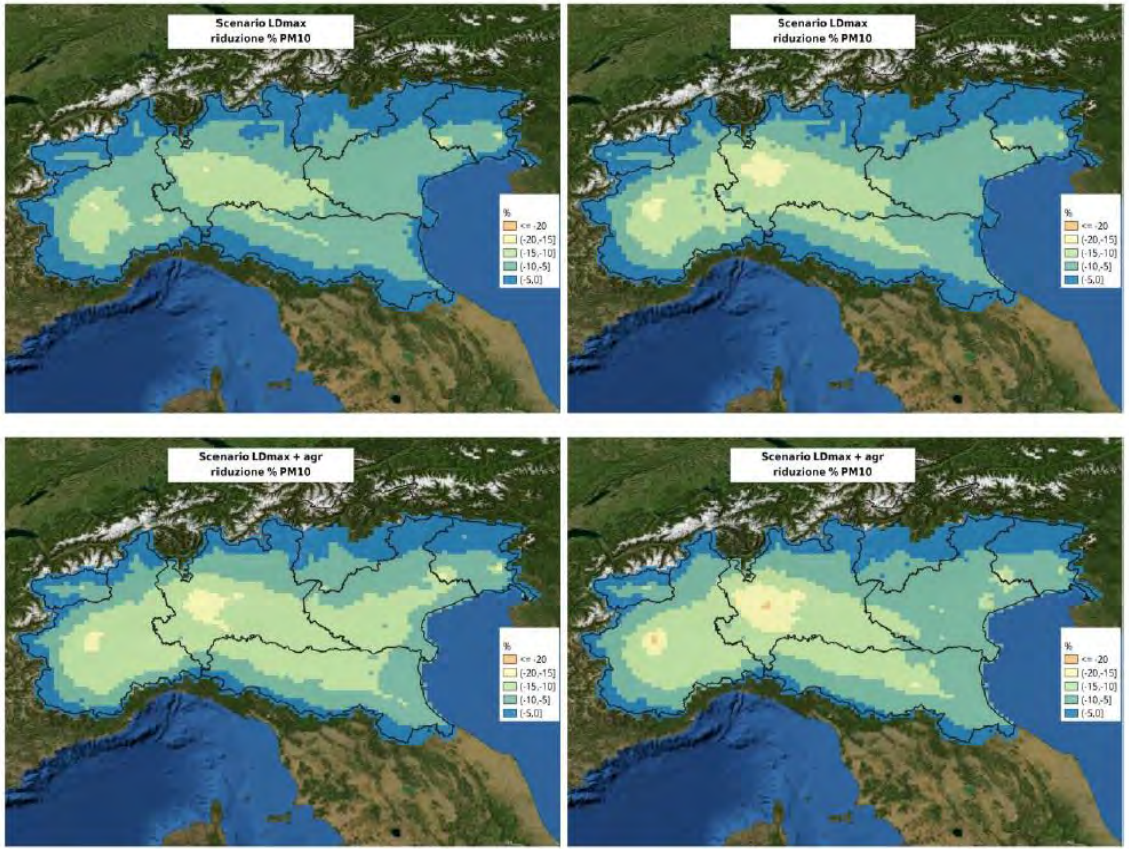
European Commission

opernicus Europe's eyes on Earth

IMPLEMENTED BY ECMWF

LIFE 15 IPE IT 013

prepAIR
Po Regions Engaged to Policies of Air



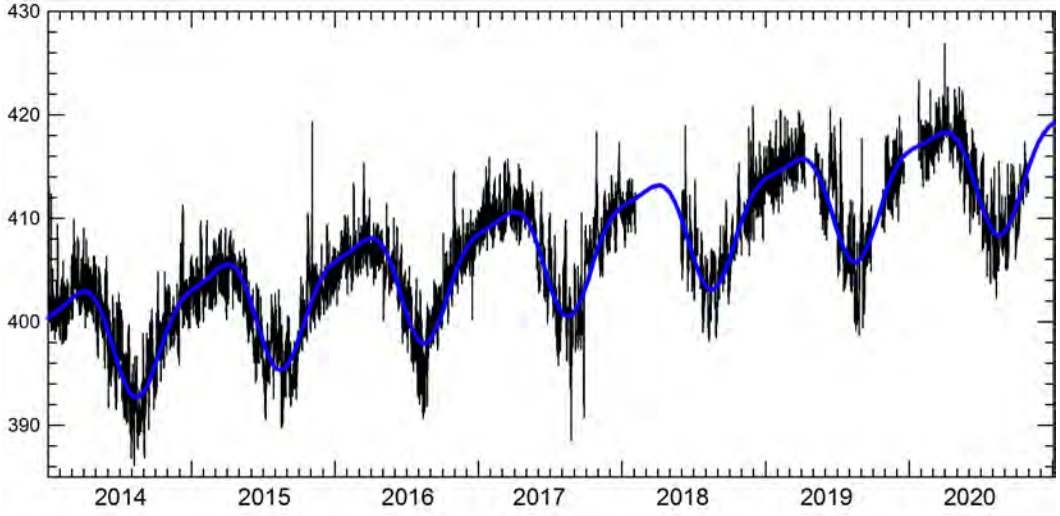
Spatial distribution of the percentage reductions of the PM10 annual average concentrations over the Po Valley (LDmax, i.e. lockdown scenario)

ENEA

Reduction of emissions and environmental concentrations of greenhouse gases.

- A background station is still influenced by:
  - sources
  - sinks
  - long range transport

- We need data analysis to define air mass trajectories.

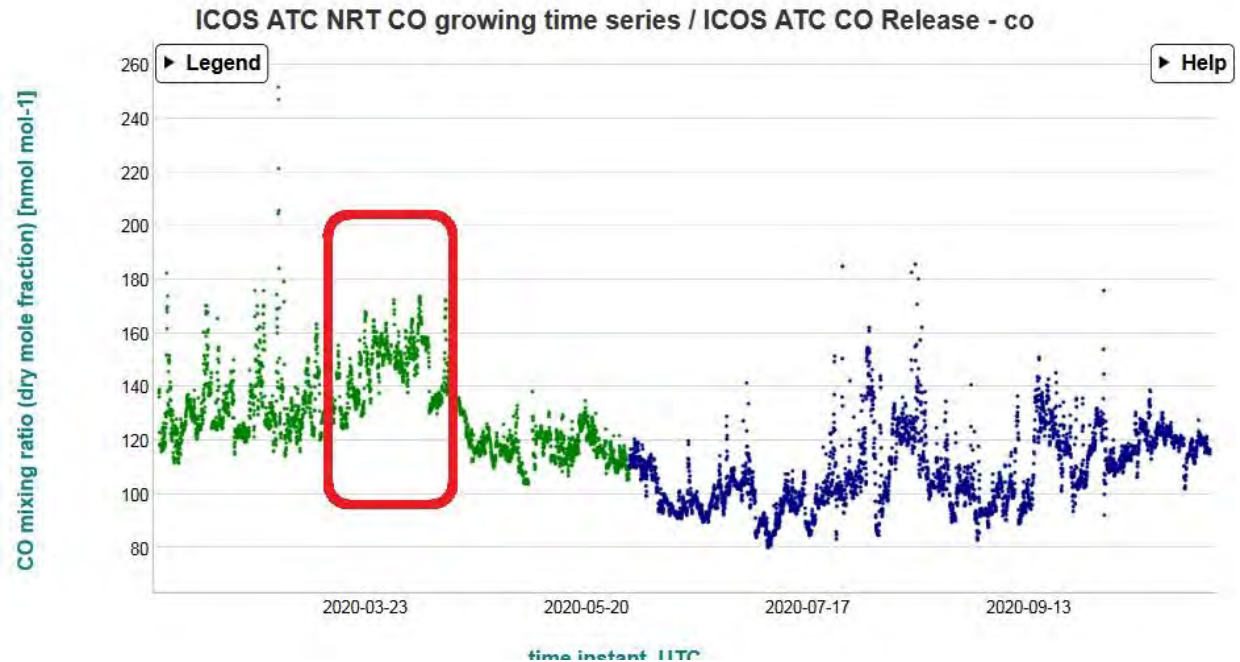


Evolution of the hourly concentration of atmospheric CO2 measured in Lampedusa.

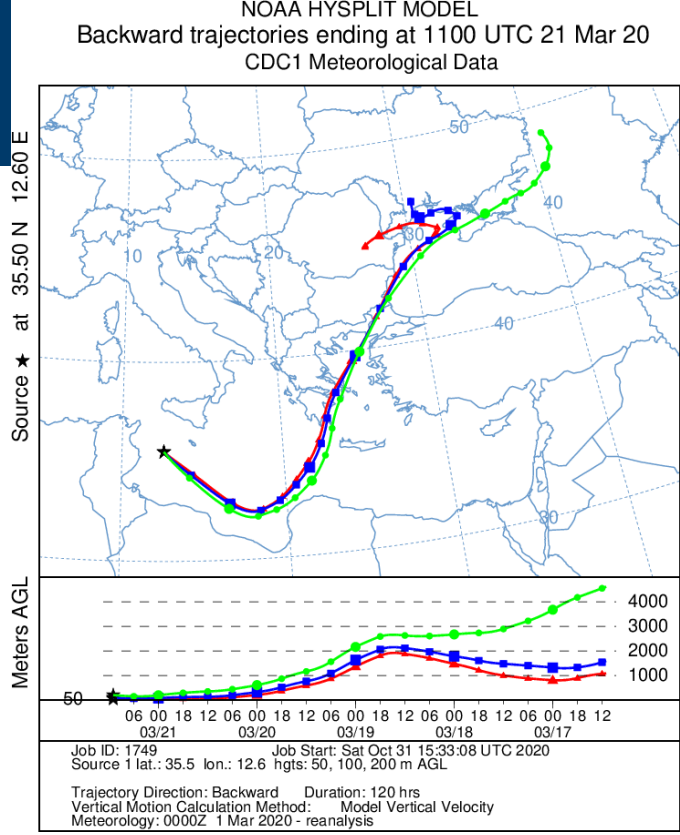
- annual growth: 2.6 ppm / year,
- amplitude of the annual cycle: 10.5 ppm
- amplitude of the semi-annual cycle: 3.0 ppm.

Extracting the direct effects of a reduction in anthropogenic emissions means being able to separate a contribution, however small, within a significant natural variability.

Reduction of emissions and environmental concentrations of greenhouse gases.



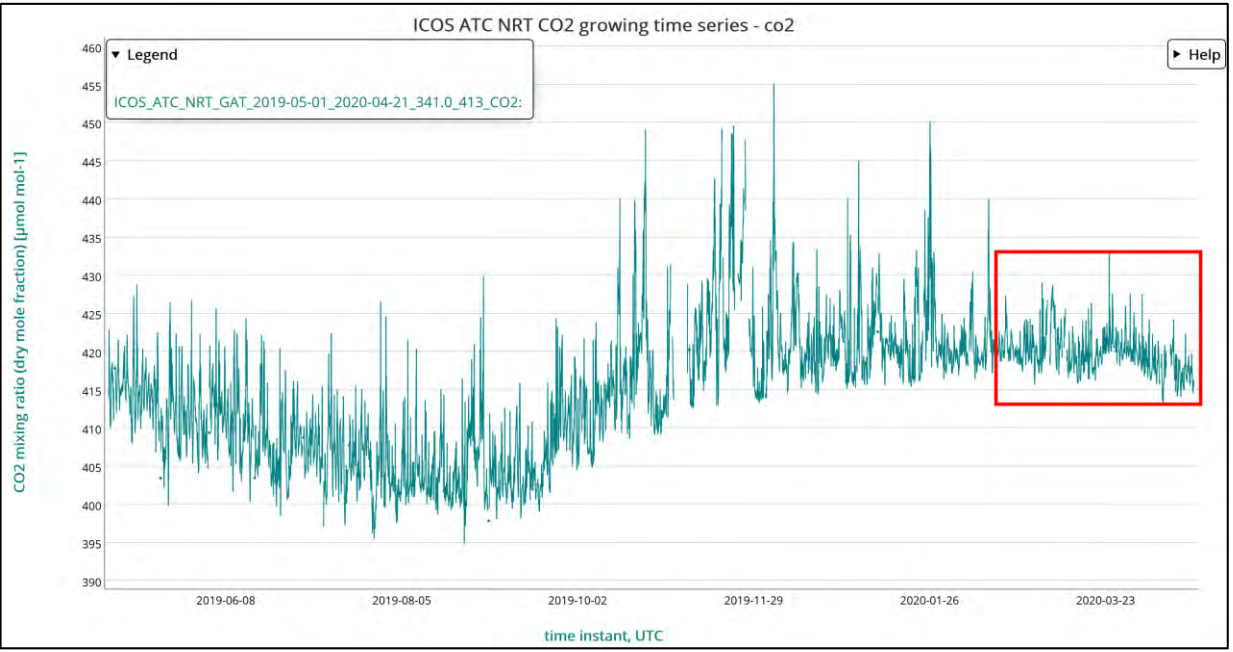
Evolution of the CO concentration in Lampedusa in the early months of 2020. The red box relates to March 2020 (fires emissions from Eastern Europe)



Trajectories of the air masses arriving over Lampedusa on march 21,2020. (HySplit model)

Reduction of emissions and environmental concentrations of greenhouse gases.

Although there is clear evidence of decreasing atmospheric CO_2 in cities[1], no significant change in background atmospheric concentration is expected.



Atmospheric CO_2 concentration at the ICOS[2] tower near Gartow, Germany. The variability was reduced in the lockdown months (red square).

[1]Clear evidence of reduction in urban CO2 emissions as a result of COVID-19 lockdown across Europe. https://www.icos-cp.eu/event/933

[2] ICOS, Integrated Carbon Observation System

Reduction of emissions and environmental concentrations of greenhouse gases.

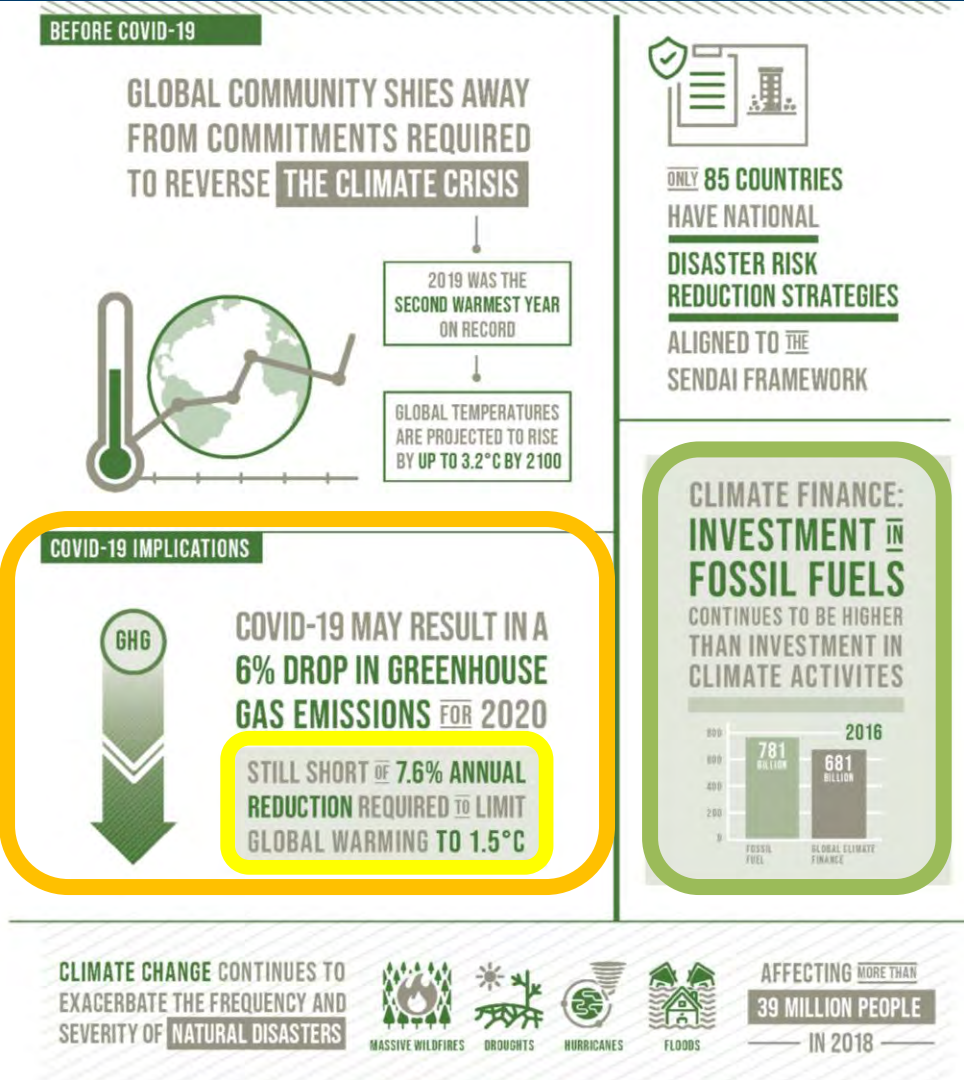
United Nations | Department of Economic and Social Affairs
Sustainable Development

SUSTAINABLE DEVELOPMENT GOALS

https://sdgs.un.org/goals/goal13

13 CLIMATE ACTION

TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS



Conclusions (1of 2)

- The lockdown caused reductions in the concentrations of some atmospheric pollutants.
- The preliminary analysis indicates that the concentrations of pollutants do not follow the same trends, as is inevitable for complex and non-linear phenomena.
- The decrease in the concentrations of nitrogen dioxide (NO_2) seems to affect more monitoring stations close to vehicular traffic and less those far from sources.

Conclusions (2of 2)

- The fluctuating trends in PM concentration depend on the role that meteorological variability and chemical reactions in the atmosphere play in its formation and dispersion.

- Although CO_2 decreases locally, there is no evidence of substantial reductions in background stations.

- The inertia of the climate system is so strong that the decline in CO_2 concentrations does not affect the warming trend.

- The efforts for decarbonization must be extended to the planet, continuous over time and of greater intensity.

gabriele.zanini@enea.it

Thanks a lot for your attention