Air quality scenarios with maximum emissions reduction

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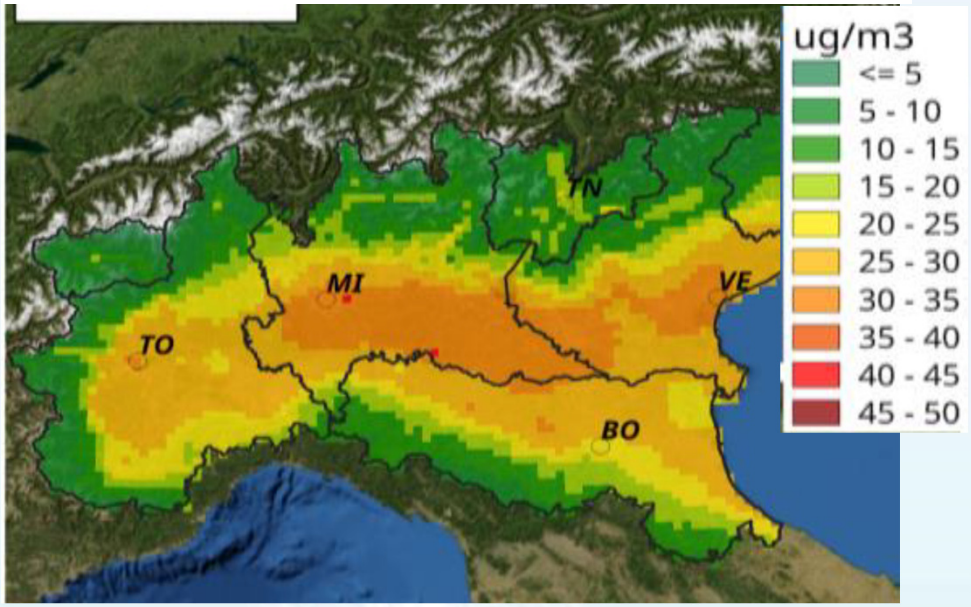
Together to improve air quality. LIFE IP PrepAIR: project's achievements and main results

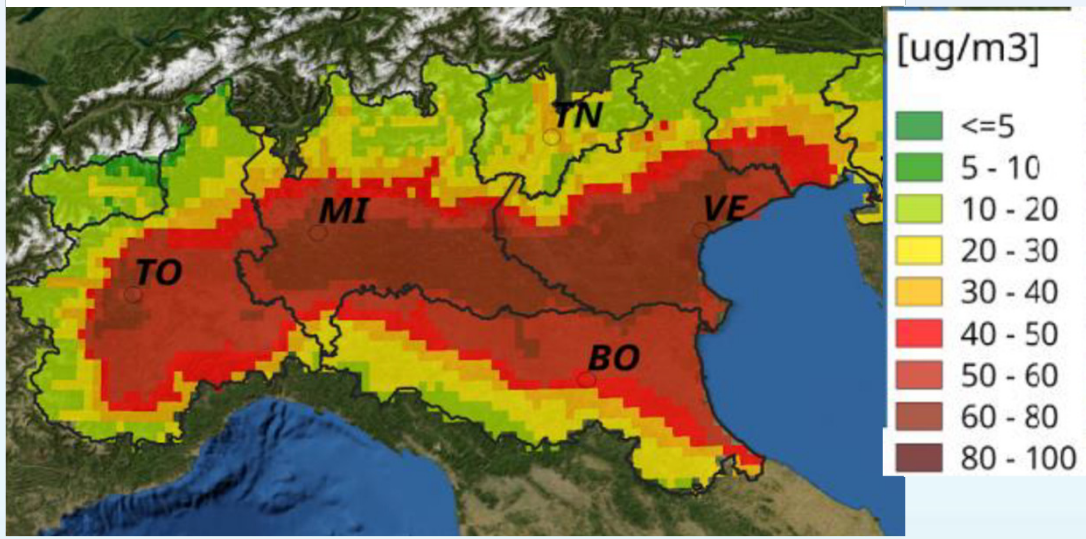
Bruxelles 31th May 2022

Air quality assessment - PM10 - 2020

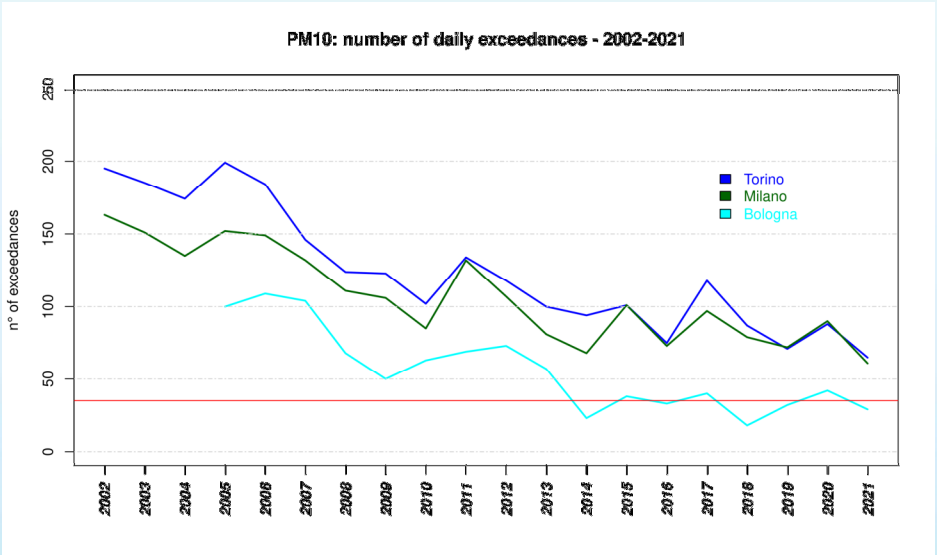
PM10 2020 annual mean



90.4 percentile of PM10 daily concentrations, 2020

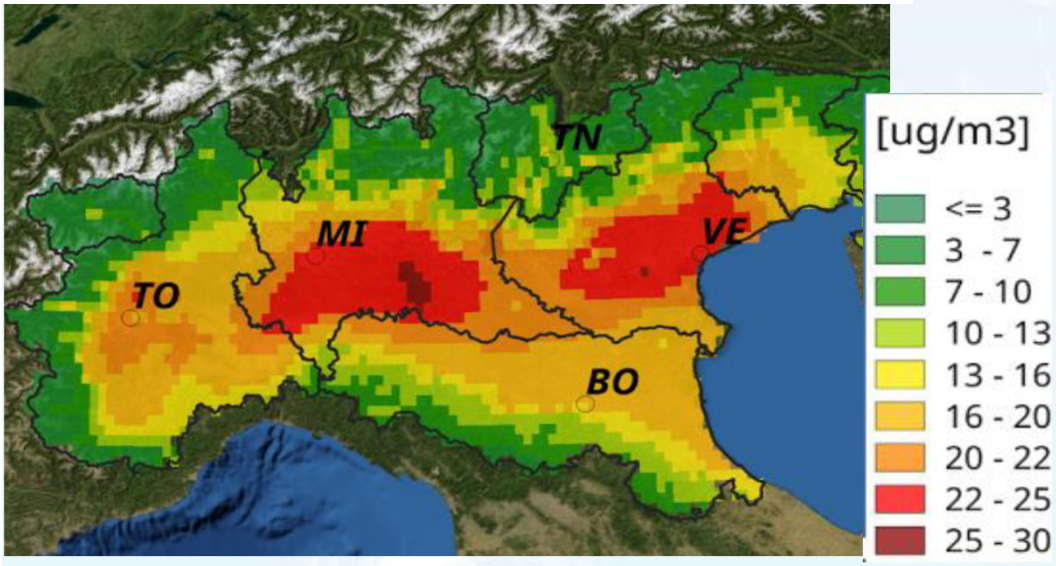


Even if the decreasing trend is confirmed, also in the year of the lockdown widespread exceedances of the daily limit

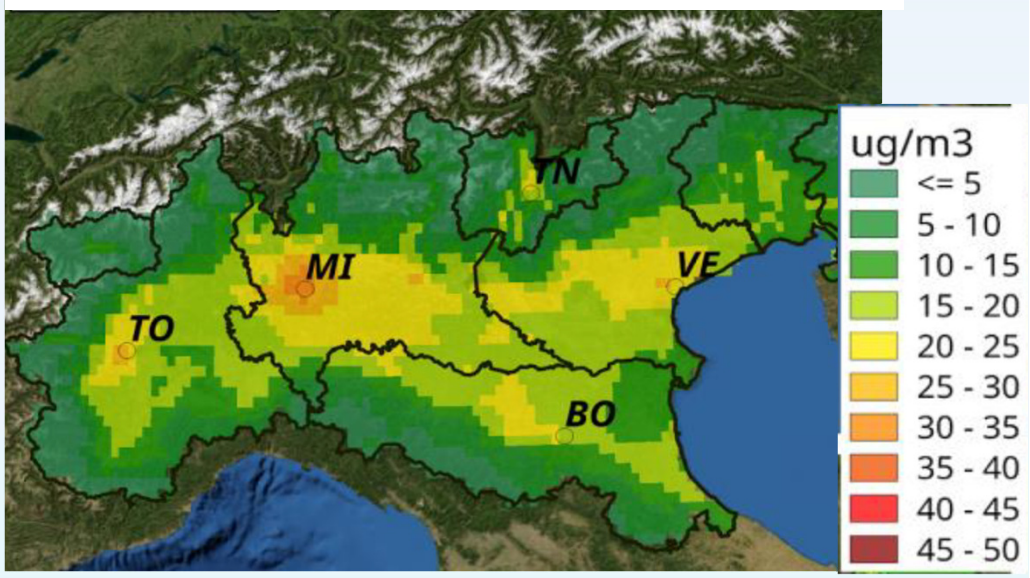


Air quality assessment – PM2.5 and NO2 -2020

PM2.5 2020 annual mean



NO2 2020 annual mean

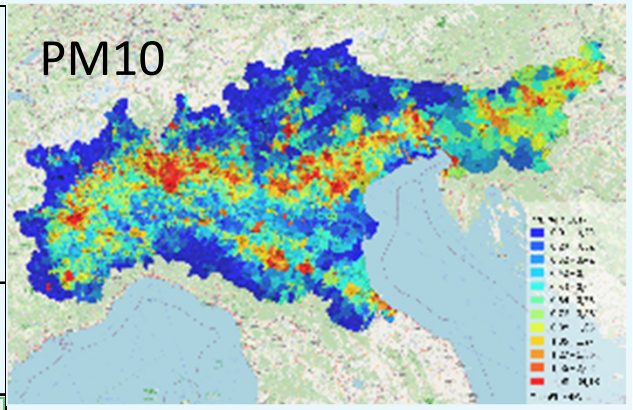


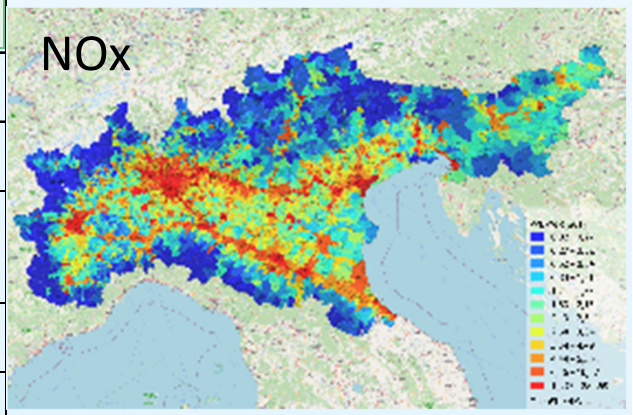
PM2.5: local exceedances of annual limit; widespread exceedances of target value

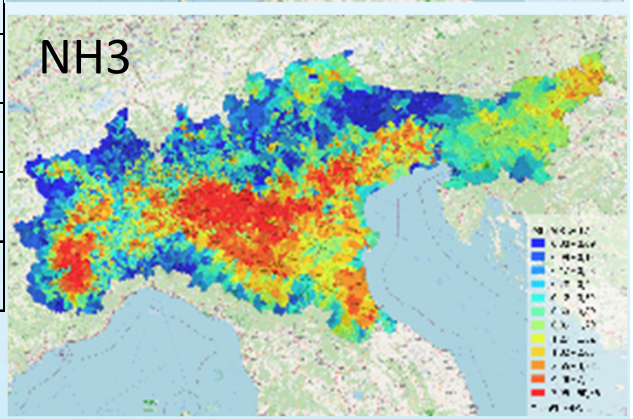
NO2: local exceedances of annual limit, above all in traffic stations; in 2020 the decreasing trend is particularly evident (also in relation to activities limitations due to COVID-19)

Emissions share on year 2017 for Po-Basin

Macrosectors	NH3	NMVOC	NMVOC without mac 10 and 11	NOx	PM10
1-Combustion in energy and transformation industries	0%	0%	0%	7%	1%
2-Non-industrial combustion plants	1%	5%	11%	11%	56%
3-Combustion in manufacturing industry	0%	1%	2%	15%	4%
4-Production processes	0%	4%	10%	3%	3%
5-Extraction and distribution of fossil fuels and geothermal energy	0%	3%	6%	0%	0%
6-Solvent and other product use	0%	23%	55%	0%	3%
7-Road transport	1%	6%	13%	48%	19%
8-Other mobile sources and machinery	0%	1%	2%	14%	3%
9-Waste treatment and disposal	1%	0%	0%	1%	0%
10-Agriculture	97%	24%		1%	5%
11-Other sources and sinks	0%	34%		0%	5%

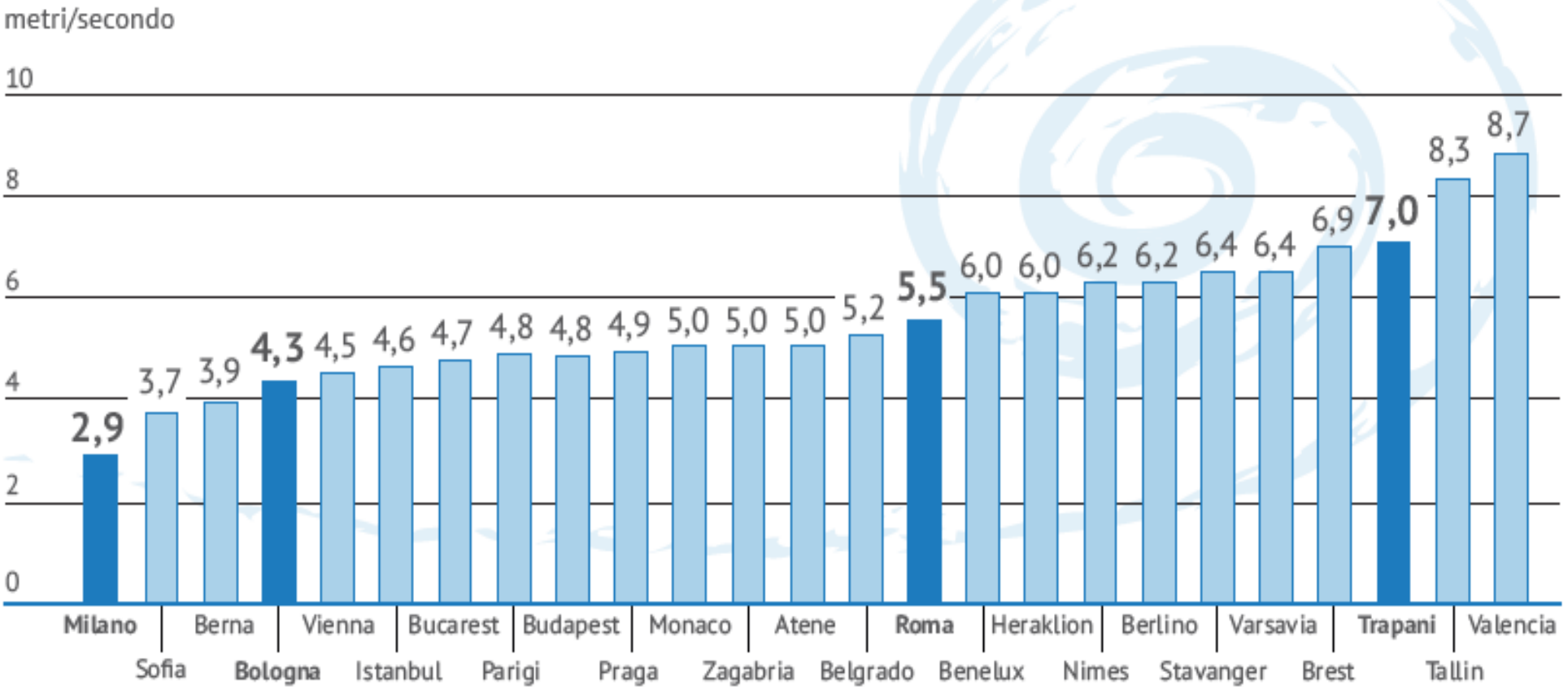






On the base of the Report Life Prepair on emission dataset (actions D2)

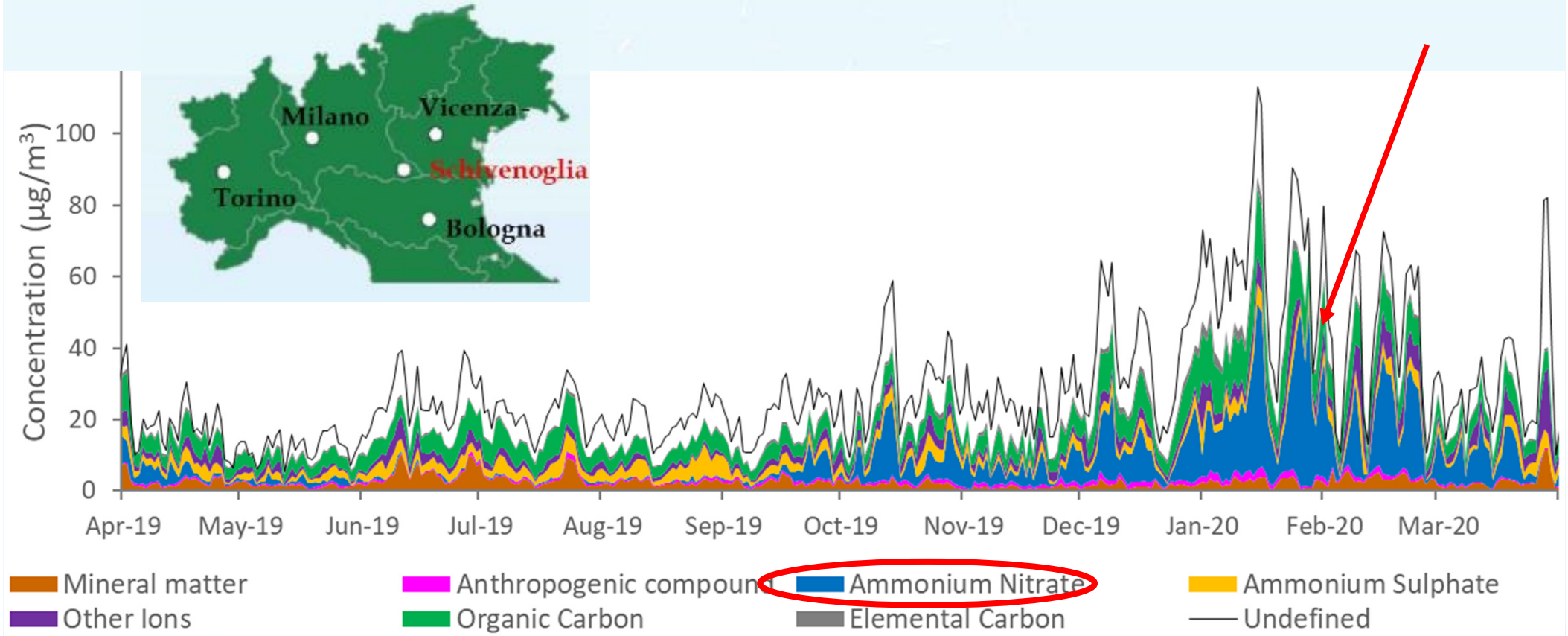
Wind average speed at 250 m winter 2016-2017



In the Po Valley the meteorological conditions are very unfavorable to the dispersion of pollutants

Ref: Arpa Emilia Romagna elaborations on WMO data

PM10 composition - average for Po-Basin

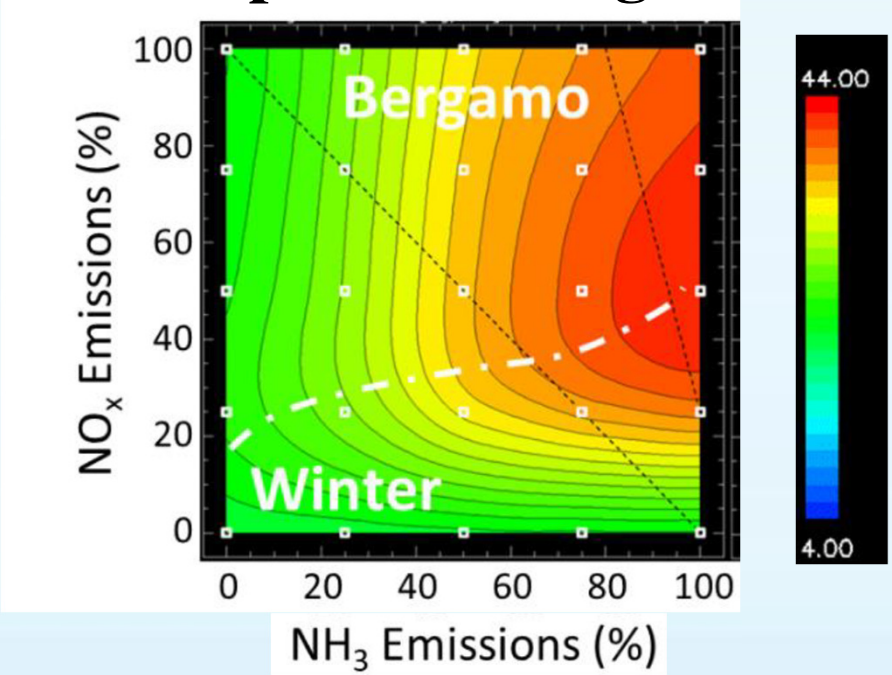


During high pollution episodes, secondary inorganic aerosol can represent 40% - 50% of the total PM10 concentration (average on the basin) and even more of PM2.5

Non linear response of PM2.5 to changes in NOx and NH3

From: ”Non linear response of PM2.5 to changes in NOx and NH3 emissions in the Po basin (Italy): consequences for air quality plans” https://doi.org/10.5194/acp-2021-65 P. Thunis et al, Atm Chemistry and Physics

PM2.5 isopleths during Winter



“One of the striking results is the increase of the PM2.5 concentration levels when NOx emission reductions are applied in NOx-rich areas, such as the surroundings of Bergamo”

A similar study is planned in Life Prepair project – first results are planned in March 22

Evaluation of emission reduction scenarios on air quality in Po Valley

- To evaluate the feasibility of different possible targets, a sensitivity analysis has been performed decreasing emissions of all principle pollutants and precursors (NOx, VOC, NH3, PPM, SOx) on the whole basin
- Scenario simulations are corrected taken into account monitoring station data
- The results of the simulations have been used to forecast the corresponding values in the air quality stations actually present

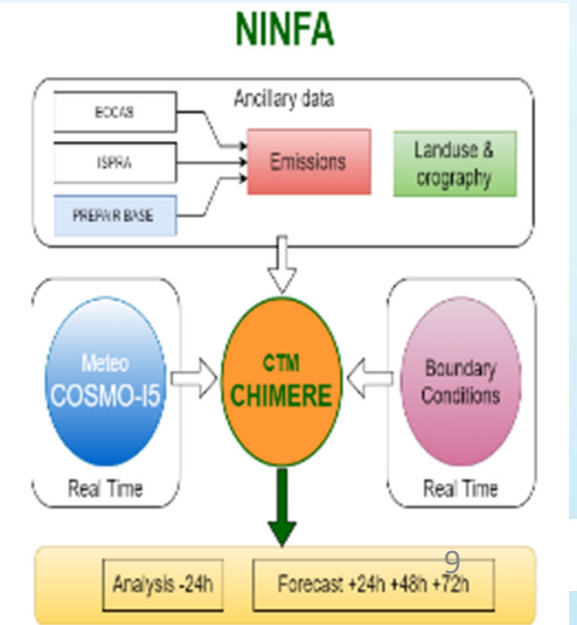
Evaluation of emission reduction scenarios on air quality in Po Valley

- Scenarios considered here:
  - ❑ T1 BASE CASE
  - ❑ T7 - 50% reduction of NOx, VOC, NH3, PPM, SOx (same meteo and IC/BC of T1)
  - ❑ T8 - 80% reduction of NOx, VOC, NH3, PPM, SOx (same meteo and IC/BC of T1)
  - ❑ T9 - 10% reduction of NOx, VOC, NH3, PPM, SOx (same meteo and IC/BC of T1)

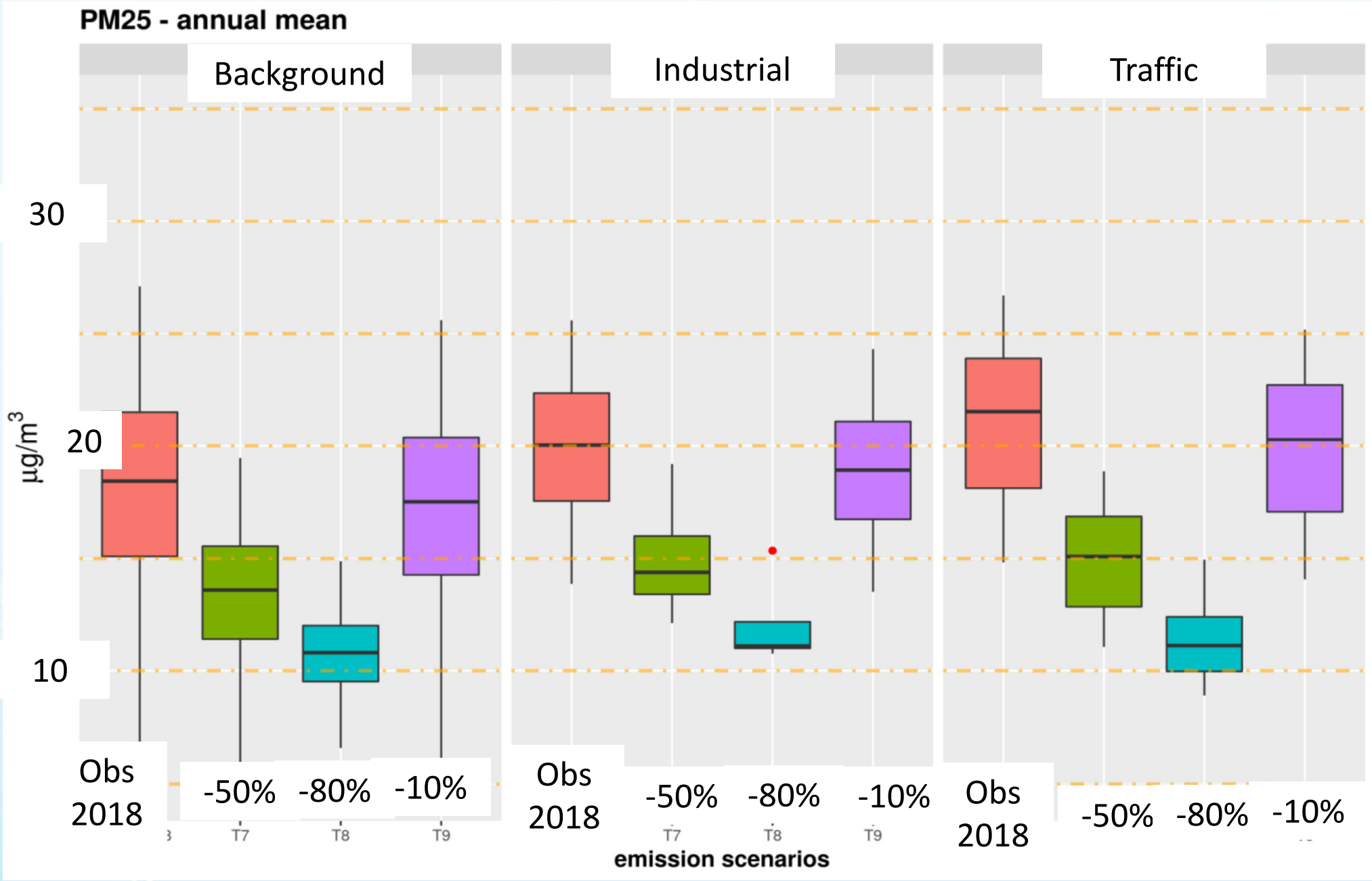
Emission Inventory (Prepair 2017)

Boundary Conditions: Prevair 2018 Meteo : COSMO 2018

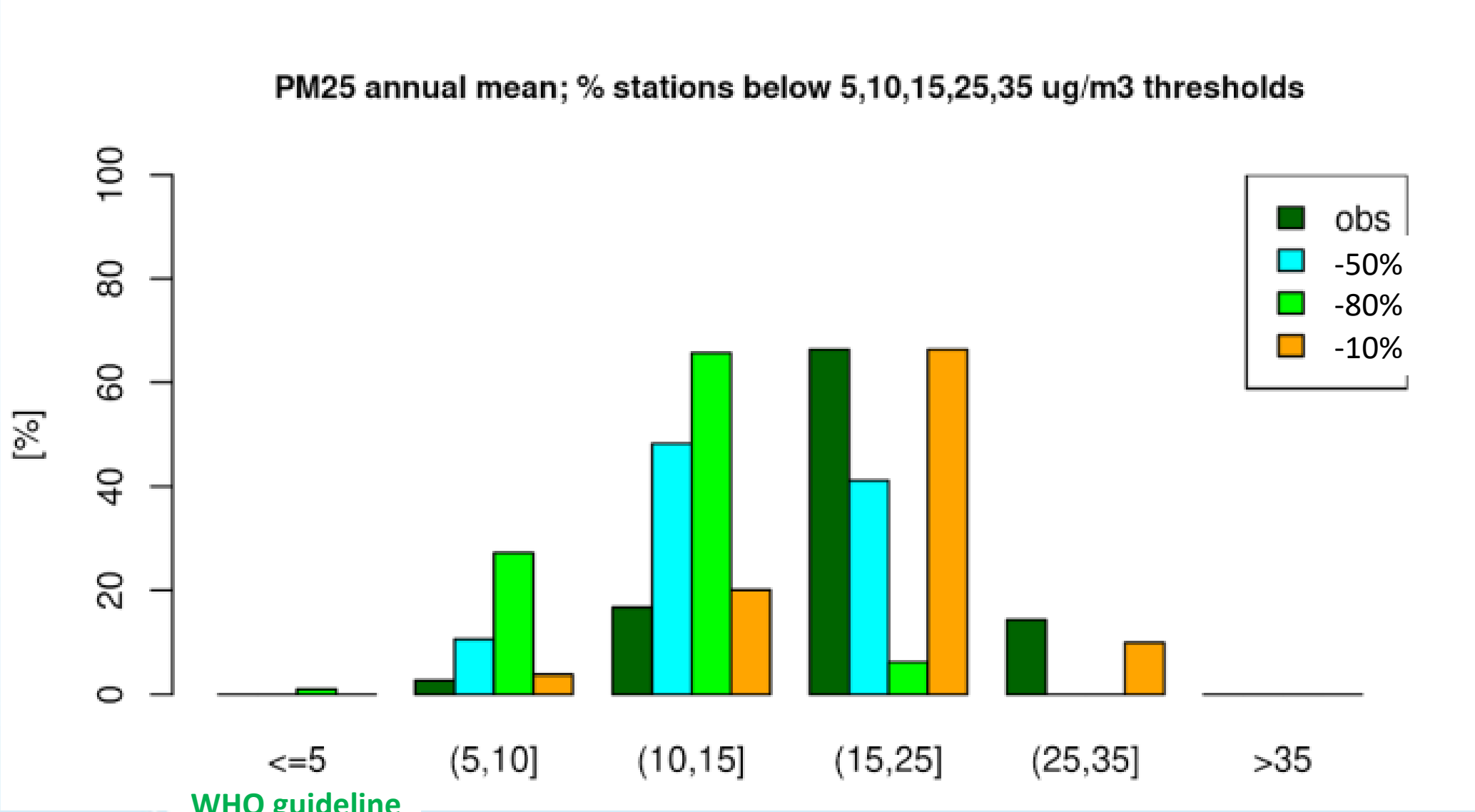
Vertical level: 9 up to 500 hp Hor. Resolution: 0.09*0.06 lat/lon (about 5 km x 5 km)



Evaluation of emission reduction scenarios on air quality in Po Valley – PM2.5 annual mean

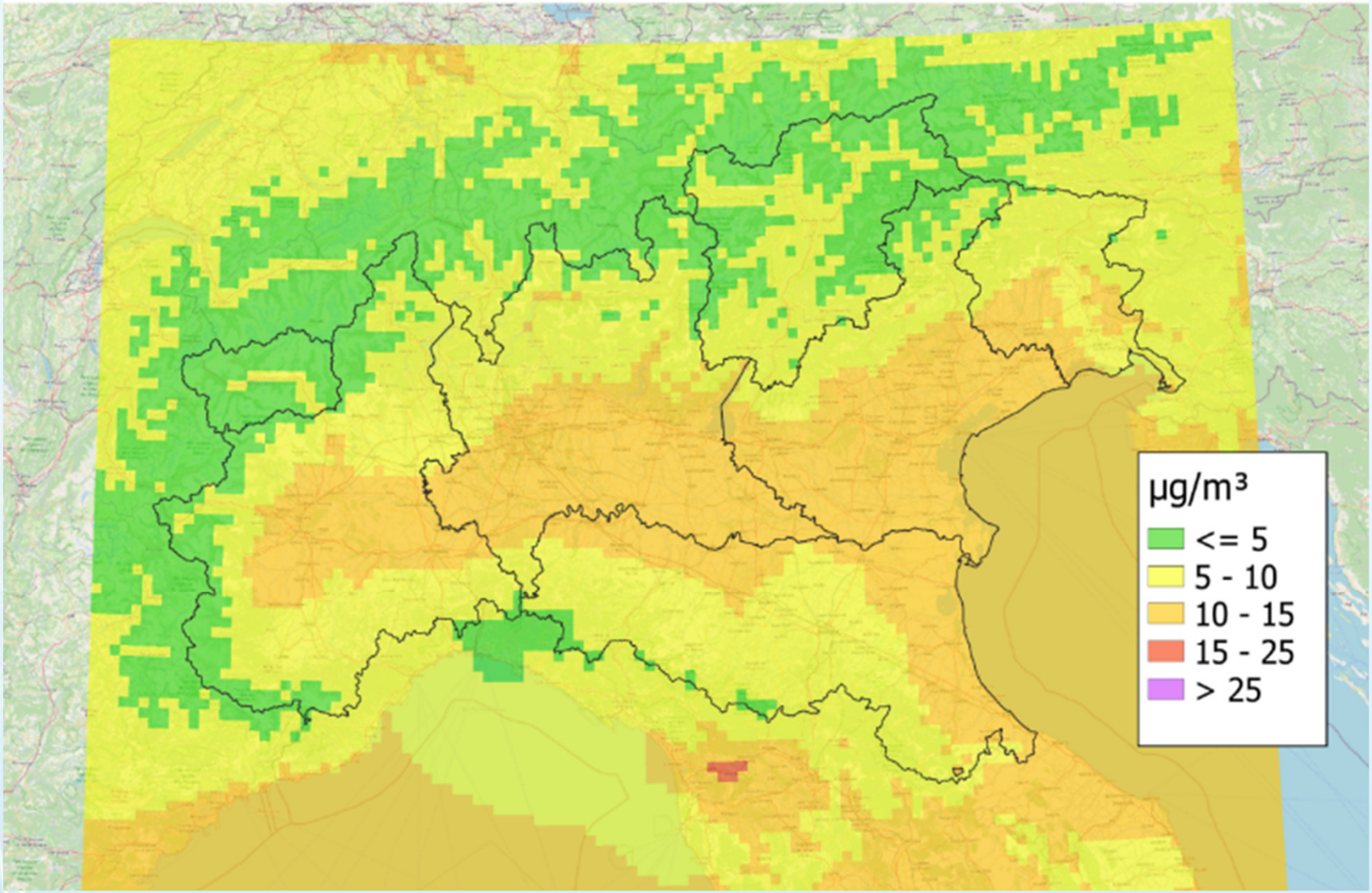


Evaluation of emission reduction scenarios on air quality in Po Valley – PM2.5 annual mean

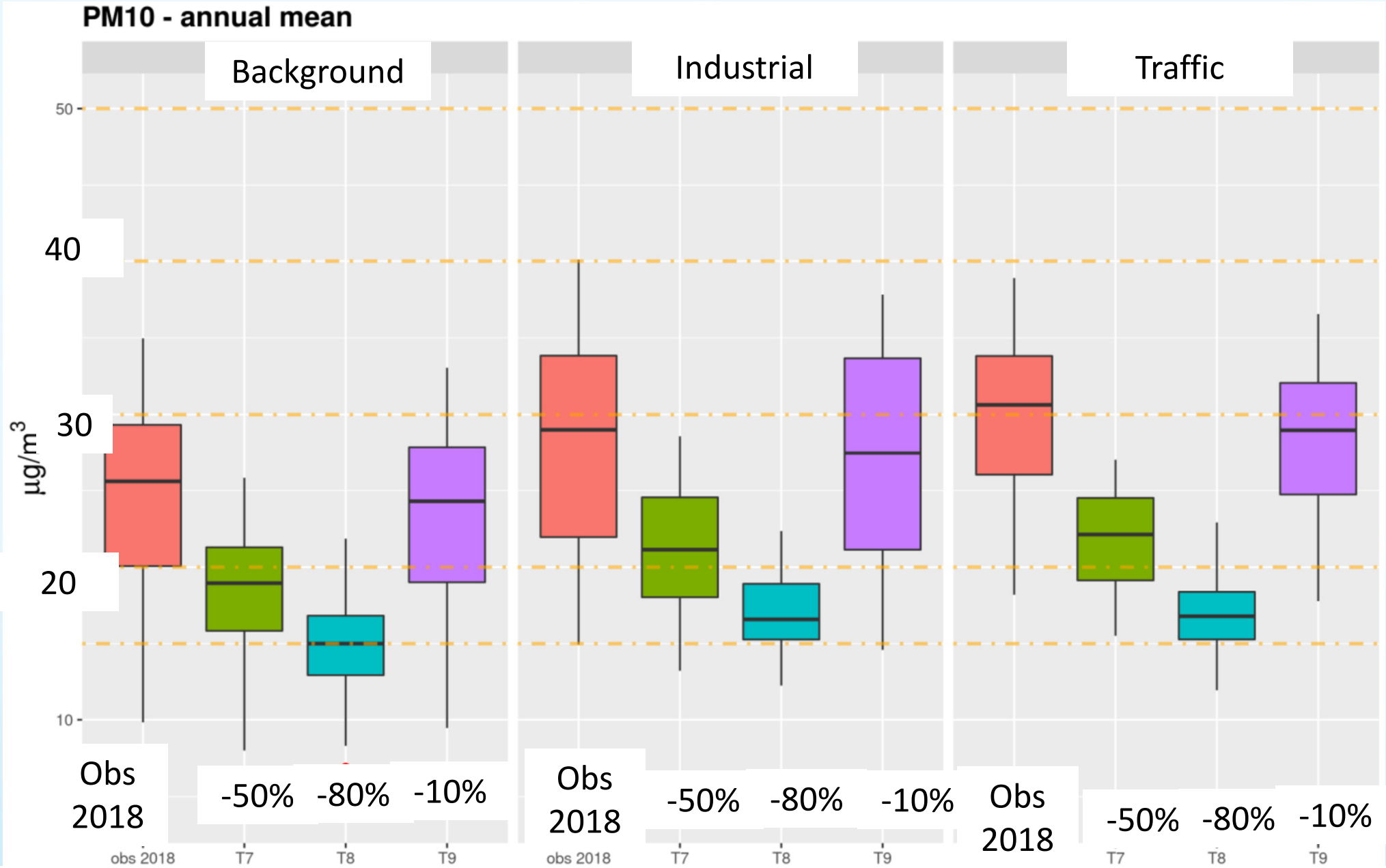


WHO guideline
5 µg/m³

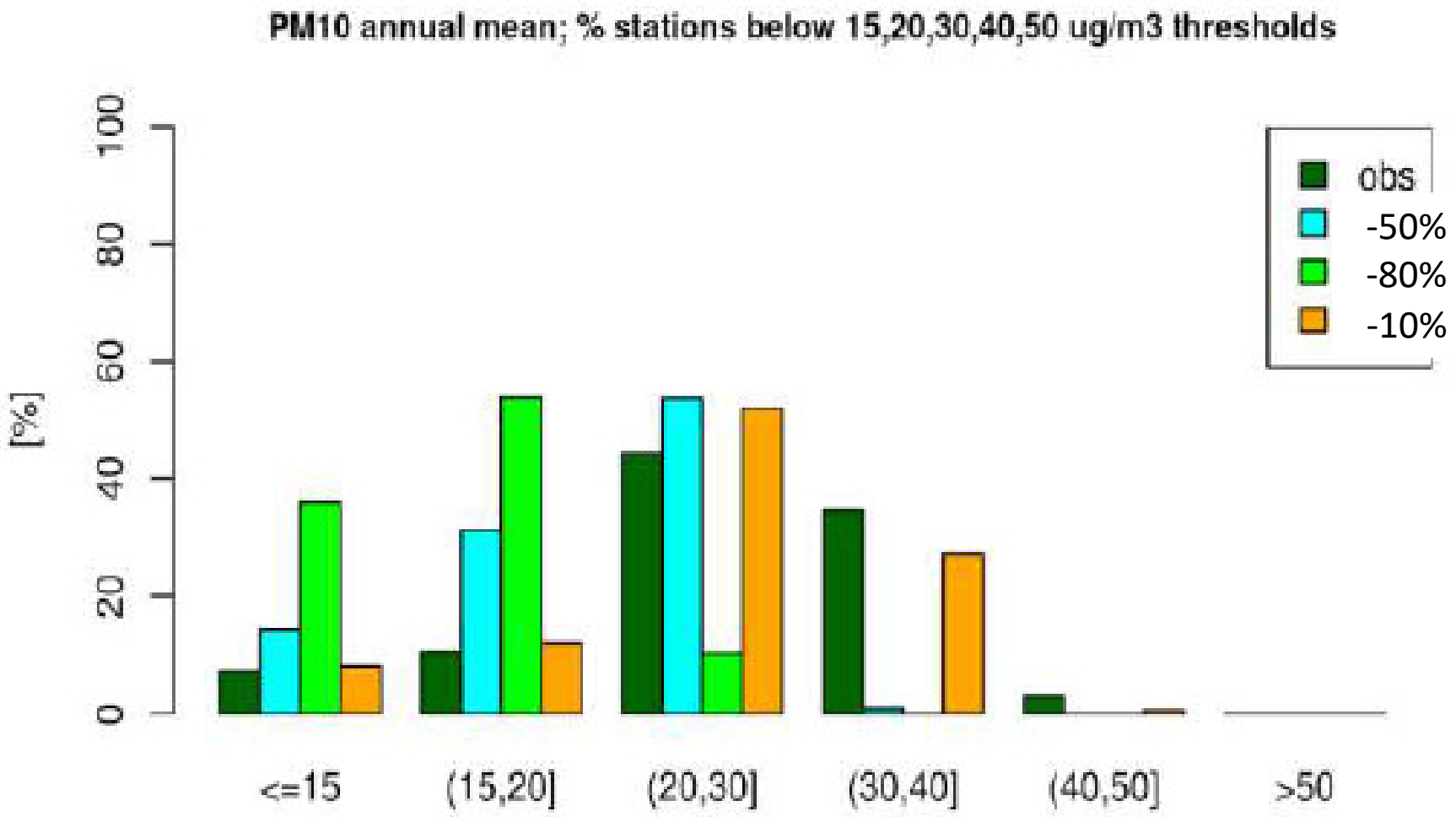
Evaluation of emission reduction scenarios on air quality in Po Valley
PM2.5 spatial distribution -80% scenario



Evaluation of emission reduction scenarios on air quality in Po Valley – PM10 annual mean

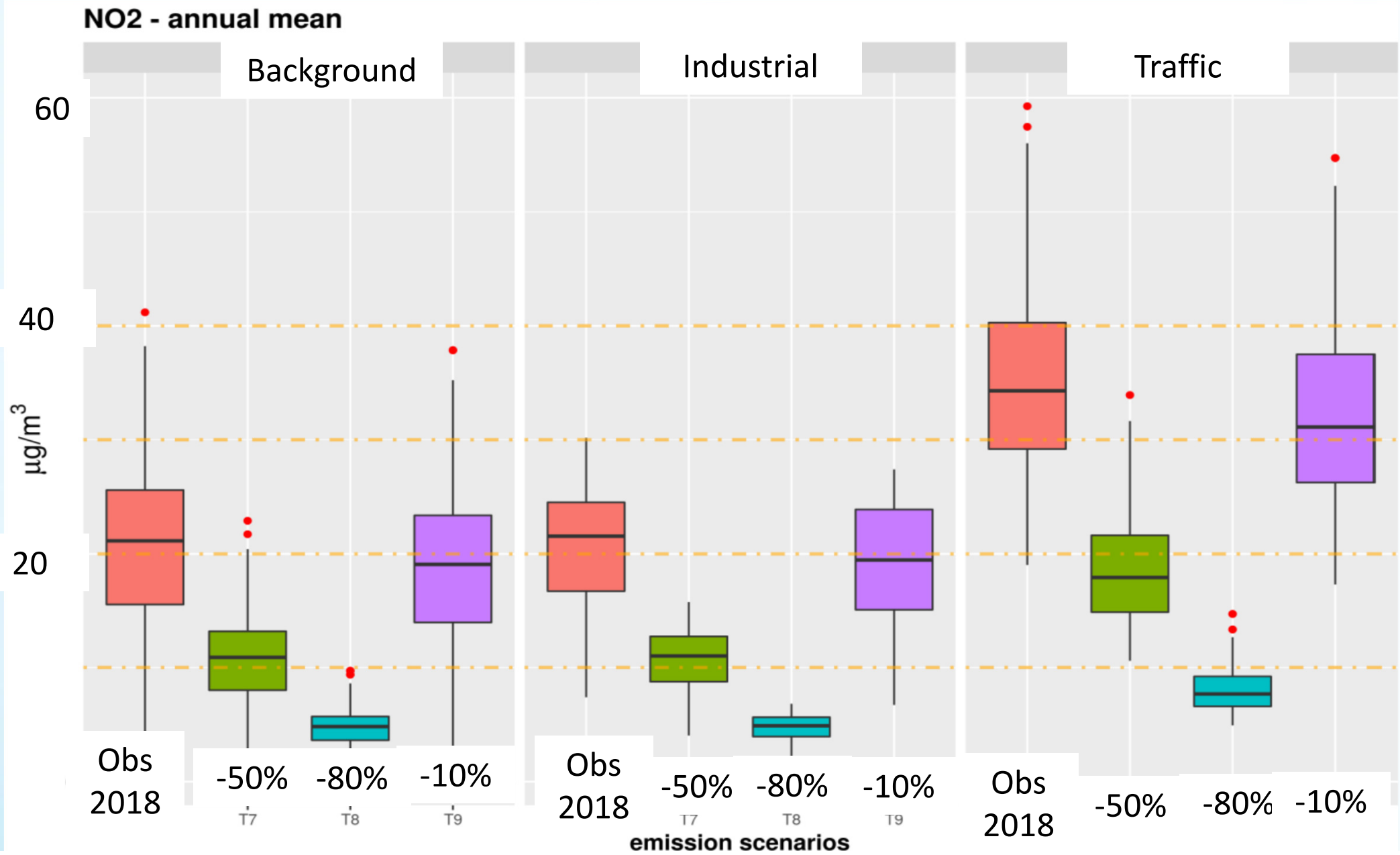


Evaluation of emission reduction scenarios on air quality in Po Valley – PM10 annual mean



WHO guideline
15 µg/m³

Evaluation of emission reduction scenarios on air quality in Po Valley – NO2 annual mean



Report Life Prepair: Evaluation of emission reduction scenarios in Po Valley

Evaluation of emissions reduction scenarios on air quality in Po Valley – summary

Pollutant	Interim target 1		Interim target 2		Interim target 3		Interim target 4		AQG (air quality guidelines)	
PM2.5 µg/m3	35	T7	25	T7	15	T7	10	T7	5	T7
		T8		T8		T8		T8		T8
PM10 µg/m3	70	T7	50	T7	30	T7	20	T7	15	T7
		T8		T8		T8		T8		T8
NO2 µg/m3	40	T7	30	T7	20	T7	-		10	T7
		T8		T8		T8				T8

T7 -50% emissions reduction

T8 -80% emissions reduction

What does it mean -50% and -80%

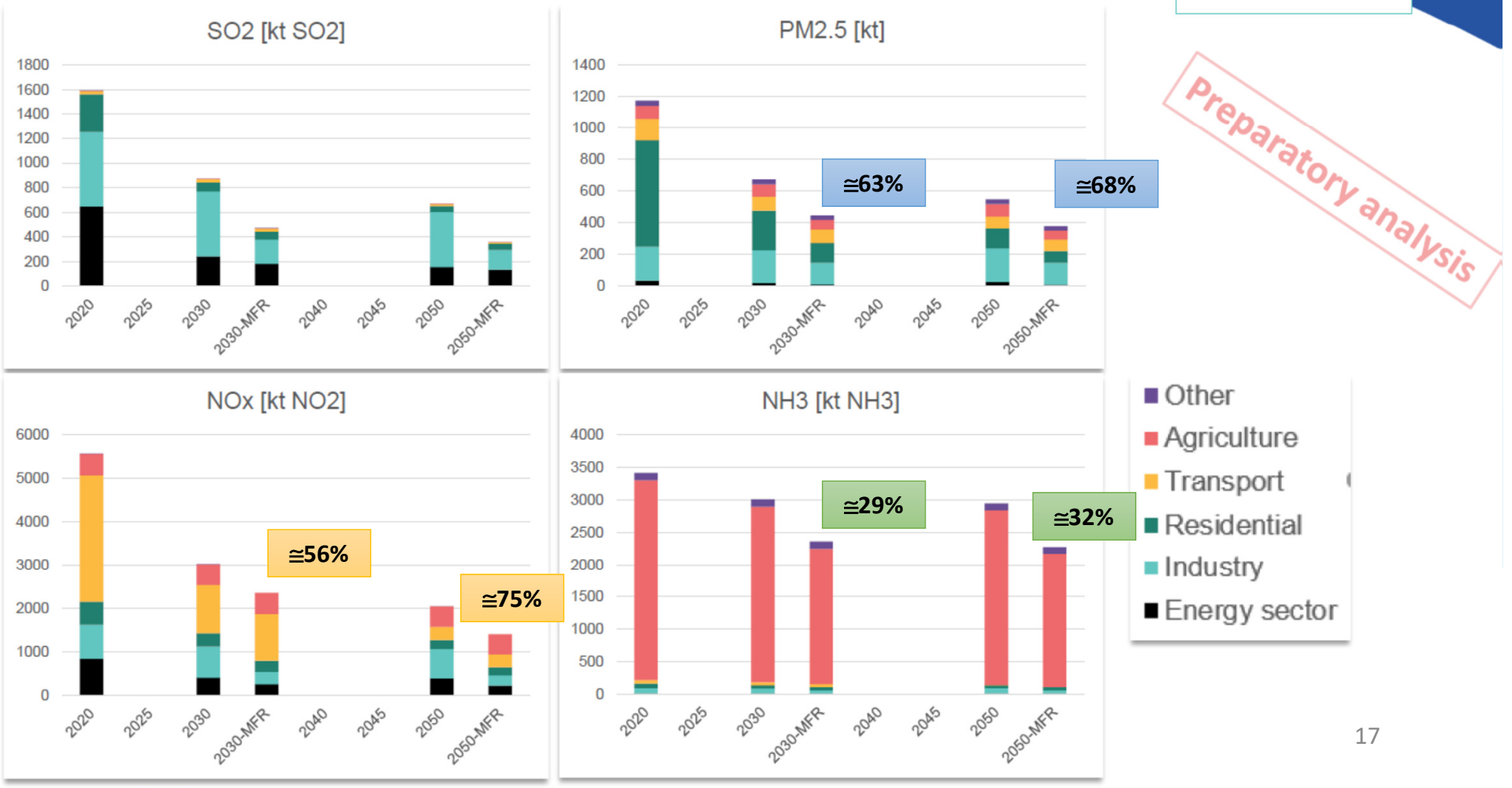
Emissions reductions of pollutants at 2030 and 2050 with Maximum Feasible Reduction

Emission trends in the EU-27

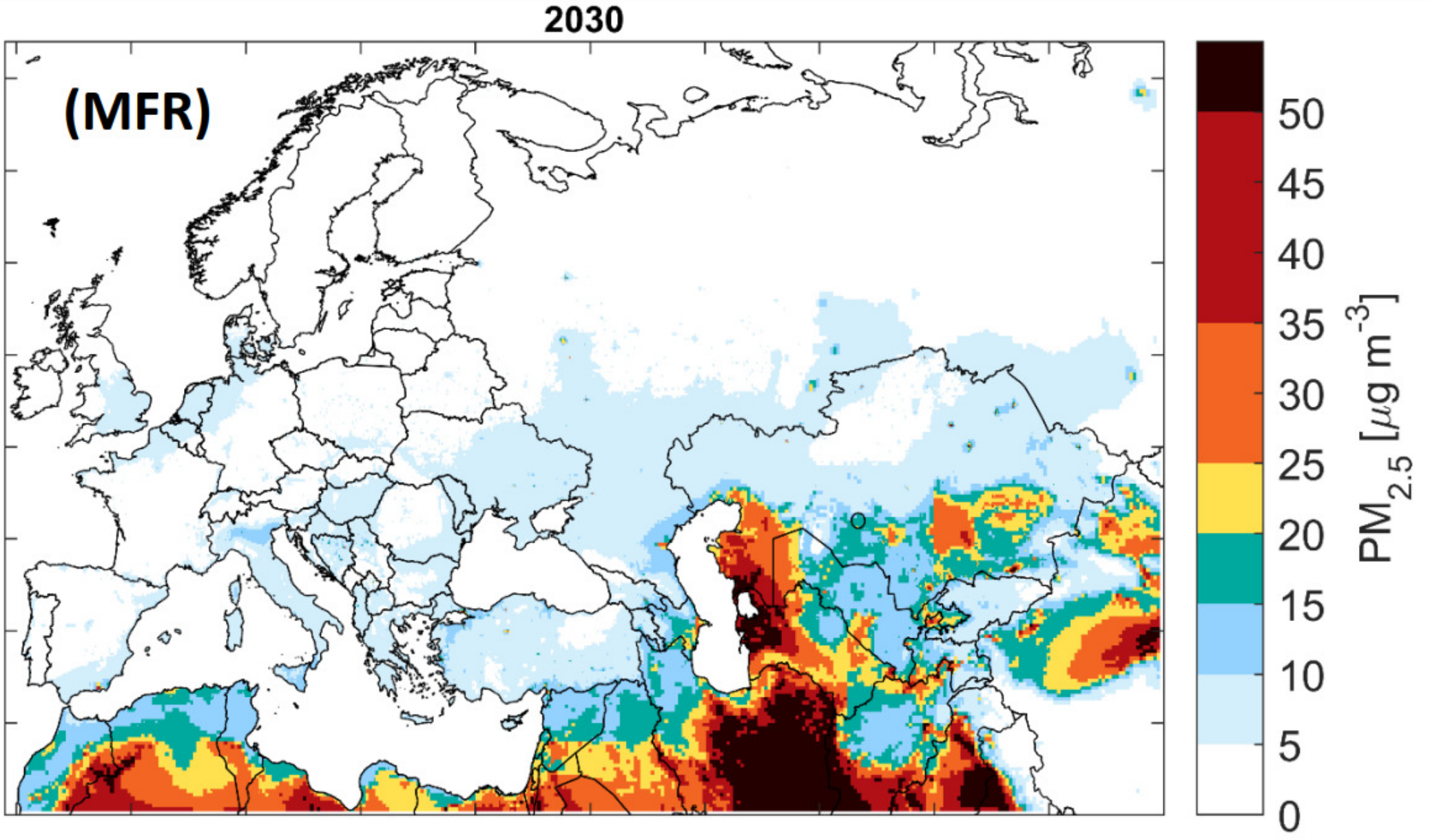
Norwegian Meteorological Institute

IIASA

Preparatory analysis



IIASA scenarios



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Thanks for your attention

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