



ALPENKONVENTION
CONVENTION ALPINE
ALPSKA KONVENCIJA
CONVENZIONE DELLE ALPI

EU GREEN WEEK 2021 - PARTNER EVENT: An Alpine approach to improving air quality

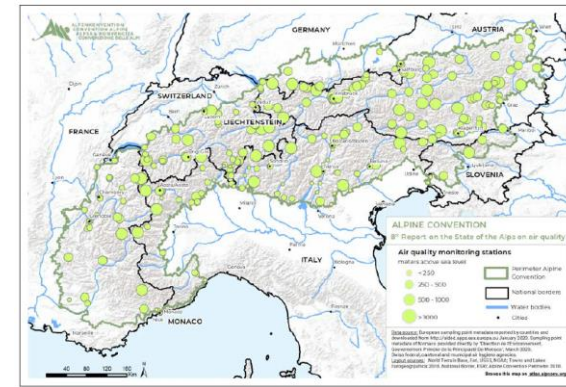
4 June 2021

Status and trends of Alpine Air Quality – Laure Malherbe, Ineris



Status and trends of Alpine Air Quality

- Monitoring of air quality in the Alpine region is ensured by a geographically well-distributed network of monitoring stations.
- Available measurement data were used to assess pollutant concentrations over the recent years in relation to EU thresholds and WHO guidelines and analyse long-term trends.



Focus on regulated air quality pollutants:

Particulate matter: PM_{10} & $PM_{2.5}$, NO_2 , O_3 , SO_2 , C_6H_6 , CO , BaP, heavy metals



Outline

- ❑ Presentation of the monitoring network
- ❑ Status of concentrations
- ❑ Air quality trends

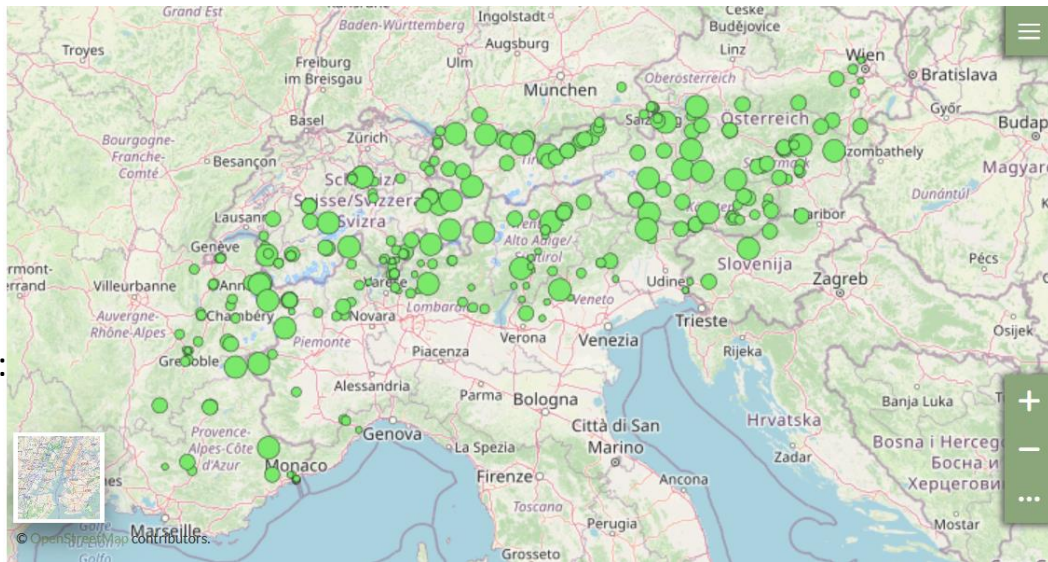
Sources of air quality data and related metadata

- European Air Quality Portal – EEA (data officially reported by countries and transmitted to the European Environment Agency)
- Office for the Environment of the Principality of Liechtenstein and www.ostluft.ch
- Government of the Principality of Monaco
- Swiss Federal Office for the Environment (BAFU)



Air quality monitoring in the Alpine region

Between 2016 and 2018:



Operational air quality monitoring stations in the 2016-2018 period (all pollutants together)

- **234** air quality monitoring stations operated at the national and regional scales:
 - 33% in rural areas
 - 31% in suburban areas
 - 36 % in urban areas
- **39** additional monitoring stations belonging to cantonal and municipal Swiss networks

About 86 % of all these stations are located in valleys.



Air quality monitoring in the Alpine region

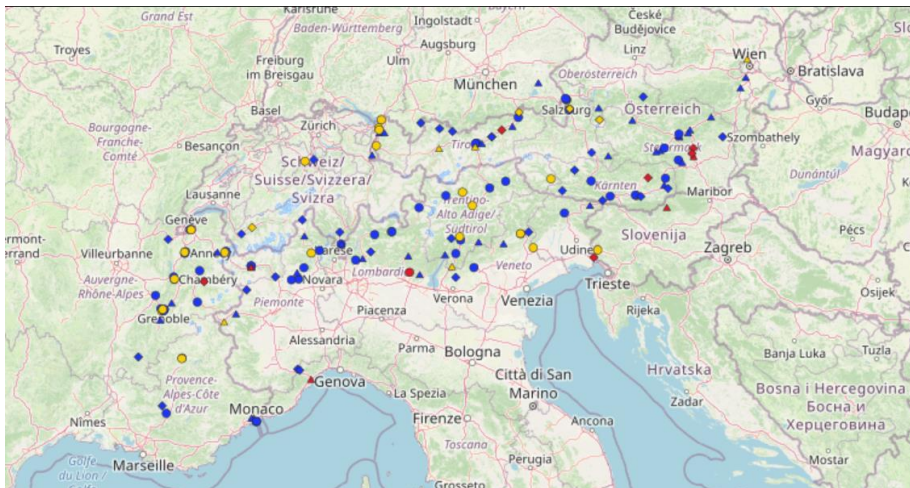
- Most extensive for pollutants which have been regulated for longest time and still present exceedances of EU thresholds in the Alps: NO_2 , O_3 , PM_{10}
- Less extensive but well developed for $\text{PM}_{2.5}$ and benzo(a)pyrene
- Sparser and more irregularly distributed for pollutants with no identified issue in the region (SO_2 , CO, benzene, heavy metals). For those pollutants less stringent types of assessment methods can also be used (like indicative measurements or objective estimation).
- Complementary monitoring campaigns (e.g. NO_2 , BTEX, NH_3)
- High altitude measurement stations as part of research-oriented programmes



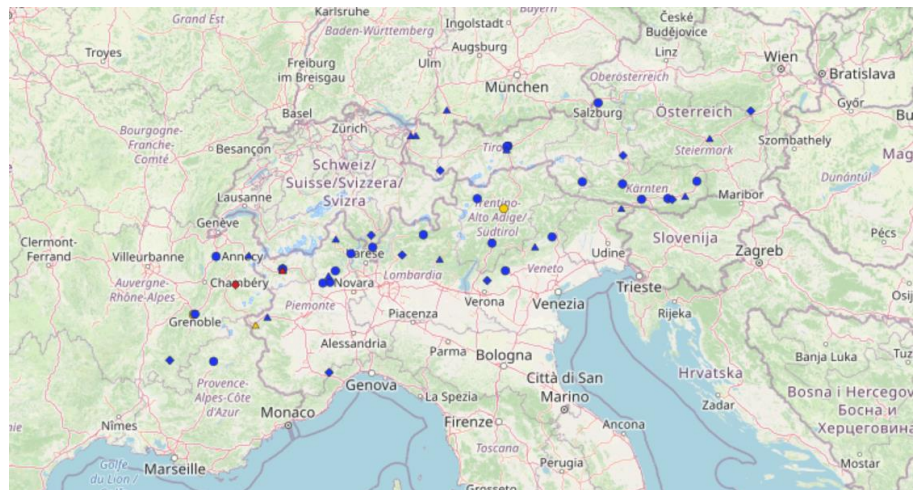
Air quality monitoring in the Alpine region

Type of area Influence

- ▲ Suburban - Background
- ▲ Suburban - Industrial
- ▲ Suburban - Traffic
- Urban - Background
- Urban - Industrial
- Urban - Traffic
- ◆ Rural - Background
- ◆ Rural - Industrial
- ◆ Rural - Traffic



PM₁₀ air quality monitoring stations in the Alpine region in 2018



B(a)P air quality monitoring stations in the Alpine region in 2018



State of air quality in the Alpine region

Comparison of concentrations with EU thresholds and WHO guidelines

- Study period: 2016-2018
- Pollutants concerned by exceedances :
 - NO_2 , O_3 , PM_{10} , $\text{PM}_{2.5}$, B(a)P
- Except for O_3 , the number of stations concerned by exceedances of EU thresholds is limited and lower in 2018 compared to previous years. PM_{10} and $\text{PM}_{2.5}$ more stringent WHO guidelines are still widely exceeded.



State of air quality in the Alpine region

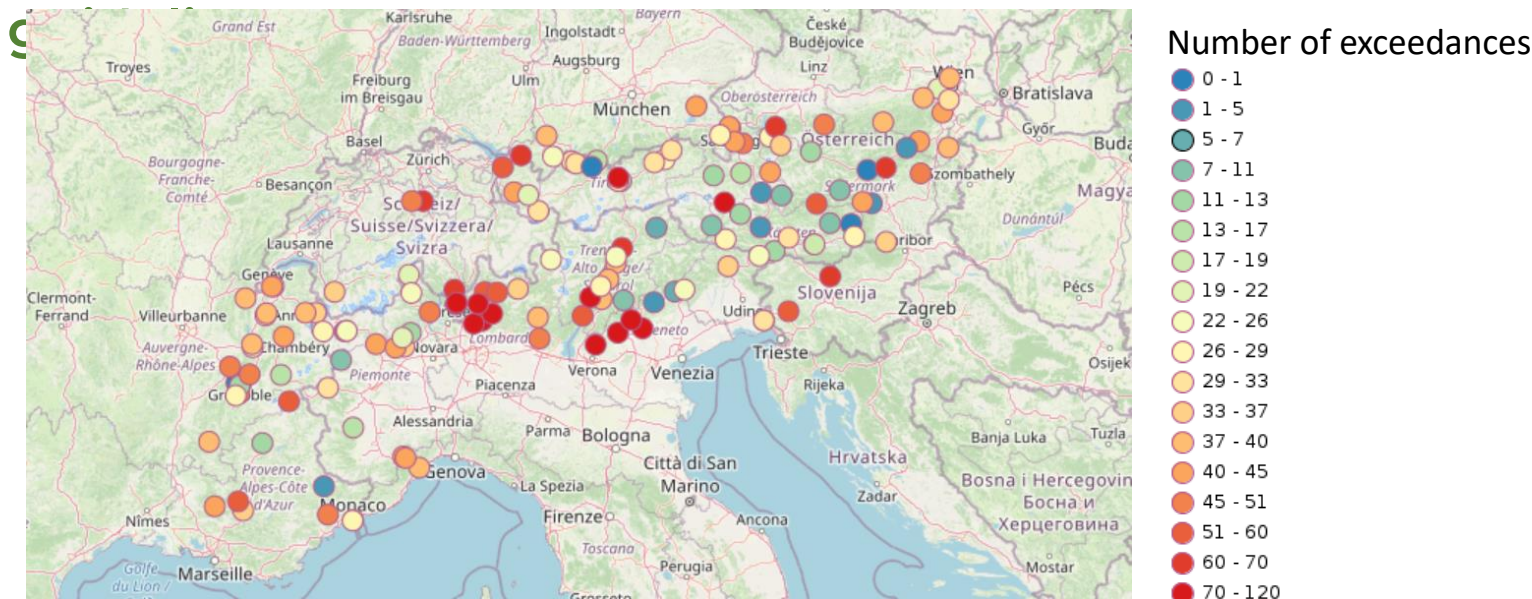
Comparison of concentrations with EU thresholds and WHO guidelines

Pollutant	Exceeded threshold	Protection target	Where ?
NO ₂	Annual limit value and WHO guideline (40 µg/m ³)	Human health	Some traffic-oriented stations located in valleys
NO ₂	Hourly WHO guideline (200 µg/m ³)	Human health	
O ₃	Long-term objective (daily max 8-hour 120 µg/m ³) Target value (120 µg/m ³ , not to be exceeded more than 25 times on average over 3 years)	Human health	Background sites across the Alpine region
O ₃	WHO guideline (daily max 8-hour 100 µg/m ³)	Human health	
O ₃	AOT40 long-term objective and target value	Vegetation	



State of air quality in the Alpine region

Comparison of concentrations with EU thresholds and WHO



Yearly number of exceedances of O₃ long-term objective (120 µg/m³) in the Alpine region in 2018



State of air quality in the Alpine region

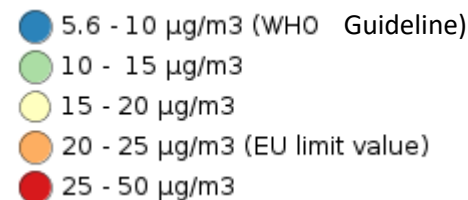
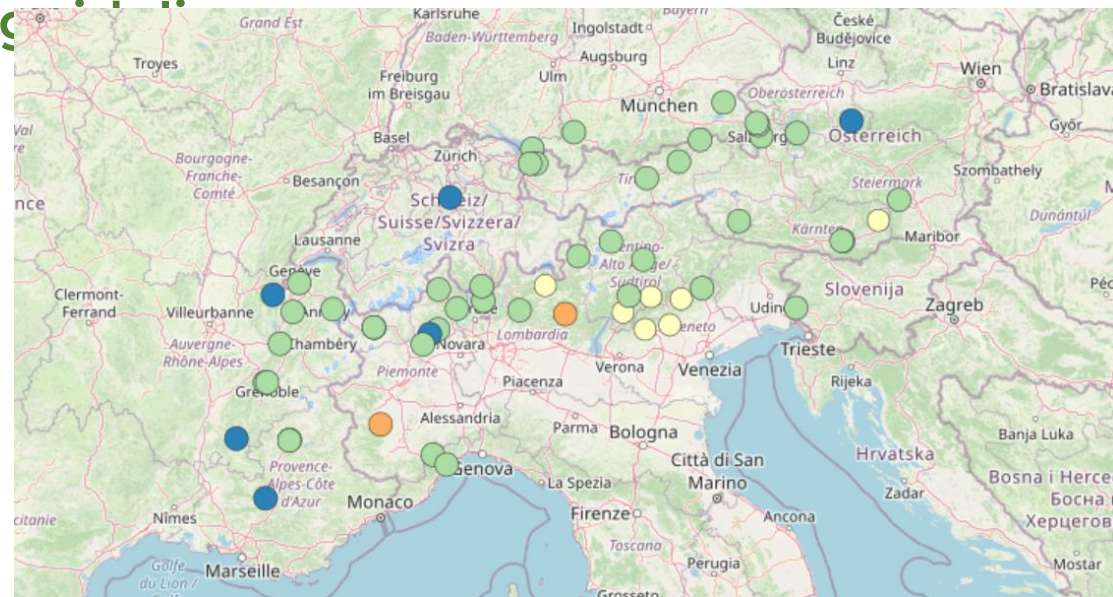
Comparison of concentrations with EU thresholds and WHO guidelines

Pollutant	Exceeded threshold	Protection target	Where ?	
PM ₁₀	Daily limit value (50 µg/m ³ not to be exceeded more than 35 times)	Human health	Very few (sub)urban background stations or industry-oriented sites	
PM ₁₀	Daily WHO guideline (50 µg/m ³ not to be exceeded more than 3 times)	Human health	Nearly half of the stations measuring PM ₁₀	
PM ₁₀	Annual WHO guideline (20 µg/m ³)	Human health	A quarter of the stations measuring PM ₁₀ , mostly in the southern half of the Alpine region	(No exceedance of the annual limit value)
PM _{2.5}	Annual WHO guideline (10 µg/m ³)	Human health	Most stations measuring PM _{2.5}	(No exceedance of the annual limit value)



State of air quality in the Alpine region

Comparison of concentrations with EU thresholds and WHO

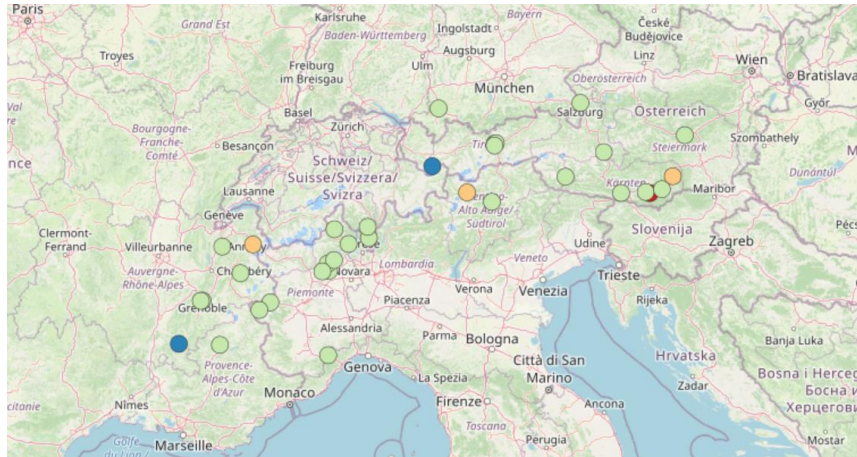


PM_{2.5} annual mean ($\mu\text{g}/\text{m}^3$) in the Alpine region in 2018

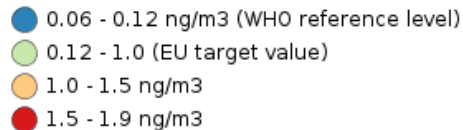


State of air quality in the Alpine region

Comparison of concentrations with EU thresholds and WHO guidelines



Locally higher levels of B(a)P at urban or suburban background stations



B(a)P annual mean (ng/m³) in the Alpine region in 2018



State of air quality in the Alpine region

Air quality trends

- Analysis focused on NO_2 , O_3 , PM_{10} , $\text{PM}_{2.5}$, B(a)P
 - Period considered: 2009-2018
- Results are consistent with trends observed at the EU-level (EEA, Air quality in Europe-2020 report)

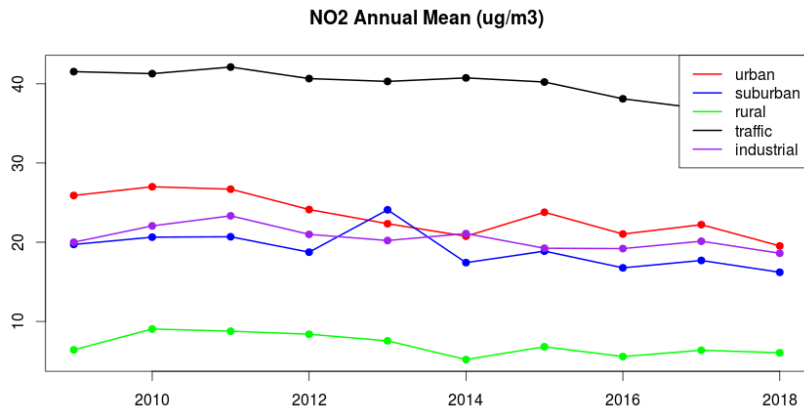


State of air quality in the Alpine region

Air quality trends

- Overall reduction in NO_2 , PM_{10} and $\text{PM}_{2.5}$ concentrations

With a more or less pronounced trend depending on the pollutant and the station

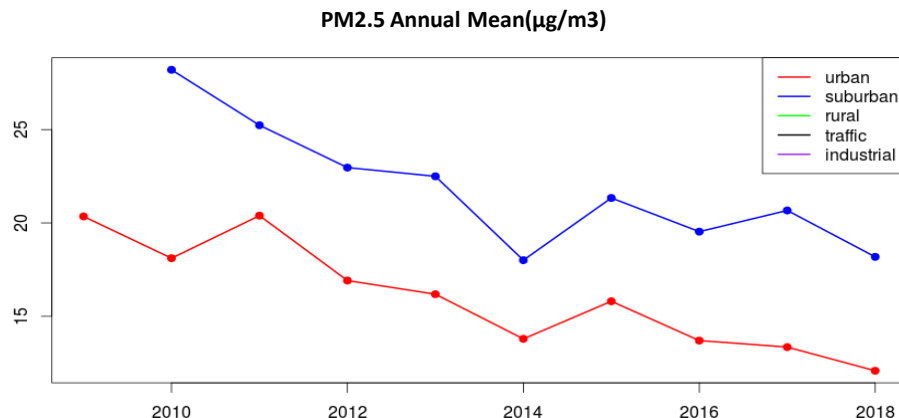
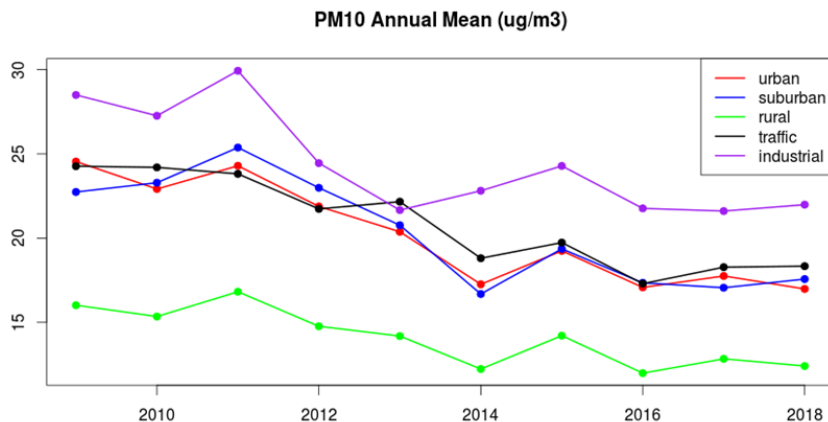




State of air quality in the Alpine region

Air quality trends

- Overall reduction in NO_2 , PM_{10} and $\text{PM}_{2.5}$ concentrations



B(a)P: rather downward evolution but need for more data to confirm



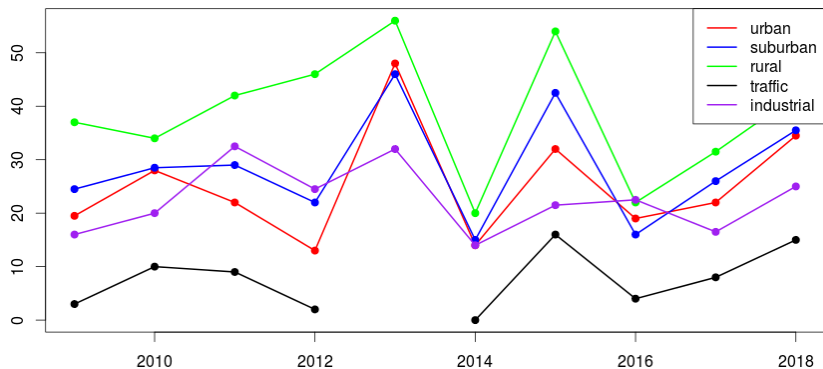
State of air quality in the Alpine region

Air quality trends

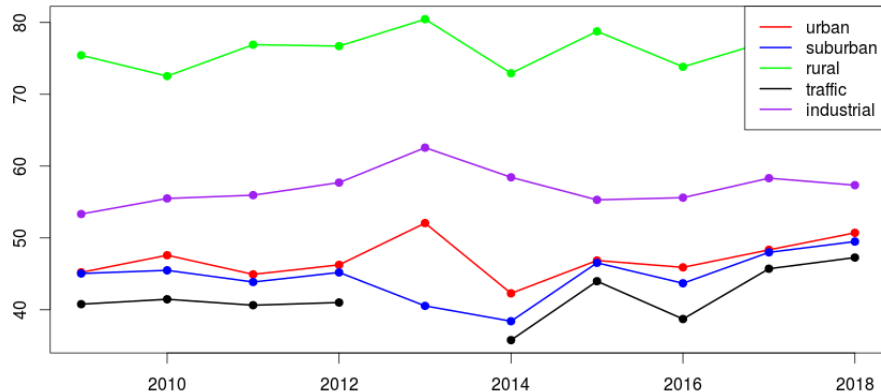
➤ No clear trend for ozone

With strong interannual variations for indicators related to short-term values

Annual number of exceedances of the long term objective (120 µg/m³)



O₃ Annual Mean (ug/m³)





Maps available at:

<https://www.atlas.alpconv.org/layers/>

(category Air quality)



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