

How RI-URBANS results may be used by AQMNs

Guido Lanzani, Cristina Colombi

Air and Support to Political Decision Maker Unit

Arpa Lombardia

g.lanzani@arpalombardia.it

c.colombi@arpalombardia.it

ARPA Lombardia



ARPA Lombardia is the Environmental Protection Agency of Lombardia Region

- Ionizing radiation and nonionizing
- Noise pollution
- Electromagnetic pollution
- Air quality
- Surface water (river and lake)
- Groundwater

Environmental Monitoring



- RIR Enterprises
- Industrial and zootechnical IPPC
- Air emissions
- Dumping
- Wastes
- Reclamations
- EMAS

Production activities Controls



- Weather climatology
- Hydrographic service
- Avalanches center
- Geologic monitoring center

Natural risks protection



- Radon measures
- Radioactivity measures
- Network of radioactivity monitoring

Radioprotection Regional center



- Environmental impact assessments
- Strategic environmental assessments
- Grandi Opere Monitoring

Environmental assessments



- ARPA, according to EU Directives, **assesses air quality** by air quality monitoring network, modelling and emission inventory
- ARPA **performs scenario studies**
- ARPA **supports** Regione Lombardia authority **in developing air quality plans**

Note: for Italian legislation, Regions are responsible for air quality plans, while Municipalities are the health authorities

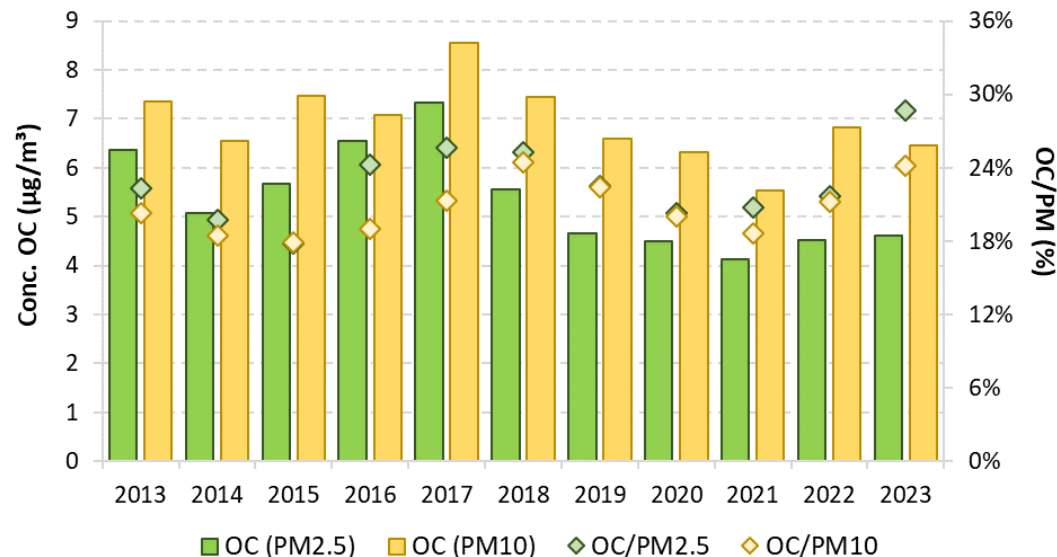
Air quality management and local authorities: current challenges

- **To update the air quality plans** to comply with the limits of conventional pollutants according to the provisions of the 2004/2881/UE directive
- **Not conventional pollutants:** according to the provisions of the new directive to be measured in supersites and in hotspots, improving the knowledge of their levels, of their sources (also in relation to emission inventories), of their health effects (and of atmospheric processes). How to measure? Where to measure?
- **Towards the microscale:** using models and “smart” sensors, to study the spatial distribution of pollutants, to guarantee a good air quality everywhere
- **Communication:** to guarantee public awareness (also to support the adoption of not popular measures)

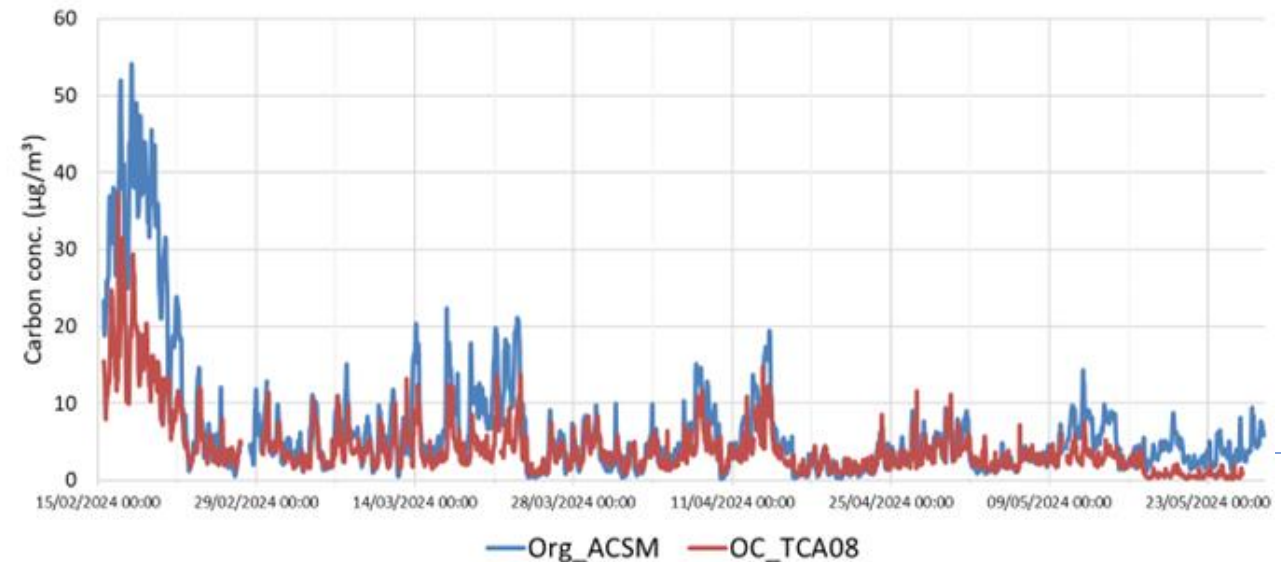
Updating air quality plans: open issues & Ri-Urbans results

- **PM speciation and source apportionment studies can help in addressing AQP measures and in communication**
 - Ri-Urbans analysis offer a framework to contextualize the measures carried out in Lombardy (ST10)
 - Ri-urbans can be a reference in the use and interpretation of the data produced by advanced instruments (ACSM, XACT,..) (and in the choice of new ones!)
 - **OA Ri-Urbans results confirm the need to work on this component (SOA, BBOA..)**

MI-Pascal OC 2013-2023



Hourly OM-OC in Milan

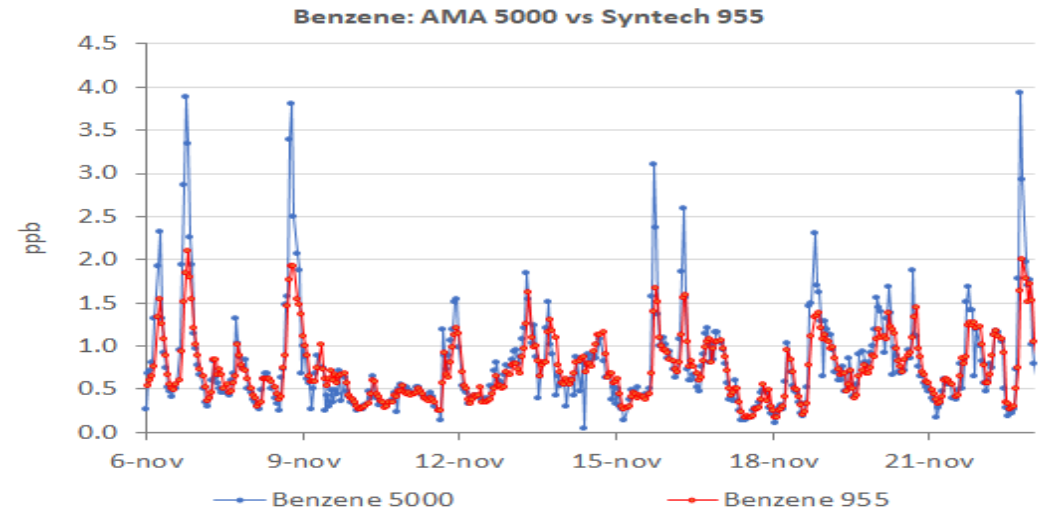
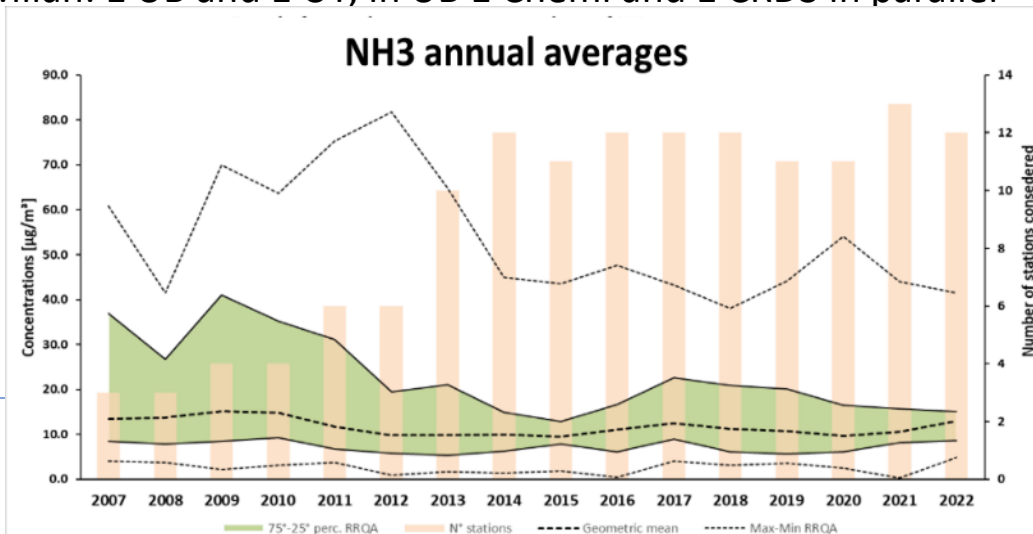


Updating air quality plans: open issues & Ri-Urbans results

- Sustainability of the new objectives/limits, with particular reference to secondary formation of pollutants (ozone, PM_{2.5}):
 - Ri-Urbans Guidelines for VOC and NH₃ measurements improve the monitoring (ST5, ST6)
 - Ri-Urbans Spatial and temporal analysis of NH₃ measurements in Europe contextualize the measures carried out in Lombardy (ST5, ST6): **NH₃ values in Po Valley are among the highest in Europe; ammonium nitrate is one of the main components in winter PM!!**

In ARPA Lombardia AQN, 15 ammonia monitors and 25 VOC analysers are active :

- 13 chemiluminescence (from 2007)
- 2 CRDS (1 Picarro-2509 and 1 Ap2E)
- 2 sites in Milan: 1 UB and 1 UT; in UB 1 Chemi and 1 CRDS in parallel
- 23 BTX analysers
- 2 AMA GC 5000 BTX +GC 5000 VOC



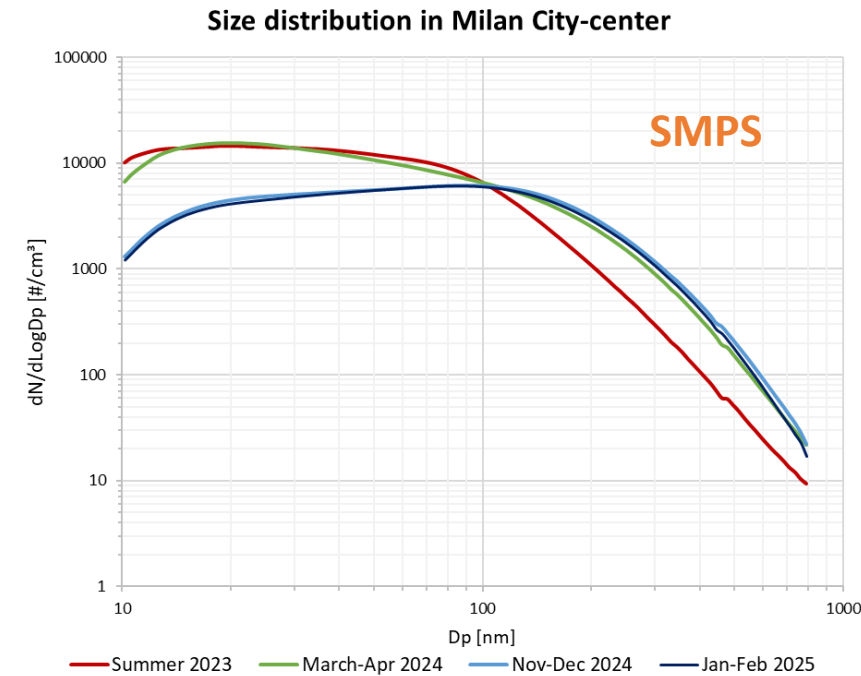
Not conventional pollutants, UFP-PNSD

open issues & Ri-Urbans results

- **How to measure UFP and PNSD in harmonized way?**
 - Methods, quality control, data management, technical problems (presence of Butanol, presence of Krypton-85..). ST1 guidance document for measurement, webinars and the discussion with the project can be valid helps

In ARPA Lombardia AQN:

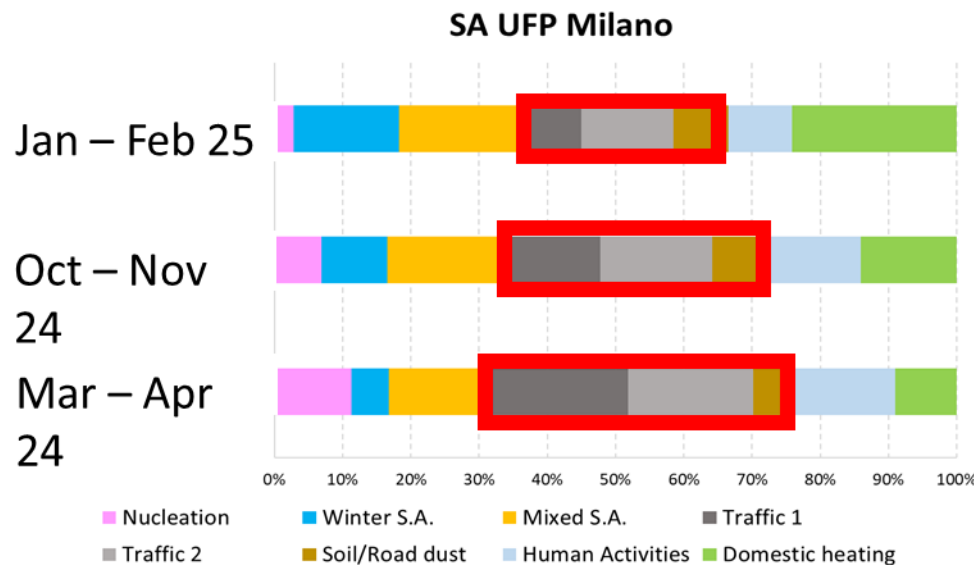
- 1 Aerodynamic Particle Sizer Spectrometer
- 1 Elpi+ (Dekati)
- 1 Scanning Mobility Particle Spectrometer (SMPS 3938W50-CEN10)
- 7 OPC (Grimm Environcheck 107, Grimm EDM 180, Con.Tec. DustMonit, FAI Multichannel Monitor)



Not conventional pollutants, UFP-PNSD

open issues & Ri-Urbans results

- **Where to measure? How to choose hot spots?**
 - Roads, ports, airports, industries and domestic heating: who has the priority?
 - For supersites, often the sites are already defined, but how can the surrounding influence UFP measurements? (Milano Pascal for example is not far from an university area (Milano Politecnico) where many street foods are sometime active..). Ri-Urbans results about distribution and source apportionment of UFP and PNSD help in contextualizing the situations and in analyzing the results
- **Health effects?**



- Traffic remain the first source (impact of new internal combustion engines? not exhaust)
- During winter also domestic heating (biomass) gives a non negligible contribution
- (Secondary) “winter regional”
- During warm seasons nucleation is more evident

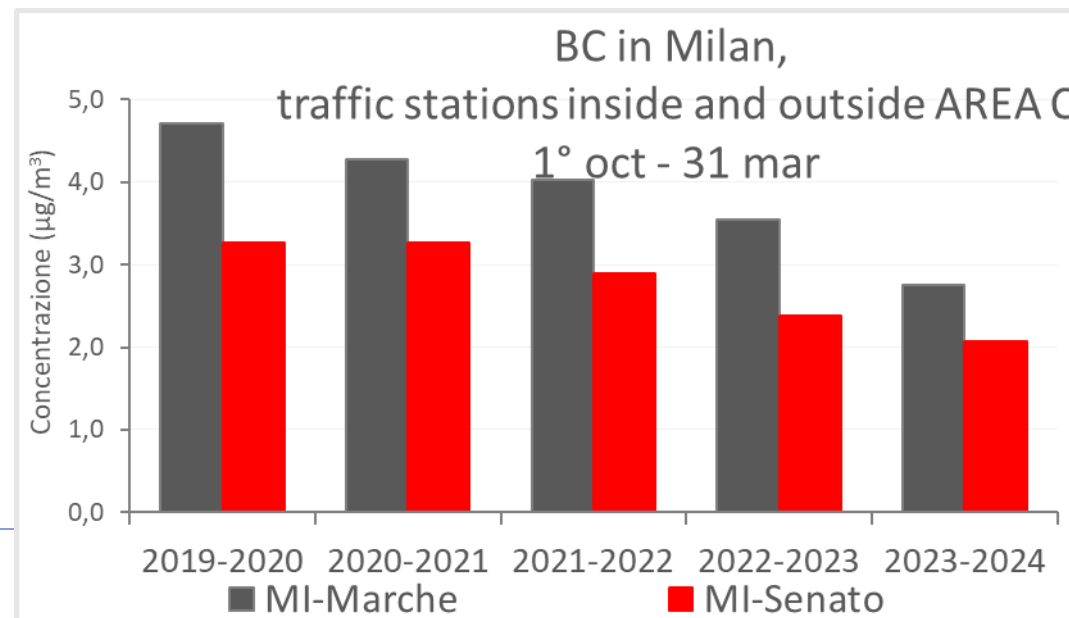
Not conventional pollutants, eBC, open issues & Ri-Urbans results

- **How to measure eBC?**
 - ST2 guidance document for measurement, webinars and the discussion with the project can be valid helps
- **What do eBC measures tell us?**
 - Ri-URBANS evaluations about eBC distribution, trends in Europe and source apportionment can be a valid reference to analyse results obtained by AQMNs

In ARPA Lombardia AQN:

In ARPA Lombardia AQN, BC measurements are active since 2013 :

- 3 sites in Milan (in UB both 1 MAAP and 1 AE33)
- 1AE 33 is paired with TCA08=> hourly TC, EC and OC
- 3 sites in other cities (Lecco, Brescia and Cremona) with AE33
- + 5 cities with AE33 during 2025



- In Milan BC is decreasing during years (in relation to the decrease of traffic component)
- Differently from PM10, BC in traffic station inside AREA C is significantly lower than in traffic station outside AREA C

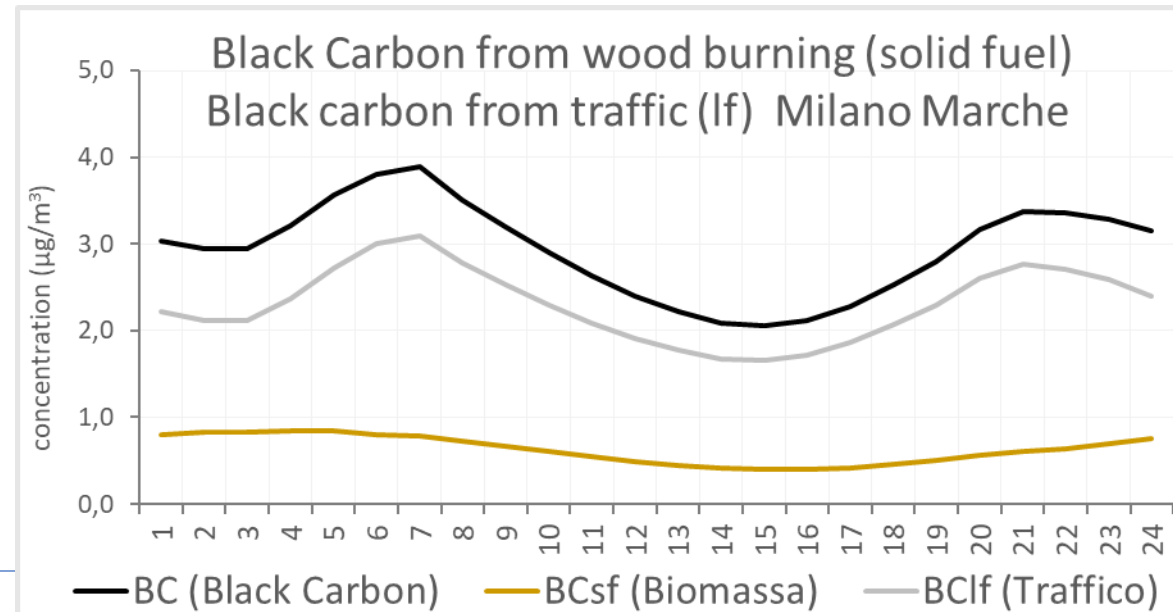
Not conventional pollutants, eBC, open issues & Ri-Urbans results

- **How to measure eBC?**
 - ST2 guidance document for measurement, webinars and the discussion with the project can be valid helps
- **What do eBC measures tell us?**
 - Ri-URBANS evaluations about eBC distribution, trends in Europe and source apportionment can be a valid reference to analyse results obtained by AQMNs

In ARPA Lombardia AQN:

In ARPA Lombardia AQN, BC measurements are active since 2013 :

- 3 sites in Milan (in UB both 1 MAAP and 1 AE33)
- 1AE 33 is paired with TCA08=> hourly TC, EC and OC
- 3 sites in other cities (Lecco, Brescia and Cremona) with AE33
- + 5 cities with AE33 during 2025

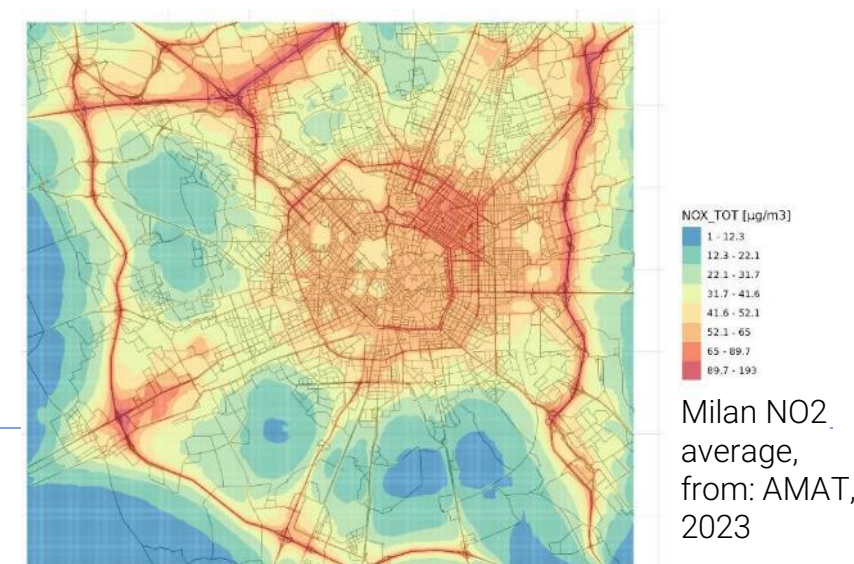
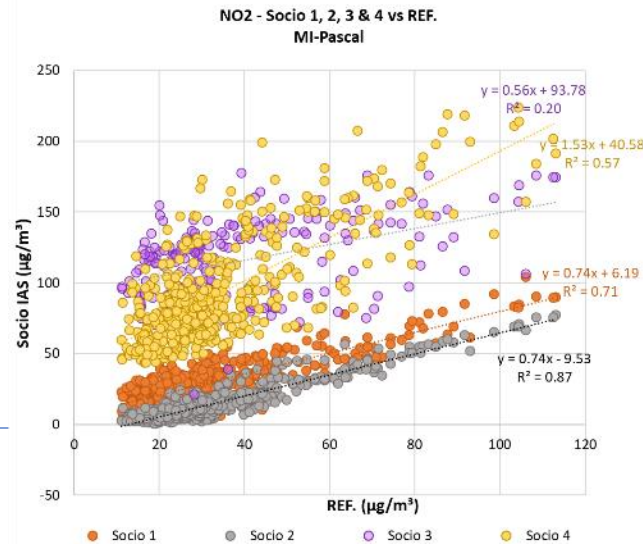


- In Milan traffic station (outside AREA C), traffic is still the main source of BC

Towards the microscale open issues & Ri-Urbans results

- Air quality directive requires to demonstrate the representativeness of AQN and to ensure an adequate spatial evaluation of pollutants
- The use of smart//low cost sensors is step by step more widespread
 - Which are models fit for purpose? Have emission inventories enough spatial and temporal resolution?
 - How to manage the uncertainty of smart sensors? How to involve citizens?
 - Ri-Urbans experiences and evaluations of urban mapping and citizen and science can be an example of useful experiences at this regard (ST12, ST13), with an analysis of strengths and weakness.

Intercomparison
of Smart Sensor
(ARPA _ IAS
collaboration)

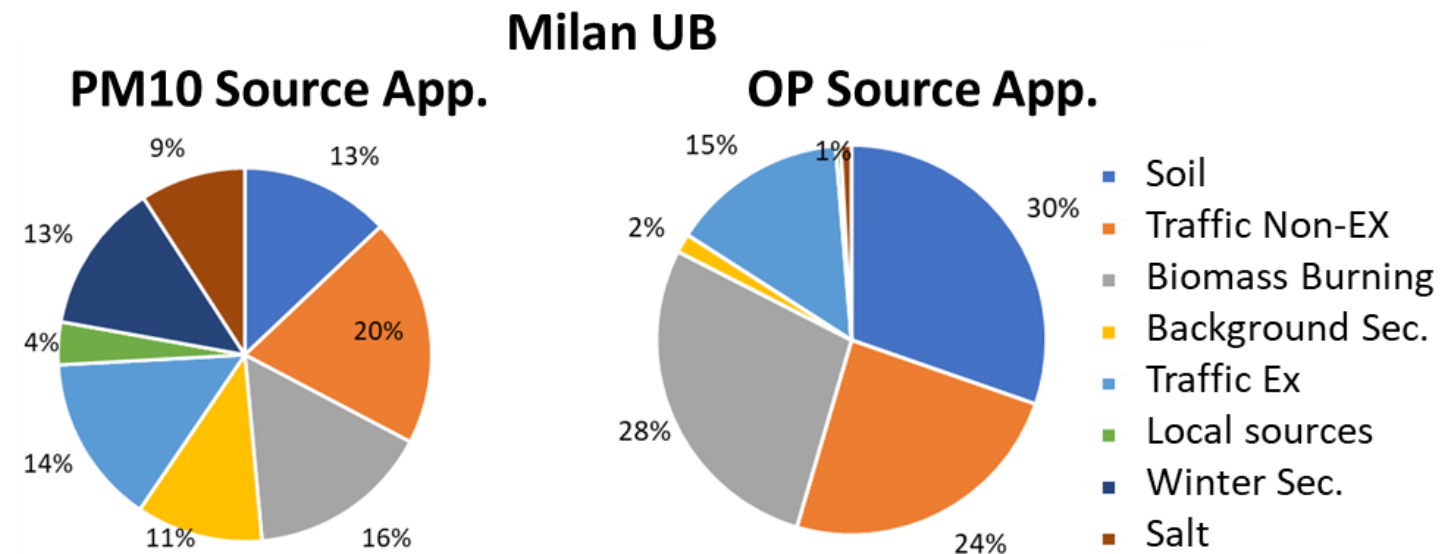


Oxidative Potential, Health effects & Communication

open issues & Ri-Urbans results

- **Also for OP** of PM the recommendations for measurements are a valid summary for AQMNs
- **Communication is a key factor in AQ plans, and health effects are a key factor both for choices and for the effectiveness of communication**
- The evaluation of OP, of its sources and, in general, the study of health effects of novel pollutants are an important part of the process, even if important questions are still open

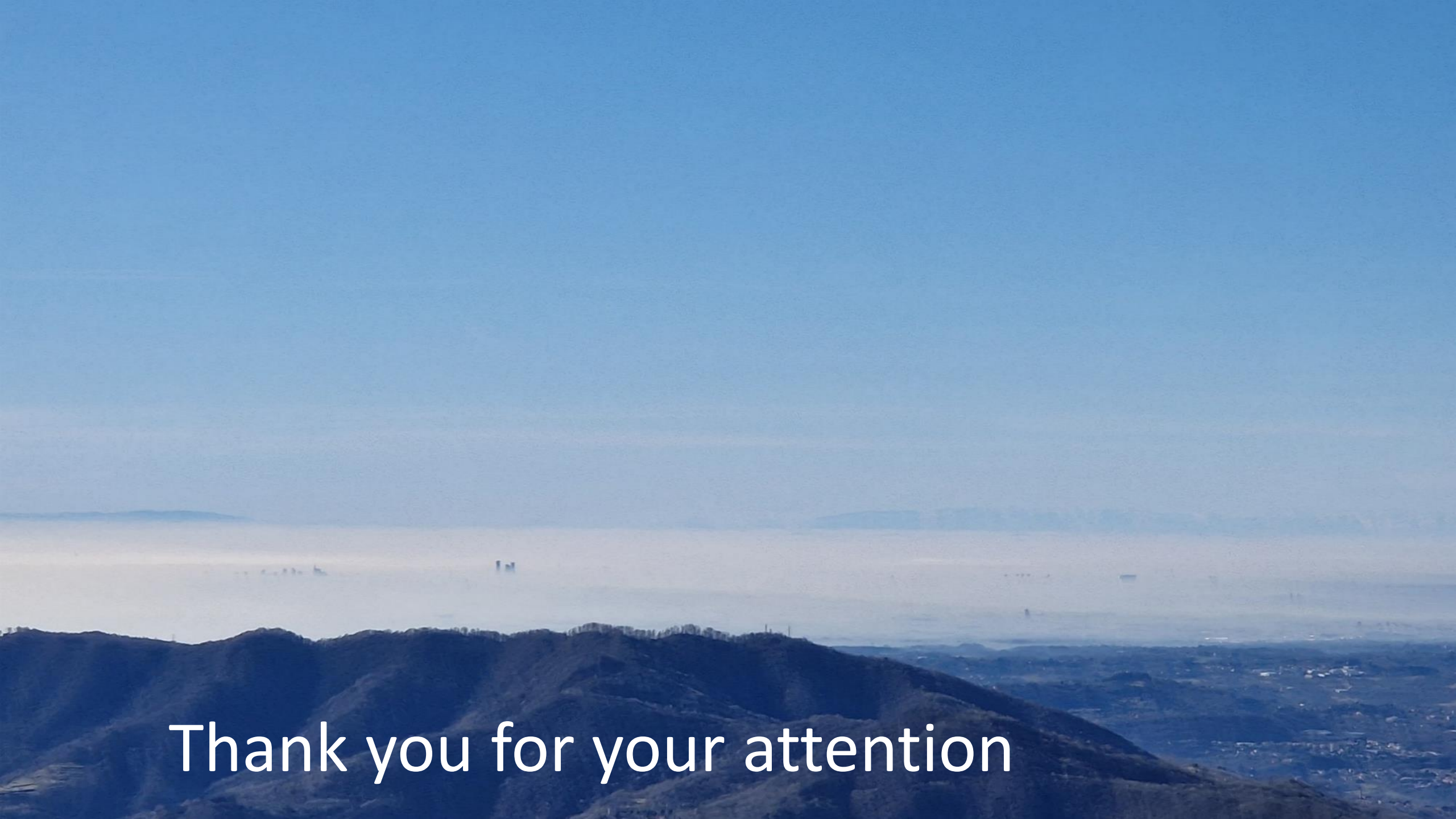
Must specific aspects be considered for traffic? For example, not exhaust contribution of traffic has been found higher for OP than for PM10!



Pietrogrande et al., different manuscripts such as
'Seasonal and spatial variations of PM10 and PM2,5 Oxidative Potential in five Urban and Rural Sites across Lombardia Region, Italy'

Conclusions

- Ri-URBANS project has dealt with many of the most actual aspects for the air quality management
- The project has produced easy-to-find recommendations to measure and analyze the results, and assessments of the European situation for the new pollutants, useful as reference for the AQMNs
- The webinars and the different collaborations with the stakeholders has been a stimulus for the AQMNs to answer to the most current challenges in a harmonious way
- So, thanks to all the participants also for the approach that is not detached but close to the needs of the local operators!

A scenic landscape photograph showing a wide bay or coastal area. In the foreground, there are dark, rolling hills. The middle ground features a calm body of water with several small, distant structures or ships visible on the horizon. The background is a vast, clear blue sky. The overall tone is serene and expansive.

Thank you for your attention