

Towards the New European Air Quality Directive: Dialogue and Synergies Between Research Infrastructures, Local Authorities, and Environmental Agencies.

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Introduction

Air quality monitoring has been set up as a key point in the European agenda in the framework of the European Green Deal and the Sustainable Development Goals (SDGs 3, 7, 10, 11 and 13). The European Commission, through the “Zero Pollution Action Plan,” has defined the pollution-related objectives to be tackled, including a reduction of over 55% in the health impact of air pollution and a 25% decrease in ecosystems affected by pollution by 2030 (European Commission, 2021). In this context, the new Directive 2881/2024 on air quality provides guidelines for EU Member States to align with the targets set by the European Green Deal, the Zero Pollution Action Plan, and the SDGs (European Parliament & Council of the European Union, 2024). Among other priorities, the regulation emphasizes emerging pollutants, the role of supersites, and updated limit values. Achieving these objectives will require significant commitment and coordinated action, especially from countries particularly impacted by the new thresholds. Italy is particularly sensitive to the air quality regulatory framework for three main aspects. The first is the national demography since it is the third most populated country in the European Union. A second factor that emphasizes the need of actions for the air quality is the presence of the Po Valley, a well-known air quality hotspot characterized by particulate matter levels expected to remain an issue in the years to come. The third reason is linked to Italy's geographical location in the Mediterranean basin, which exposes especially the southern regions to intense desert dust intrusion events. Guidelines on how to consider and manage exceedances due to natural events in relation to the new Directive, are also expected to be released by the European Commission next year. In fact, in the framework of the Directive 2881/2024 which is expected to be effective from 2030, the need of establishing a dialogue path between the air quality Italian stakeholders that will be involved in the compliance of the new regulation, emerged.

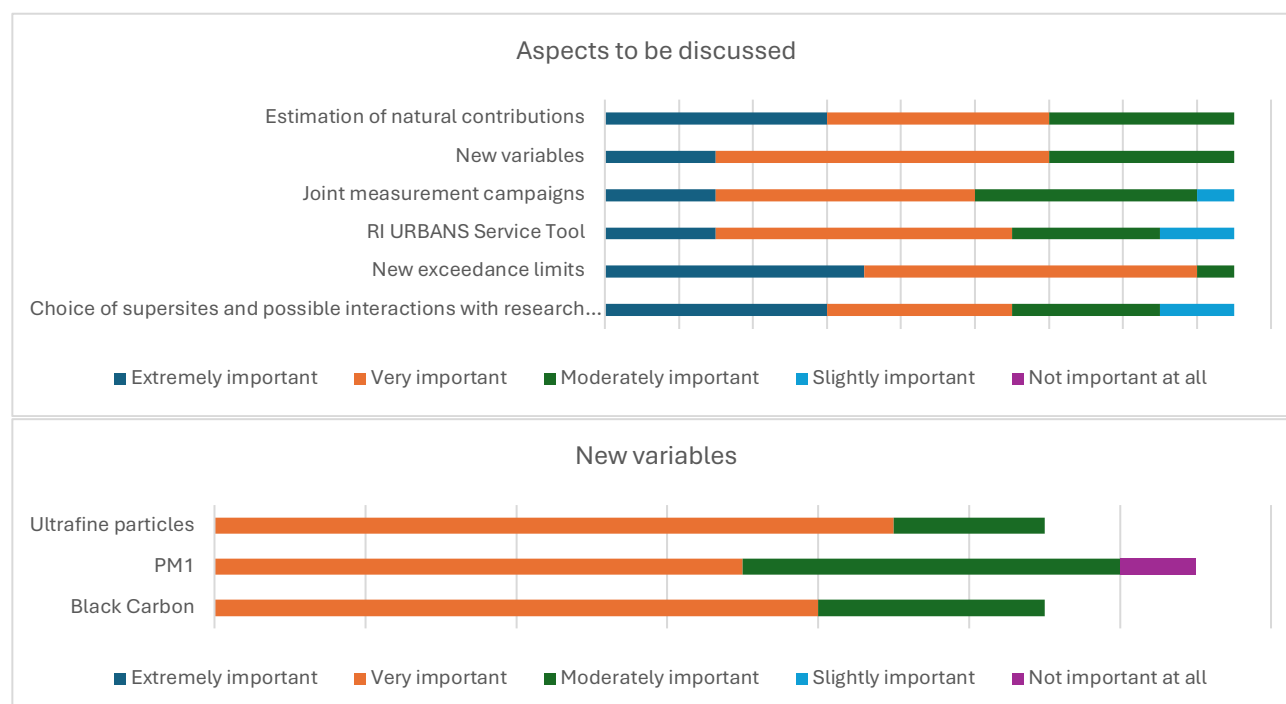
Preliminary survey

In this scenario the Italian component of ACTRIS (Aerosol, Clouds and Trace Gases Research Infrastructure), together with the project Next Generation EU ITINERIS (Italian Integrated Environmental Research Infrastructures System) and the H2020 project RI-URBANS (Research Infrastructures Services Reinforcing Air Quality Monitoring Capacities in European Urban & Industrial AreaS), planned an event on the 7-8 April 2025, to set a common ground among the air quality Italian stakeholders. The main actors that needed to be considered were the 21 Regional Environmental Protection Agencies (ARPA) and the Italian Institute for Environmental Protection and Research (ISPRA). These agencies were reached via an online survey that aimed at:

- collecting the criticalities that these stakeholders were expecting to emerge with the new regulation;
- understand in which aspects the interaction and synergies between ARPA, ISPRA and the research infrastructures could support the regulation compliance at national level;
- collecting the agencies interest in the 16 air quality management Service Tools provided within the RI URBANS project.

The results revealed strong interest on the new exceedance limits and the new variables. Regarding the new variables introduced through the new regulation, the agencies expressed interest on Black Carbon and Ultrafine Particles. Agencies also expressed a desire to collaborate on methodologies and engage with the scientific community for technical support. From the questions related to the Service Tools the respondents showed interest in the Service Tools focused on the new variables, particularly the Particulate Matter, Ultrafine Particles and Black Carbon (ST1; ST2; ST3). Other elements that respondents wanted to address from the Service Tools are those linked to aerosol vertical profiles (ST7; ST8) and the ones focused on the source apportionment (ST10; ST11). A summary of the results is showed in Figure 1.

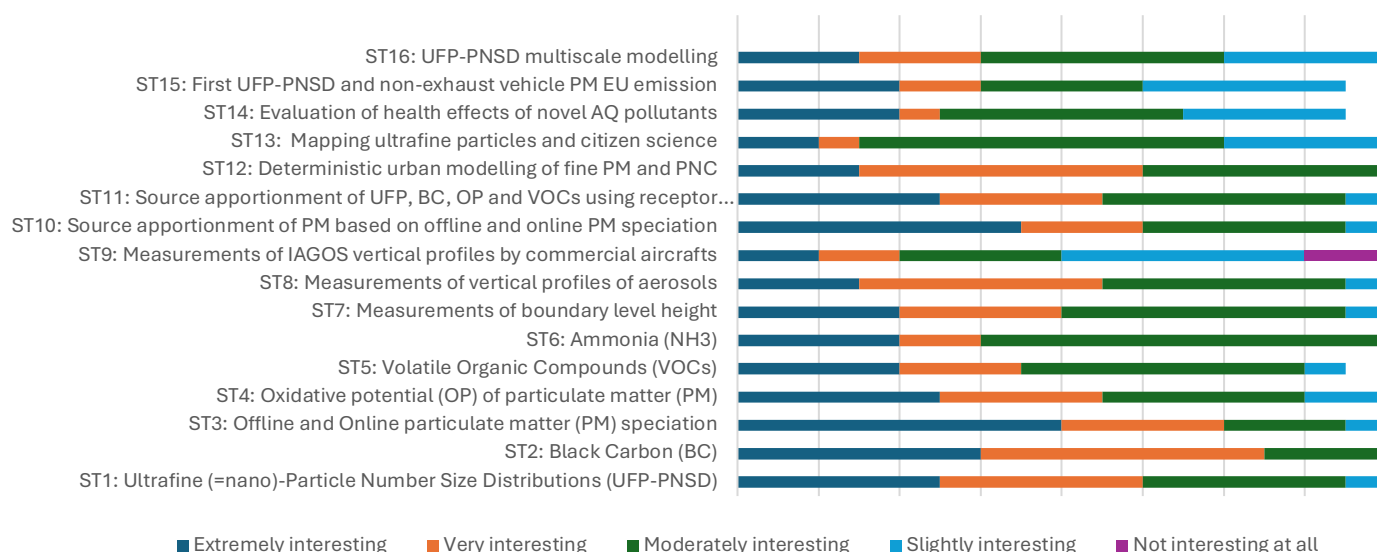
Figure 1: preliminary survey results' overview



New variables: aspects to be addressed



Service Tools interest



Towards the New European Air Quality Directive: Collaborative Experiences Between Agencies and Research.

Based on the survey findings, ACTRIS Italy organized an event to bring together national stakeholders, including ARPA and ISPRA. The structure emphasized open dialogue, with roundtables dedicated to the key topics raised in the survey.

Over 120 participants attended the event, including representatives from the research community, 14 ARPAs and ISPRA. Other 60 participants were connected from remote.

The opening session underscored the strategic role of the National Research Council (CNR) in linking scientific research with European strategies. This was followed by presentations from various research infrastructures and air quality projects. Among the key initiatives discussed was ACTRIS Italy, the national node of the European ACTRIS research infrastructure. ACTRIS plays a pivotal role in atmospheric research, offering high-quality, standardized, FAIR and high-quality data. Its technical recommendations concerning pollutants and measurement techniques have been integrated into the new directive, and its facilities are expected to aid member states in aligning with the directive's quality standards.

The Horizon 2020 project RI-URBANS was also presented, demonstrating how collaboration between research institutions and air monitoring networks has expanded observational

capacity in urban and industrial regions. Pilot cities included Paris, Amsterdam, and Milan. The Service Tools developed under RI-URBANS were presented in depth.

Another major project introduced was ITINERIS, developed under Italy's National Recovery and Resilience Plan and coordinated by the CNR. ITINERIS aims to serve as an integrated access point for environmental research data and services, facilitating their use by ARPAs and policymakers, particularly in the context of the new directive.

After the morning session, time was left to ARPA and ISPRA to share their collaboration experiences with the research world. ARPA and ISPRA shared their experiences of collaboration with research institutions. ARPA discussed their participation in RI-URBANS, projects and collaboration with ACTRIS, and involvement in the ALICENet network. ISPRA and CNR provided a policy-oriented perspective on the connection between scientific research, regulatory frameworks, and national strategies.

Towards the New European Air Quality Directive: Roundtables.

The thematic roundtables took place during the second day of the event and were organized accordingly to the aspects that have emerged both through the preliminary survey as well as through the feedback collected during the first day of the event.

First session: Black Carbon and Ultrafine Particles

The first roundtable was focused on the variables introduced by the new regulation. In particular, the roundtable topics were Black Carbon and Ultrafine Particles.

The Black Carbon topic was introduced by Marco Pandolfi from the Institute of Environmental Assessment and Water Research (IDAEA-CSIC). The roundtable was introduced through a presentation showing the main principles linked to the Black Carbon and Elemental Black Carbon with a focus on the impacts, measurement techniques, mass concentration determination and instruments mainly used. This session on Black Carbon continued with a discussion focused on: collecting information from the ARPA on the type of instruments they are using for Black Carbon determination and addressing the main needs emerging from the ARPA's side.

Most of the ARPA are using AE33 Aethalometer with PM10 and PM2.5 inlets and Nafyon Dryer. ARPA evaluated as extremely useful a methodological support from the researchers. The agencies expressed a strong need for addressing the following specific topics:

- i) better understanding of the concept of equivalent Black Carbon;
- ii) standardization of the equivalent Black Carbon concentration measurements;
- iii) local determination of the mass absorption cross-section using absorption measurements on the particularly on the Equivalent Black Carbon.

The second roundtable was introduced and moderated by Jean-Philippe Putaud from the European Commission Joint Research Center and Francesca Costabile from CNR. The moderators treated the topic of Ultrafine Particles (UFP). As for the roundtable on the Black Carbon the speakers introduced the topic by identifying which are the UFP impacts, how their measurement will be affected by the new regulation and which are the main challenges linked to UFP measurement. The roundtable introduction was also presenting the most commonly used techniques and instruments for UFP concentration measurements. The discussion that followed was focused on understanding to which extent the supersites foreseen by the new

regulation are able to measure the particle number concentration and size distribution. Only few agencies positively replied to this question and the discussion continued on the needs from the ARPA sides in being supported for measuring the particle number concentration and size distribution in near-real-time. Most of the ARPA reported that they are not ready for this type of measurements for lack of trained personnel and experience. Furthermore, the agencies underlined the importance of the support from the research infrastructures through trainings and a virtual space where the agencies could get the needed resources.

Second session: source apportionment and vertical profiling

The roundtables continued with two sessions focused respectively on source apportionment and vertical profiling. The first topic was introduced by Daniele Contini from the CNR who showed some case studies and methodological approaches to separate the different PM sources such as anthropic sources, biomass burning and organic compounds. The presenter also showed how the source contributions are affected by seasonal changes. Finally, the speaker stressed the importance of having near-real-time measurements as a key element to determine the sources of peak PM concentrations. This roundtable was followed by a discussion that highlighted some important aspects that could link the agencies work with the research infrastructures. The ARPA underlined how important is for them to characterise the source of the particulate, specially from those sources linked to sporadic events (like desert dust intrusion) or to specific seasons (biomass burning during the summer and particles produced by domestic heating during the winter). Finally, the agencies showed interest in enhancing the collaboration with ACTRIS through specific training on source apportionment and access to ACTRIS facilities.

The roundtable that followed was introduced by Lucia Mona from the CNR who shared a quick overview of the ACTRIS Italian community involved in lidar vertical profiling techniques. In particular, the vertical profiling is useful to analyse the intrusion of aerosol related to long range transported sources and aerosol concentration at the ground such as the relationship between heatwaves and desert dust concentration. Furthermore, the profiling techniques is used for the aerosol characterization and the Planetary Boundary Layer (PBL) height which influences the aerosol concentration at the ground and more in general the dynamics regulating the aerosol transport and deposition at the ground. In this session, the collaborative work done in recent years involving several ARPAs and the Italian network ALICENet was briefly presented as a success story. The agencies showed interest in the possibilities of combining the PBL height with particles concentration and detection of long-range events, and think that the support from the research world can be enhanced through the creation of a virtual access point for accessing all the useful resources and contact persons.

Third session: supersites

The roundtables were concluded by a short overview of the aspects linked to the supersites. According to the new regulation Italy will have to establish around 6 supersites for urban background, 4 supersites for rural background and 1 or 2 supersites for the “hotspots”. The main objective of this session was to have an inventory of the current status of the Italian supersites, and which are the potential synergies with existing ACTRIS sites. Currently four supersites are operative in the Po Valley, two for rural background and two for urban background, other potential supersites can be found in Capogranitola in Sicily and in Villa Ada in the Lazio region. Another potential rural background supersite is located in the mountain region of Umbria in central Italy. The last roundtable highlighted the importance of building on

the existing collaboration experiences for building the future synergies that will be needed to establish and coordinate the new supersites.

Concluding remarks

The event closed with remarks from Fabio Romeo of the Ministry of Environment and Energy Security, who emphasized how these two days laid the groundwork for strategic actions needed under Regulation 2881. The speaker also referenced the existence of a Ministerial technical group involving ARPA, ISPRA and other actors, that is working on the air quality measures, which welcomes new members and new proposals from the interested stakeholders.

The air quality stakeholders' community will build on the main aspects discussed starting from a series of key take-home messages emerged during the two days:

- Strengthening the knowledge transfer from the scientific community to the agencies system in terms of theoretical and practical knowledge. This will support the agencies capacity to respond to the new regulation and will support a more conscious use of the economic resources in terms of equipment acquisition.
- Recognizing the variability in local monitoring needs, while keeping in mind that a more standardized approach will be required by the new regulation.
- Support a unified data sharing and access system.
- Foresee the involvement of Italian and European Health organizations.
- Increase the communication to citizens and implement awareness raising campaign on which are the most impacting daily behaviours in terms of air quality.

This event marked a pivotal step in fostering existing collaborations and encouraging new ones in the framework of the new regulation. The community that was involved actively participated throughout the two days and during the roundtable discussions, demonstrating that a strategic path towards the new regulation is not only feasible but already taking shape through coordinated efforts, shared expertise, and a strong commitment to compliance and innovation.

Actions and future plans.

- All the materials and event information, are made available in the ACTRIS Italia web page at the following link: <https://actris.it/qualita-dellaria/documenti-evento-verso-la-nuova-direttiva-europea-sulla-qualita-dellaria-dialogo-e-sinergie-tra-infrastrutture-di-ricerca-enti-locali-e-agenzie-ambientali/>
- A follow-up meeting should be organized for discussing to set up the involvement of other key actors that will be involved by the new Air Quality regulation
- ACTRIS will provide a document that will gather all the key-reference people for each topic based on their expertise.

Reference

European Commission. (2021). Pathway to a healthy planet for all: EU action plan 'Towards zero pollution for air, water and soil' (COM (2021) 400 final). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0400>

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