

Milestone M23 (M4.7) Compilation of pilot datasets



RI-URBANS

**Research Infrastructures Services Reinforcing Air
Quality Monitoring Capacities in European Urban &
Industrial Areas (GA n. 101036245)**

By

EMPA, NILU



Empa

Materials Science and Technology



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Milestone M23 (M4.7): Compilation of pilot datasets

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Work package (WP)	Pilot implementations for testing and demonstrating services (WP4)
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Table of Contents

1. ABOUT THIS DOCUMENT	1
2. INTRODUCTION	1
3. COMPILATION OF DATA IN WP4	2
3.1 NRT DATA ON AEROSOL ABSORPTION COEFFICIENTS	2
3.2 NRT DATA ON AEROSOL CHEMICAL COMPOSITION	3
3.3 NRT DATA ON PARTICLE NUMBER SIZE DISTRIBUTION PNSD	4
3.4 OFFLINE CHEMICAL COMPOSITION DATA FOR PM2.5 AND PM10	5
4. NEXT STEPS	5

1. About this document

This document reports the progress made towards the RI-URBANS Milestone M23 (M4.7) within Work Package 4 and provides an overview on the current status of the compilation of datasets for the pilot activities in RI-URBANS.

This is a public document, available at the RI-URBANS website, <https://riurbans.eu/work-package-4/#milestones-wp4>, and distributed to all RI-URBANS partners for their use as well as submitted to the European Commission as the RI-URBANS Milestone M23 (M4.7).

2. Introduction

The RI-URBANS project is collecting observational data from various sources and is generating data by own atmospheric measurements. The data collected in RI-URBANS includes a wide range of different atmospheric compounds, both gases and particulate matter (PM). All data collected in RI-URBANS will be publicly accessible and available to interested users.

The data production and data compilation in RI-URBANS aim to ensure harmonized management of urban air quality (AQ) data across Europe and globally using already established service tools (STs) from atmospheric Research Infrastructures (RIs). This is particularly important for non-regulated pollutants for which typically no widely accepted standardised measurement protocols exist. RI-URBANS therefore aims to build a lasting connection between RIs and urban AQ monitoring networks (AQMNs), as well as to build capacity on FAIR principles in data management for urban AQMNs. By this, traceable, comparable, and harmonized data across urban and regional AQMNs is ensured.

Deliverable [D36 \(D5.2\)](#) gives a comprehensive overview of the general data management of RI-URBANS, information on how to access the RI-URBANS data, and the up-to-date status (mid-September 2023) of the accessible RI-URBAN in-situ data.

As described in details in [D36 \(D5.2\)](#), data collection in RI-URBANS is following different pathways (PWs):

PW1. Compilation of data from existing AQ supersites was done in WP1, see deliverable [D1 \(D1.1\)](#). Most of these datasets have been submitted centrally to [EBAS](#) database. Data submission of aerosol data (particle number size distribution, PNSD, aerosol absorption coefficients for elementary black carbon (eBC)) was, however, done by IDAEA CSIC Partner, existing volatile organic carbons, VOCs, and ammonia, NH₃, data were compiled and reported by IMT-Nord. Some datasets have not been submitted yet to EBAS, but are openly available from the Zenodo data repository (<https://zenodo.org>), see [D36 \(D5.2\)](#).

PW2. Annual data submission was done by RI-URBANS partners using established routines and guidelines in the Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS; <http://www.actris.eu>) or using the ATMO-ACCESS Virtual Access Portal (<https://www.atmo-access.eu/virtual-access/#/>), and in particular, through homeless data portal).

PW3. Near-real-time (NRT) and offline data generation and submission for the pilot implementations for testing and demonstrating services in WP4.

Compilation and submission of RI-URBAN data following PW1 is largely completed as described in [D36 \(D5.2\)](#). The PW2 is to be scaled up and provision of the RI-URBANS data for WP4 (PW3) is ongoing, and there has been progress since mid-September 2023, the time when Deliverable [D36 \(D5.2\)](#) was completed. The remainder of this document provides a brief update on the data compilation in WP 4 (pathway 3) above).

3. Compilation of data in WP4

3.1 NRT data on aerosol absorption coefficients

NRT data submission of aerosol absorption measurements at all pilot cities was established in Task 4.1.

A showcase of the selected Sep-Oct 2023 data is provided by the EBAS NRT service (<https://ebas-nrt.nilu.no/>) as outlined in [D36 \(D5.2\)](#), and as an example is shown as a time-series for the pilot site Zurich-Kaserne (Switzerland) in Figure 1.

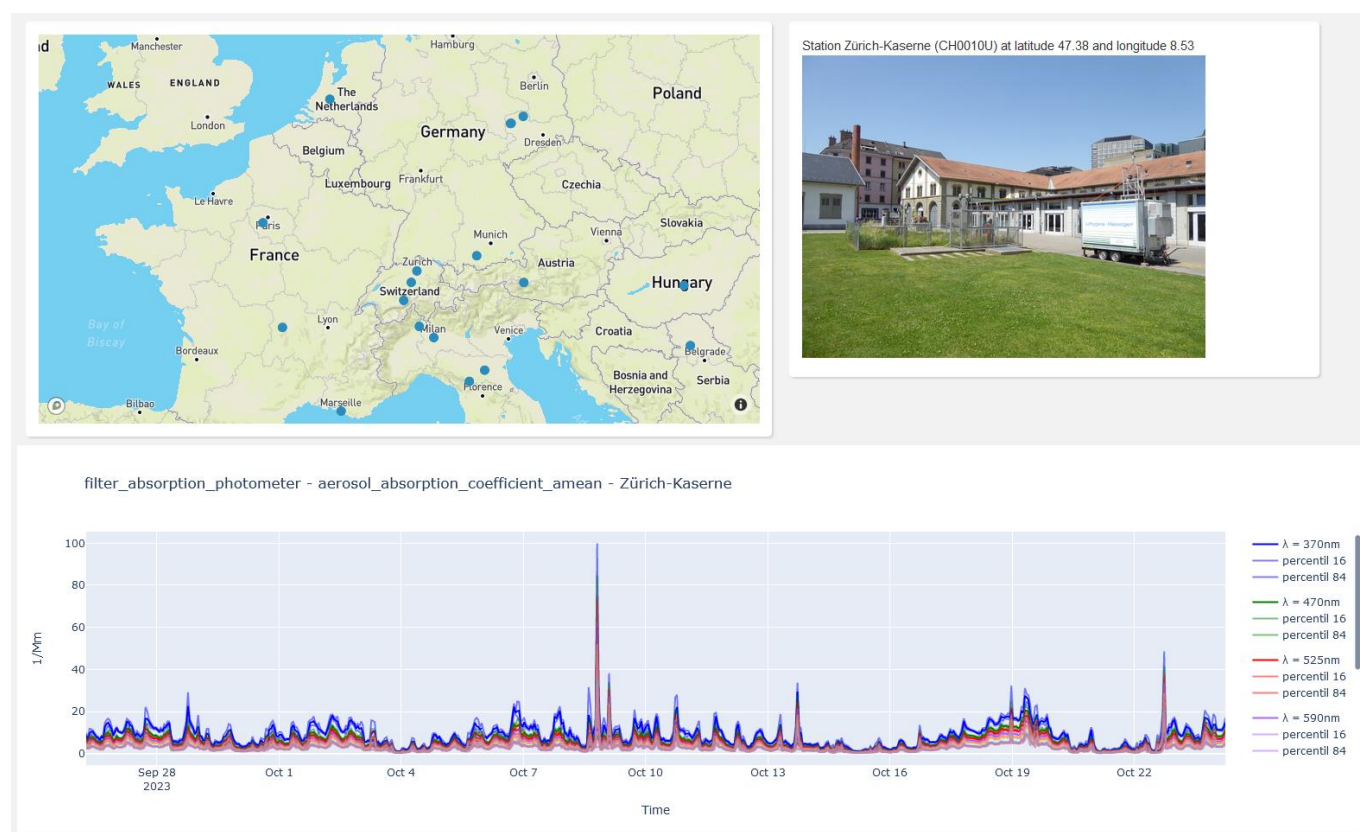


Figure 1. Screenshot from the EBAS near-real-time data portal with example NRT aerosol absorption coefficients at Zurich-Kaserne measurement site (CH0010U) for the period from September 28 to October 24, 2023.

It should be noted that a data stream disappears from the showcase if it has stopped for more than a month. At the EBAS web portal all the NRT data are available, also if data are not very new. The NRT data will be replaced when a submission of QA/QC level 2 data of the same time-series is completed. The NRT data can be accessed and downloaded from this EBAS web portal (Figure 2) and a direct link to the RI-URBANS data on absorption coefficient is found [here](#).

The screenshot displays the EBAS web interface with the following filters and options:

- Framework [1]:** RI-URBANS_NRT
- Country [6]:** France, Greece, Italy, Romania, Spain, Switzerland
- Station [8]:** Barcelona (Palau Reial), DEM_Athens, ISAC Bologna II, Marseille Longchamp, Milano Pascal, RADO-Bucharest II, SIDRA Atmospheric Research Observatory
- Instrument type [1]:** filter_absorption_photometer
- Component [3]:** aerosol_absorption_coefficient, pressure, temperature
- Matrix [4]:** aerosol, pm1, pm10, pm25

Additional resources listed on the right include:

- Near-Real-Time data
- European Monitoring and Evaluation Programme (EMEP-CCC)
- Site descriptions - EMEP
- WMO Global Atmosphere Watch (GAW)
- Site descriptions - GAW
- Air mass trajectories
- Data submission
- About EBAS
- EBAS User Feedback Tracker

The map shows red pins at Paris, Barcelona, Bucharest, Athens, and Milan/Bologna, indicating the locations of the monitoring sites.

Figure 2. Screenshot from the EBAS web interface showing which sites provide NRT aerosol absorption coefficients data.

These NRT aerosol absorption data are used for employing the NRT source apportionment service tool for black carbon (BC) provided by Task 1.2 (see [D4 \(D1.4\)](#)).

3.2 NRT data on aerosol chemical composition

NRT data on the composition of non-refractory aerosol constituents as obtained from measurements using aerosol chemical speciation monitors (ACSMs) will also be provided in WP4 (Task 4.1). These data will be used for demonstration of NRT source apportionment of fine atmospheric aerosol (Task 1.2, see [D4 \(D1.4\)](#)) in the pilot cities Athens (Greece), Barcelona (Spain), Bucharest (Hungary), Paris (France), Helsinki (Finland), Zurich (Switzerland) and the supersites in the Po valley (Milan and Bologna of Italy).

NRT data provision of ACSM data including the NRT source apportionment of fine aerosol particles turned out to be more challenging than expected and many specific technical issues needed to be addressed and resolved. The data flow is arranged and progressing, but currently additional improvements and developments are still undergoing. Currently ACSM NRT data flow is available through EBAS from Bucharest, but NRT data flow from Paris and Barcelona has stopped. We expect that more sites with ACSM NRT data will be publicly accessible in the next few months.

NRT source apportionment from ACSM monitors is not foreseen to be included in EBAS in the nearest future. There is a need to develop this service and when the pilot studies have become robust and provide consistent results, the

EBAS infrastructure will be developed to also include source apportionment data from ACSM. NRT source apportionment data are provided at a centralized server, located at AERIS-ICARE (CNRS) as part of ECAC-ACMCC (Topical centre unit coordinating in-situ online measurements of aerosol chemical speciation within ACTRIS). It should also be noted that offline ACSM data and data on source contributions as determined from offline ACSM source apportionment from 22 sites are publicly available through the Zenodo repository at <https://zenodo.org/records/6522811> (see [D36 \(D5.2\)](#)).

3.3 NRT data on particle number size distribution PNSD

The data flows for NRT provision of PSND data are operational in all three pilot cities (Barcelona, Birmingham and Helsinki). A description of the sites in these pilot cities is available in the Milestone document [M20 \(M4.4\)](#).

Due to technical problems by implementing an updated software in the instruments, only the PSND data from two sites in Helsinki are visible on the EBAS data access interface. The data from Barcelona and Birmingham (UK) will soon also be publicly available in EBAS, when the problems are solved.

Figure 2 shows example NRT data for total particle number concentration, PNC, and particle number size distribution, PNSD, for the urban background site in Helsinki (on Kumpala campus).

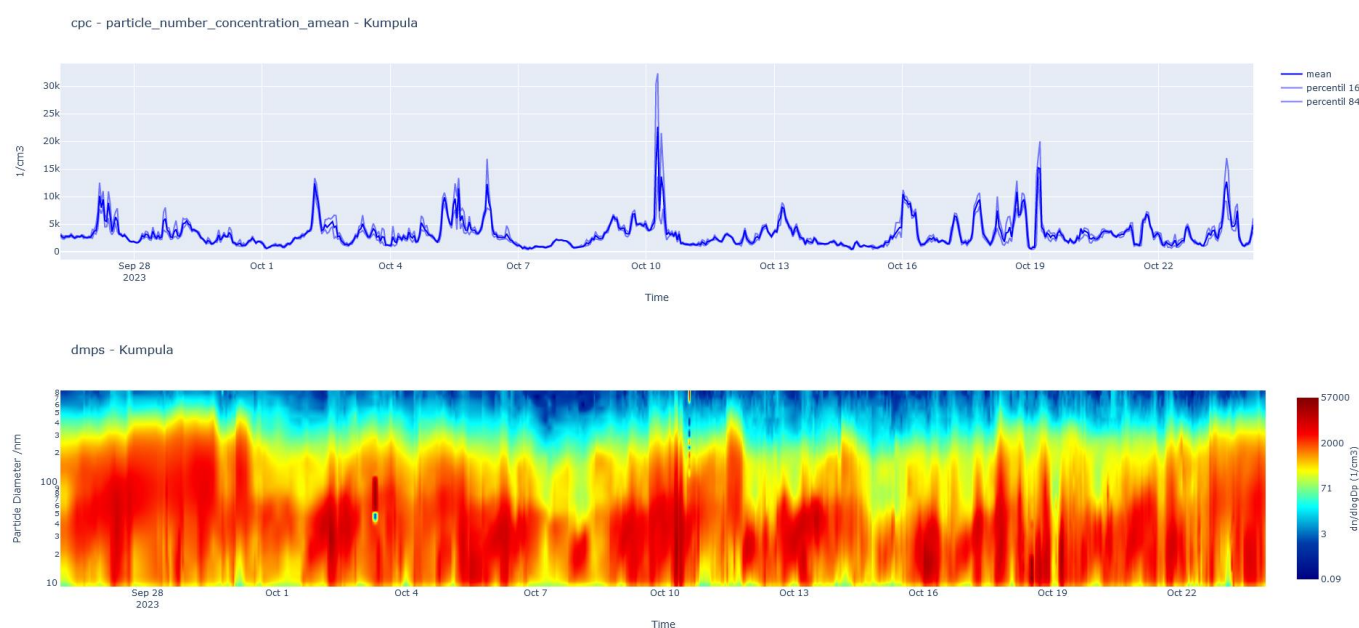


Figure 2. Screenshot from the EBAS near-real-time data portal with example NRT data for total PNC (upper panel) and PNSD (lower panel) at Helsinki (Kumpala campus, FI0038U) of Finland for the period from September 26 to October 24, 2023.

In spring 2023, a measurement system for PSND that is fully compliant with ACTRIS requirements and, therefore, fully consistent with the instruments operated at the pilot sites in Barcelona, Birmingham and Helsinki. The NRT data submission of these measurements from the Zurich-Kaserne urban background site has recently been initiated, NRT PSND data from this additional site should soon be available through the EBAS NRT portal.

3.4 Offline chemical composition data for PM2.5 and PM10

Milestone [M22 \(M4.6\)](#) describes the strategy and the data needed for Task 4.4, where novel health indicators are measured and investigated for its relationships between novel health indicators and other components of fine particulate matter as well as contributions from major sources of PM10 and PM2.5 are examined.

As outlined in [M22 \(M4.6\)](#), targeted PM measurement campaigns will be performed in the pilot cities allowing a comprehensive characterization of PM composition and the identification and attribution of PM sources. Samples obtained will be analysed following the protocols devised in WP1 and WP2.

New samples will be collected at the pilot sites in Athens, Barcelona and Paris. For Zurich, samples already collected in 2018-2019 will be used. This strategy permits to start the analytical tasks earlier, testing and refining the methodologies.

Collection of daily PM2.5 and PM10 filter samples and subsequent chemical characterization has started in the pilot cities Athens, Barcelona and Paris in spring and summer 2022 and ended in the summer of this year. Evidently, these comprehensive chemical analyses of the measurement campaigns in the three pilot cities are under way but could not yet be fully completed (end of October 2023).

The partners involved in Task 4.4 decided that the provision of the chemical composition data of PM2.5 and PM10 from all four pilot cities should be done in a coordinated manner and at the same time. The data from all four pilot cities will therefore be submitted to EBAS as soon as these are available and validated. The data from Zurich (Switzerland) has, however, already been made available directly upon request from interested users. The datasets are already now publicly available through the Zenodo data repository at <https://doi.org/10.5281/zenodo.4668158>.

4. Next steps

The RI-URBANS pilots are still going on and data collection is the active phase.

As detailed in [D36 \(D5.2\)](#) and in the introduction of this document, the data collection in RI-URBANS is following different pathways (see PW1 to PW3 in section 2 of this report). PW2 - Annual data submission was done by RI-URBANS partners using established routines and guidelines in ACTRIS or using the ATMO-ACCESS homeless data portal.

During the 2nd (RP2) & 3rd (RP3) reporting periods of RI-URBANS we will discuss and plan among the pilots, how to continue the demonstration of the Service tools (focus of the pilots) and how elaborating information packages and datasets to be used for upscaling. In collaboration with WP5 upscaling of the work and service tools are outlined. Each pilot task in WP4 has a summary deliverable that will provide insights into the pilots, lessons learned, and data products developed within the pilots.