

Milestone M1 (M1.1)

Datasets for source apportionment, health modelling and measurement guidelines



RI-URBANS

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

By

IMT, CSIC, PSI, NILU & UHEL



UNIVERSITY OF HELSINKI

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Milestone M1 (M1.1): Datasets for source apportionment, health modelling and measurement guidelines

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Comments	This is a document describing the data survey and compilation of non-regulated pollutants carried out in RI-URBANS, with the objective of making data, as well as the guidelines, available and accessible and stored in repositories for source apportionment (T1.2), health studies (WP2), and modelling evaluation (WP3)

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1. About this document

This is a document describing the data survey and compilation of non-regulated pollutants carried out in RI-URBANS, with the objective of making data, as well as the guidelines, available and accessible and stored in repositories for source apportionment (T1.2), health studies (WP2), and modelling evaluation (WP3).

This milestone is strongly related to WP1 – T1.1. The datasets compiled and the respective measurement guidelines cover particle number concentration (PNC), particle number size distribution (PNSD), equivalent black carbon, offline PM chemical composition, online PM chemical composition, volatile organic compounds (VOC), and ammonia (NH₃). The datasets have been made available to the other WPs in the RI Urbans Intranet ([RI-URBANS D1 \(D1.1\) DATASETS](#)), some data are also available in EBAS. The ACTRIS Data Centre is implementing data repositories in EBAS dedicated to RI-URBANS and a data submission training is planned for data providers. The links to measurement guidelines are included in the text.

The document is organised in sections covering the considered variables with links to datasets, metadata, and guidelines.

This is a public document that will be distributed to all RI-URBANS partners for their use and submitted to European Commission as the RI-URBANS Milestone M1 (M1.1). This document can be downloaded at <https://riurbans.eu/work-package-1/#milestones-wp1>

2. Particle number concentration (PNC) and particle number size distribution (PNSD)

Table 1. Site names, type, abbreviation and location and EBAS name for PNC and PSND datasets. Datasets and metadata can be found [here](#)

Measured compounds	City	Station Name	Station type	EBAS name	Abbreviation
PNC & PSND	Athens (GR)	Thissio	UB	X	ATH_UB
PNC & PSND	Barcelona (ES)	Palau Reial	UB	X	BCN_UB
PNC & PSND	Birmingham (UK)	BAQS	UB	X	BIR_UB
PNC & PSND	Budapest (HU)	CAAG	UB	X	BUD_UB
PNC & PSND	Dresden (DE)	Winckelmannstraße	UB	DE0064B	DRE_UB
PNC & PSND	Granada (ES)	UGR	UB	ES0020U	GRA_UB
PNC & PSND	Helsinki (FI)	Kumpula Campus	UB	FI0038U	HEL_UB
PNC & PSND	Langen (DE)	UBA	UB	X	LAN_UB
PNC & PSND	Leipzig (DE)	TROPOS	UB	DE0055B	LEI_UB
PNC & PSND	London (UK)	North Kensington	UB	X	LND_UB
PNC & PSND	London (UK)	Honor Oak Park	UB	X	LND2_UB
PNC & PSND	Madrid (ES)	CIEMAT-Moncloa	UB	ES0021U	MAD_UB
PNC & PSND	Marseille (FR)	Longchamp	UB	X	MAR_UB
PNC & PSND	Rochester NY (USA)	NYS DEC	UB	X	ROC_UB
PNC & PSND	Zurich (CH)	Kaserne	UB	X	ZUR_UB
PNC & PSND	Dresden (DE)	North	TR	DE0063K	DRE_TR
PNC & PSND	Helsinki (FI)	Mäkelänkatu	TR	X	HEL_TR
PNC & PSND	Leipzig (DE)	Mitte	TR	DE0067K	LEI_TR
PNC & PSND	Leipzig (DE)	Eisenbahnstraße	TR	DE0066K	LEI2_TR
PNC & PSND	London (GB)	Marylebone Road	TR	X	LND_TR
PNC & PSND	Stockholm (SE)	Hornsgatan	TR	X	STO_TR
PNC & PSND	Athens (GR)	Demokritos	SUB	GR0100B	ATH_SUB
PNC & PSND	Lille (FR)	Villeneuve d'Ascq	SUB	X	LIL_SUB
PNC & PSND	Paris (FR)	SIRTA	SUB	FR0020R	PAR_SUB
PNC & PSND	Prague (CZ)	Schudol	SUB	CZ0004B	PRA_SUB
PNC & PSND	Ispra (IT)	JRC	RG	IT0004R	ISP_RB

List of guidelines for the measurement of PNC and PNSD:

- CEN/TS 17434:2020 - Ambient air - Determination of the particle number size distribution of atmospheric aerosol using a Mobility Particle Size Spectrometer (MPSS) for UFP-PSD measurements from 10 to 800 nm.
- CEN/TS 16976:2016 - Ambient air - Determination of the particle number concentration of atmospheric aerosol for total PNC measurements.
- ACTRIS measurement guideline (MG) ([ACTRIS MG](#)).
- ACTRIS recommendations (<http://www.actris-ecac.eu/actris-gaw-recommendation-documents.html>).

3. Equivalent black carbon

Table 2. Site names, type, abbreviation and location and EBAS name for equivalent black carbon datasets. Datasets and metadata can be found [here](#)

Measured compounds	City	Station Name	Station type	EBAS name	Abbreviation
Equivalent BC	Athens (GR)	Thissio	UB	X	ATH_UB
Equivalent BC	Barcelona (ES)	Palau Reial	UB		BCN_UB
Equivalent BC	Granada (ES)	UGR	UB		GRA_UB
Equivalent BC	Madrid (ES)	CIEMAT	UB	X	MAD_UB
Equivalent BC	Valencia (ES)	Burjassot	UB	X	VLC_UB
Equivalent BC	Brussels (BE)	Uccle	UB	X	BRU_UB
Equivalent BC	Marseille (FR)	Longchamp	UB	X	MAR_UB
Equivalent BC	Paris (FR)	Paris-13	UB	X	PAR_UB
Equivalent BC	Dresden (DE)	Winckelmannstrasse	UB	X	DDW_UB
Equivalent BC	Leipzig (DE)	Tropos	UB		LEJ_UB
Equivalent BC	Budapest (HU)	BpART Lab	UB	X	BUD_UB
Equivalent BC	Helsinki (FI)	Kallio (UB1)	UB	X	HEL_UB1
Equivalent BC	Enschede (NL)	Winkelhorst (UB1)	UB	X	NLD_UB1
Equivalent BC	Groningen (NL)	Nijensteinheerd (UB2)	UB	X	NLD_UB2
Equivalent BC	Heerlen (NL)	Jamboreepad (UB3)	UB	X	NLD_UB3
Equivalent BC	Nijmegen (NL)	Ruyterstraat (UB4)	UB	X	NLD_UB4
Equivalent BC	Rotterdam (NL)	NL01488 (RZW)	UB	X	RZW_UB
Equivalent BC	Veldhoven (NL)	Europalaan (UB5)	UB	X	NLD_UB5
Equivalent BC	Stockholm (SE)	Torkel Knutssonsgatan	UB	X	STH_UB
Equivalent BC	Bern (CH)	Bollwerk	UB	X	BER_UB
Equivalent BC	Lugan (CH)	Università	UB	X	LUG_UB
Equivalent BC	Zurich (CH)	Kaserne	UB	X	ZUR_UB
Equivalent BC	Birmingham (UK)	BAQS	UB	X	BIR_UB
Equivalent BC	London (UK)	North Kensington	UB	X	LND_UB
Equivalent BC	Rochester (USA)	ROC	UB	X	ROC_UB
Equivalent BC	Milan (IT)	Pascal	UB	X	MLN_UB
Equivalent BC	Dresden (DE)	Nord	TR	X	DDN_TR
Equivalent BC	Helsinki (FI)	Mannerheimintie (TR1)	TR	X	HEL_(TR1)
Equivalent BC	Helsinki (FI)	Mäkelänkatu (TR2)	TR	X	HEL_(TR2)
Equivalent BC	Helsinki (FI)	Töölöntulli (TR3)	TR	X	HEL_(TR3)
Equivalent BC	Helsinki (FI)	Kehä I (TR4)	TR	X	HEL_(TR4)
Equivalent BC	Helsinki (FI)	Tikkurila (TR5)	TR	X	HEL_(TR5)
Equivalent BC	Helsinki (FI)	Leppävaara (TR6)	TR	X	HEL_(TR6)
Equivalent BC	Paris (FR)	Hausmann	TR	X	PAR_TR
Equivalent BC	Leipzig (DE)	Mitte (TR1)	TR		LEJ_TR1
Equivalent BC	Leipzig (DE)	Eisenbahnstrasse (TR2)	TR		LEJ_TR2
Equivalent BC	Milan (IT)	Senato (TR1)	TR	X	MLN_TR1
Equivalent BC	Milan (IT)	Marche (TR2)	TR	X	MLN_TR2
Equivalent BC	Eindhoven (NL)	Noordbrabantlaan (TR1)	TR	X	NLD_TR1
Equivalent BC	Rotterdam (NL)	NL01492 (RDM)	TR	X	RDM_TR
Equivalent BC	Nijmegen (NL)	Graafseweg (TR2)	TR	X	NLD_TR2
Equivalent BC	Rotterdam (NL)	NL01487 (RPW)	TR	X	RPW_TR
Equivalent BC	Stockholm (SE)	Hornsgatan 108	TR	X	STH_TR
Equivalent BC	London (UK)	Marylebone Road	TR	X	LND_TR
Equivalent BC	Athens (GR)	Demokritos	SUB		ATH_SUB
Equivalent BC	Bucharest (RO)	INO	SUB	X	BU_SUB
Equivalent BC	Helsinki (FI)	Rekola (DH4)	SUB	X	HEL_DH4
Equivalent BC	Helsinki (FI)	Itä-Hakkila (DH5)	SUB	X	HEL_DH5
Equivalent BC	Helsinki (FI)	Pirkkola (DH6)	SUB	X	HEL_DH6
Equivalent BC	Lille (FR)	Villeneuve d'Ascq	SUB	X	LIL_SUB
Equivalent BC	Paris (FR)	SIRTA	SUB		PAR_SUB
Equivalent BC	IPR	Ispra	RB		ISP_RB
Equivalent BC	Juupajoki (Hyytiälä) (FI)	SMEAR II	RB	X	HYT_RB

List of guidelines for the measurement of equivalent black carbon:

- ACTRIS In Situ Aerosol: Guidelines for Manual QC of MAAP (Multiangle Absorption Photometer) data ([ACTRIS Guideline](#)).

- ACTRIS In Situ Aerosol: Guidelines for Manual QC of AE33 absorption photometer data ([ACTRIS Guideline](#)).
- GAW recommendation for instruments measuring the particle light absorption (<https://www.gaw-wdca.org/Publications>).

4. Offline PM chemical composition

Table 3: Site names, type, abbreviation and location and EBAS name for offline PM chemical composition datasets. Datasets and metadata can be found [here](#)

Measured compounds	City	Station Name	Station type	EBAS name	Abbreviation
PM10	Chamonix (FR)	Chamonix	UV		CHAM_UV
PM10	Dunkerke-Gran Synthe (FR)	Grande Synthe	UI		DKI_UI
PM10	Grenoble (FR)	GRE-cb	UB		GRE-cb_UB
PM10	Grenoble (FR)	Frenes	UB		GRE-fr_UB
PM10	Grenoble-VIF (FR)	VIF	UB		VIF_UB
PM10	Lens (FR)	Lens	UB		LEN_UB
PM10	Marnaz (FR)	Marnaz	PUBV		MNZ_PUBV
PM10/PM1	Marseille (FR)	Marseille-5av	UB		MAR_UB
PM10	Aix-en-Provence (FR)	Aix-en-provence	UB		AIX_UB
PM10	Port de Bouc (FR)	PdB	UI		PdB_UI
PM10	Nice (FR)	Nice	TR		NIC_TR
PM10	Nogent sur Oise (FR)	Nogent	PUB		NGT_PUB
PM10	Poitiers (FR)	Poitiers	UB		POI_UB
PM10	Roubaix (FR)	Roubaix	TR		RBX_TR
PM10	Rouen (FR)	Rouen	TR		ROU_TR
PM10	Strasbourg (FR)	Strasbourg	TR		STG_TR
PM10/PM2.5	Athens (GR)	Demokritos	SUB		ATH_SUB
PM10/PM2.5	Florence (IT)	Florence AIRUSE	UB		FLO_UB
PM10	Florence (IT)	Calenzano	UB		CAL_UB
PM10	Florence (IT)	Montale	SUB		MON_SUB
PM10	Florence (IT)	Capannori (Lucca)	UB		CA_UB
10;2.5	Milano (IT)	Pascal	UB		MIL_UB
PM10	Milano (IT)	Senato	UB		MILSEN_TR
PM10/PM2.5	Milano (IT)	Shivinoglia	UB		MILSHI_TR
PM10	Turin (IT)	Turin	UB		TUR_UB
PM10	Coimbra (PT)	Coimbra	UB		COIM_UB
PM10	Coimbra (PT)	Coimbra	TR		COIM_TR
PM10/PM2.5	Porto (PT)	Porto	TR		PORT_TR
PM10	Bailen (ES)	Bailén	UI		BAI_UI
PM10/PM2.5	Barcelona (ES)	Barcelona	UB		BCN_UB
PM10	Gijon/Aviles (ES)	Gijón	UI		GIJ_UI
PM10	Granada (ES)	Granada	UB		GRA_UB
PM10	Madrid E. Vallecas (ES)	Madrid	UB		MAD-EV_UB
PM10	Madrid Esc. Aguirre (ES)	Madrid	TR		MAD-EA_TR
PM10/PM2.5	Manlleu (ES)	Manlleu	UB		MAN_UB
PM10/PM2.5	Villanueva Arz. V (ES)	Villanueva	UB		VIL_UB
PM10/PM2.5	Basel (CH)	Basel	UB		BAS_UB
PM10/PM2.5	Bern (CH)	Bern	TR		BER_TR
PM10/PM2.5	Magadino (CH)	Magadino	UB		MAG_UB
PM10/PM2.5	Payerne (CH)	Payerne	UB		PAY_UB
PM10/PM2.5	Zurich (CH)	Zurich	UB		ZUR_UB

There are not specific guidelines for a complete characterization of atmospheric particulate matter. Below, a list of procedures and recommendations:

- CEN procedure for the determination of PM10 and PM2.5 (EN 12341:2014).
- CEN procedure for the determination of OC and EC in PM2.5 (EN 16909:2017).
- CEN procedure for the determination of inorganic ions in PM2.5 (EN 14902:2005).

- CEN procedure for the determination of specific metals in PM₁₀ (EN 14902:2005).
- ACTRIS recommendation for the determination of OCEC in PM_{2.5} and the analysis of metals in PM ([ACTRIS recommendation](#)).
- EMEP manual for sampling and chemical analysis (EMEP/CCC-Report 1/95 Revision 1/2001; <https://projects.nilu.no/ccc/manual>).

5. Online PM chemical composition: Organic aerosol (OA), SO₄²⁻, NO₃⁻, NH₄⁺ and Cl⁻.

Table 4: Site names and location, type, abbreviation and EBAS name for online PM chemical composition datasets. Datasets and metadata can be found [here](#)

City	Station Name	Station type	EBAS name	Abbreviation
Athens DEM (EL)		Urban		athd
Athens NOA (EL)		Urban		athn
Barcelona (ES)		Urban		bar
Birmingham (UK)		Urban		
Bucharest (RO)		Urban		buc
Dublin (IE)		Urban		dub
Granada (ES)		Urban		gra
Helsinki (FI)		Urban		hel
Kraków (PL)		Urban		kra
Lille (FR)		Urban		lil
London North Kensington (UK)		Urban		lon
Manchester (UK)		Urban		
Marseille (FR)		Urban		mar
Nikosia (CY)		Urban		
Paris (FR)		Urban		par
Prague (CZ)		Urban		
Tartu (EE)		Urban		tar
Zürich (CH)		Urban		zur
Birkenes (NO)		non-urban		bir
Carnsore Point (IE)		non-urban		casp
Cyprus Atmos. Obs. (CY)		non-urban		cao
Hohenpeissenberg (DE)		non-urban		hoh
Hyytiälä (FI)		non-urban		hyy
Košetice (CZ)		non-urban		kos
Magadino (CH)		non-urban		mag
Melpitz (DE)		non-urban		mel
Puy de Dôme (FR)		non-urban		puy

List of guidelines for the measurement of online PM chemical composition:

- Quadrupole Aerosol Chemical Speciation Monitor (Q-ACSM) Standard Operating Procedure ([ACTRIS procedure](#)).
- TOF – ACSM Standard Operating Procedures ([ACTRIS procedure](#)).
- Guidelines for the source apportionment of organic aerosol using organic mass spectra (two approaches) ([Chen et al., 2022](#)) and their advantages and disadvantages ([Via et al., 2022](#)).
- COLOSSAL, 2021. Guidelines for comparison of ACSM measurements with co-located external data ([Guideline](#)).

6. Volatile Organic Compounds (VOCs)

Table 5: Site names, type, abbreviation and location and EBAS name for VOCs datasets. Datasets and metadata can be found [here](#)

Measured compounds	City	Station Name	Station type	EBAS name	Abbreviation
C2 – C16 NMHC	Marseille (FR)	Longchamp	Urban	X	MAR_UB
C2 – C9 NMHC	Strasbourg (FR)	Strasbourg-Ouest	Urban	X	STB_UB
C2 – C9 NMHC	Paris (FR)	Châtelet	Urban	X	PAR_UB
C2 – C9 NMHC	Grenoble (FR)	Les frênes	Urban	X	GRE_UB
C4 – C9 NMHC + chloroethanes and chloroethenes	Charleroi-Mayence (BE)	Charleroi-Mayence	Urban	X	CHM_UB
C4 – C9 NMHC + chloroethanes and chloroethenes	Lodelinsart (BE)	Lodelinsart	Urban	X	LDS_UB
C4 – C9 NMHC + chloroethanes and chloroethenes	Angleur (BE)	Angleur	Urban	X	ANG_UB
C4 – C9 NMHC + chloroethanes and chloroethenes	Herstal (BE)	Herstal	Urban	X	HET_UB
C4 – C9 NMHC + chloroethanes and chloroethenes	Namur (BE)	Namur	Urban	X	NAM_UB
C4 – C9 NMHC + chloroethanes and chloroethenes	Mons (BE)	Mons	Urban	X	MON_UB
C2 – C9 NMHC	Zurich (CH)	Zurich	Urban	X	ZUR_UB
OVOcs	Zurich (CH)	Zurich	Urban	X	ZUR_UB
C7 – C10 NMHC + C5 – C10 biogenic VOC (TD-GC-MS) & C2 – C9 NMHC (TD-GC-FID)	Helsinki (FI)	SMEAR III	Urban	X	HEL2_UB
C2 – C9 NMHC	London (UK)	Eltham	Urban	X	LND_UB
C2 – C12 NMHC	Athens (GR)	Athens NOA	Urban	X	ATH_UB
C4 – C9 NMHC chloroethanes and chloroethenes	Mouscron (BE)	Mouscron	Industrial	X	MSR_IND
	Lyon (FR)	Feyzin-stade	Industrial	X	LYO_IND
	Lyon (FR)	Vernaison	Industrial	X	LYO2_IND
C5 – C9 NMHC + OVOC	Paris (FR)	SIRTA	Suburban	FR0020R	PAR_SUB
C2 – C9 NMHC	London (UK)	Marylebone road	Traffic	X	LND2_TR
C6 – C9 aromatics + C5 – C15 biogenic VOC	Helsinki (FI)	MÄkelankatu street	Street canyon	X	HEL_CAN

List of guidelines for the measurement of VOCs:

- ACTRIS Updated Measurement Guideline for NO_x and VOCs ([ACTRIS Guideline](#)).
- Ambient air quality - Standard method for measurement of benzene concentrations - Part 1: Pumped sampling followed by thermal desorption and gas chromatography (EN 14662-1:2005).
- Ambient air quality - Standard method for measurement of benzene concentrations - Part 2: Pumped sampling followed by solvent desorption and gas chromatography (EN 14662-2:2005).

- Standard method for the measurement of benzene concentrations — Part 3: Automated pumped sampling with in situ gas chromatography (EN 14662-3:2005).
- Ambient air quality Standard method for measurement of benzene concentrations - Part 4: Diffusive sampling followed by thermal desorption and gas chromatography (EN 14662-4:2005).
- Ambient air quality Standard method for measurement of benzene concentrations - Part 5: Diffusive sampling followed by solvent desorption and gas chromatography (EN 14662-5:2005).

7. Ammonia (NH₃)

Table 6: Site names, type, abbreviation and location and EBAS name for NH₃ datasets. Datasets and metadata can be found [here](#)

Measured compounds	City	Station Name	Station type	EBAS name	Abreviation
NH3	Barcelona (ES)	Barcelona	Urban	X	BCN_UB
NH3	Helsinki (FI)	SMEAR III	Urban	X	HEL2_UB
NH3	Valencia (ES)	Bulevard S.	Suburban	X	VLC_SUB
NH3	Paris (FR)	SIRTA	Suburban	X	PAR_SUB
NH3	Barcelona (ES)	Barcelona	Traffic	X	BCN_TR
NH3	Valencia (ES)	La marina	Traffic	x	VLC_TR

List of guidelines for the measurement of NH₃:

- CEN Technical Committee 264 Working Group (WG) 11: EN 17346:2020 «Ambient air - Standard method for the determination of the concentration of ammonia using diffusive samplers».
- VDI 3869-4, Measurement of ammonia in ambient air – Sampling with diffusive samplers – Photometric or ion chromatographic analysis.
- Guide métrologique pour la mesure des concentrations en ammoniac dans l’air ambiant ([LCSQA guideline](#)).

8. Data management

At this stage, databases have been collected, checked and processed following the methodology described for each variable. Processed and original databases are archived at RI-Urbans intranet and are available for other WP’s partners, mainly WP2 and WP3 for health studies and modelling. Guidelines and recommendations are also available for WP4 (Pilot studies).

In next steps, we will use a 3-stage approach for the data collected in RI-URBANS, that has been devised in collaboration with WP5 and ACTRIS Data Centre:

- The complete dataset will be archived as a collection at the ACTRIS secondary dataset repository. It will receive a collection DOI.
- Data from stations that haven’t reported to ACTRIS / EBAS before will be independently archived there.
- Stations that have been reporting to ACTRIS, but where quality issues have been discovered, will receive corresponding feedback on ACTRIS QC issue tracker, with a task to improve their data quality.

The data reporting routines for the data are established and go very much along the lines of procedures used in ACTRIS. These are shortly summarized below.

- Nanoparticle PNSD from PNSD:

Established ACTRIS template: <https://ebas-submit.nilu.no/templates/Differential-Scanning-Mobility-Particle-Sizer/lev2>

Stations which haven't been reported before will need station IDs.

- BC:

According to ACTRIS procedures, eBC data are not reported as such, but are converted to the parameter actually measured, which is the absorption coefficient. The data reporting template would be: <https://ebas-submit.nilu.no/templates/Filter-Absorption-Photometer/lev2>

Stations which haven't been reported before will need station IDs.

- Offline PM chemical composition:

This is not an ACTRIS parameter. The templates would be:

<https://ebas-submit.nilu.no/templates/Inorganic-air-aerosol-chemistry-filter-based/lev2>

<https://ebas-submit.nilu.no/templates/Heavy-metals-in-aerosol-particle-phase/lev2>

<https://ebas-submit.nilu.no/templates/Mercury-aerosol/lev2>

Stations which haven't been reported before will need station IDs.

- Online PM chemical composition: ACSM

The guidelines for measurements can be found here: https://www.actris.eu/sites/default/files/Documents/ACTRIS-2/Deliverables/WP3_D3.3_M16.pdf

The template for data submission can be found here:

<https://ebas-submit.nilu.no/templates/ACSM-regular/lev2>

Stations, which haven't been reported before will need to obtain a station ID.

- VOCs

The ACTRIS template is: <https://ebas-submit.nilu.no/templates/VOC/all>

Stations which haven't been reported before will need station IDs.

- NH₃

No template available for NH₃.