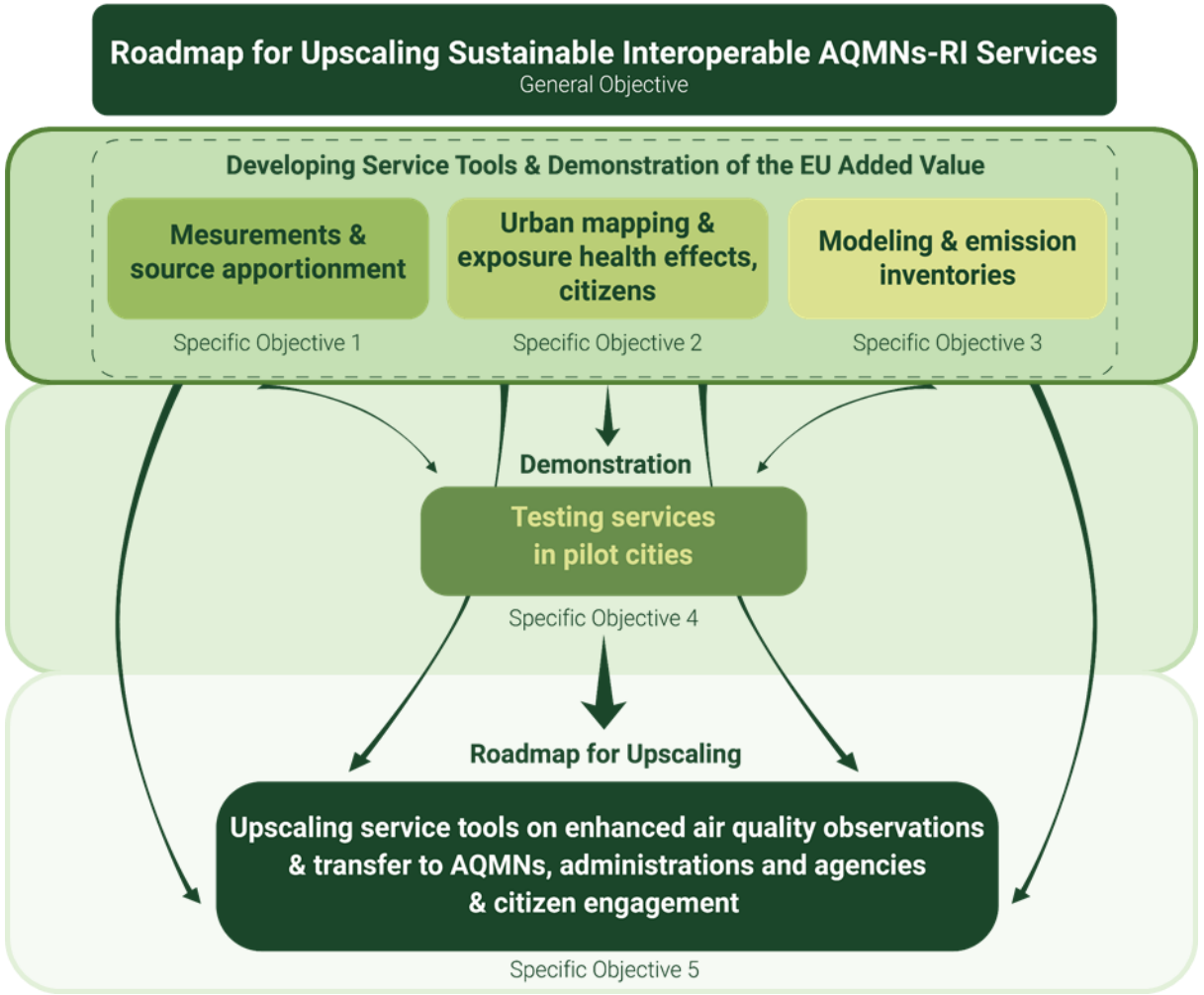
RI-URBANS: Progress & RP3

Research Infrastructures Services Reinforcing Air Quality Monitoring Capacities in European Urban & Industrial AreaS

Xavier Querol & Tuukka Petäjä

Final Scientific Meeting, 8th & 9th June 2025

RI-URBANS



RP1

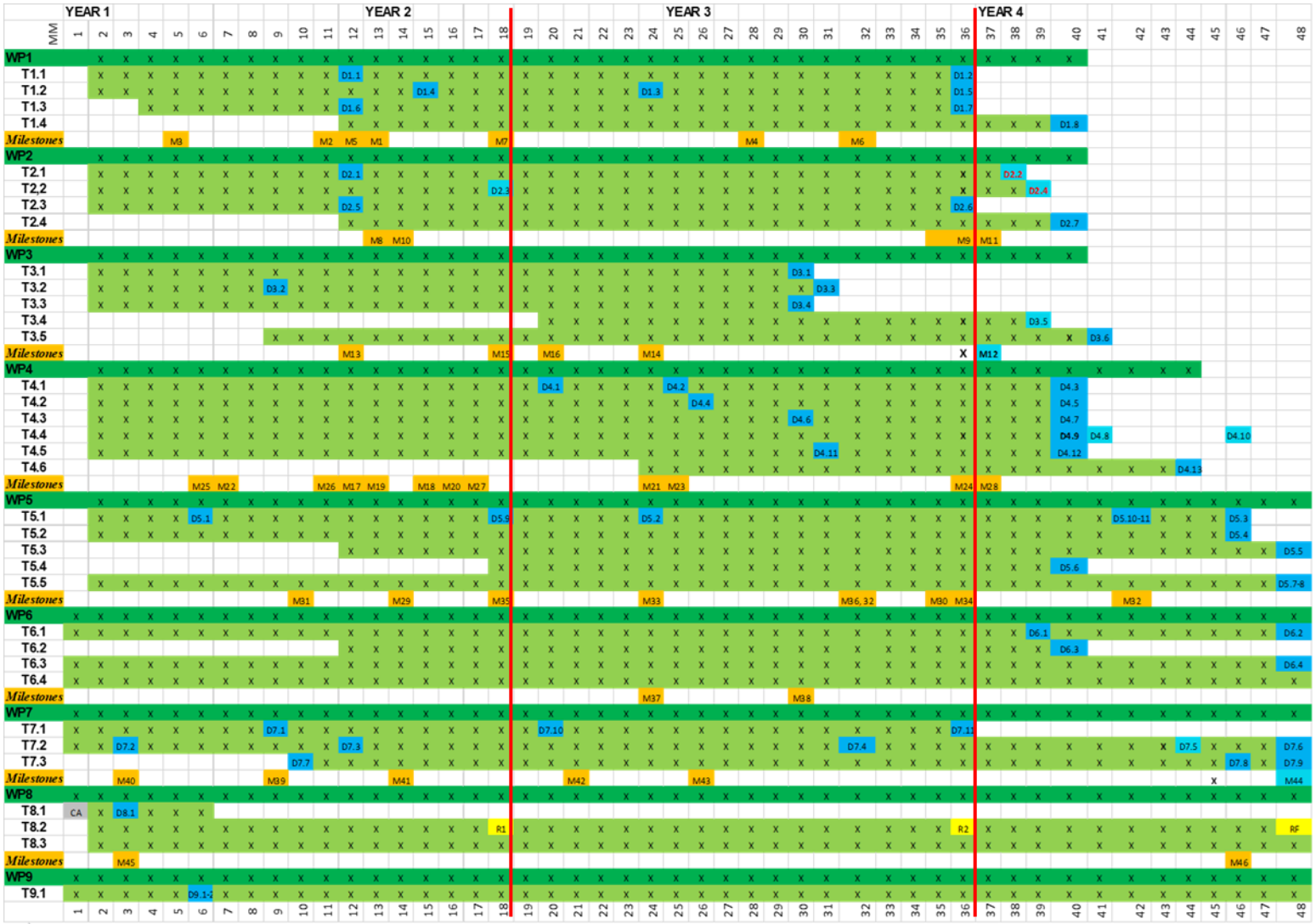
RP2

September 2025

RP3

RI-URBANS progress (1/3)

[Unforeseen deliverable (D6.1b): Recommendations for DG ENV and AQUILA from RI-URBANS and ACTRIS for implementing advanced AQ parameters of the new EU AQ Directive (in M17)](#).



D10 (D2.2): New AQ metrics and health. M36 to M38 (embargo)
D12 (D2.4): OP to assess health. M36 to M39 (embargo)
D20 (D3.5): Modelling supporting policy M36 to M39.
D21 (D3.6): Modelling health indicators M40 to M41.
D29 (D4.8): Health effects of novel AQ metrics M36 to M41.
D31 (D4.10): Novel health effect indicator pilots M40 to M46.
D54 (D7.5): Final video. M43 to M44.

M12 (M3.1): Regional models' vertical profiles M36 o M36.5.
M44 (M7.7): Project final meeting. M45 to M48.

RP3

	D	M
WP1	1	0
WP2	3	1
WP3	2	1
WP4	8	1
WP5	8	1
WP6	5	0
WP7	4	1
WP8	0	1
TOTAL	31	6

RI-URBANS progress

- RP1 & 2 accepted very positively
- All Ds and Ms submitted in time until now, but some postponements required to EC (accepted)
- 16 ST guidance documents, 1 summary booklet
- Very successful stakeholders meetings, and webinars, some with 250 attendees. List of 824 stakeholders that jhave been involved in activities
- RI-URBANS specific meetings at DG-ENV, WHO, UNECE-EMEP, EEA
- Impact in the new AAQD 2024/2881
- High impact in the official guidance documents from DG ENV on measurements, and also comments in the one on modelling

RI-URBANS progress

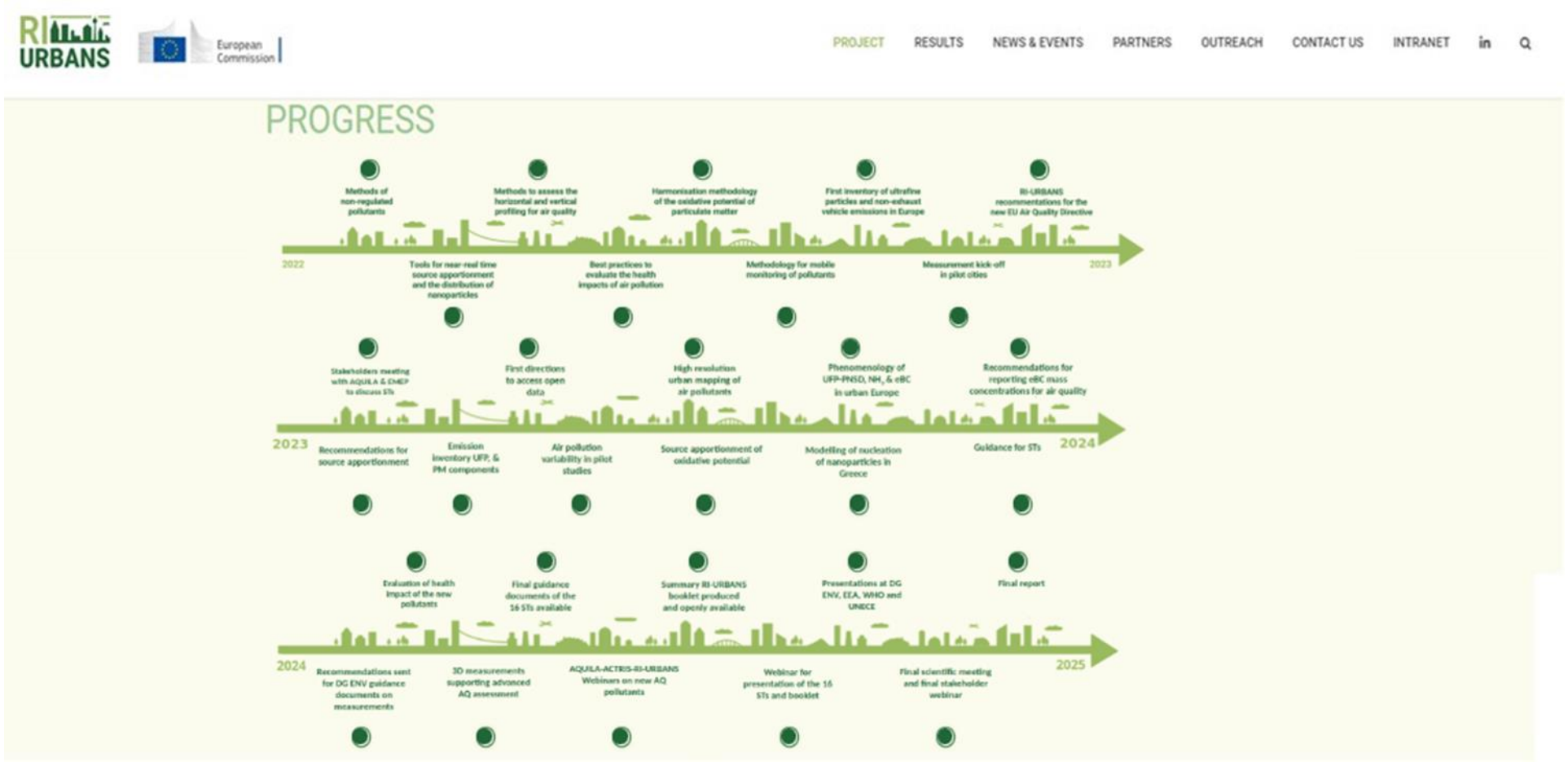
- 115 peer review articles
  - WP1: 51, WP2: 21, WP3: 20, WP4: 19, WP6: 3
- 51 PhDs involved !!!!
- Continuation in ACTRIS-NEXT, and other proposals
- RP3 report mostly finished but missing contributions to support person/month from CNR, CNRS and UU in some WPs.
- Financial reports to be sent in October

RI-URBANS Reporting period 3

Show Word doc on Final Report

RI-URBANS Progress, open data, STs

https://riurbans.eu/#progress
https://riurbans.eu/results/#open-data
https://riurbans.eu/project/#service-tools
https://riurbans.eu/results/#publications



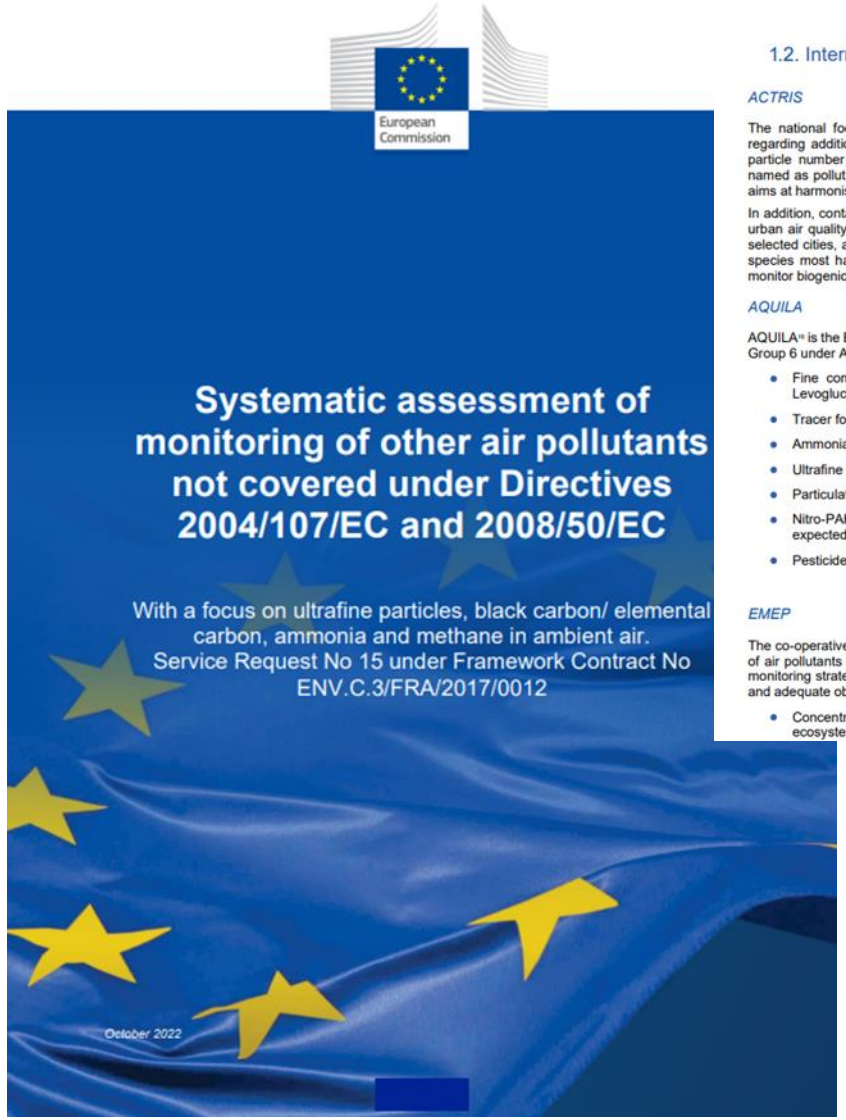
UFP, BC, OP, PM chemistry, VOCs, NH_3, source apportionment mapping, 3D measurements recommended for supersites in 2021 to DG ENV

Recommendations sent to the drafts of the new AQD, with ACTRIS

Guidance documents elaborated & openly available, webinars for AQMN experts along 2024 & 2025

HIGHLY CITED IN THE REPORT ON MEASUREMENTS FROM DG-ENV

29 references to RI-URBANS



1.2. International organisations

ACTRIS

The national focal points (NFP) of the ACTRIS[34] network were asked for information regarding additional pollutants to be monitored and their priorities. In their replies UFP, particle number size distribution (PNSD), aerosol composition (including BC/EC) were named as pollutants which are of interest to ACTRIS and for which the ACTRIS network aims at harmonising monitoring.

In addition, contact was established to the project RI-URBANS[35] which aims at innovative urban air quality service tools, complementing existing air quality monitoring networks in selected cities, and providing innovative tools to better quantify the impact of atmospheric species most harmful to human health. Next to this, the importance was highlighted to monitor biogenic VOC as ozone precursor by an ACTRIS NFP.

AQUILA

AQUILA[36] is the European Network of National Air Quality Reference Laboratories. Working Group 6 under AQUILA currently discusses additional pollutants as well, which include:

- Fine combustion particles (Black Carbon, Elemental Carbon, Organic Carbon, Levoglucosan) at urban sites
- Tracer for non-exhaust emissions of traffic, esp. metals such as Mn
- Ammonia (NH_3) in areas where critical loads for eutrophication are largely exceeded
- Ultrafine particles (UFP) and size distribution at urban super-sites
- Particulate matter oxidative potential (urban sites under research projects)
- Nitro-PAH (mainly from diesel engines, in areas where high concentrations are expected)
- Pesticides (in areas where high concentrations are expected)

EMEP

The co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe (EMEP)[37] under the UNECE Air Convention[38] has developed a monitoring strategy[39], which covers a large set of pollutants that should provide consistent and adequate observational data supporting the EMEP objectives. These include *inter alia*:

- Concentrations and deposition fluxes to assess exposure and impacts on health, ecosystems, vegetation, materials;

https://op.europa.eu/en/publication-detail/-/publication/1c9b2b51-54dd-11ed-92ed-01aa75ed71a1/language-en

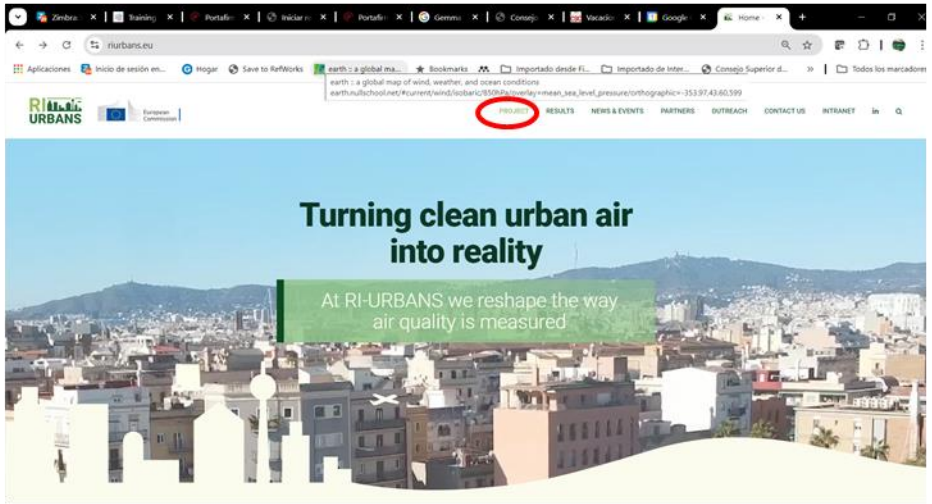
5.7. Relevant guidance documents and references

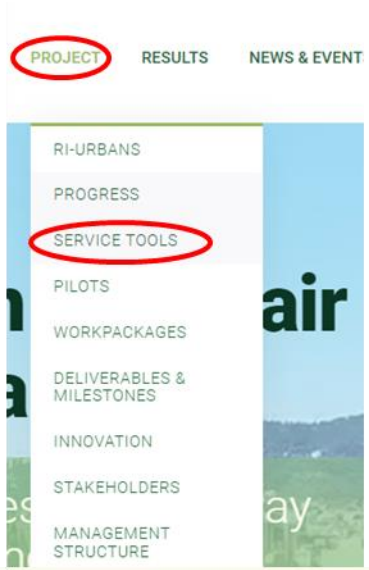
The technical support provided in this document refers to the instructions provided in Standard Methods and Technical Specifications published by the European Committee for Standardization (CEN). These Standard Methods and Technical Specifications are available for purchase from National Standards Institutes. Other relevant guidance documents are also included at the end of the section, including the EMEP Manual, RI-URBANS guidance document ST3 and GMOS SOP that are available online.

https://op.europa.eu/en/publication-detail/-/publication/8ddd9bca-3464-11f0-8a44-01aa75ed71a1/language-en

RI-URBANS' service tools

https://riurbans.eu/project/#service-tools





Explore all our advanced Service Tools for optimised urban air quality management:

- Protocols for the measurement of novel air quality variables
- Methodologies for vertical profiles of pollutants and meteorology
- Methodologies for source apportionment receptor modelling
- Methodologies for urban mapping of novel air quality variables
- Methodologies for evaluating the health effects of novel air quality variables
- Obtaining emission inventories for novel air quality variables
- Modelling methodologies for novel air quality variables

RI-URBANS' service tools

https://riurbans.eu/project/#service-tools

Summary booklet

Summary booklet

Protocols for the measurement of novel air quality variables

ST1: Ultrafine (=nano)-Particle Number Size Distributions (UFP-PNSD)

ST2: Black Carbon (BC)

ST3: Offline and Online particulate matter (PM) speciation

ST4: Oxidative potential of particulate matter (PM)

ST5: Volatile Organic Compounds (VOCs)

ST6: Ammonia (NH3)

Methodologies for vertical profiles of pollutants and meteorology

ST7: Measurements of boundary level height

ST8: Measurements of vertical profiles of aerosols

ST9: Measurements of vertical profiles by commercial aircrafts

Methodologies for source apportionment receptor modelling

ST10: Source apportionment of PM based on offline and online PM speciation

ST11: Source apportionment of UFP, BC, OP and VOCs using receptor modelling

Methodologies for urban mapping of novel air quality variables

ST12: Deterministic urban modelling of fine PM and PNC

ST13: Mapping ultrafine particles and citizen science

Methodologies for evaluating the health effects of novel air quality variables

ST14: Evaluation of health effects of novel air quality parameters

Obtaining emission inventories for novel air quality variables

ST15: Emission inventories for regional and urban scale modelling applications

Modelling methodologies for novel air quality variables

ST16: UFP-PNSD multiscale modelling

The 16 RI-URBANS' ST & the booklet

https://riurbans.eu/project/#service-tools

The advanced air quality variables and RI-URBANS's ST

Article 10 & Annex VII

Table 1 - Pollutants to be measured at supersites at urban [background] locations

Pollutant	Type of measurement
PM_{10}, $PM_{2.5}$, UFP, BC	Fixed measurements
NO_2, O_3	Fixed measurements
SO_2, CO	Fixed or indicative measurements
Size distribution of UFP	Fixed or indicative measurements
Benzo(a)pyrene, other polycyclic aromatic hydrocarbons (PAH) as relevant [1]	Fixed or indicative measurements
Total deposition [1] of benzo(a)pyrene, and other polycyclic aromatic hydrocarbons (PAH) as relevant	Fixed or indicative measurements
Arsenic, cadmium, lead, and nickel	Fixed or indicative measurements
Total deposition [1] of arsenic, cadmium, lead, nickel and mercury	Fixed or indicative measurements
Benzene	Fixed or indicative measurements
Chemical composition of $PM_{2.5}$ in accordance with Section 1 of Annex VII	Fixed or indicative measurements

Table 2 - Pollutants to be measured at supersites at rural background locations

Pollutant	Type of measurement
PM_{10}, $PM_{2.5}$, UFP, BC	Fixed measurements
NO_2, O_3 and ammonia (NH_3)	Fixed measurements
SO_2, CO	Fixed or indicative measurements
Total deposition of benzo(a)pyrene and other polycyclic aromatic hydrocarbons (PAH) as relevant	Fixed or indicative measurements
Total deposition of arsenic, cadmium, lead, nickel and mercury	Fixed or indicative measurements
Benzo(a)pyrene, other polycyclic aromatic hydrocarbons (PAH) as relevant [1]	Fixed or indicative measurements
Arsenic, cadmium, lead, and nickel	Fixed or indicative measurements
Chemical composition of $PM_{2.5}$ in accordance with Section 1 of Annex VII	Fixed or indicative measurements
Total gaseous mercury	Fixed or indicative measurements

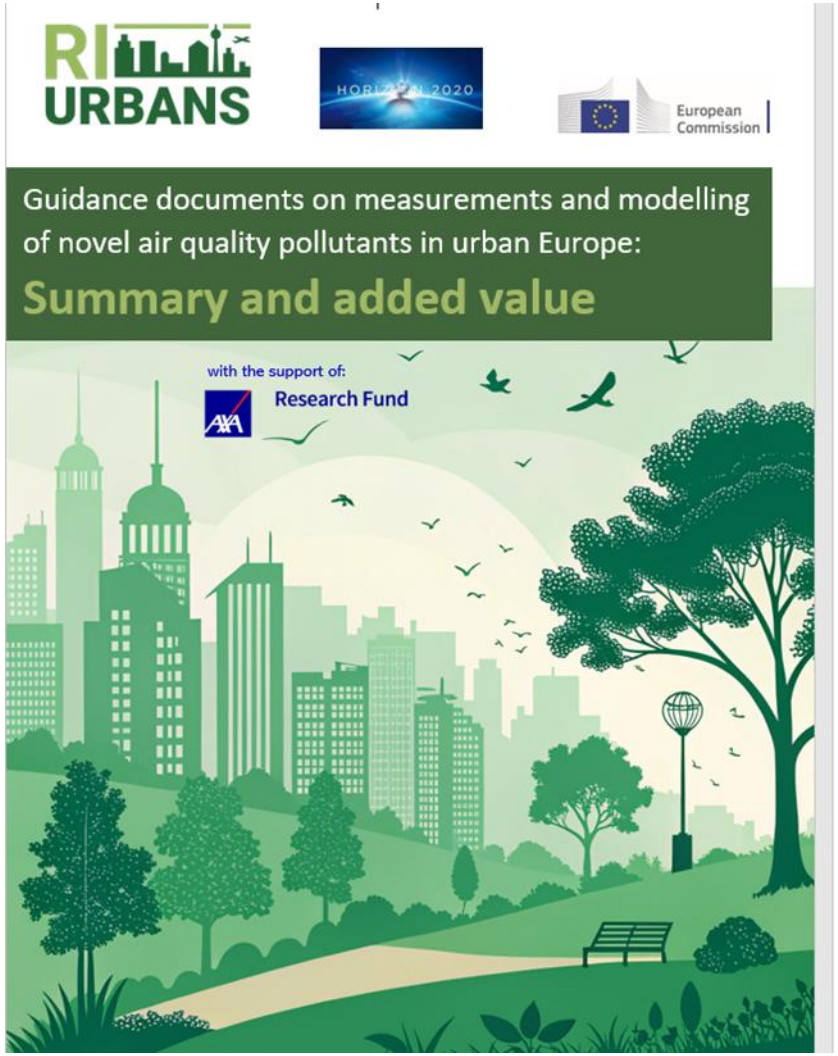
[1] benzo(a)pyrene and the other polycyclic aromatic hydrocarbons referred to in Article 9(8)

Table 3 - Pollutants recommended to be measured at supersites at urban and rural locations if not covered by the requirements of Tables 1 and 2

Pollutant	Type of measurement
Size distribution of UFP	Fixed or indicative measurements
Particulate matter oxidative potential	Fixed or indicative measurements
Total deposition of benzo(a)pyrene and other polycyclic aromatic hydrocarbons (PAH) as relevant	Indicative measurements
Ammonia (NH3)	Fixed or indicative measurements
Levoglucosan to be measured as part of the chemical composition of PM2.5	Fixed or indicative measurements
Total gaseous mercury	Fixed or indicative measurements
Particulate and gaseous divalent mercury	Fixed or indicative measurements
Nitric acid	Fixed or indicative measurements

In many cases following WHO (2021) recommendations, in others support assessing policies

The RI-URBANS' booklet



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Authors & Reviewers: See Table 2.2.

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Research Infrastructures Services Reinforcing Air Quality Monitoring Capacities in European Urban & Industrial AreaS (RI-URBANS)

RI-URBANS (http://www.RIURBANS.eu) is supported by the European Commission under the Horizon 2020 – Research and Innovation Framework Programme, H2020-GD-2020,

Grant Agreement number: 10103624

RI URBANS HORIZON 2020 European Commission

The RI-URBANS' booklet

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SPANISH MINISTRY OF ENVIRONMENT SUPPORTED THE TRANSLATION INTO SPANISH

https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/atmosfera-y-calidad-del-aire/documentacion-oficial.html

Guías RI - URBANS

Guías RI URBANS - Resumen y valor añadido

Guía RI URBANS ST1 - Partículas Ultrafinas - Distribución del tamaño

Guía RI URBANS ST2 - Determinación de Black Carbon

Guía RI URBANS ST3 - Especiación de PM en tiempo real y en laboratorio

Guía RI URBANS ST4 - Potencial oxidativo de las partículas

Guía RI URBANS ST5 - Compuestos orgánicos volátiles

Guía RI URBANS ST6 - Amoníaco

RI-URBANS' open data

Table 1 – quality-controlled data sets

The total number of sites given in parentheses includes those relevant sites that have been reported to other frameworks and those sites expected to be in EBAS soon. It does not include NRT data.

Note that the number of sites and datasets is continuously changing, current information is representative for end of **August 2025**.

IMPORTANT
The first time you follow the link to the EBAS page, a general disclaimer will appear. Please accept it and follow the link again to visit the pollutant info.

Variable	Instruments	#NRT sites	#sites	# data sets (level 2)	Link to dataset (level 2)
Aerosol absorption coefficient (also used for estimating eBC)	Filter absorption photometers (MAAP, AE33, AE31)	10.0	47.0	288.0	EBAS
particle number size distribution (PNSD)	DMPS, SMPS, CPC, APS	8.0	17.0	2082.0	EBAS
VOC data (111 number of different gas components)	Adsorption, tube, PTR-MS, online-GC, steel canister	-	23.0	1078.0	EBAS
NH_3	Online absorption, CRDS, online IC, chemiluminescence, passive sampler	-	60.0	65.0	EBAS
Aerosol chemical composition (NH_4, SO_4, NO_3, organic mass)	Aersol mass spectrometer (ACSM)	2.0	4.0	53.0	EBAS
NO, NO_2	CAPS, chemiluminescence	-	1.0	8.0	EBAS
SO_2	UV- fluorescence	-	1.0	4.0	EBAS
Elemental and organic carbon (EC/OC)	High volume sampler	-	1.0	18.0	EBAS
eBC	-	53.0	53.0	-	ZENODO
Non-refractory PM speciation	ACSM	22.0	22.0	-	ZENODO

Thank you very much for your attention!!

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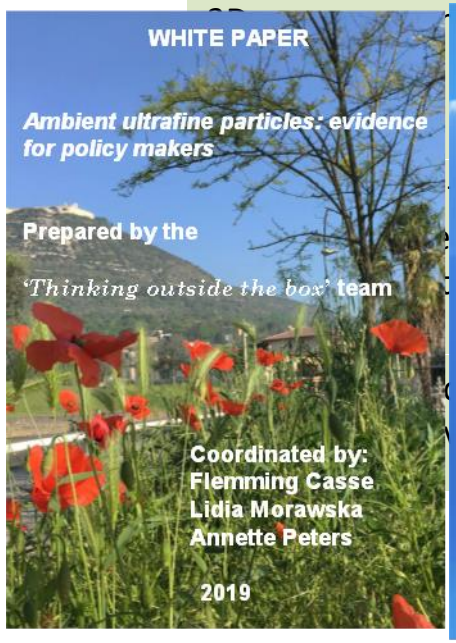
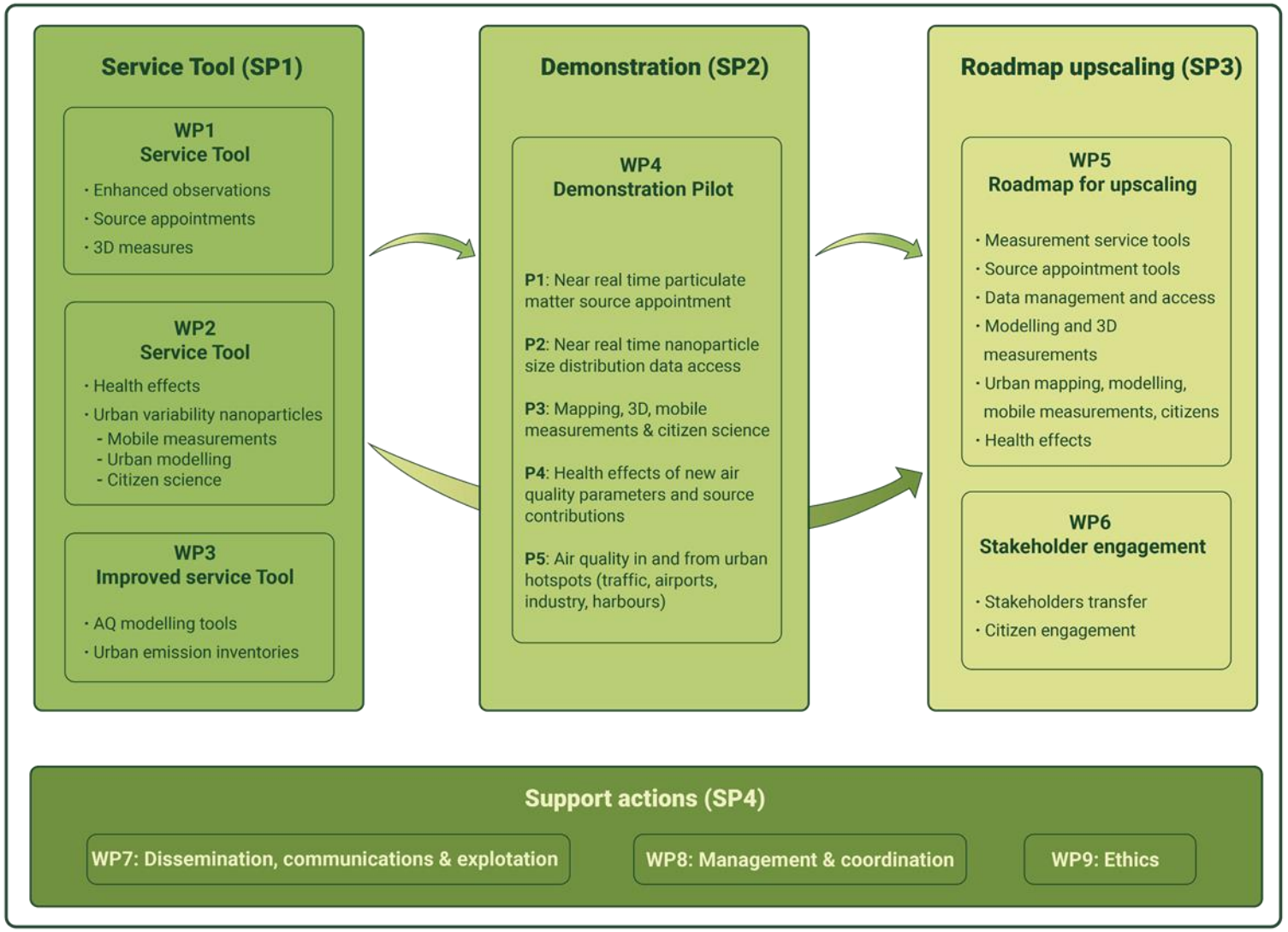
14 countries, 26 beneficiaries, 1 associated beneficiary, starting with 11 cities, 19 associated collaborators
October 2021 – September 2025

RI-URBANS' concept and service tools

UFP-PNSD
BC
Offline PM speciation
Online PM speciation
Source apportionment
NH_3
VOCs

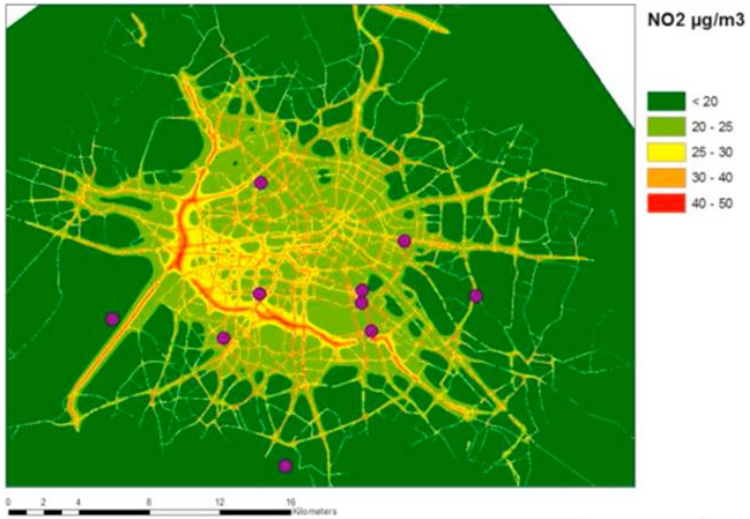




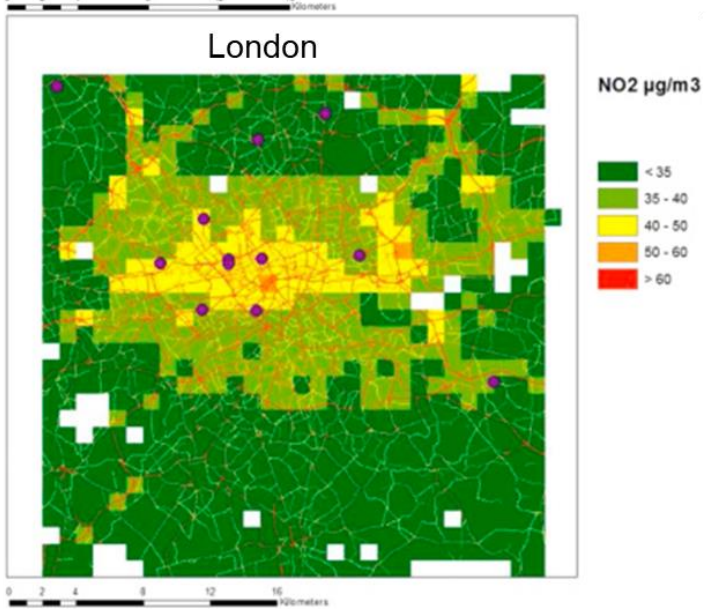
Representativeness of monitoring stations and networks

Barcelona

Berlin



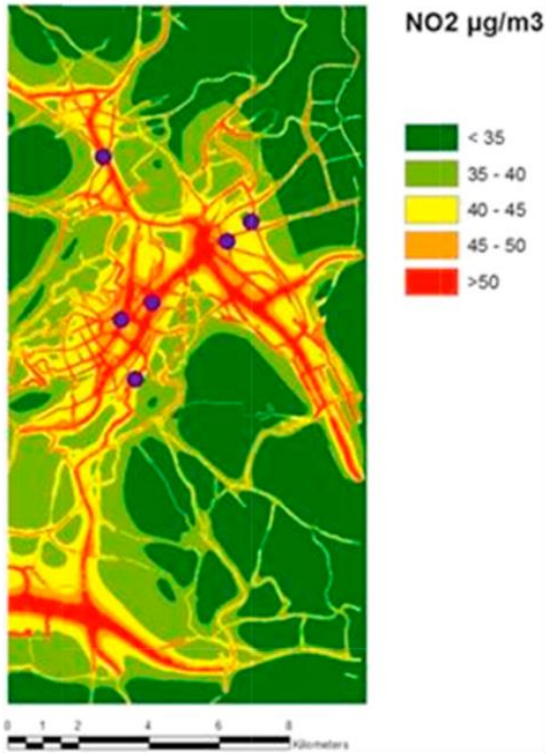
London



Duyzer J. et al., 2015, Atmos Environ

https://doi.org/10.1016/j.atmosenv.2014.12.067

Stuttgart



Representativeness of monitoring stations and networks

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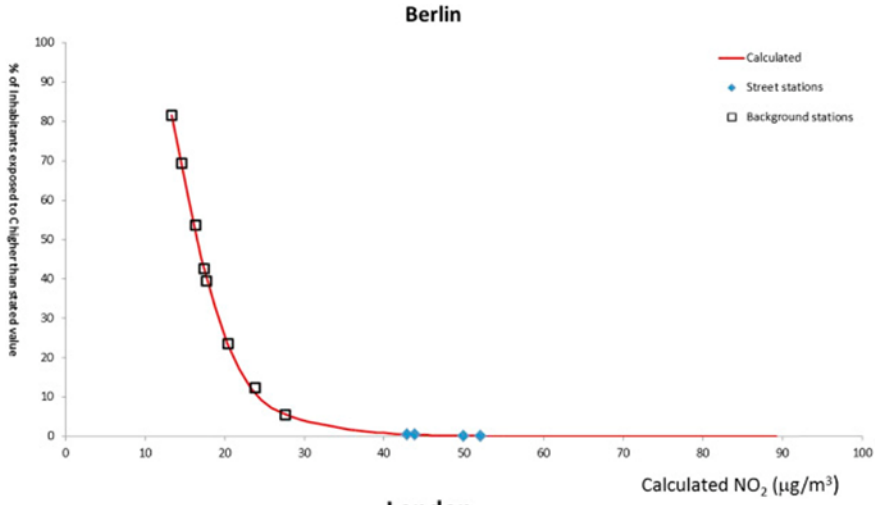
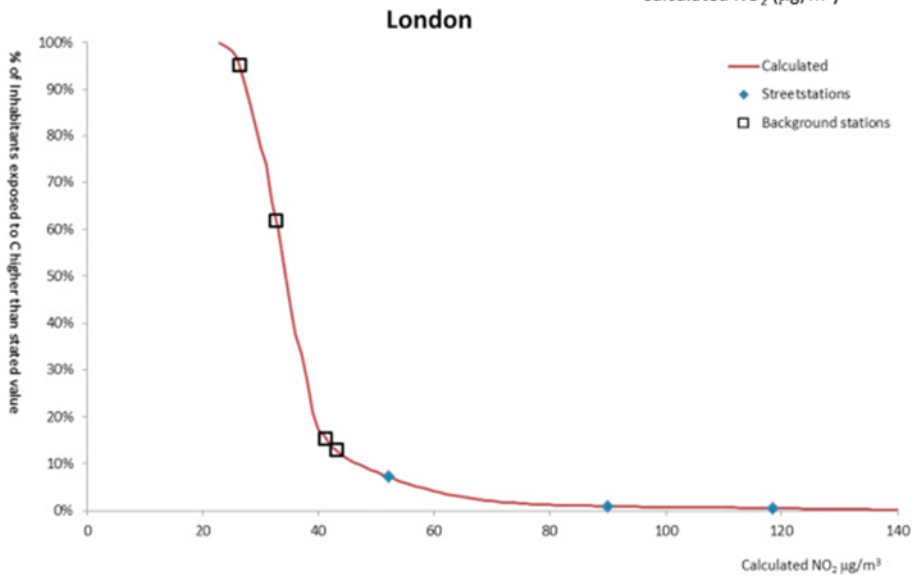
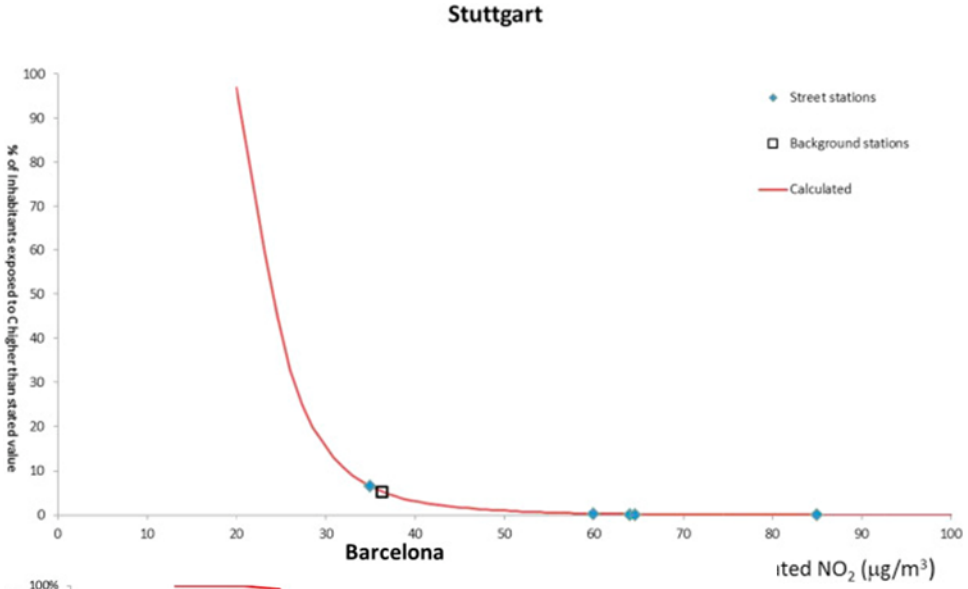
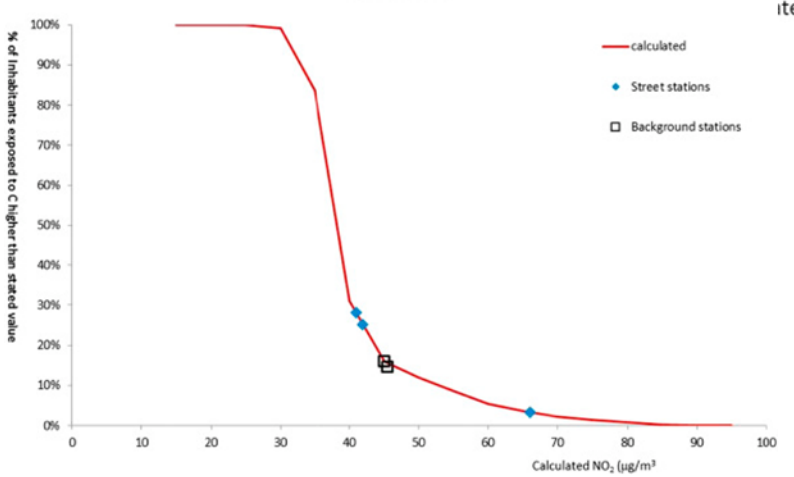


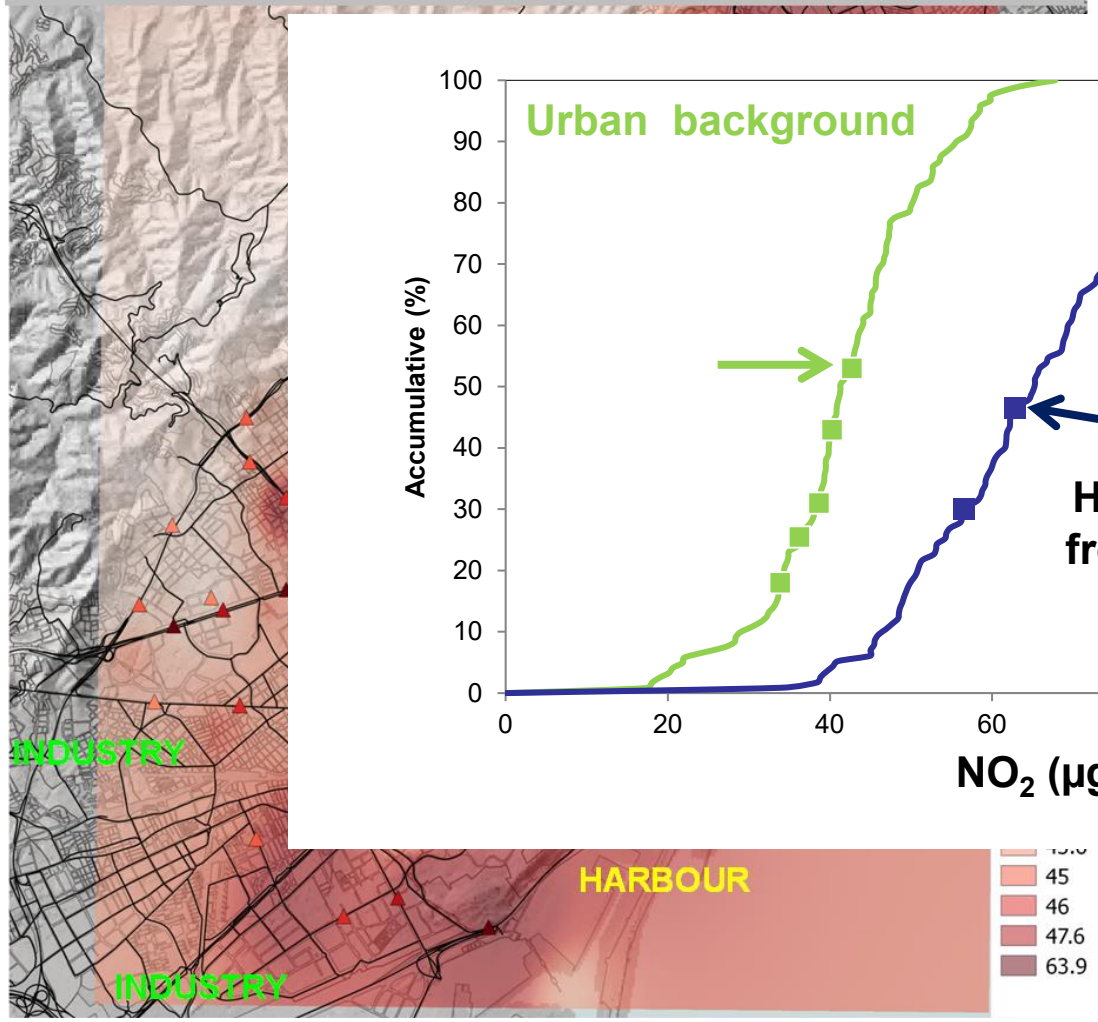




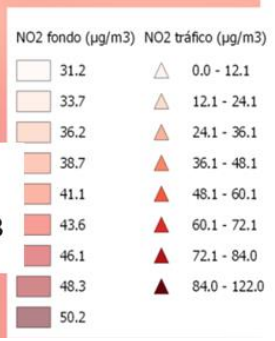


Representativeness of monitoring stations and networks

NO_2 FEBRUARY-MARCH 2017, 225 PASSIVE DOSIMETERS

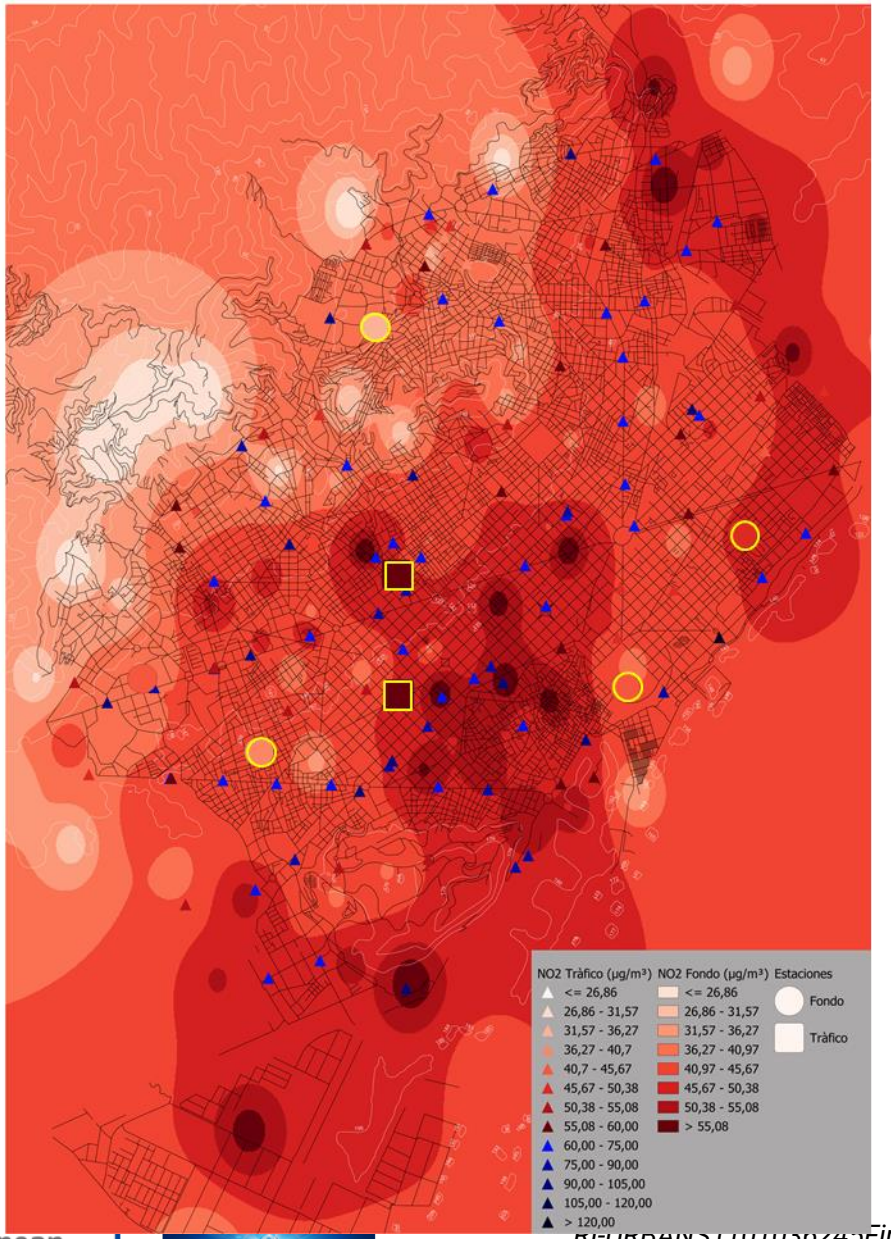


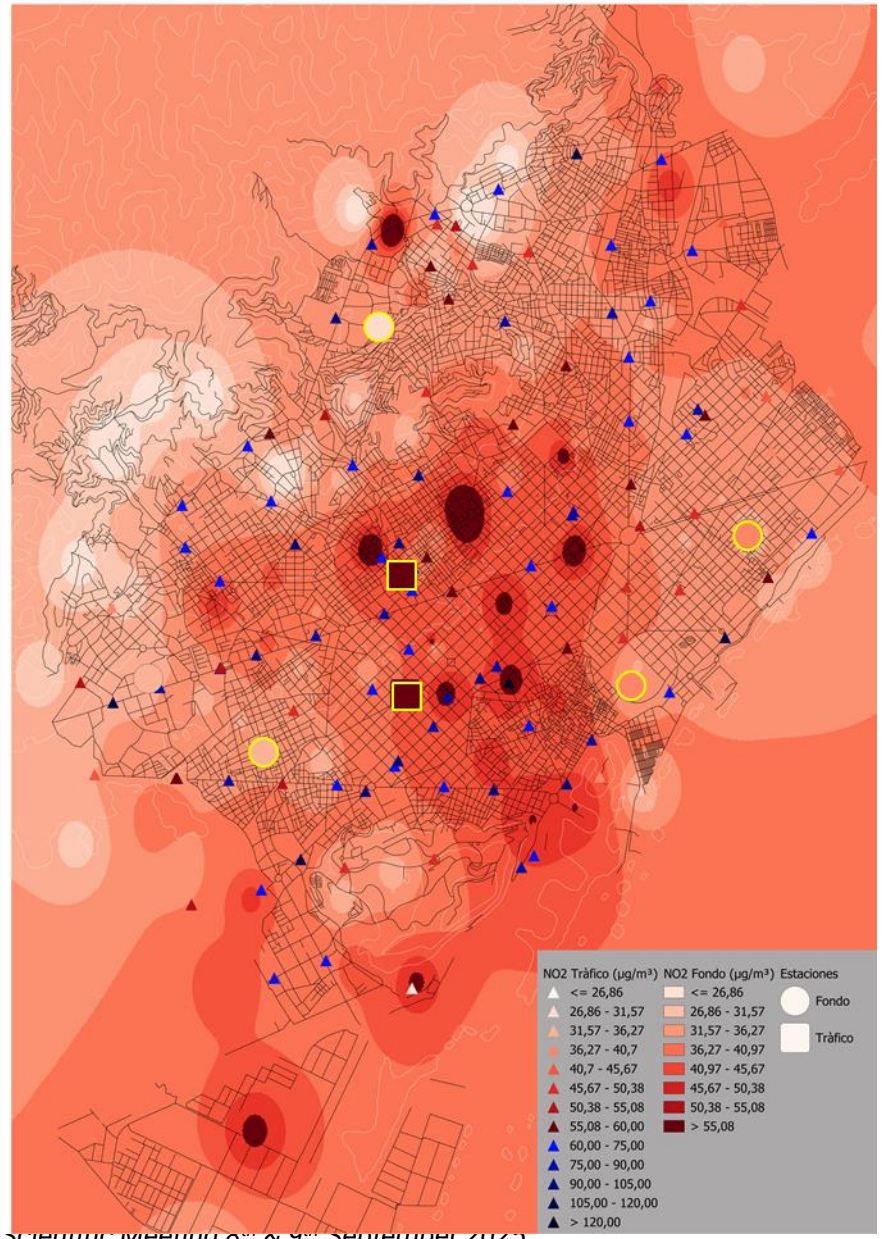
NO_2 JUNE 2018, 233 PASSIVE DOSIMETERS



Urban B-: 43 µg/m³
Traffic: 66 µg/m³

Average AQ network: 49 µg/m³


NO2 Tràfico (µg/m³)
<= 26,86
26,86 - 31,57
31,57 - 36,27
36,27 - 40,7
40,7 - 45,67
45,67 - 50,38
50,38 - 55,08
55,08 - 60,00
60,00 - 75,00
75,00 - 90,00
90,00 - 105,00
105,00 - 120,00
> 120,00
NO2 Fondo (µg/m³)
<= 26,86
26,86 - 31,57
31,57 - 36,27
36,27 - 40,97
40,97 - 45,67
45,67 - 50,38
50,38 - 55,08
> 55,08
Estaciones
Fondo
Tràfico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60,00 - 75,00
75,00 - 90,00
90,00 - 105,00
105,00 - 120,00
> 120,00
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