RI-URBANS
Research Infrastructures Services Reinforcing Air Quality Monitoring Capacities in European Urban & Industrial AreaS (Project n. 101036245)

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CSIC & UHEL

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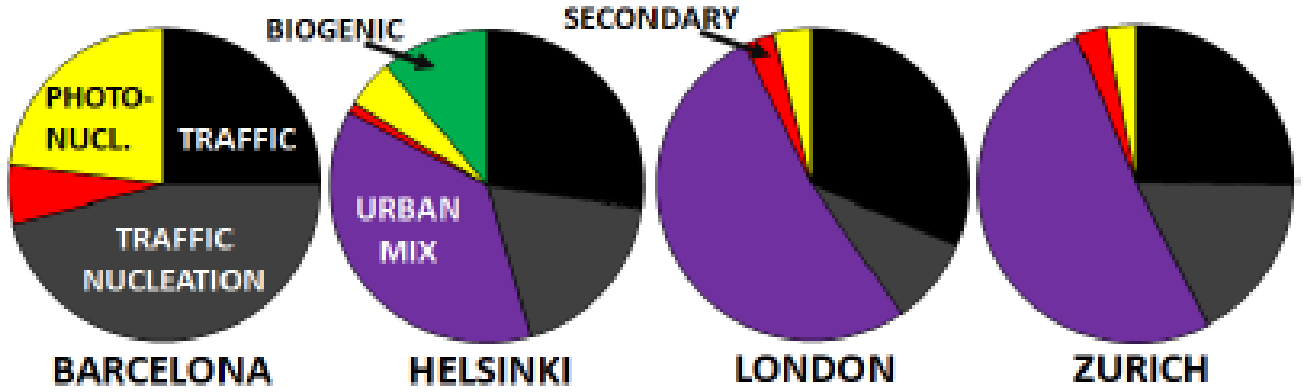
Research Infrastructures Services Reinforcing Air Quality Monitoring Capacities in European Urban & Industrial AreaS (RI-URBANS)

25 European partners

Co-coord: Xavier Querol, CSIC, Barcelona
Co-coord: Tuukka Petäjä, UHEL, Helsinki

8 MEUR budget
4 year RIA project
2021-2025

2018	% Population exposed to levels exceeding		% AQMNs recording Levels exceeding	
	EU AQ Standards	WHO AQGs	EU AQ Standards	WHO AQGs
PM2,5	4%	74%	4%	70%
NO_2	4%	4%	8%	8%
BaP	15%	75%	27%	83%
O_3	34%	99%	41%	96%



Source apportionment of particle number size distribution in urban background and traffic stations in four European cities

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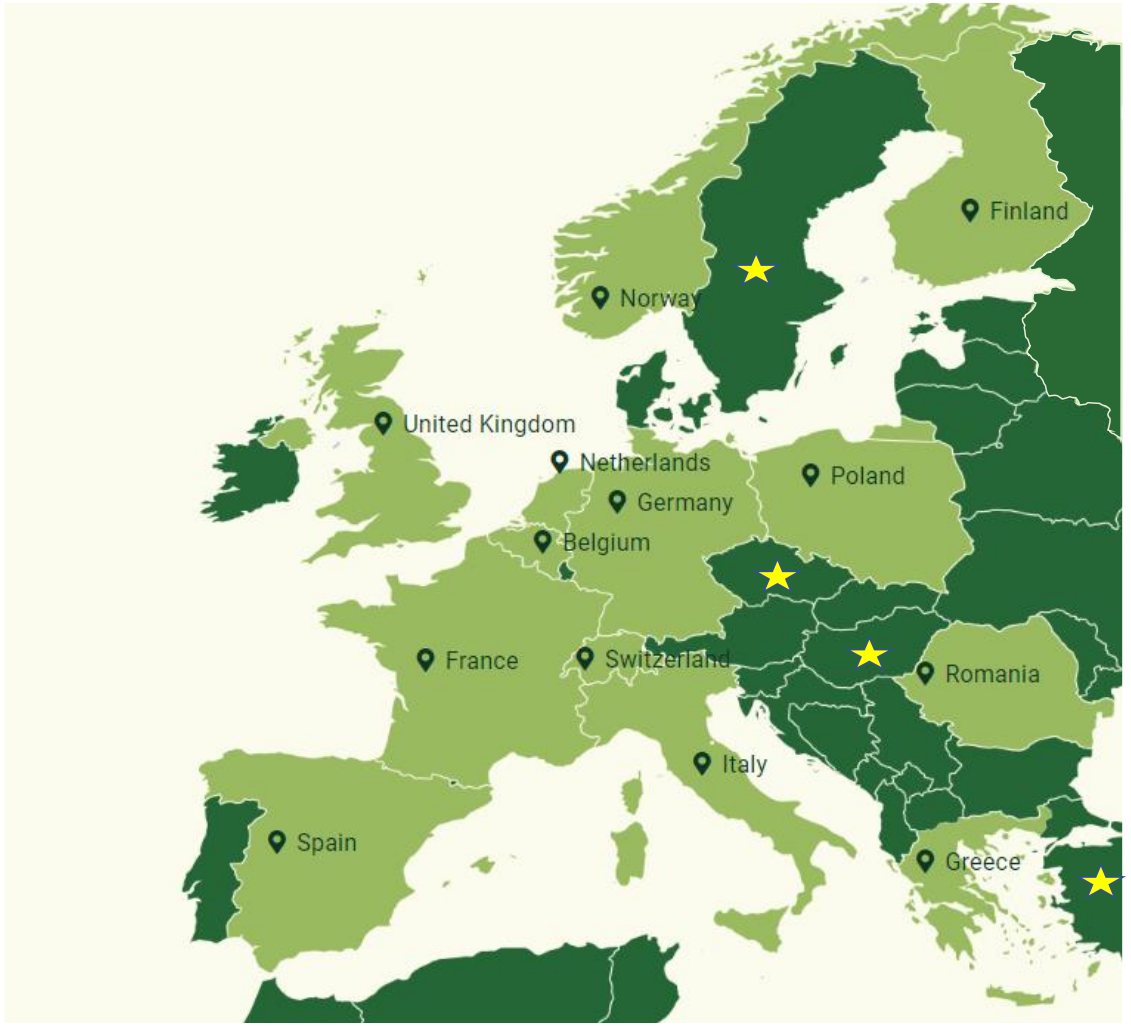
14 countries, 25 beneficiaries, 1 associated beneficiary, starting with 11 cities



CSIC · Helsingin Yliopisto · cnrs · Consiglio Nazionale delle Ricerche

University of Birmingham · FORTH · Paul Scherrer Institut PSI

vito · Empa · TROPOS Leibniz-Institut für Troposphärenforschung · Jülich Forschungszentrum · NILU

ISGlobal Barcelona Institute for Global Health · INERIS · Imperial College London · Institut Mines-Télécom

Meteorologisk institutt · TNO innovation for life · Barcelona Supercomputing Center · Inoe 2000 · Uniwersytet Warszawski

Joint Research Centre JRC

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THE TEAM

- 25 beneficiaries, 1 associated beneficiary 11 cities: Athens, Barcelona, Birmingham, Bucharest, Helsinki, Milan-Bologna, Paris, Rotterdam-Amsterdam, Zürich
- Other cities accepted for upscaling

11 cities involved in tasks, supplying instrumentation & services

Private sector providing advanced instruments for demonstration

Urban air quality expert teams

EU-Infrastructure

AQ-Heath expert teams

Experts in AQ modelling & emission inventories

Data from advanced urban AQ-supersites national networks

3D & regional dimension

IAGOS

IN-SERVICE AIRCRAFT FOR A GLOBAL OBSERVING SYSTEM

Experts in urban mapping & citizens science

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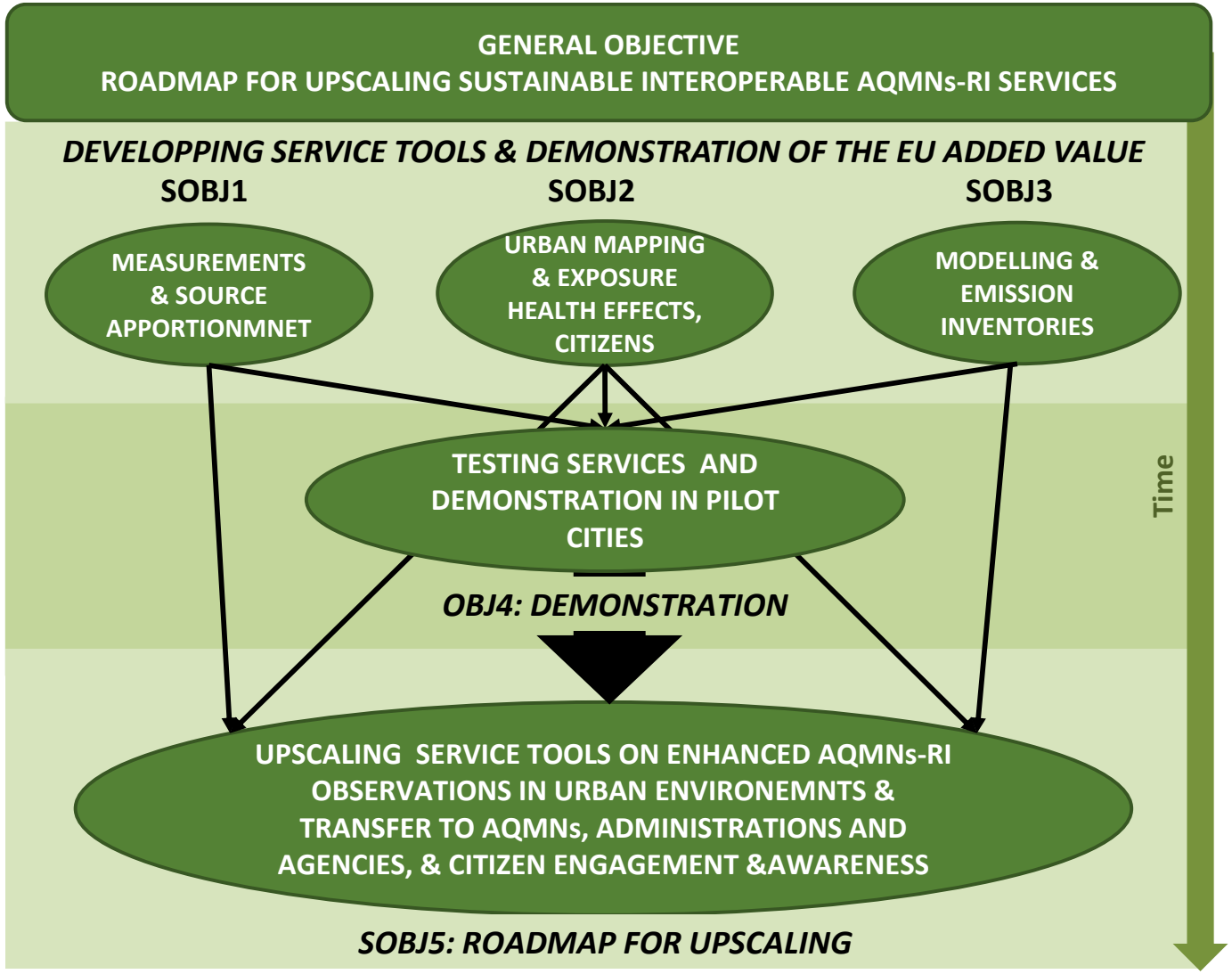
OBJECTIVES



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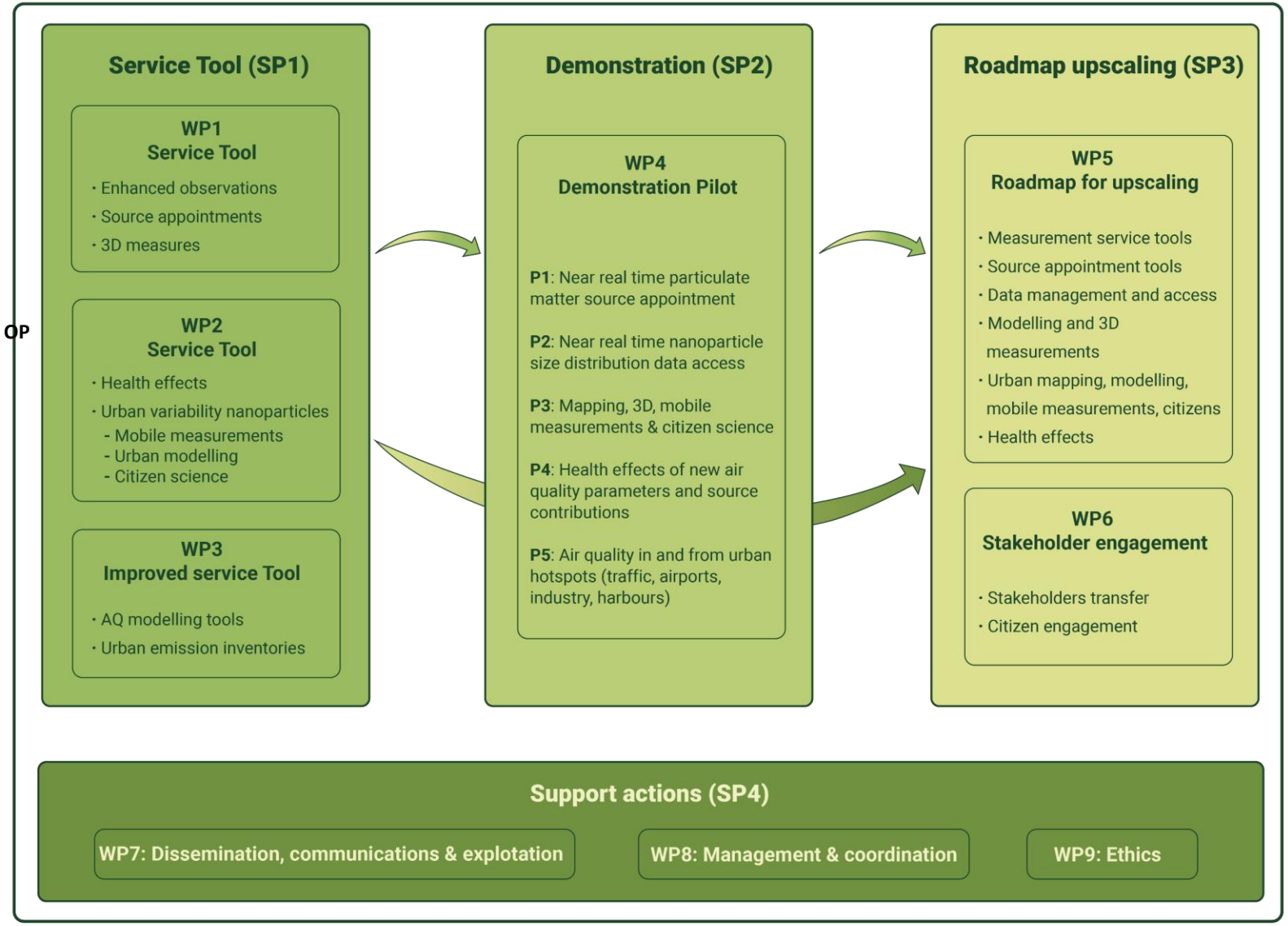
PILLARS & WORK PACKAGES

- **PM Source apportionment**
- **BC and source apportionment**
- **UFP-PNSD**
- **Urban mapping of pollutants**
- **Health effects of UFP, BC, PM sources, OP**
- **Oxidative potential**
- **NH3**
- **VOCs**



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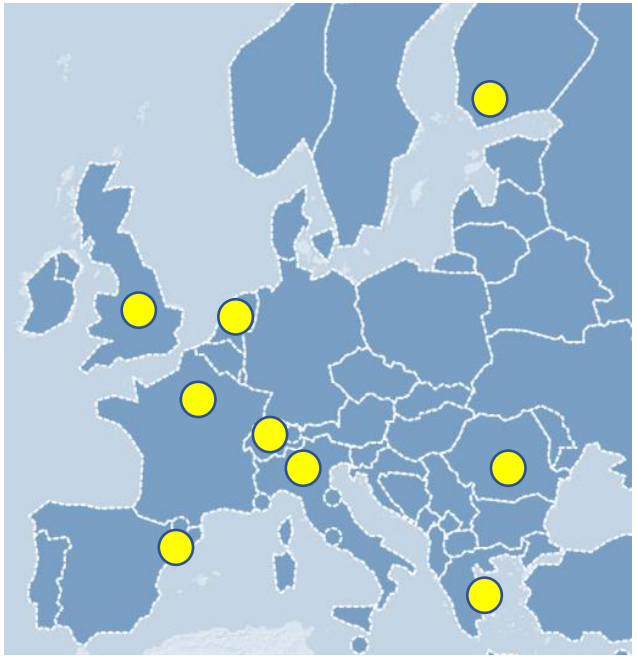
Athens, Barcelona, Birmingham, Bucharest, Helsinki, Milano, Paris, Rotterdam, Zurich

5 pilots for testing and demonstrating RI-URBANS services:

- Near-real time data on:
  - aerosol source apportionment of carbonaceous aerosols,
  - nanoparticle-number size distribution
- urban fine scale mapping including with innovative modelling, monitoring, and crowdsourcing
- novel health indicators of nanoparticles and PM components and source contributions,
- quantifying the air pollution emission sources in urban hotspots (intense traffic and/or industries)



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WP4: Pilots in 9 cities

- Overall, the 5 pilots are organised in 9 urban areas, representing a **variety of conditions** (climate zone, size of the urban area, presence of hot spots such as industrial areas, harbours, airports, roadsides).
- At least 3 cities involved in each pilot, where some STs are already implemented in one of the cities, and the others will replicate, in such a way that all cities will replicate at least one STs in the pilot.

Pilot – Task / European City	ATH	BCN	BIRM	BUC	HEL	MIL	PAR	ROT	ZUR
P1 - T4.1 - NRT aerosols	X				X	X	X		X
P2 - T4.2 - NRT nanoparticles		X	X		X				
P3 - T4.3 - Urban fine scale mapping			X	X			X	X	
P4 - T4.4 - Novel health indicators	X	X							X
P5 - T4.5 - Pollution hotspots				X		X		X	

Aerosol source apportionment

- An open access web-browser based data visualization tool to communicate about the NRT-SA results has been developed and will be shortly available publicly.
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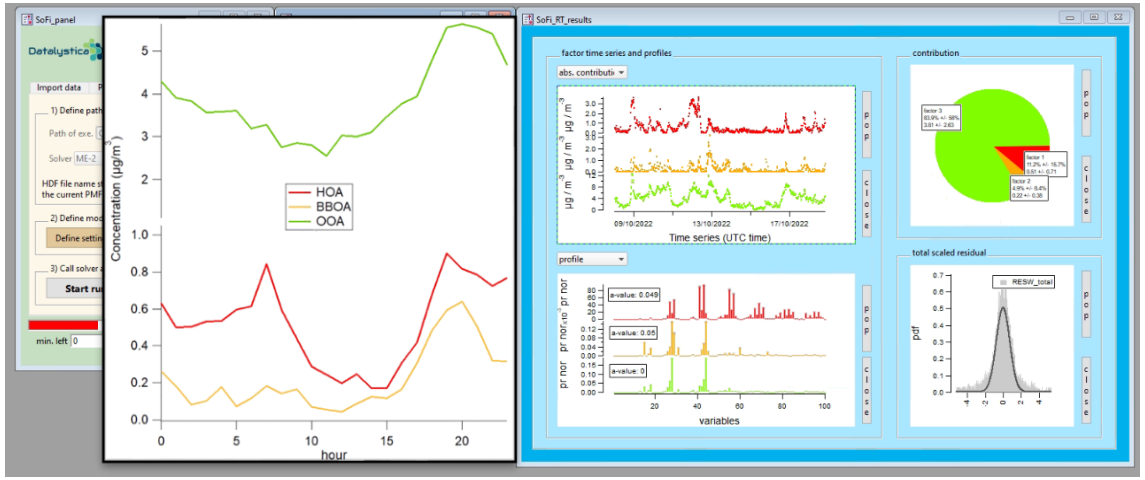
- https://dataviz.icare.univ-lille.fr/acsm_dataviz
- ACSM SA results to be added to visualization



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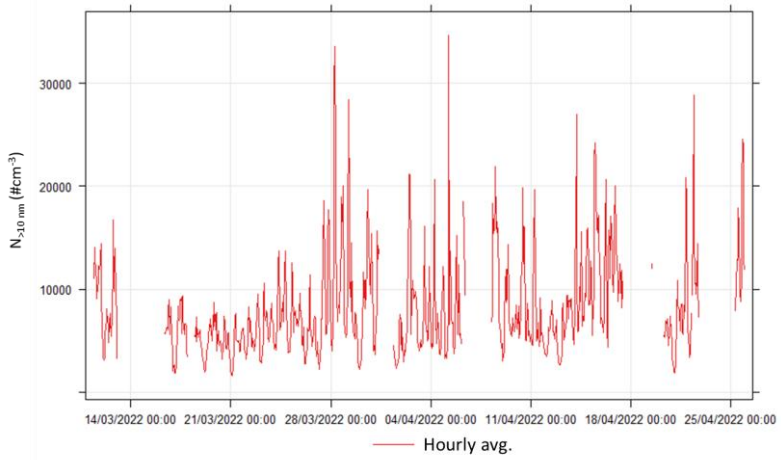
Near Real Time (NRT) data provision of nanoparticles and size distributions

- 3 main sites: BCN; HEL and BHAM



MEASUREMENT SITE:	Barcelona (Palau Reial)	Helsinki (Mäkelänkatu)	Birmingham (BAQS)
EBAS ID:	ES0019U	NA	
TYPE OF STATION:	Urban background	Urban traffic	Urban background
COORDINATES:	41º23'15''N, 02º07'050'E	60.196436N 24.951979E	52° 27' 19.872" N, 1° 55' 44.213'' W
ALTITUDE:	80 m.a.s.l.	22 m.a.s.l.	146 m.a.s.l.
NOTES:	Located in a residential area in the NW of Barcelona at 200 m distance from one of the busiest avenues of the city (>60,000 vehicles per working day)	Located in a street canoyn by a busy road. Additional data available from an urban background site (SMEAR III) ca. 1 km from the Mäkeänkatu site.	3.5 km SW of city centre, located within a small green space within the grounds of the University, surrounded by residential and campus facilities. (~7,000 vehicle per day)

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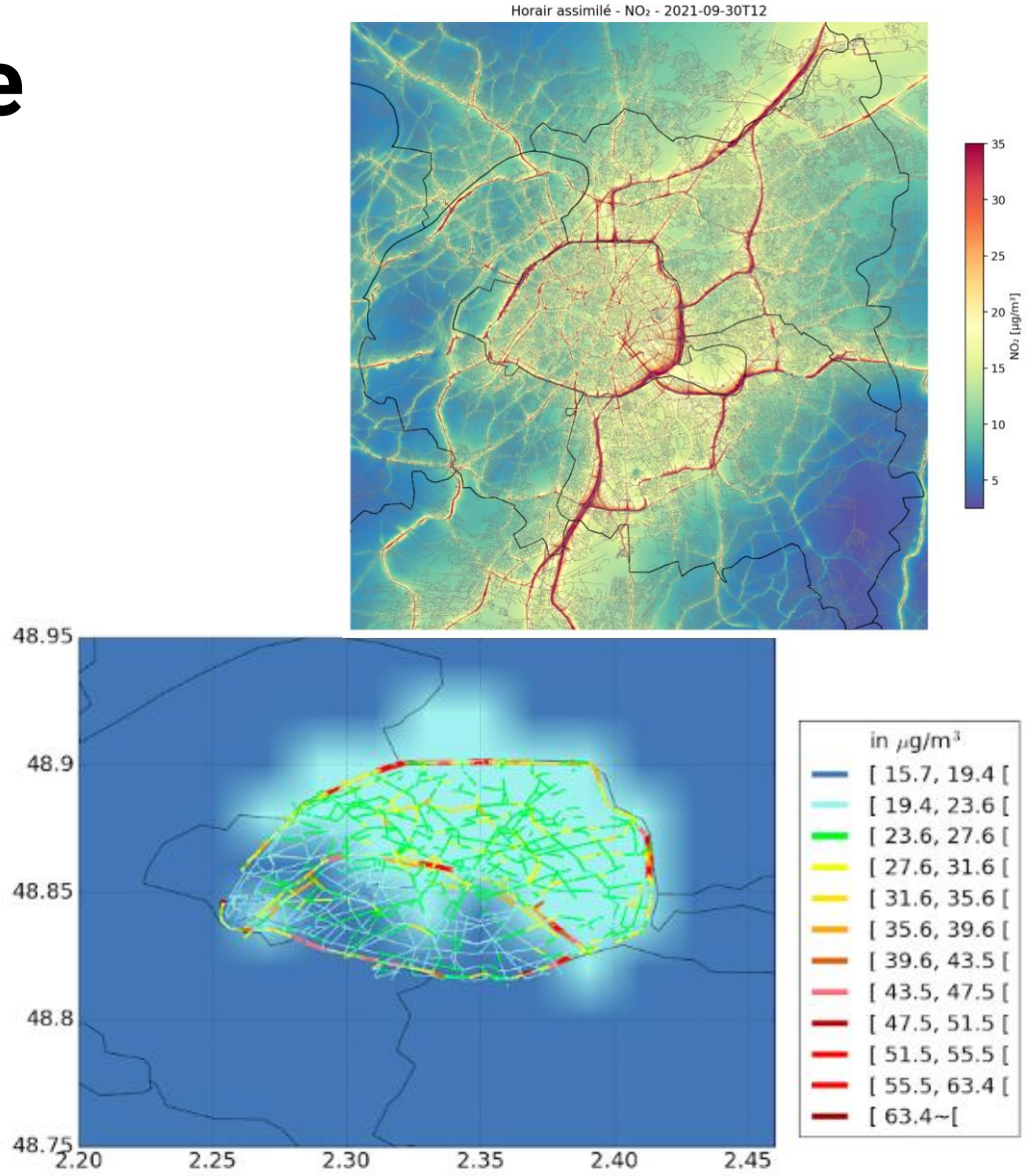
PARIS: mapping with multi-scale modelling

- Regional-scale background concentrations 1 km x 1 km
- Local-scale modelling with ADMS/data assimilation (Airparif) and MUNICH model
  - **ADMS/data assimilation**: daily forecast for NO_2, PM_{10}, $PM_{2.5}$, ***BC*** (to be added)
  - **MUNICH**: street-network model with comprehensive chemistry and aerosol dynamics (NO_2, PM_{10}, $PM_{2.5}$, BC, organics and inorganics, **PN** (to be added))



$PM_{2.5}$ concentrations in 2014 *(Lugon et al. 2021)*

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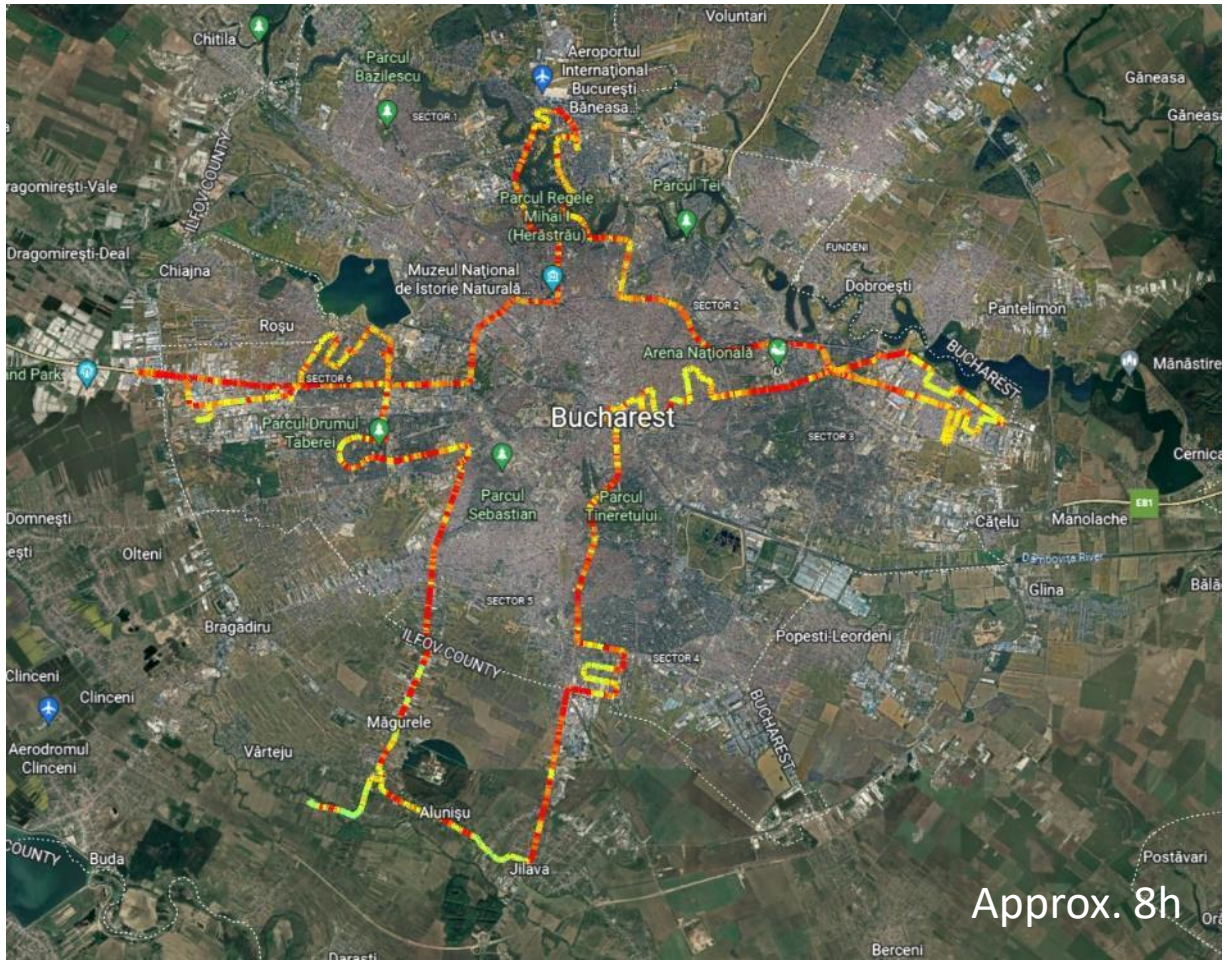
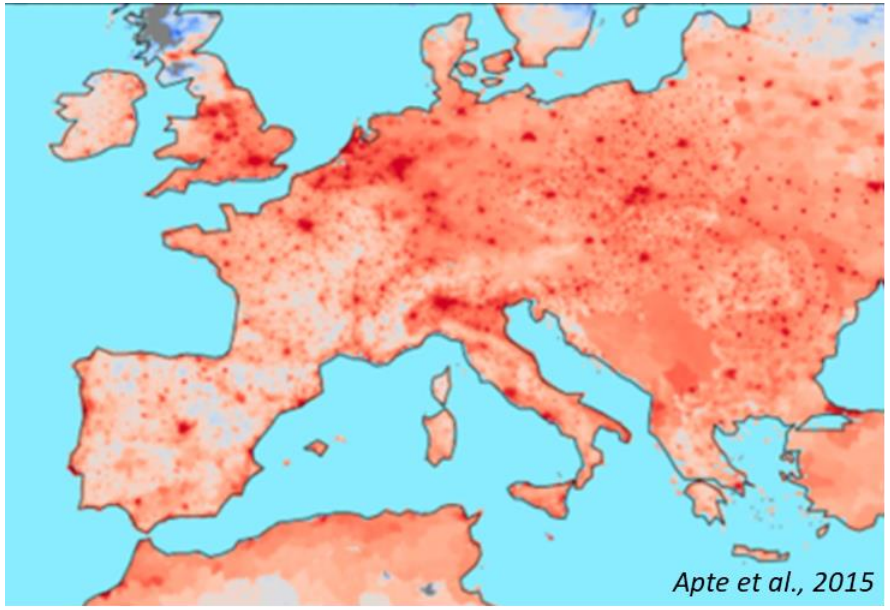
Bucharest mapping

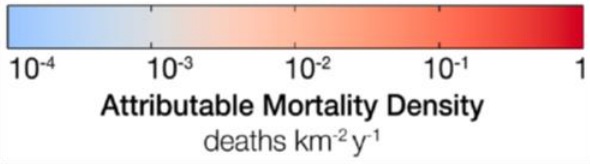
- **Route**
  - Approx. 8h (8:30-17:00), including rush hours
  - Main traffic roads
  - Residential areas
  - Industrial and commercial areas
- **Model:** ESCAPE Land Use Regression models + RLUR tool +QGIS
  - Road segments: ~250 m; midpoint coordinates
  - Dependent variables: average concentration of pollutant per road segment (UFP, PM10, PM2.5, PM1)
  - GIS predictors variables: Corine CLC2018 Land use (industry, urban, green) in buffers of 100, 500, 1000 si 5000 m, traffic variables (including traffic intensity and road lengts variables) in buffers from 50 to 5000 m, and population density in buffers from 100 to 5000 m.



Health effects of PM

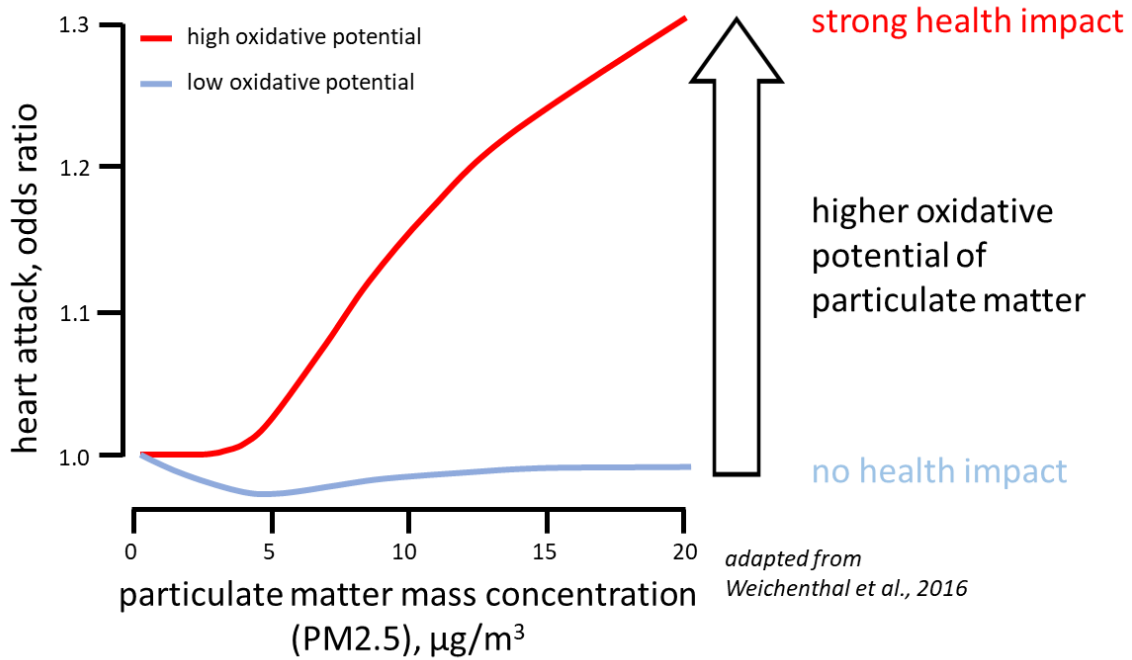
Health impacts estimated based on **particulate matter (PM) mass concentration**.





Particulate matter's oxidative potential (OP):

- PM's capacity to oxidize molecules by producing reactive oxygen species
- PM's OP depends on chemical composition of PM.
- What are the emission sources controlling PM's OP?



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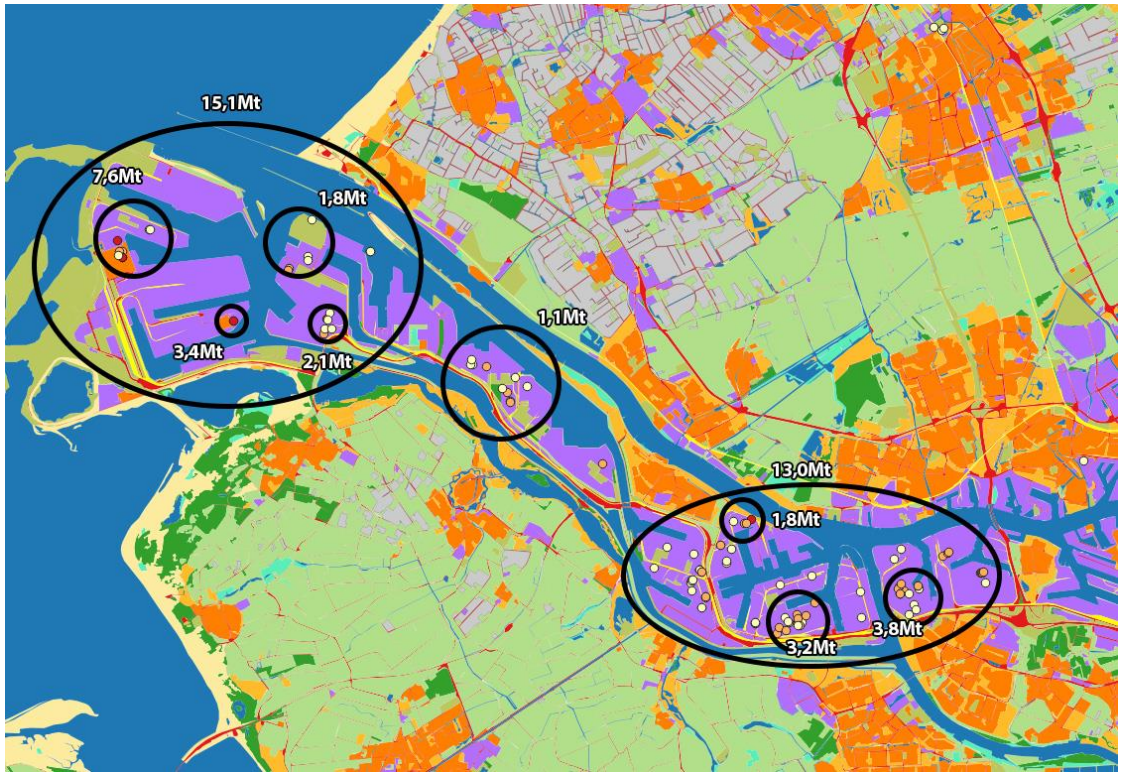
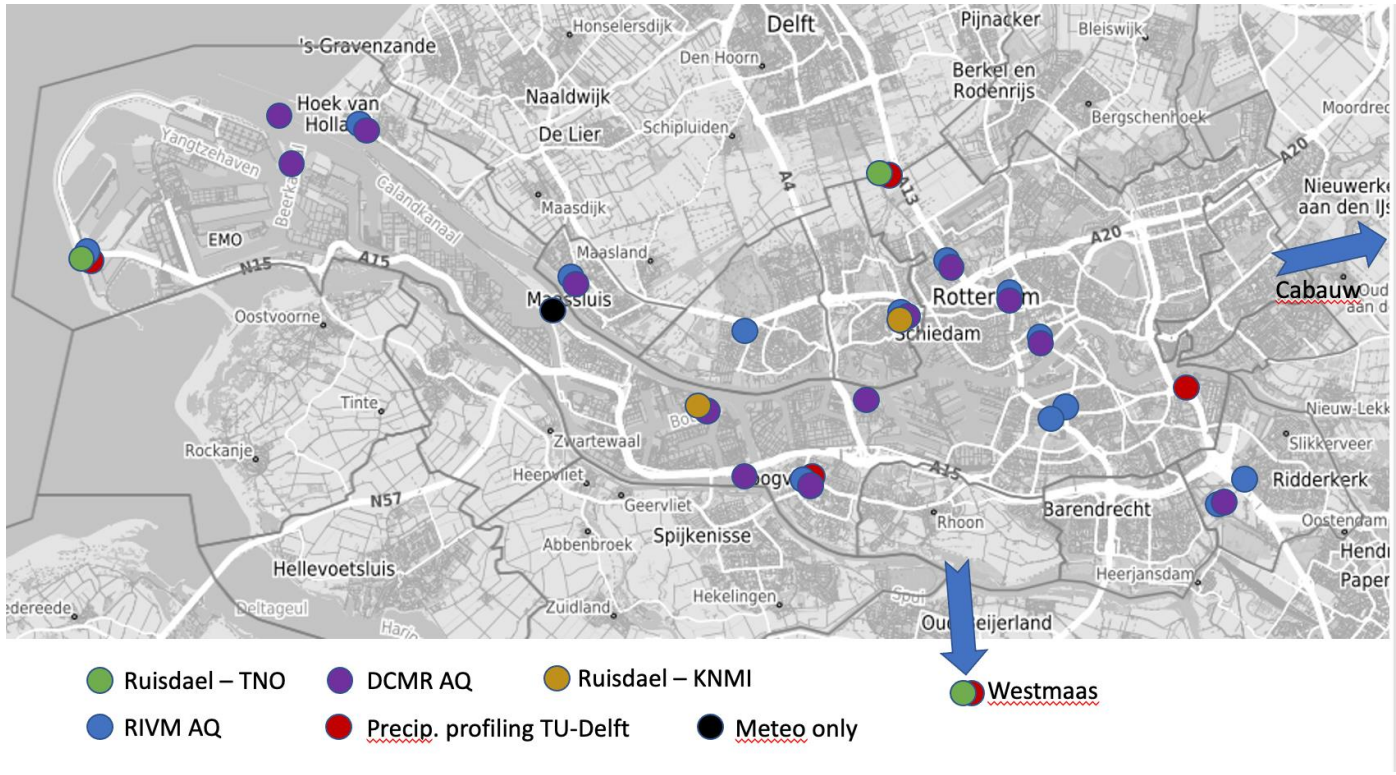
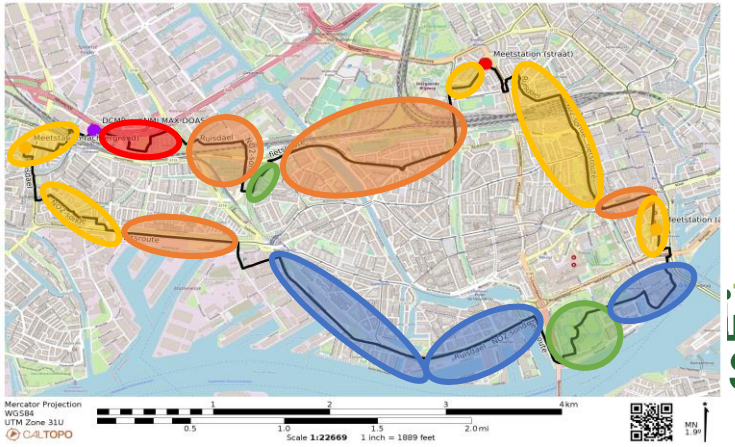
Rotterdam harbor CO_2 emissions



Air quality observations



NOx mapping with citizens



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Service tools already provided

i) Guidelines, datasets of non-regulated pollutants incl. metadata, methods, QA. BC, UFP-PNSD, PM speciation, NH3, VOCs
ii) Providing of data management and QA/QC tools for centralising, communicating and analysis.
iii) NRT source apportionment ST for submicron carbonaceous matter (pilots).
iv) Data management for online source apportionment ST.
v) NRT aerosol number size distribution ST for RI-URBANS.
vi) Observational methodologies for horizontal and vertical profiling for AQ purposes.
vii) Harmonization of oxidative potential (OP)
viii) Best practices for evaluation of nanoparticles and health for application in pilots.

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Thank you very much for your attention!!!!!

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