H2020 ClairCity project: Assessment of air quality impacts for Bristol City Council

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ClairCity objectives

- Putting **citizens behaviour** and practices at the **heart of the debate**
- Develop a suite of **innovative toolkits** for enhanced **quantification**, **engagement** and **impact evaluation**
- Integrate **citizens behaviours in city policies** now and in the **future**
- Raise **awareness** of environment changes and their **solutions**

The ClairCity approach

- Six distinct case studies
  - Bristol: pilot case study
  - **City with a traffic problem: high NO_2 concentrations**
  - **Potential problem related with PM2.5 concentrations**

Not every city is the same…

The ClairCity approach

Benchmarking behaviour

Quantification of baseline

Assessment of Policy

DELPHI survey & workshops

Skylines game

MLW

Stakeholders Dialogue Workshop for scenarios generation

Quantification of Impacts

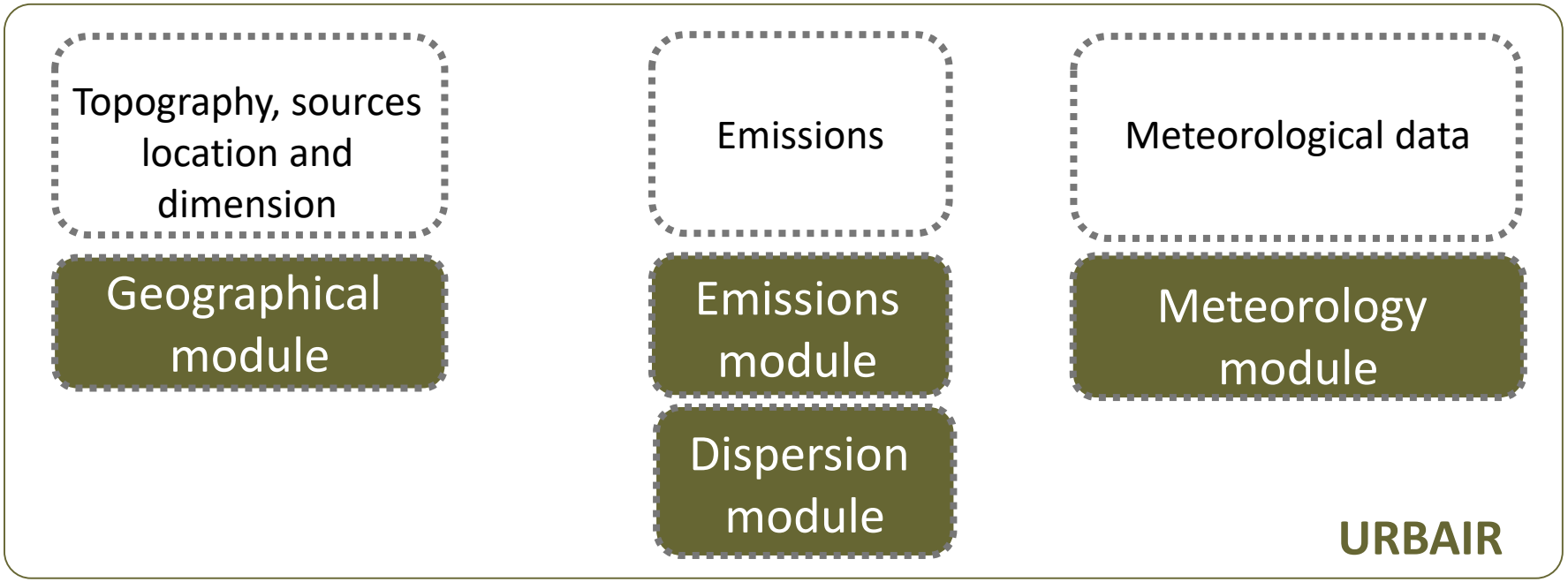
Scenarios Evidence

Policy Package

Air quality at urban scale

URBAIR modelling approach

- Road traffic
- Industrial
- Residential
- Commercial
- Power generation



'Priority Air Pollutants'

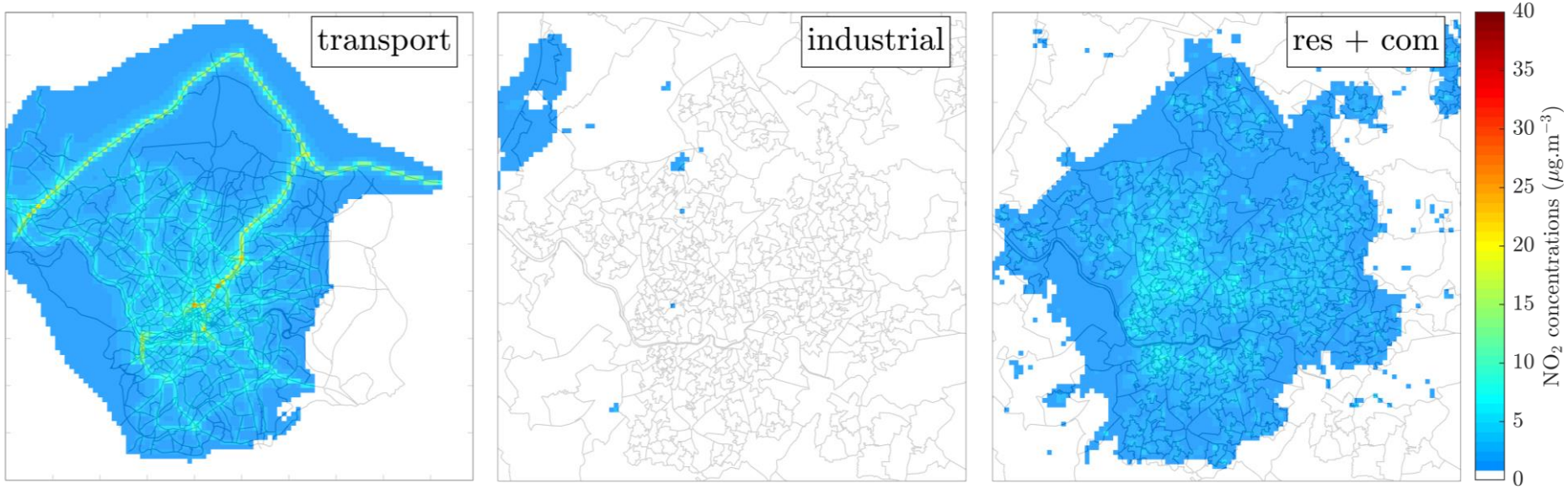
concentration fields
NO_2, PM10, PM2.5

Air quality maps

NO_2 concentrations

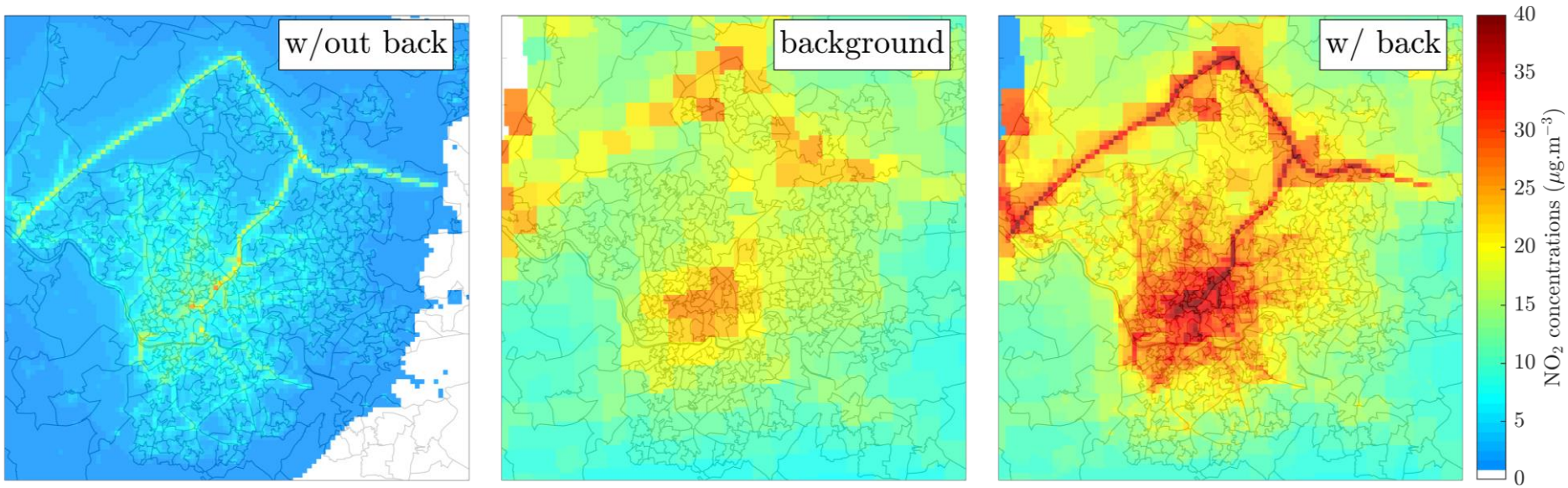
NO_2 concentrations

- URBAIR model outputs
- Different categories were simulated separately
- Underestimation of the simulated concentrations



Background concentrations

- NO_2 concentrations
- Transboundary contribution and other remaining sources
- Concentration maps from UK's Department for Environment Food & Rural Affairs (DEFRA)
- Contributions from aircraft, rail, other and rural sectors



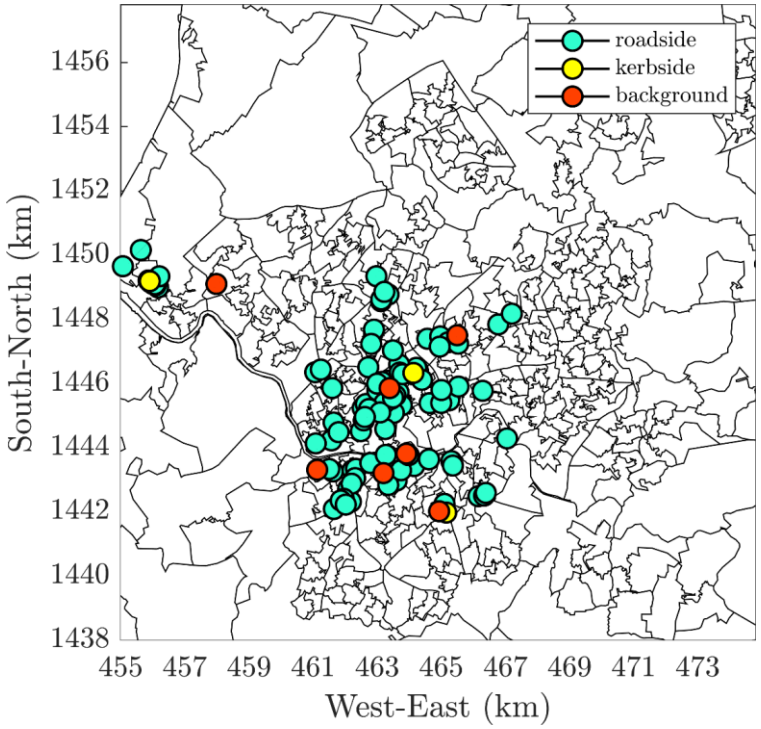
Model adjustment

NO_2 concentrations

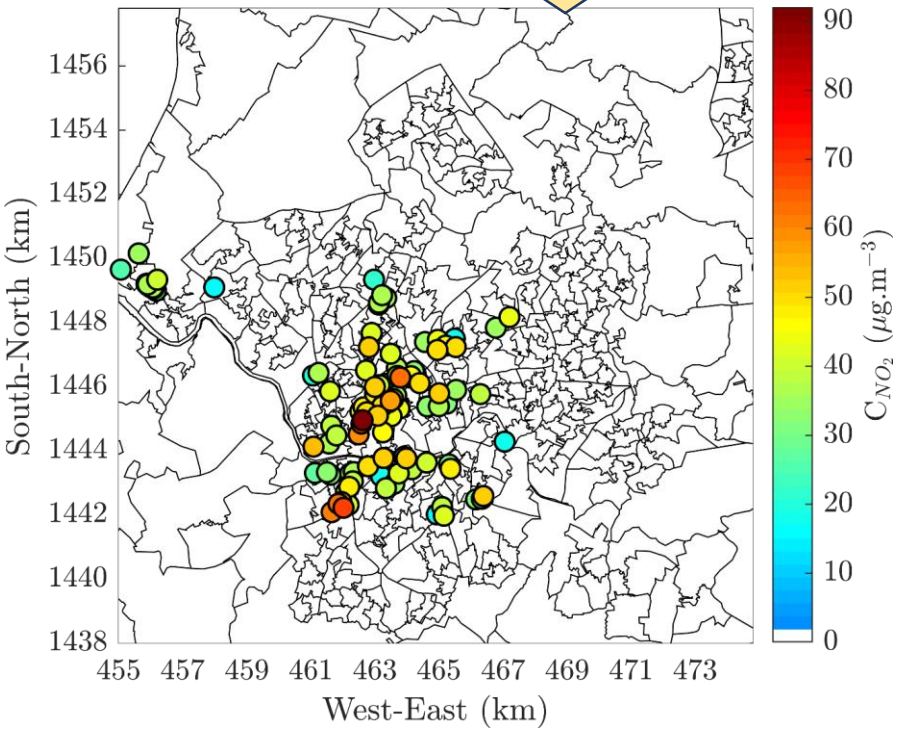
Diffusion tubes measurements

- A total of 107 tubes:
- 96 roadside, 4 kerbside and 7 background tubes

min = 16.6 µg.m^{-3}
max = 91.2 µg.m^{-3}
mean = 42.1 µg.m^{-3}



Location of the diffusion tubes with information about the site type

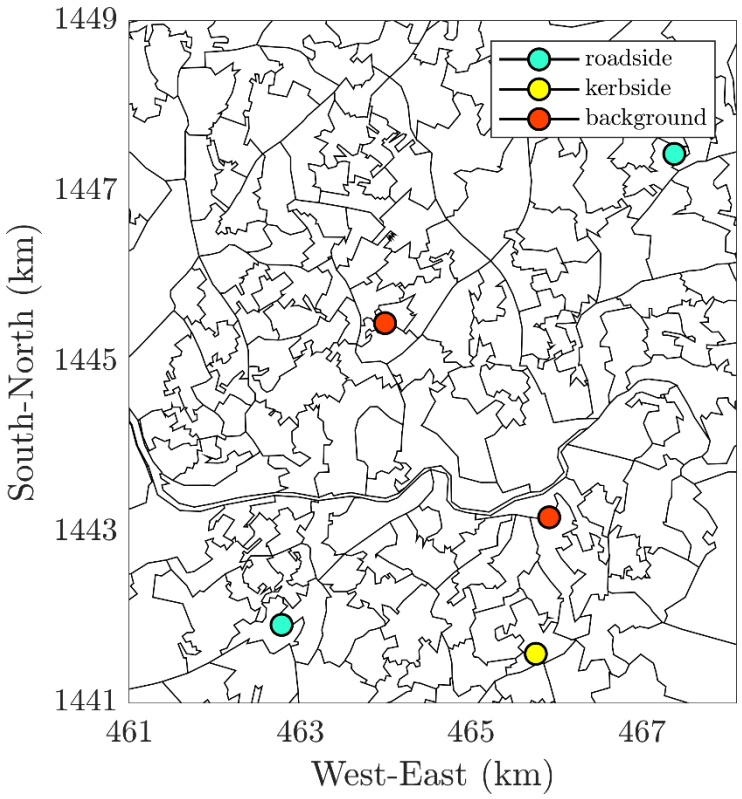


Annual mean NO_2 concentrations measured by each diffusion tube in 2015

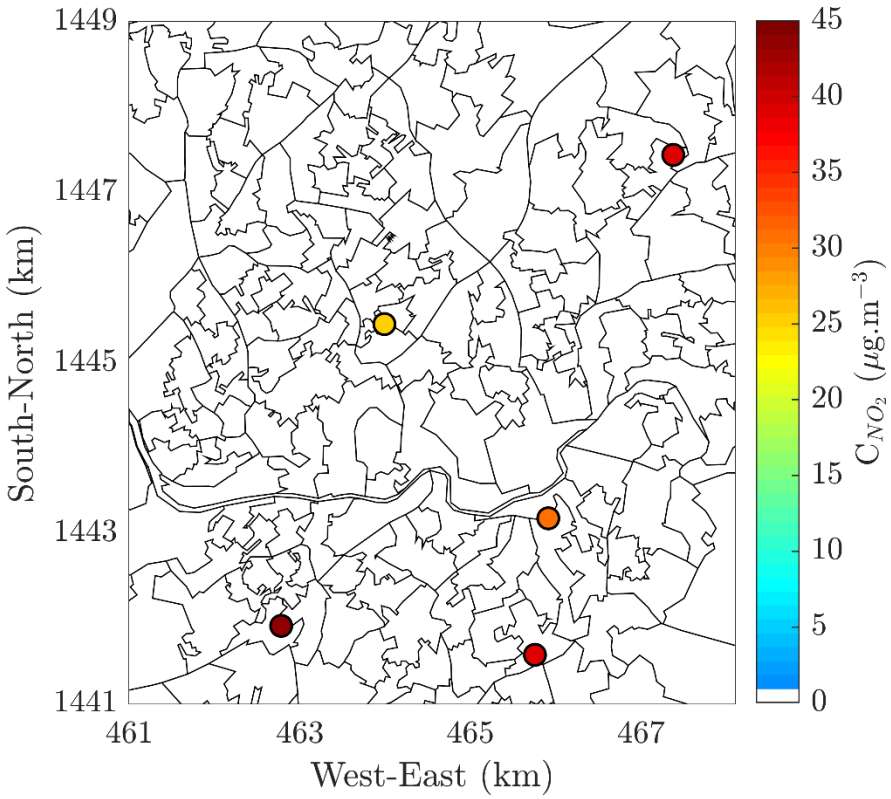
Continuous measurements

min = 22.5 µg.m^{-3}
max = 44.2 µg.m^{-3}
mean = 36.0 µg.m^{-3}

- 2 roadside, 1 kerbside and 1 background sites
- St Paul's urban background station from the AURN network



Location of the continuous sites with information about the site type

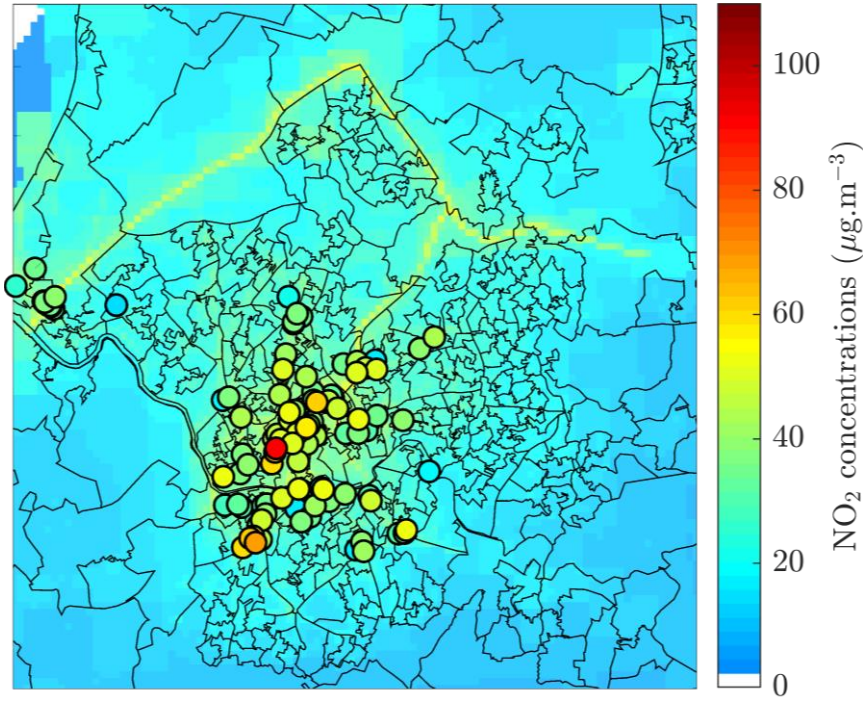


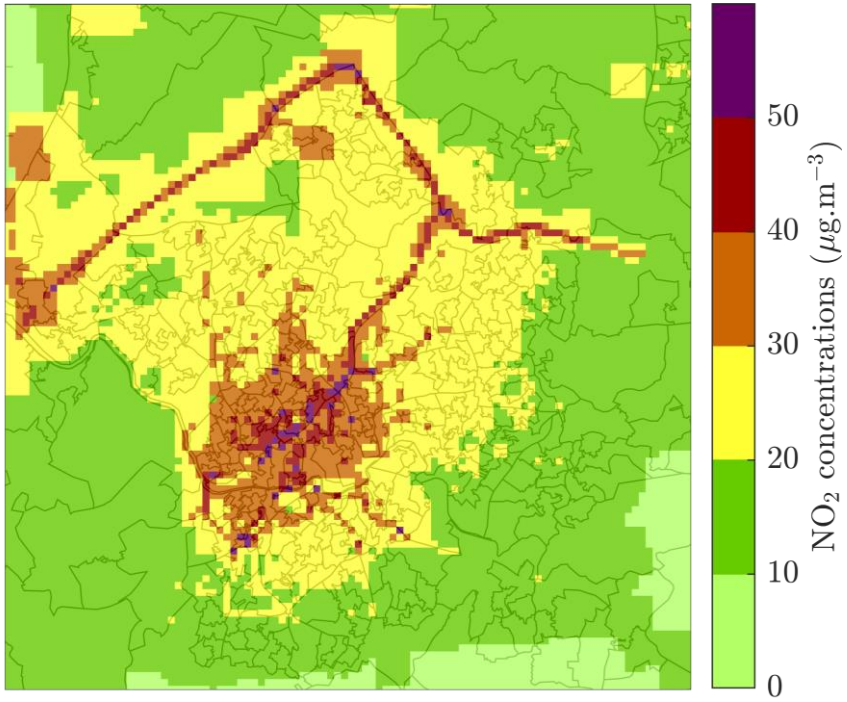
Annual mean NO_2 concentrations measured by equipment in 2015

Air quality for the baseline year

- NO_2 concentrations
- 231 cells exceeding the EU legal limit value

adjustment factor of 1.6





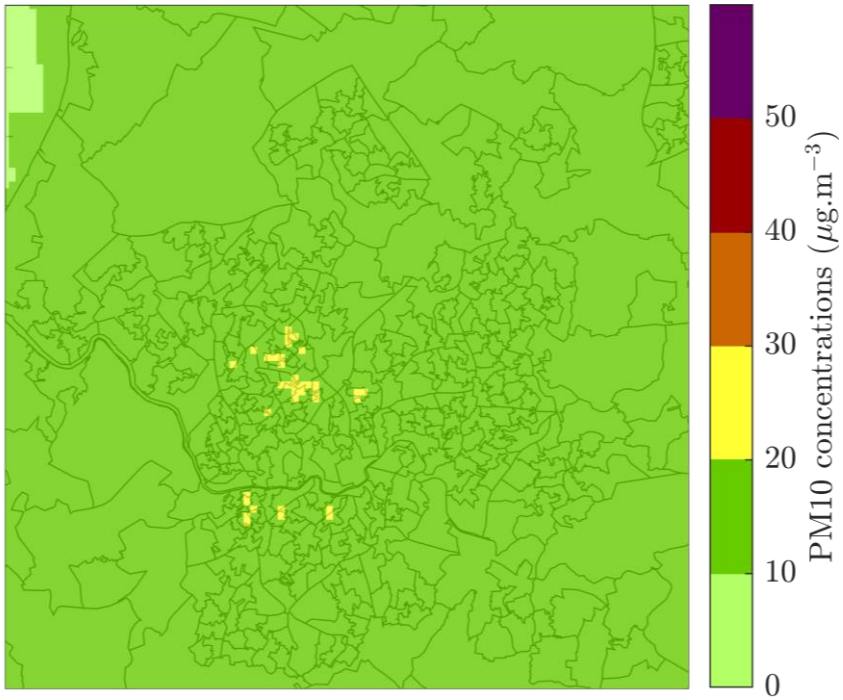
Air quality maps

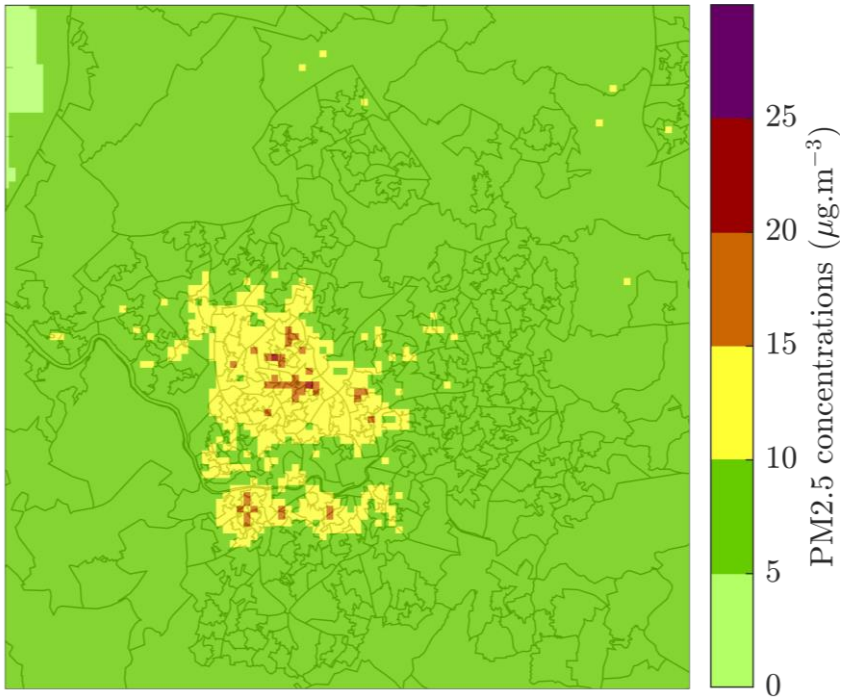
PM concentrations

Air quality for the baseline year

- Particulate matter concentrations
- Cells exceeding the WHO guidelines:
  - 16 for PM10 concentrations
  - 655 for PM2.5 concentrations

adjustment factor:
PM10 = 0.9
PM2.5 = 0.8



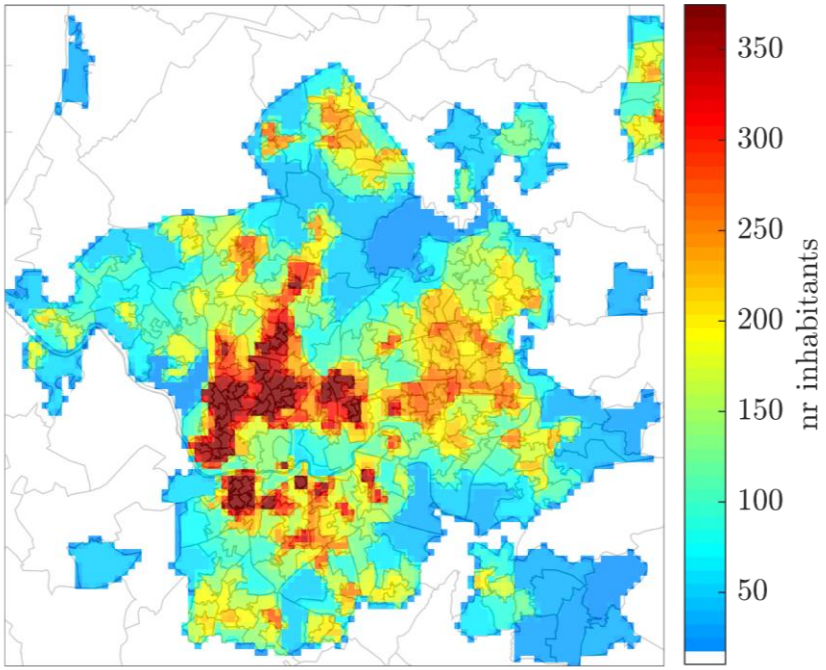


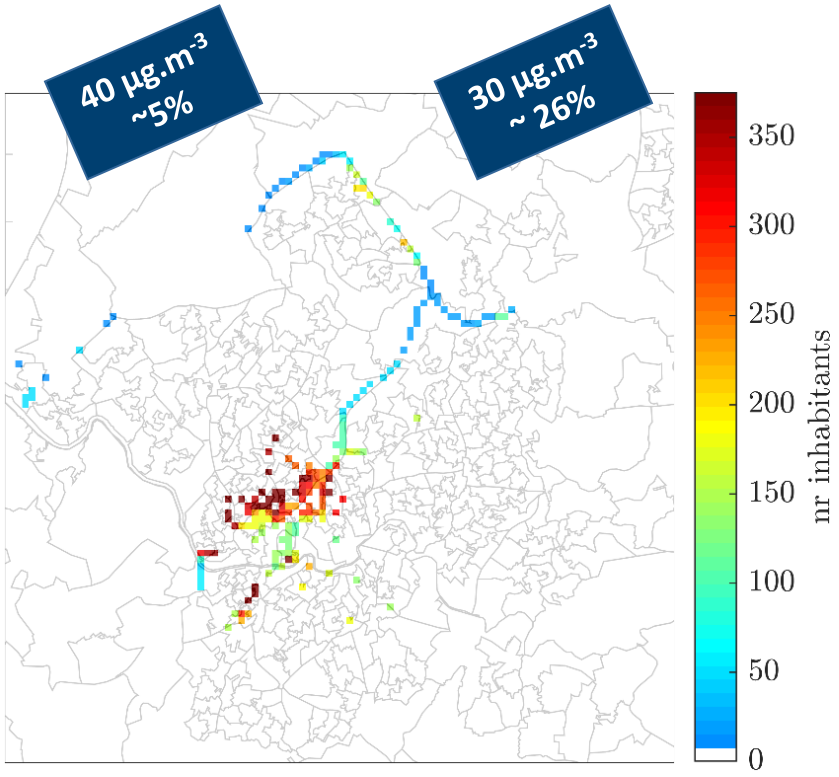
Population exposure

Bristol

Population exposure in Bristol

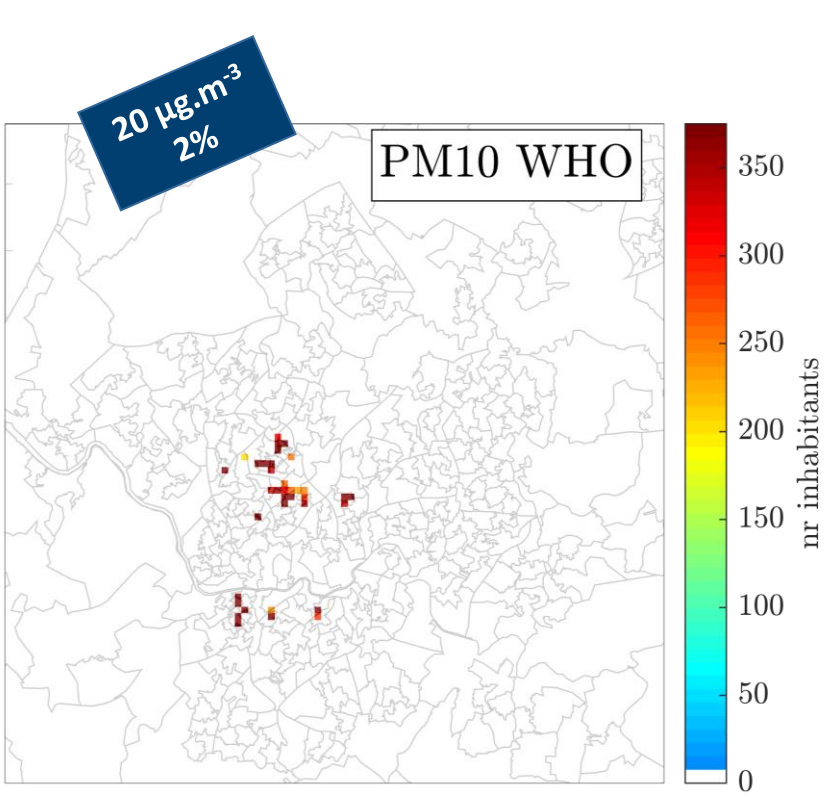
- **5% of Bristol population was potentially exposed to harmful levels of NO_2 concentrations in 2015**

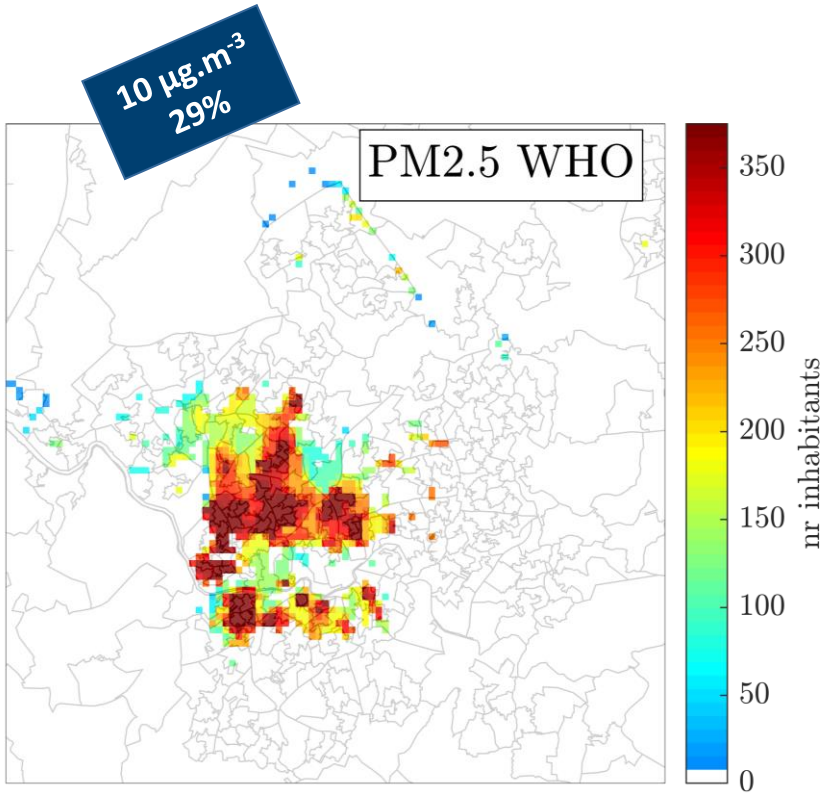




Population exposure in Bristol

- **Population potentially exposed to PM10 and PM2.5 concentrations above the WHO recommendations**





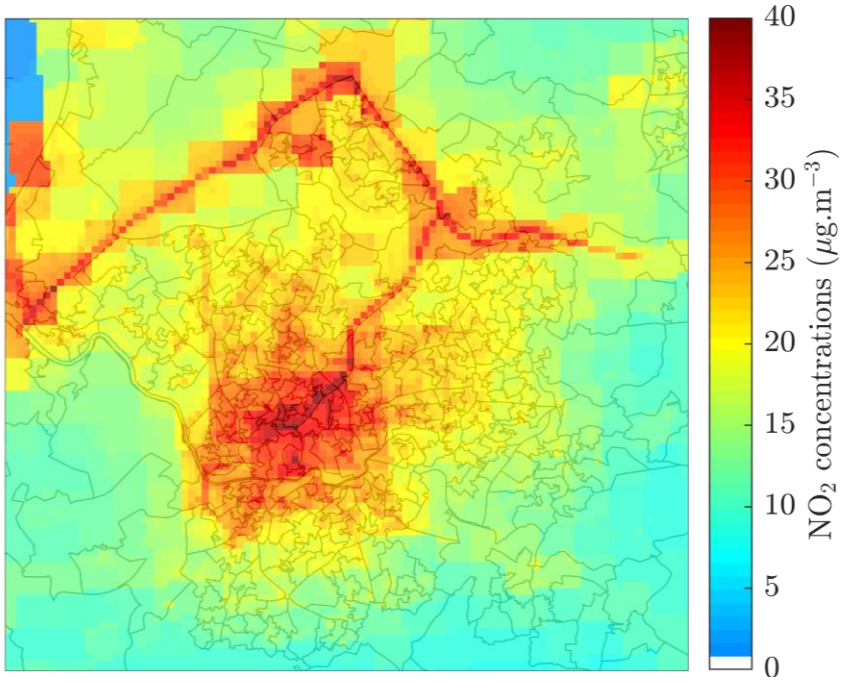
BAU scenario

Business-as-usual (BAU): assess how emissions change in the future, without policy changes but taking into account behavioral, technological changes and effects of existing policy, for 3 years (2025, 2035, 2050)

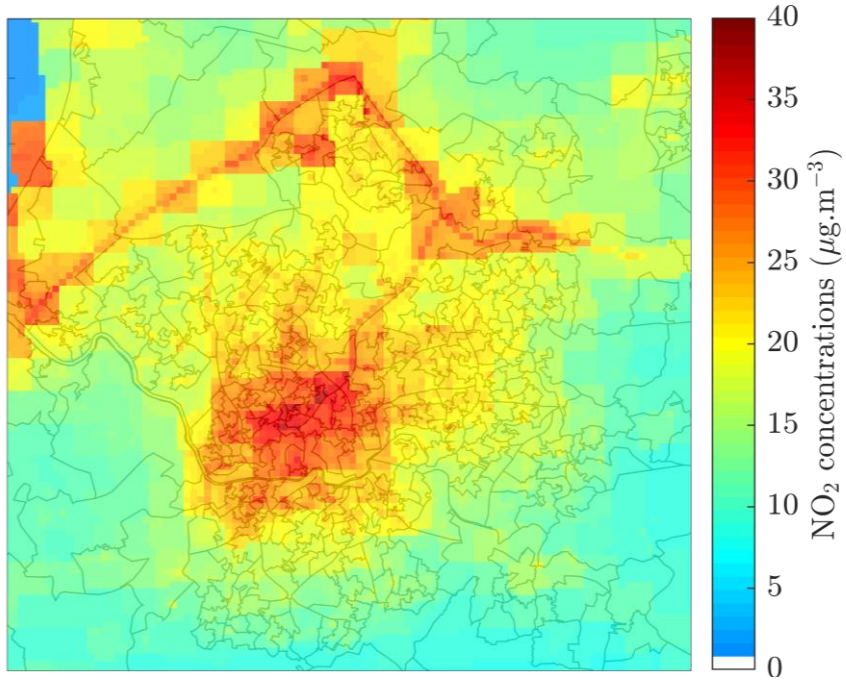
BAU impacts on NO_2

- **Overall reduction of the maximum concentration in 16%**, in 2050 when compared with 2025
- **Exceedances to the EU limit value in 2025** (only 5 cells)

2025



2050



Citizen-led and Citizen-targeted scenarios

Targeted scenarios that identify 'enabling' policies so that greener choices/behaviour become the social norm for everyone

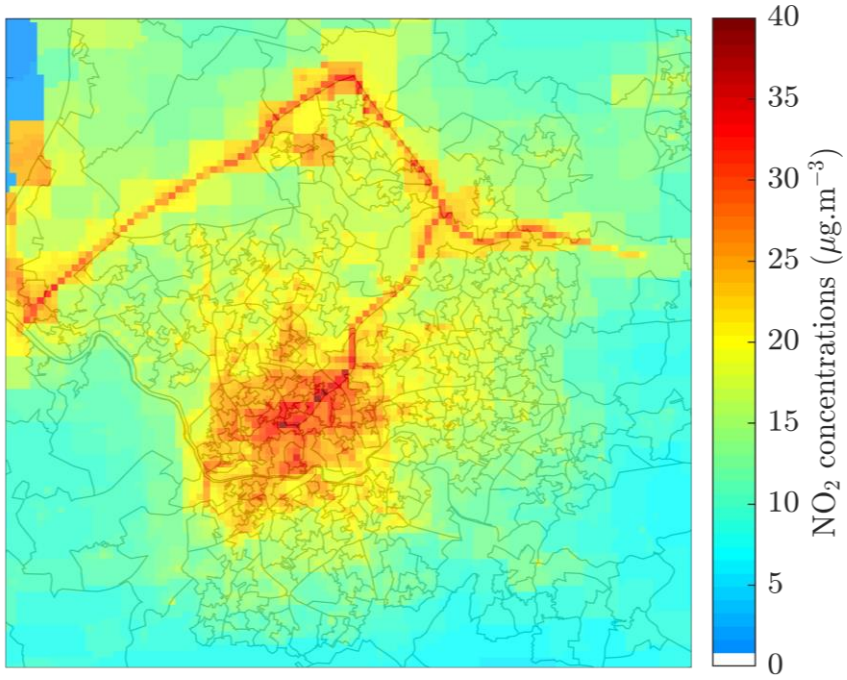
Unified Policy Scenario

- Ban polluting cars
- Cheaper public transport
- Cleaner buses
- Walking and cycling
- Charge polluting vehicles entering the city
- Reduce private car road space
- Improve energy efficiency in housing
- Promote electrical vehicles
- Increase solar and wind
- Property developers to consider air quality and climate change
- Spread economic opportunities across the city

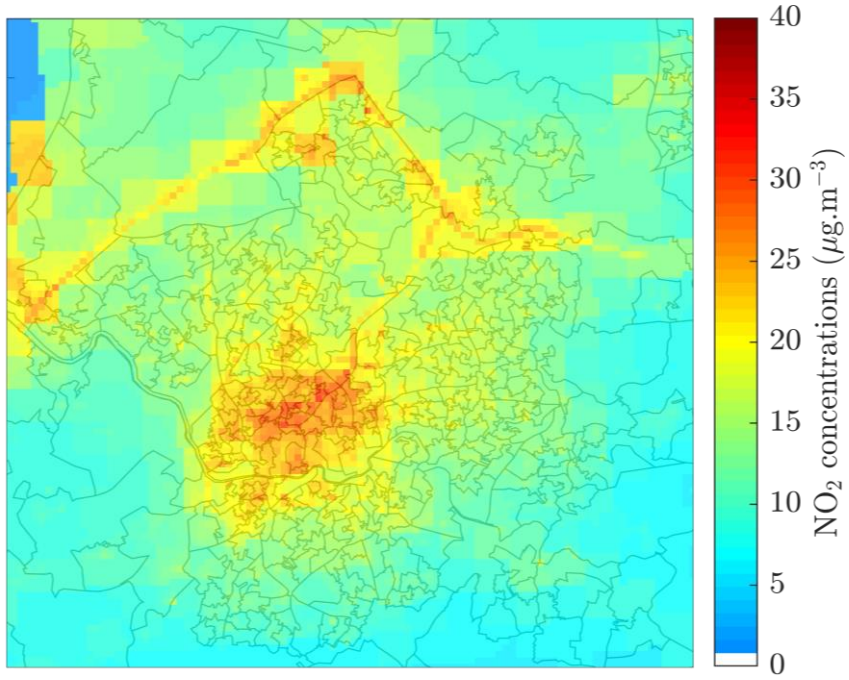
UPS impacts on NO_2

- **UPS scenario leads to compliance** with **legal NO_2 limit values in 2025**, whereas **BAU scenario does not**
- **Maximum concentration: reduction of 11% and 17% in the UPS,** compared to the BAU

2025



2050



What have we learnt with ClairCity?

- **Popular and effective (or not?) measures**
  - "Promoting public transport":
    - quite popular
    - moderate effect…
  - "Reduce access to private cars":
    - very effective for No_x
    - if access restriction level is set ambitious enough (e.g. no diesel)

What have we learnt with ClairCity?

- **Popular and effective measures**
  - "residential fuel switch":
    - effective for PM
    - importance currently underestimated by most citizens
  - "stimulate walking/cycling":
    - can be effective!
    - cultural shift needed!
    - more a "desire" then a true policy measure

- Also **important** to note: **already in the BAU** situation will **improve a lot**

ClairCity

Our future with clean air

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