Air Quality

From statutory Requirements to monitoring and tools for data analysis

Oxfordshire Analyst Network Meeting

12th October 2021

OXFORD CITY COUNCIL

OXFORDSHIRE COUNTY COUNCIL

Structure

LAQM Duties and Statutory requirements

- Local Government Structure
- How the LAQM process works

Oxford's Air Quality monitoring and data analysis

- Coverage of the current AQ monitoring network
- Tools for the Analysis of Air Pollution Data

LAQM Duties and Statutory requirements

Local Government Structure

Oxford operates under a two tier authority system

OXFORDSHIRE COUNTY COUNCIL

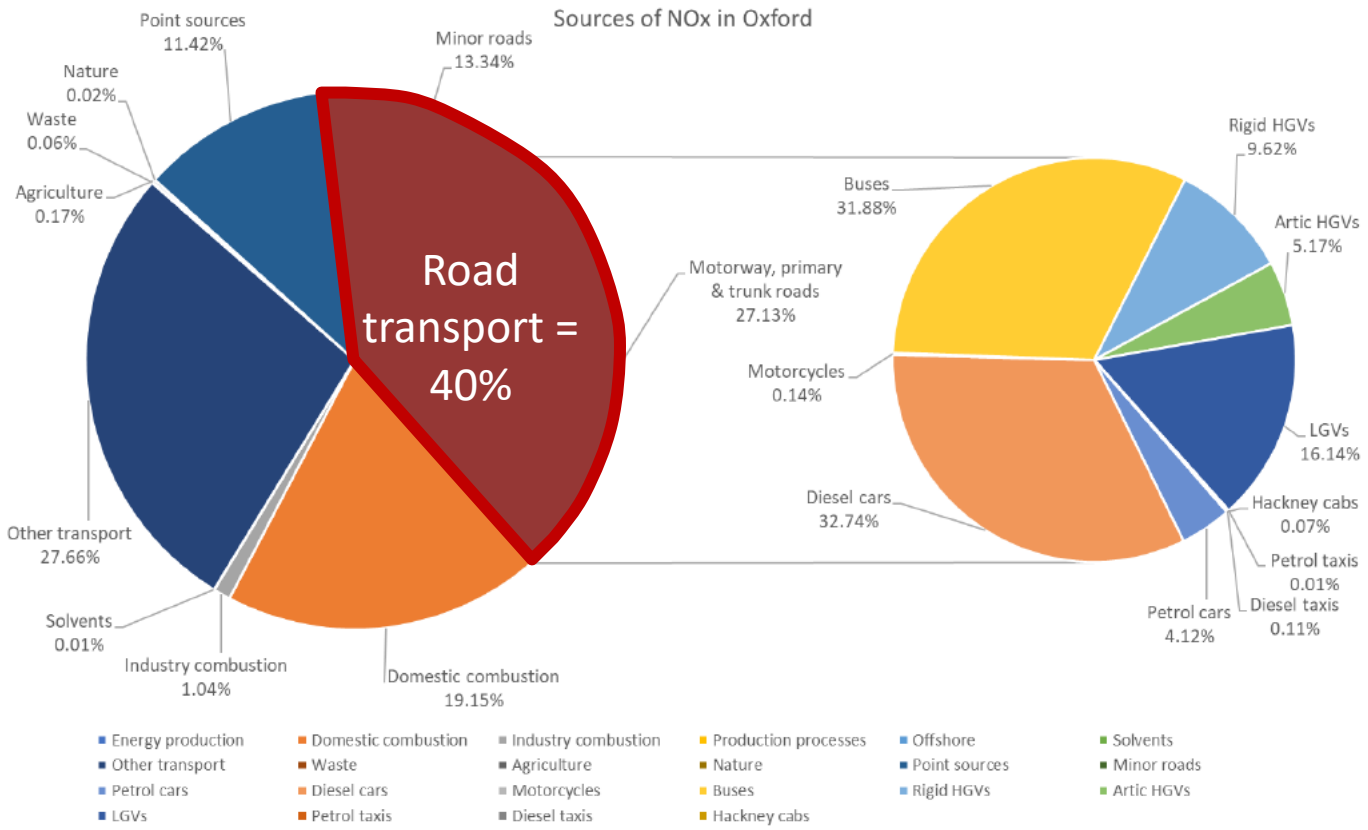
responsible for:
Highways, transport planning,
Passenger transport,
Implementation of LTP

OXFORD CITY COUNCIL

responsible for:
Implementation of LAQM regime,
Review of AQ planning Applications

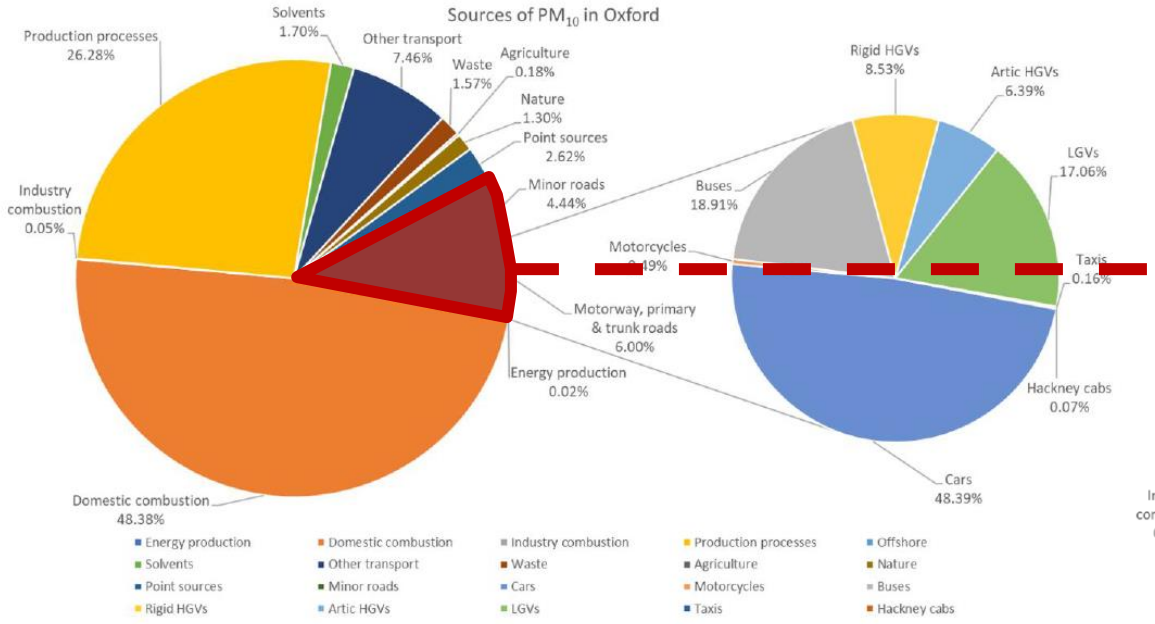
"(…) although district councils prepare the annual reports and Action Plans under LAQM, the Secretary of State expects lower and upper tier councils to work together to develop their content and, with respect to Action Plans, ensure that all necessary measures to address air pollution in their local area are included". **(LAQM Policy Guidance 16)**

Oxford: sources of NOx (oxides of nitrogen)

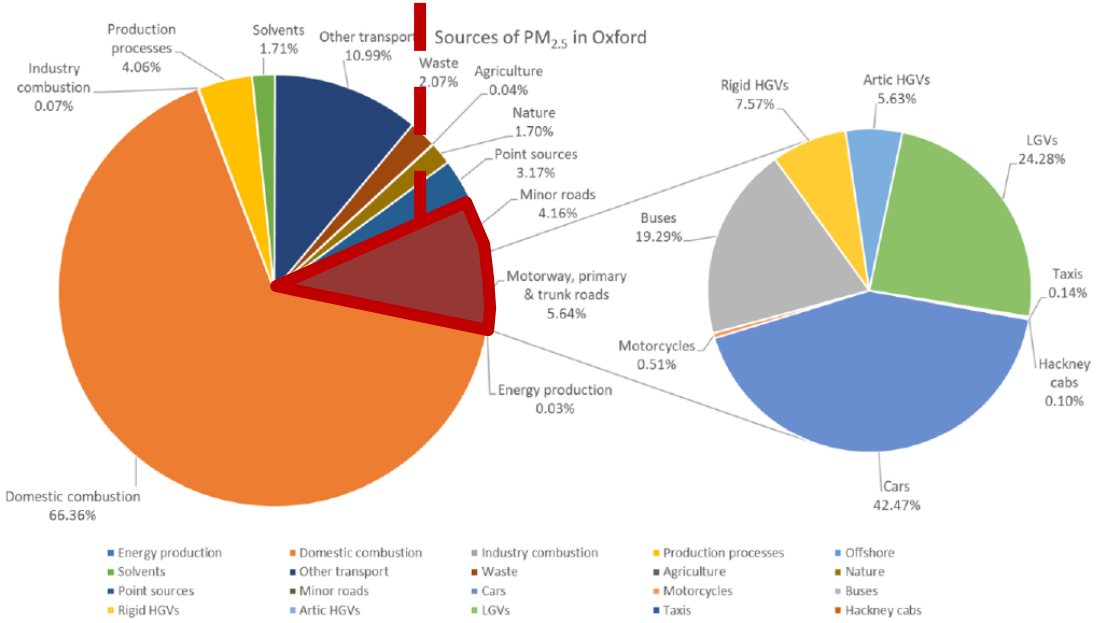


At busy **roadside** locations, traffic can be responsible for up to **75%** of NOx emissions

Oxford: sources of particulate matter

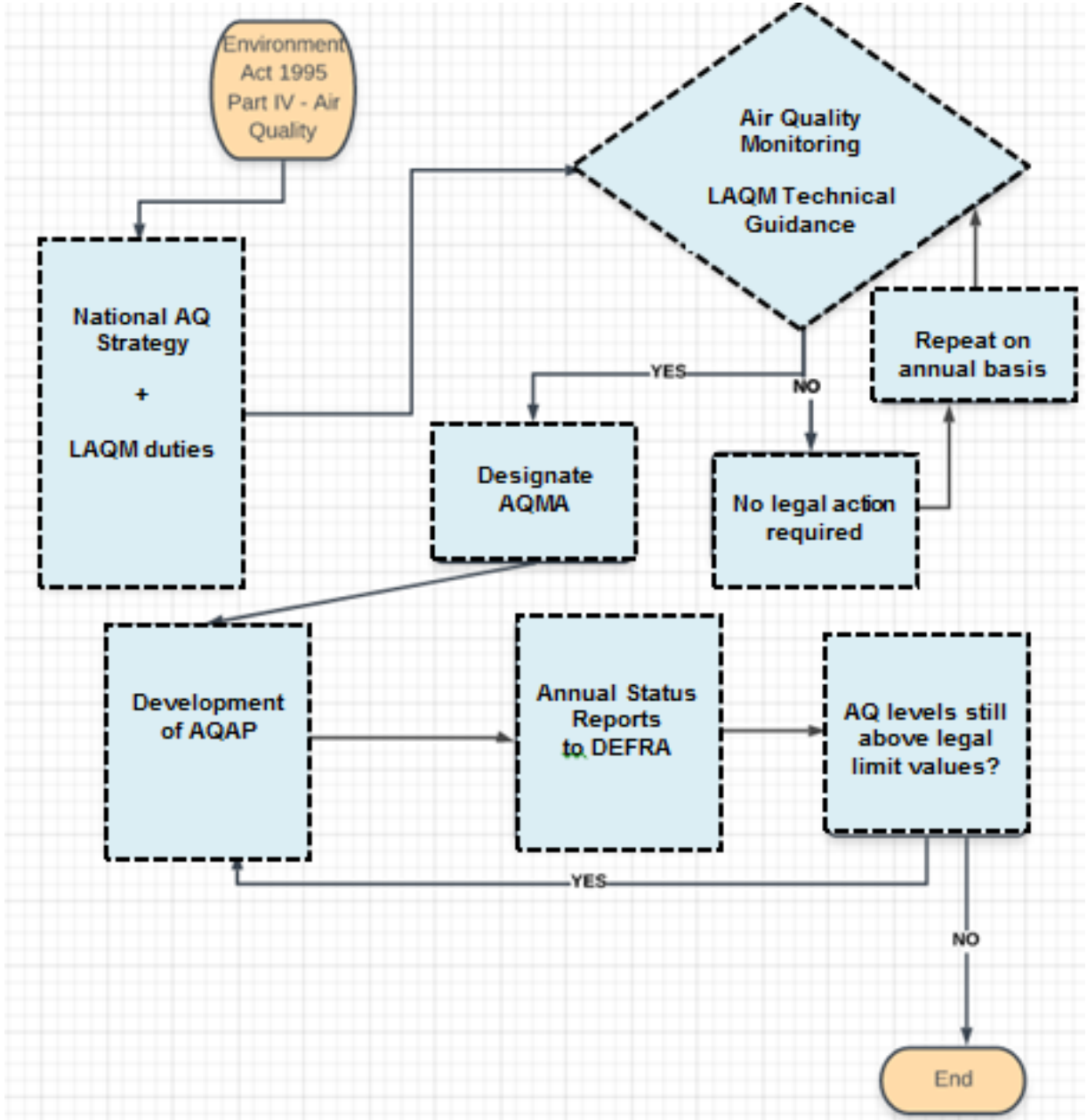


Road transport = approx. 10% citywide



At busy **roadside** locations, traffic can be responsible for up to **20%** of particulate matter emissions

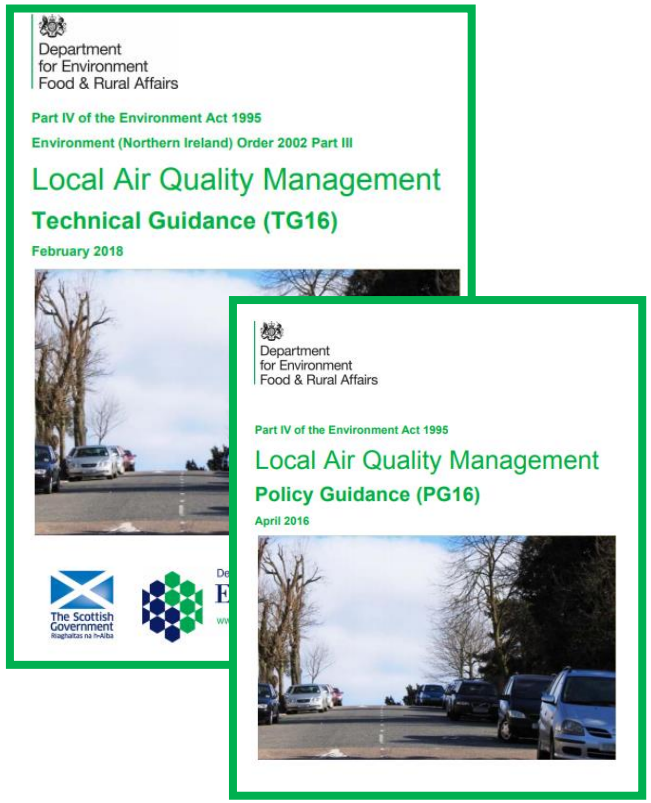
LAQM: How the regime works…..



LAQM: Relevant Documents…..

Clean Air Strategy - National Plan for the reduction of all sources of air pollution

LAQM Guidance - Technical aspects of AQ monitoring + Policy behind LAQM regime



Local Air Quality Plan for the reduction of air pollution

The public health perspective

- Public Health England (PHE) advises that ‘there is no evidence of a threshold for health effects’ from air pollution and that local authorities should ‘seek to lower population-level exposure and reduce everyone’s exposure to air pollution, as well as targeting ‘hotspots’’.

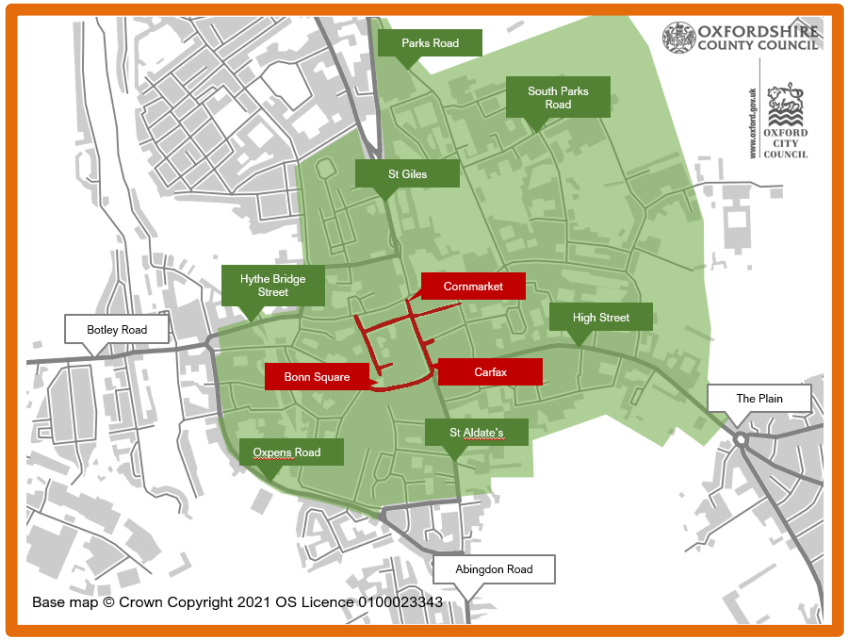
- An excessive focus on small areas where legal limits are breached (in some cases affecting relatively few people) risks missing opportunities to reduce public exposure to air pollution more broadly.

Estimated **28,000 – 36,000** deaths per year attributable to human-made air pollution in the UK

Beyond ‘compliance’

Achieve a local annual mean NO_2 target of 30 µg/m³ by 2025

“30 by 25”



Zero Emission Zone

Zero Emission Buses (ZEBRA)

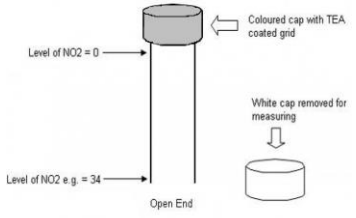
Connecting Oxford (Traffic filters & workplace parking levy)

LAQM monitoring regime…..

LAQM Monitoring Methods & Limitations

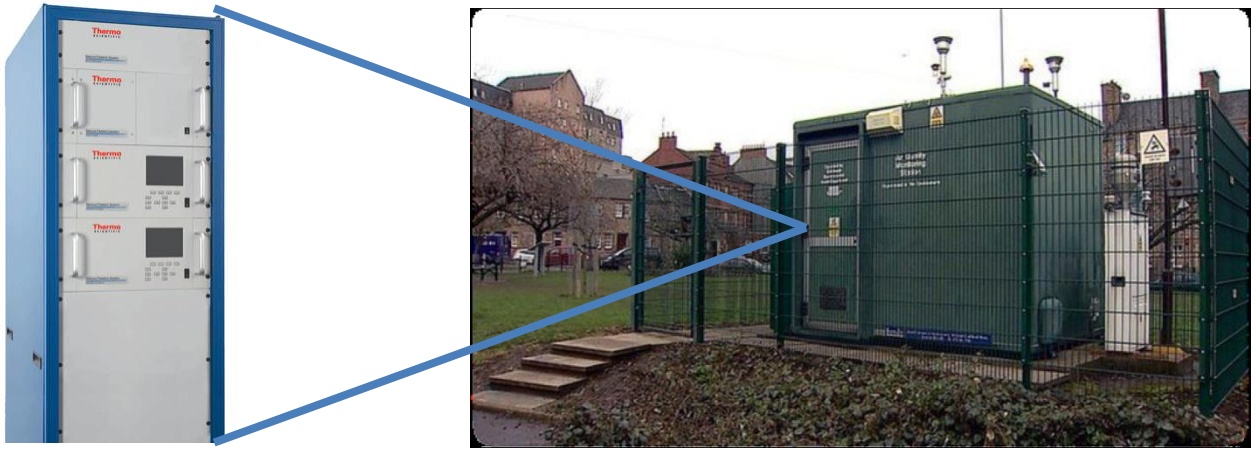
Diffusion tubes Cheap and easy to deploy

- Only give you 12 monthly averages that can be used to calculate annual mean
- "indicative" monitoring - Relatively high uncertainty (±25%)



Automatic Methods give you automatic data

- very big, and bulky (they cant be installed in every location)
- Very expensive (**Typical network monitoring site for NO2 and PM costs £50 - 150K to buy and £10k - 30K p.a. to run)**



Electro chemical Air Quality Sensors

Main constraints

- A huge variety in the market
- Susceptible to Relative Humidity and Temperate
- Susceptible to interfering gases (cross-sensitivity)
- Raw, unprocessed data uncertainty estimates outside of minimum required on 2008/50/EC.
- High maintenance costs
- High data processing costs
- Not yet approved by EU/DEFRA for the purpose of AQ monitoring
- Not accepted by the LAQM regime that LAs need to comply with

LAQM monitoring regime

LAQM monitoring dates and reporting times

Calendar

Monitoring period: 1st January to 31st December (202X)

LAs are required to gather an entire year of data for full comparison against the annual mean air quality limit values of the different pollutants with Data capture rates > 90% for fixed evidence, and >75 for indicative evidence (https://www.gov.uk/government/statistics/air-quality-statistics/background)

Ratification/Data correction period: January to March (202X+1)

Provisional AQ yearly data needs to be revised and ratified by a team of expert consultants to ensure that the final dataset is representative of true air pollution and not a result of any instrument malfunction, calibration, etc

Final AQ data submitted to local authorities: April (202X+1)

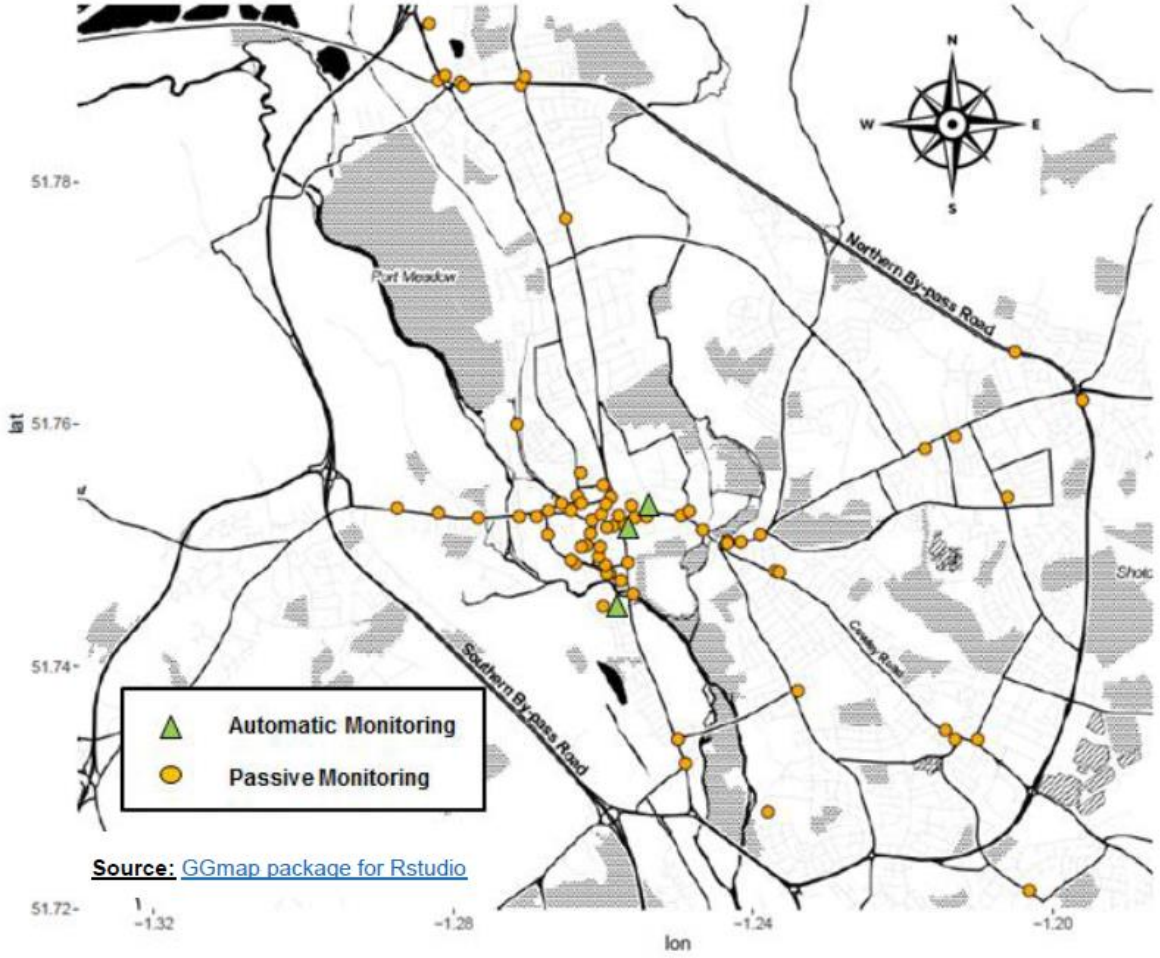
Development and Submission of AQ Annual Status Report to DEFRA: April-June (202X+1)

LAs are then given 2-3 months maximum from the moment they receive the final AQ datasets to analyse & compile the data and submit a new AQ ASR to DEFRA

Oxford's Air Quality Monitoring and Tools for the Analysis of Air Pollution Data

Total amount of monitoring sites and coverage

Figure D 2- Oxford's automatic and passive monitoring locations, 2020

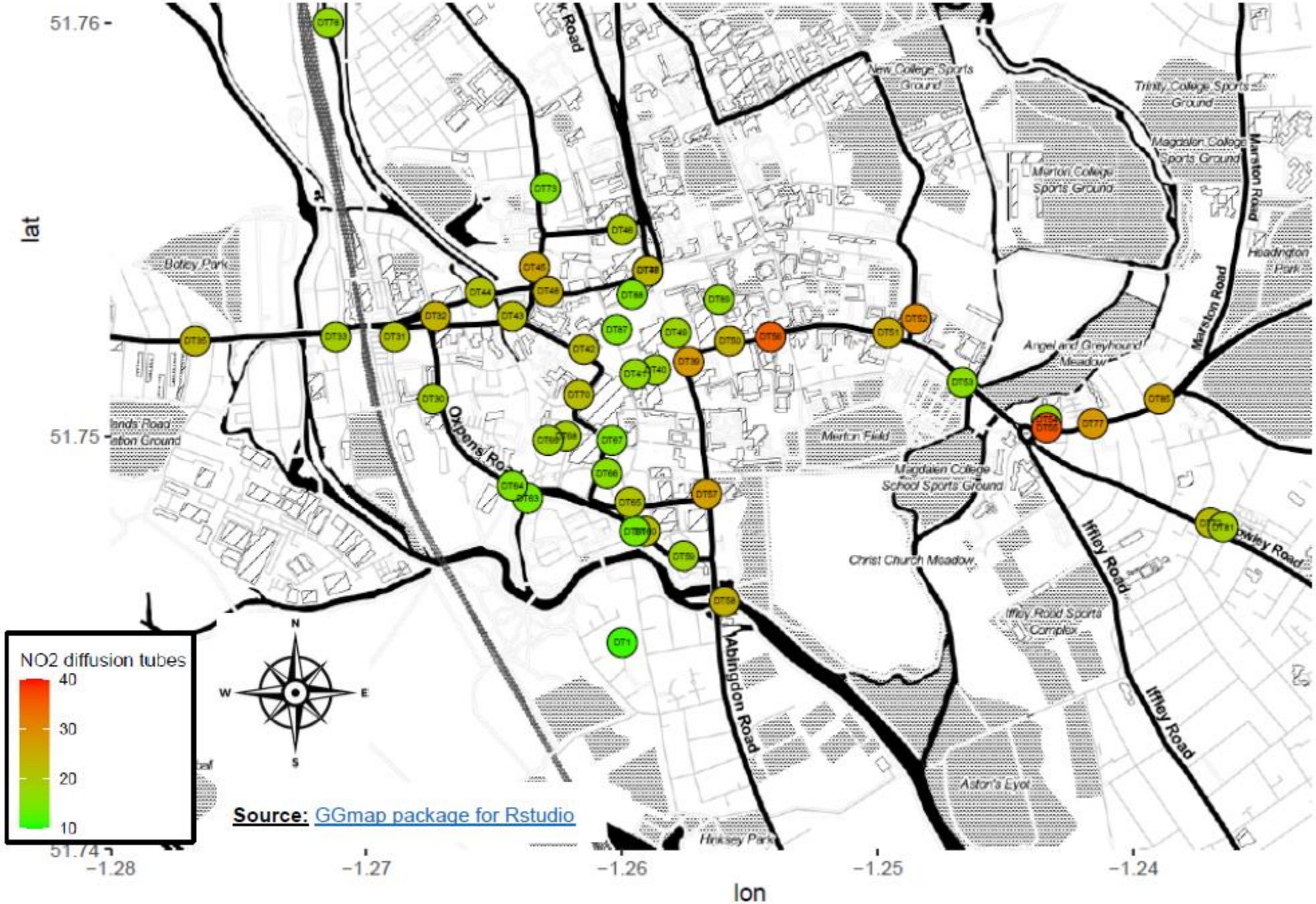


Automatic monitors (x3)
Diffusion tubes (x75)

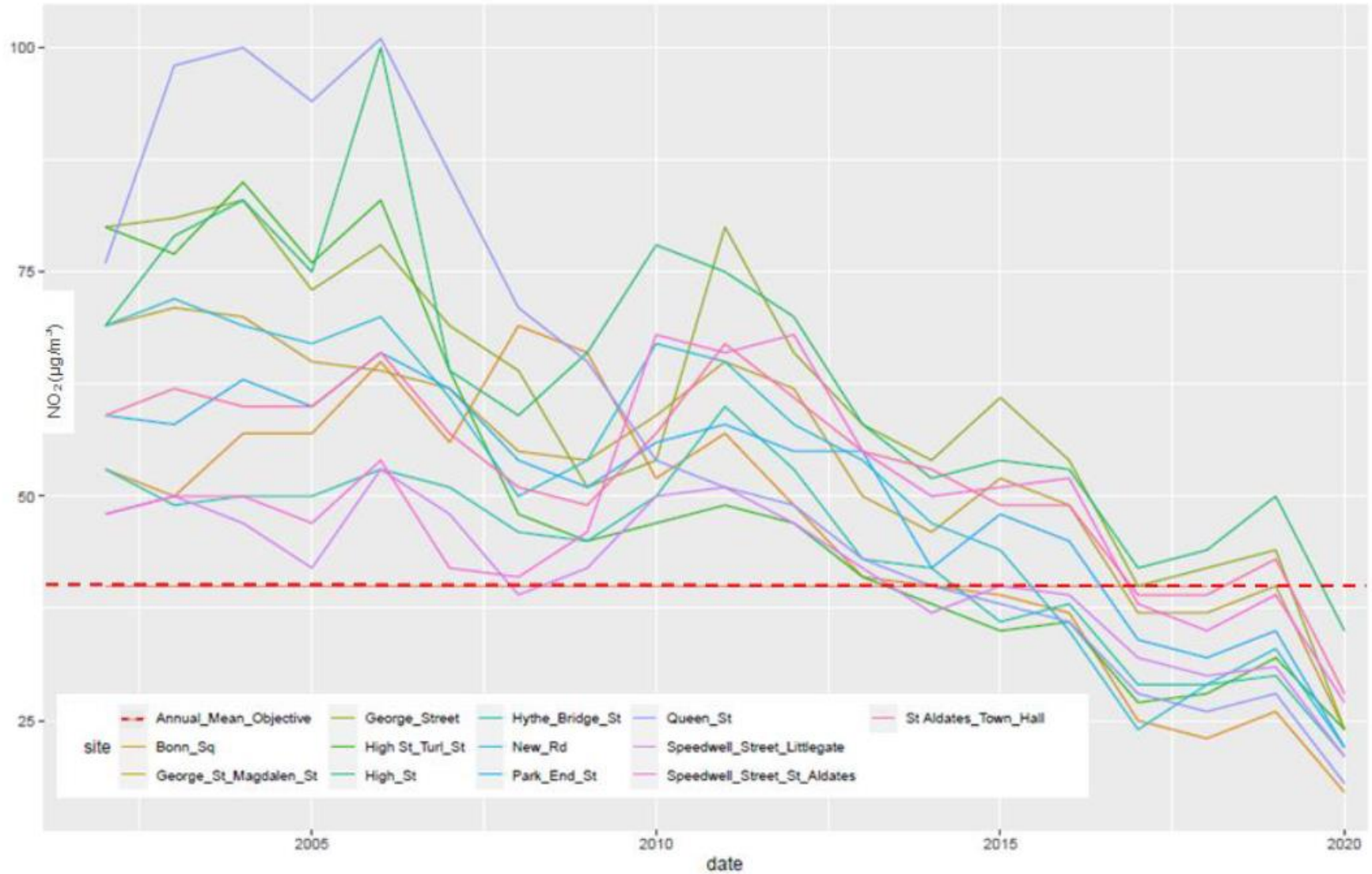
Additional monitoring sites added to the current network in January 2021:

- DT 63 to Ashhurst Way (Rose Hill)
- DT66 to Garsington Road
- DT67 to Cuddesdon Way (Blackbird leys)
- DT78 Marston Ferry Road

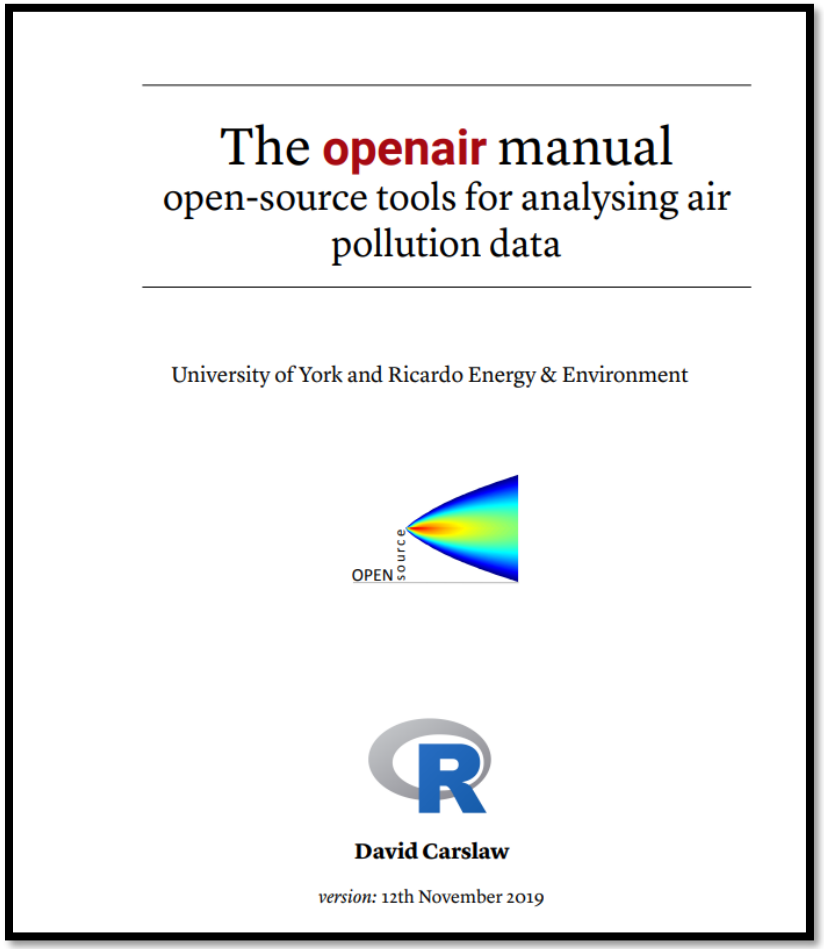
The exact location and air pollution levels of each one of the 75 diffusion tubes can be found in Oxford City Council's latest Air Quality Annual Status Report here


51.76
51.75
51.74
lat
−1.28
−1.27
−1.26
−1.25
−1.24
lon
NO2 diffusion tubes
40
30
20
10
N
W
E
S
Source: GGmap package for Rstudio
Botley Park
Oxpens Road
Abingdon Road
Iffley Road
Marston Road
Merton Field
Christ Church Meadow
Magdalen College School Sports Ground
Iffley Road Sports Complex
Aston's Eyot
Hinksey Park
New College Sports Ground
Merton College Sports Ground
Magdalen College Sports Ground
Trinity College Sports Ground
Angel and Greyhound Meadow
Headington Park
Rowley Road

Oxford city centre NO_2 2003 - 2020



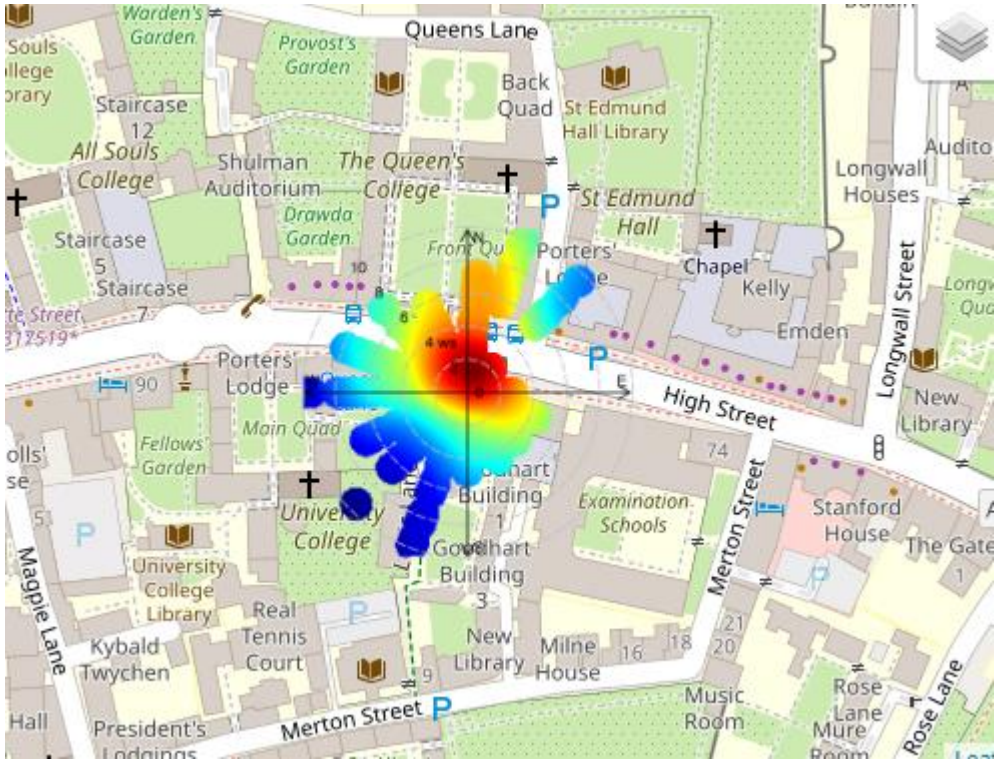
Tools for the Analysis of Air Pollution Data



R package developed for the purpose of analysing air quality data

https://davidcarslaw.com/files/openairmanual.pdf

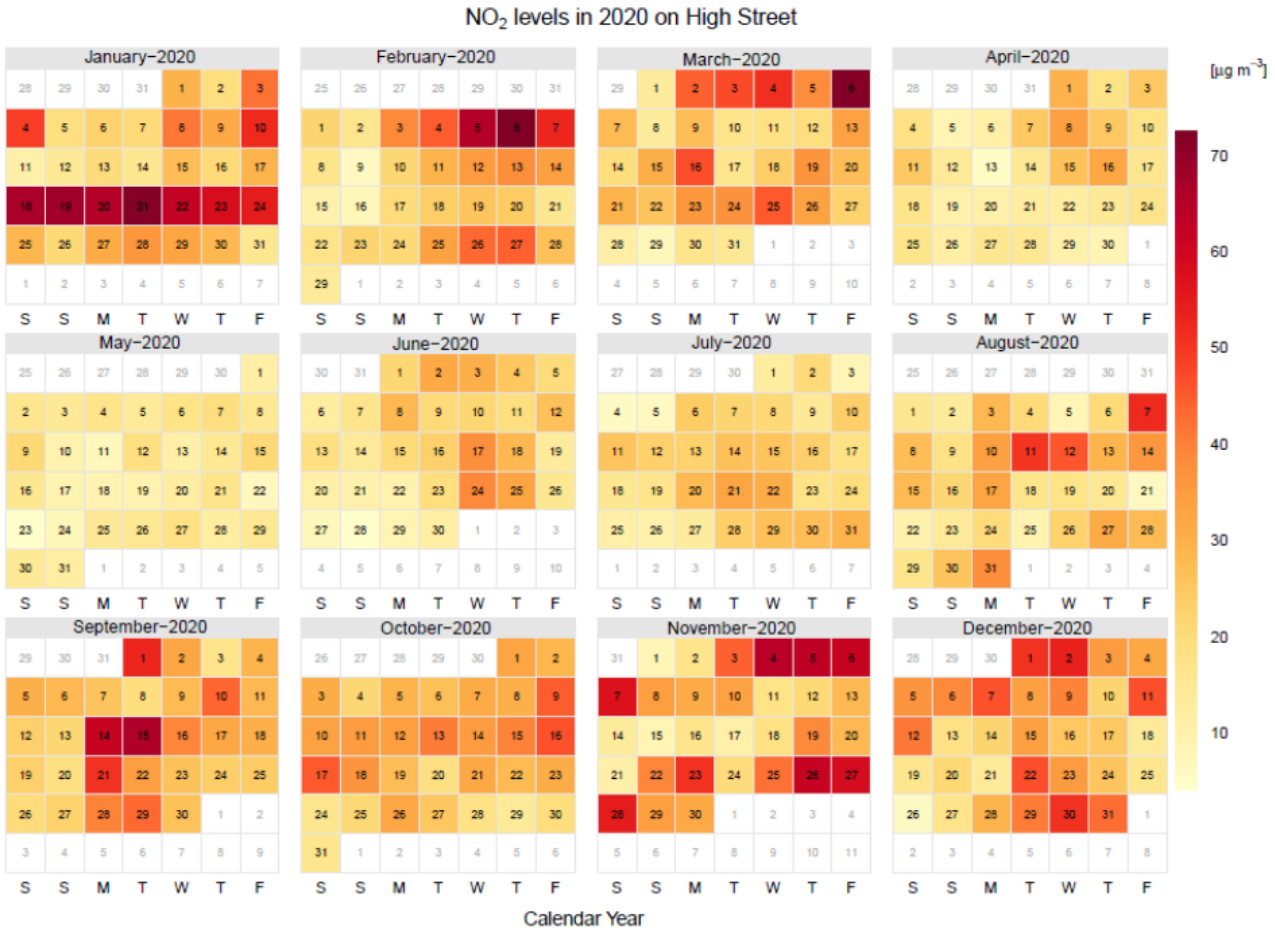
Examples of data analysis: Polar Plots



Integration of wind speed data with concentrations measured

Allows to gain a better understanding of air pollution sources

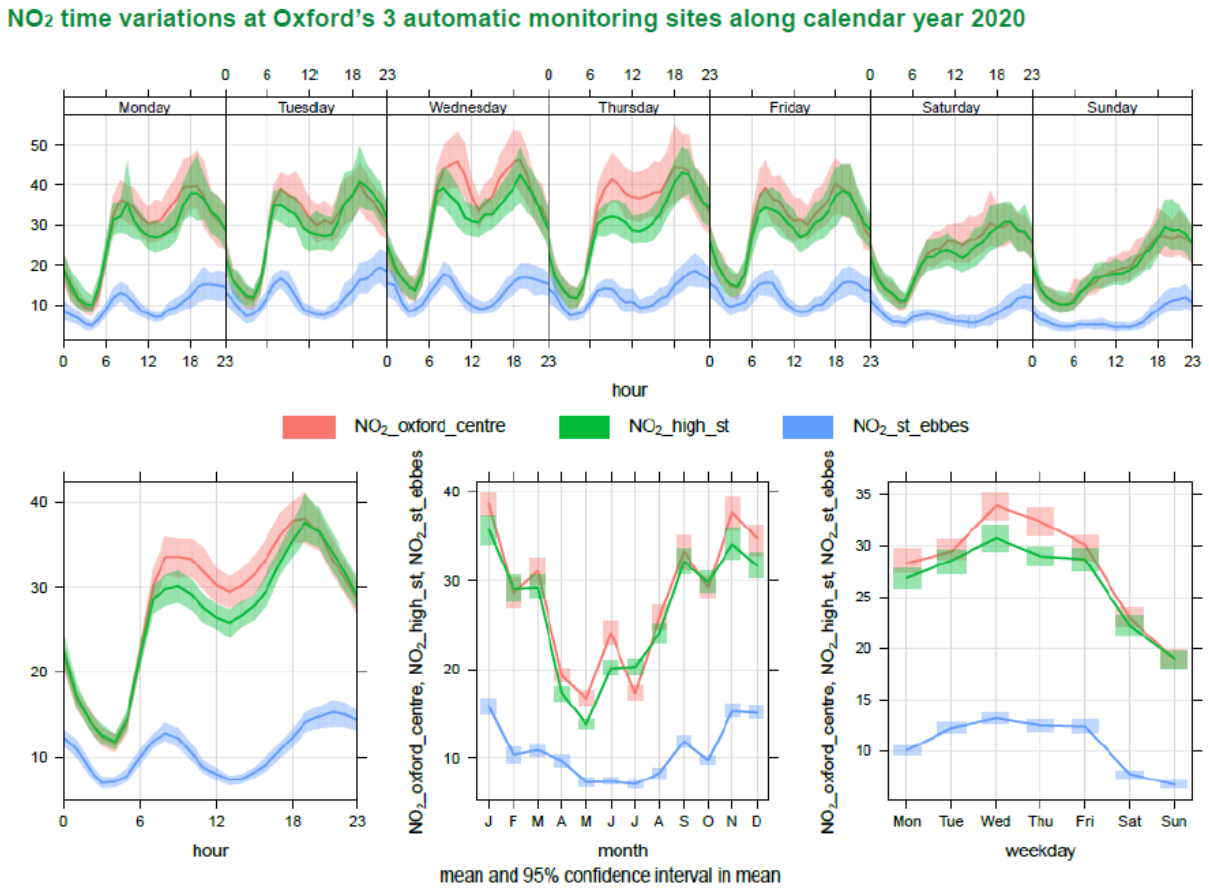
Examples of data analysis: Calendar Plots



Daily variation in concentrations by pollutant across the period of a calendar year

allows intuitive viewing of day to day headline trends in the wider context of the period

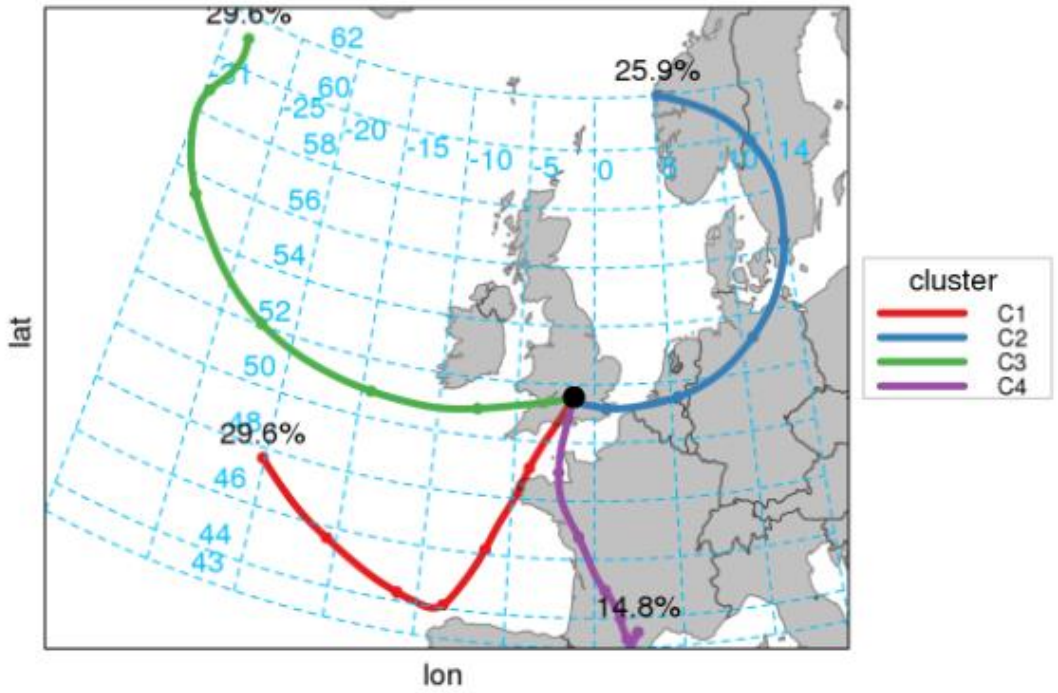
Examples of data analysis: Time Variation Plots



Concentrations over different intervals such as diurnal, day of the week and month of year

Help explain variations in concentration according to the emissions activity associated with them.

Examples of data analysis: Back Trajectory Analysis



The back trajectory plot shows data from the HYSPLIT model (NOAA HYSPLIT [3]) run in analysis mode

Useful to get an overview of air mass origin during the report perod