

Some thoughts on future air quality issues

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Oxford Air Quality Meeting January 2020

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LONDON

The key issues?

- Post-Brexit legislation – The Environment Bill - AQ Targets and small area compliance or improved public health? Post-Brexit accountability?
- How can the commitments in the Clean Air Strategy be translated into action?
- The NO₂ issue - will CAZs/ULEZ work?
- Will non-UK and agricultural emissions reduce enough?
- The impact of a Net-Zero Climate Change Act have on air quality? Can we manage the antagonisms?
- How will the WHO air quality Guidelines change?
- What will monitoring look like in future? Will small sensors and satellites deliver?
- What are the health effects of 'new' sources and microenvironments?

BREXIT

- The terms of leaving are still to be worked through, but....
- The draft Environment Bill gives priority to air quality and commits the Secretary of State to setting a long-term target for “PM2.5” and to ensuring that it is met
- The draft Bill gives the SoS until 31 October 2022 to set the target and the date by which it must be achieved
- This potentially gives time for a detailed analysis of options for (i) the concentration (note there is no mention of WHO) and (ii) the timescale for compliance

Status of the PM_{2.5} target

- Unlike the current EU legislation which mandates compliance and where **costs** (in the Opinion of the UK Courts) should only be used to aid choice between **several compliant options**, the current Bill allows for the target to be changed if costs are disproportionate to the benefits
- This highlights the fundamental problem of a policy based on a 'single-point' target or limit – as the area of non-compliance gets smaller the benefits to health also decrease and the costs are likely to rise
- There is no mention of WHO Guidelines *per se*, cf the Clean Air Strategy
- ***There is no provision in the Bill as it stands for actions to improve public health more widely.***

What accountability is there after Brexit?

- Currently we have an *independent* institutional check on the UK government's performance in meeting legal obligations via the European Commission and the ECJ
- We also have the challenges in the UK Courts from Client Earth
- So what accountability checks will we have?
- Is it enough to rely on the goodwill and diligence of NGOs such as Client Earth to take cases to the High/Supreme Court?

After Brexit continued

- If we have an Office of Environmental Protection as the Environment Bill proposes, how effective will it be in practice?
- As drafted, the OEP has powers to apply for a judicial review if it considers that there has been a '***serious failure to comply with environmental law***' – what criteria will determine '***serious***' here?
- Current EU Directives are transposed into UK law but what happens to the next generation?!

The Clean Air Strategy



Published January 2019
and available at:
<https://www.gov.uk/government/publications/clean-air-strategy-2019>

Unlike previous strategies which focussed on air quality standards and objectives, the new strategy deals with commitments to *actions*

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Clean Air Zones and NO₂ Plans

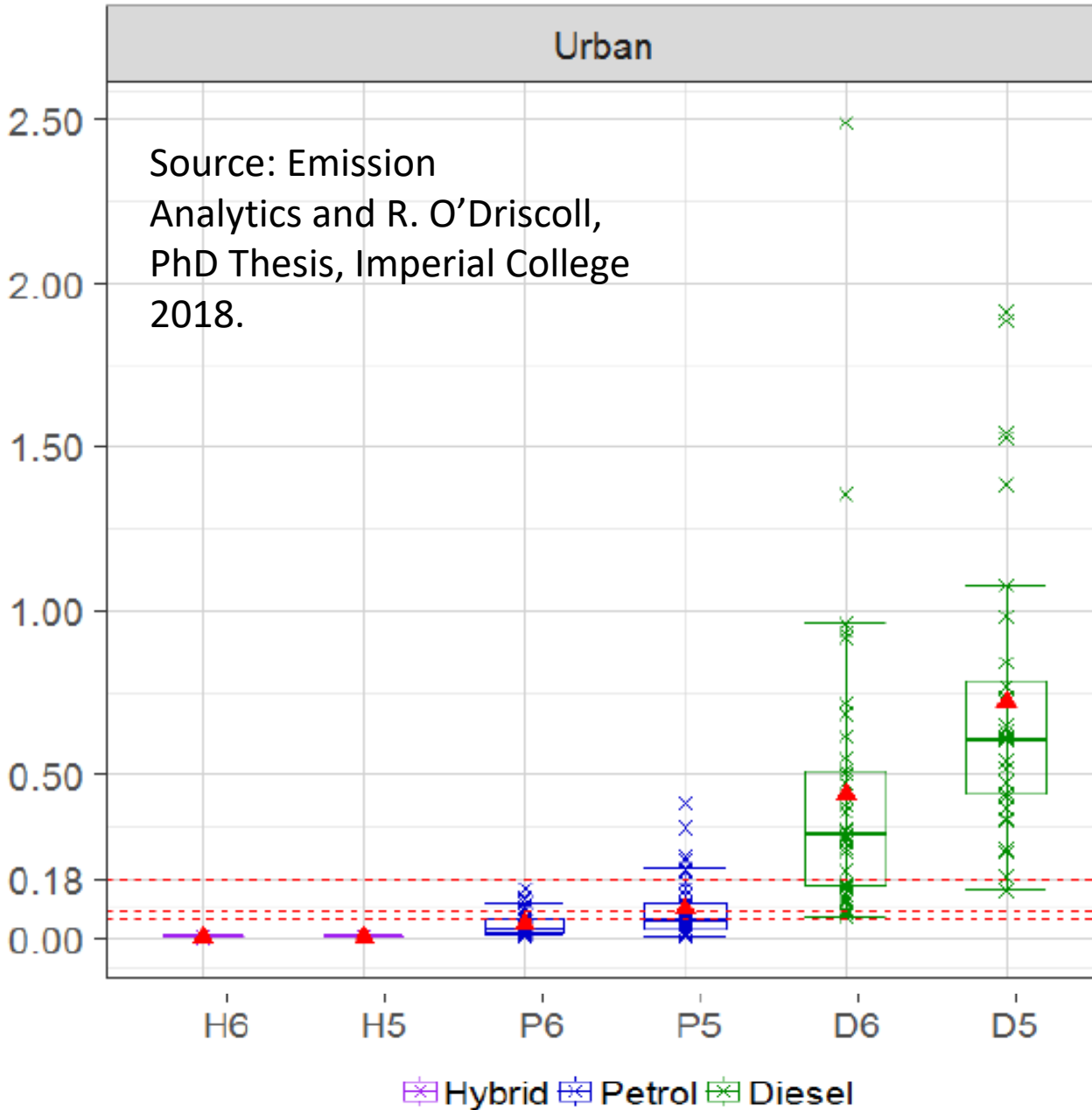
- We have 33 LAs required to submit plans:

Ashfield District Council	Basingstoke and Deane Borough Council	Blaby District Council	Bolsover District Council	Bournemouth Borough Council
City of Bradford Metropolitan District Council	Broxbourne Borough Council	Burnley Borough Council	Calderdale Metropolitan Borough Council	Cheltenham Borough Council
Dudley Metropolitan Borough Council	Kirklees Council	Leicester City Council	Liverpool City Council	Newcastle-under-Lyme Borough Council
Oldham Council	Oxford City Council	Peterborough City Council	Plymouth City Council	Poole Borough Council
Portsmouth City Council	Reading Borough Council	Sandwell Metropolitan Borough Council	Sefton Metropolitan Borough Council	Solihull Metropolitan Borough Council
South Gloucestershire Council	South Tyneside Council	Southend-on-Sea Borough Council	Stoke-on-Trent City Council	Sunderland City Council
Wakefield Metropolitan Borough Council	Walsall Council	City of Wolverhampton Council		

CAZs, the ULEZ and NO₂

- Not all LAs will necessarily opt for CAZs
- But where they are implemented there are question marks:
 - How will the public respond?
 - What health benefit will the CAZs have?
 - Are Euro standards too blunt an instrument to be effective?
 - What's Plan B?

Real World Emissions of NOx – Euro 5 and Euro 6



<https://www.fleeteurope.com/en/connected/europe/features/cleaner-legal-mercedes-and-jaguar-diesels-are-euro-6d-compliant?a=DQU04&t%5B0%5D=Diesel&t%5B1%5D=WLTP&t%5B2%5D=RDE&t%5B3%5D=Euro%206d-TEMP&t%5B4%5D=NOx&t%5B5%5D=JLR&t%5B6%5D=Mercedes&curl=1>

Climate change policy and air quality

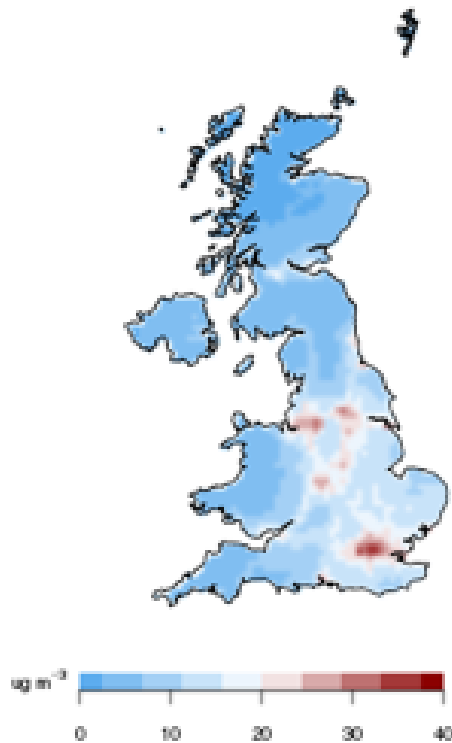
- We now have a net-zero CO₂-equivalents target for 2050
- A range of measures will be needed some of which could worsen air quality (Williams et al, 2018)
- Since that study important changes have taken place
- The cost of off-shore wind generation has plummeted
- Heat pumps are potentially significant
- Defra have begun to address possible antagonisms – the CAS has commitments to address wood burning and other polluting fuels as well as measures on agriculture
- Non-exhaust emissions (NEE) of PM are still uncertain however, as is their toxicity
- Industry is beginning to address the issue of NEE
- We could therefore see very large improvements in air quality

A major feature of CC policy affecting air quality is road transport fleet electrification

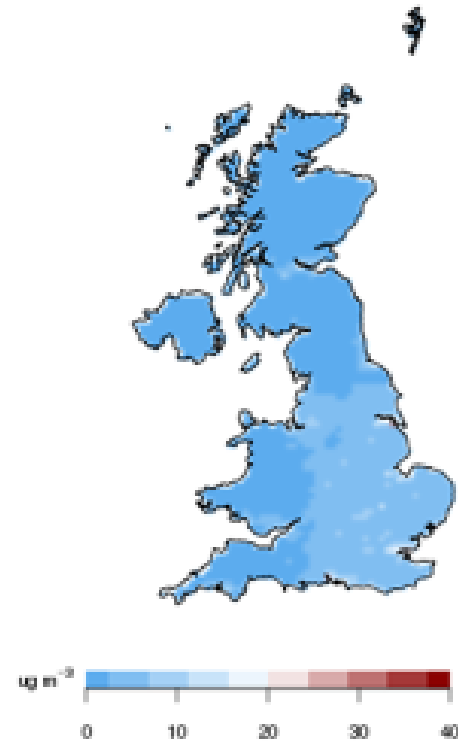


Annual average NO₂ concentrations in Great Britain in 2011 and 2050 on achieving the CCA target

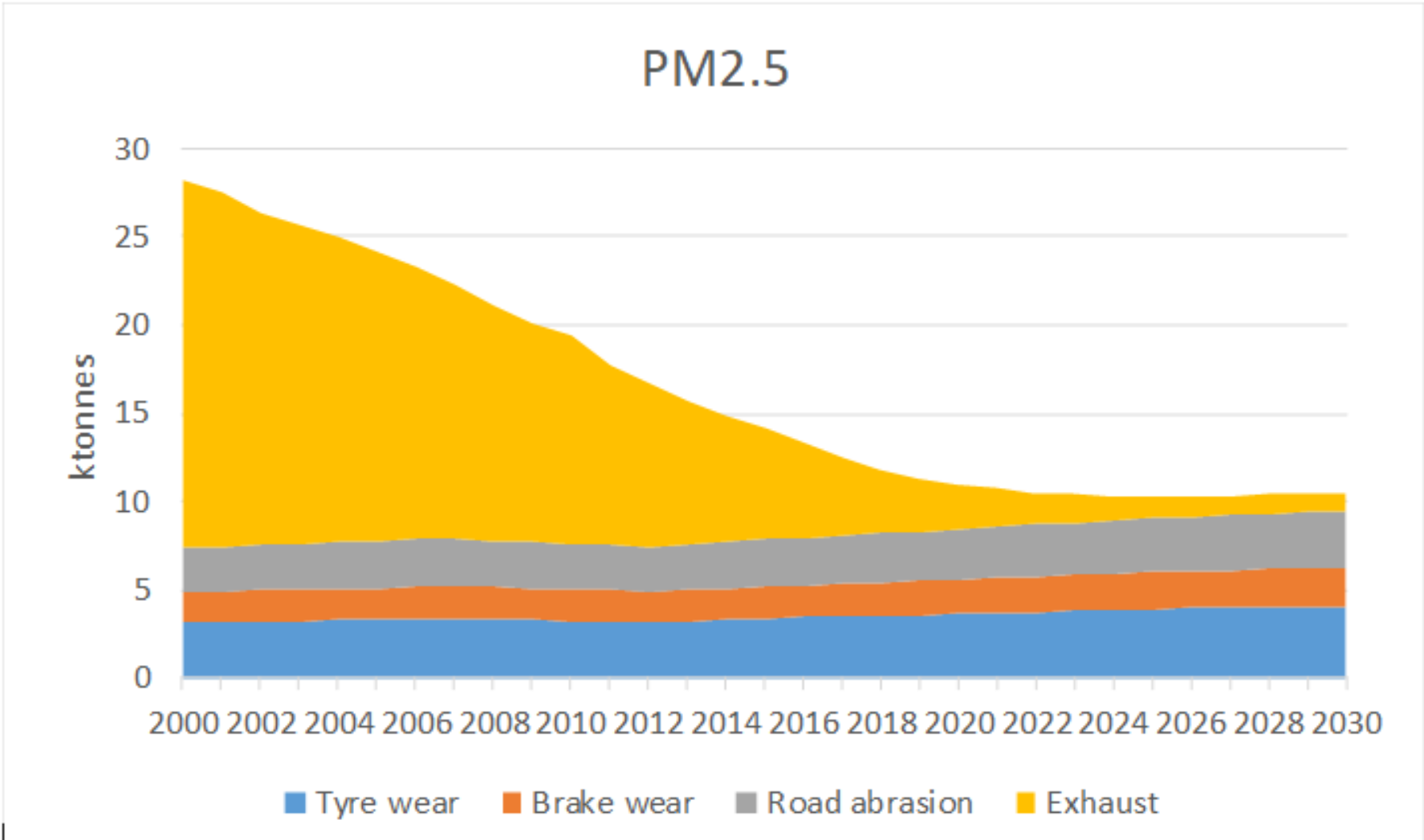
Annual NO₂ Concentration 2011



Annual NO₂ Concentration 2050



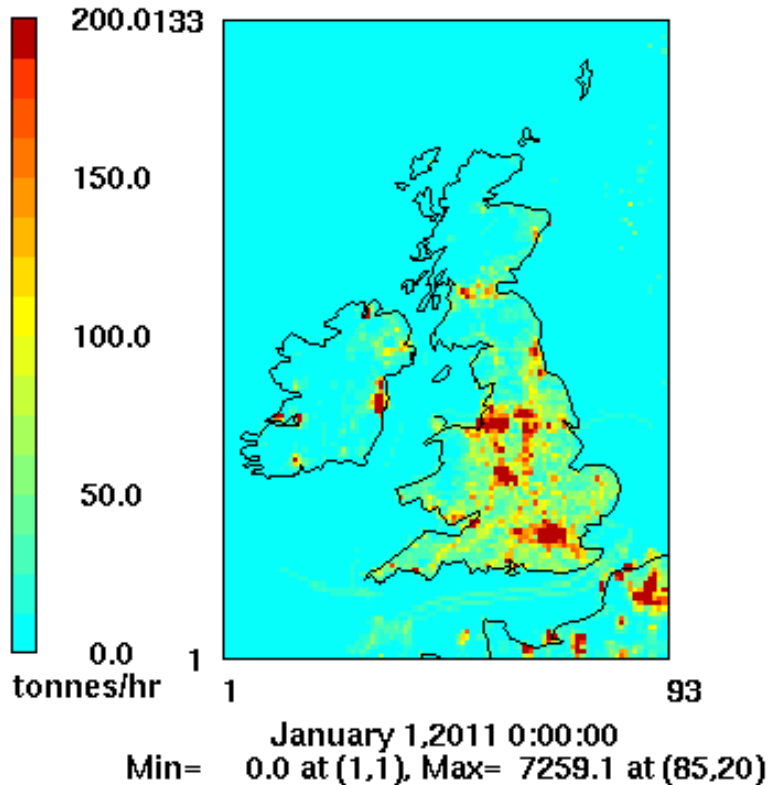
Emissions of PM_{2.5} from road transport



Non-exhaust emissions may mean that primary PM₁₀ emissions may not decrease (toxicity?)

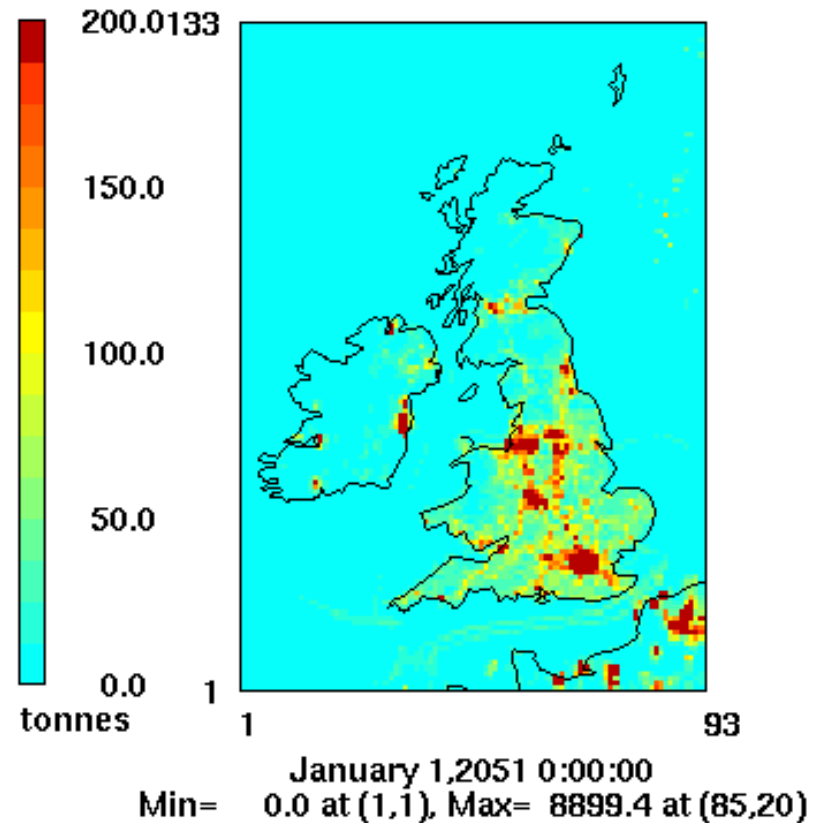
PM10 emissions

2011

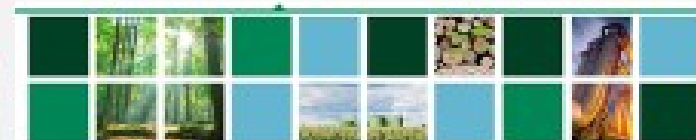


PM10 emissions

2050 LGHG



Wood burning – solid fuel is back in fashion



Non-Domestic Renewable Heat Incentive (RHI)

Atmospheric Environment 2013, 53(1), 1-10

Contents lists available at ScienceDirect

Atmospheric Environment

Journal homepage: www.elsevier.com/locate/atmosenv



Contribution of wood burning to PM₁₀ in London^a

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Atmospheric Environment 2013, 53(1), 1-10

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New Directions: Time to tackle urban wood burning?



Atmospheric Environment
 New Directions
 NPS, 11

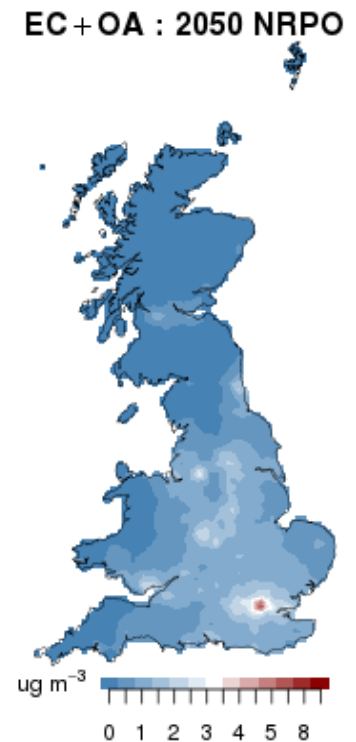
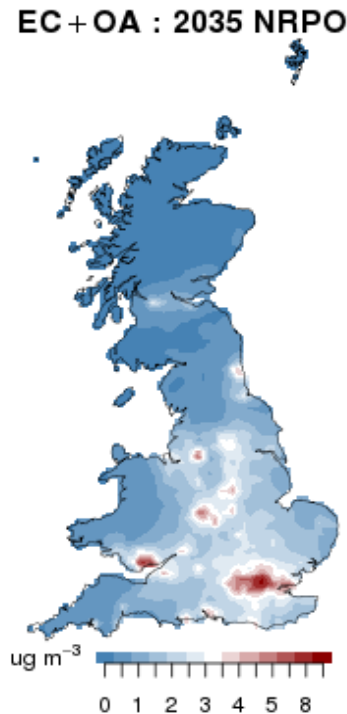
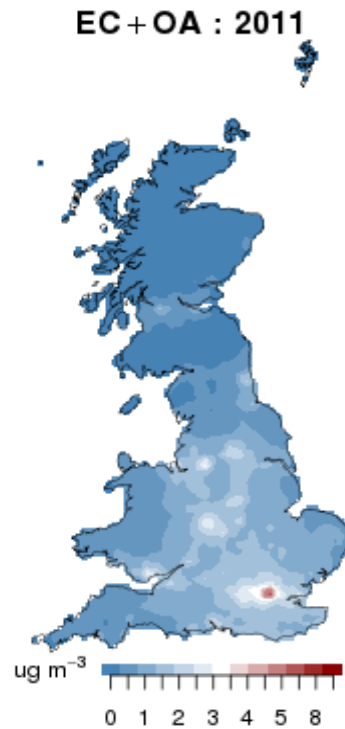
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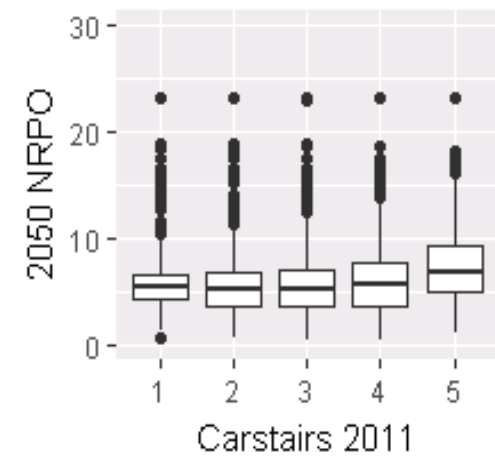
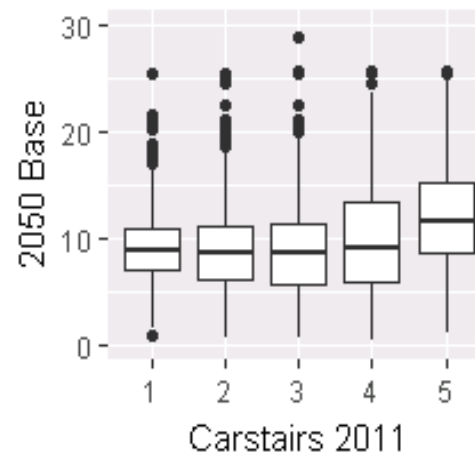
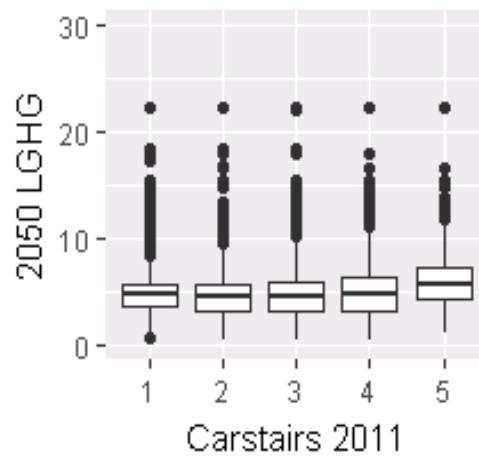
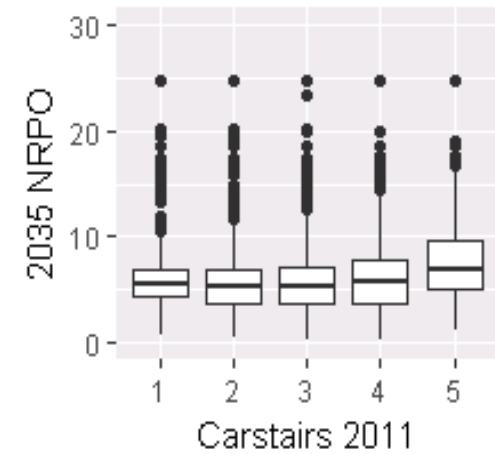
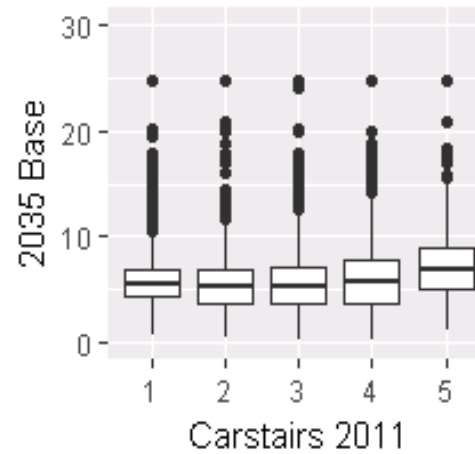
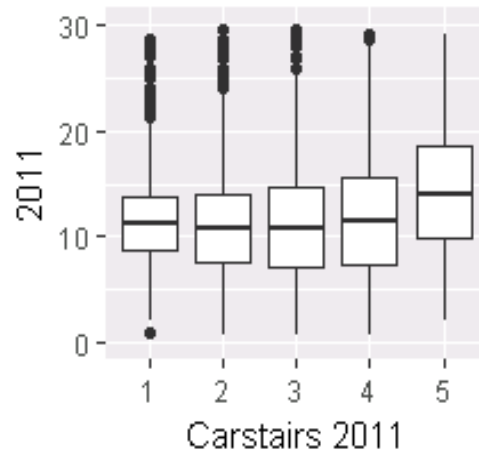
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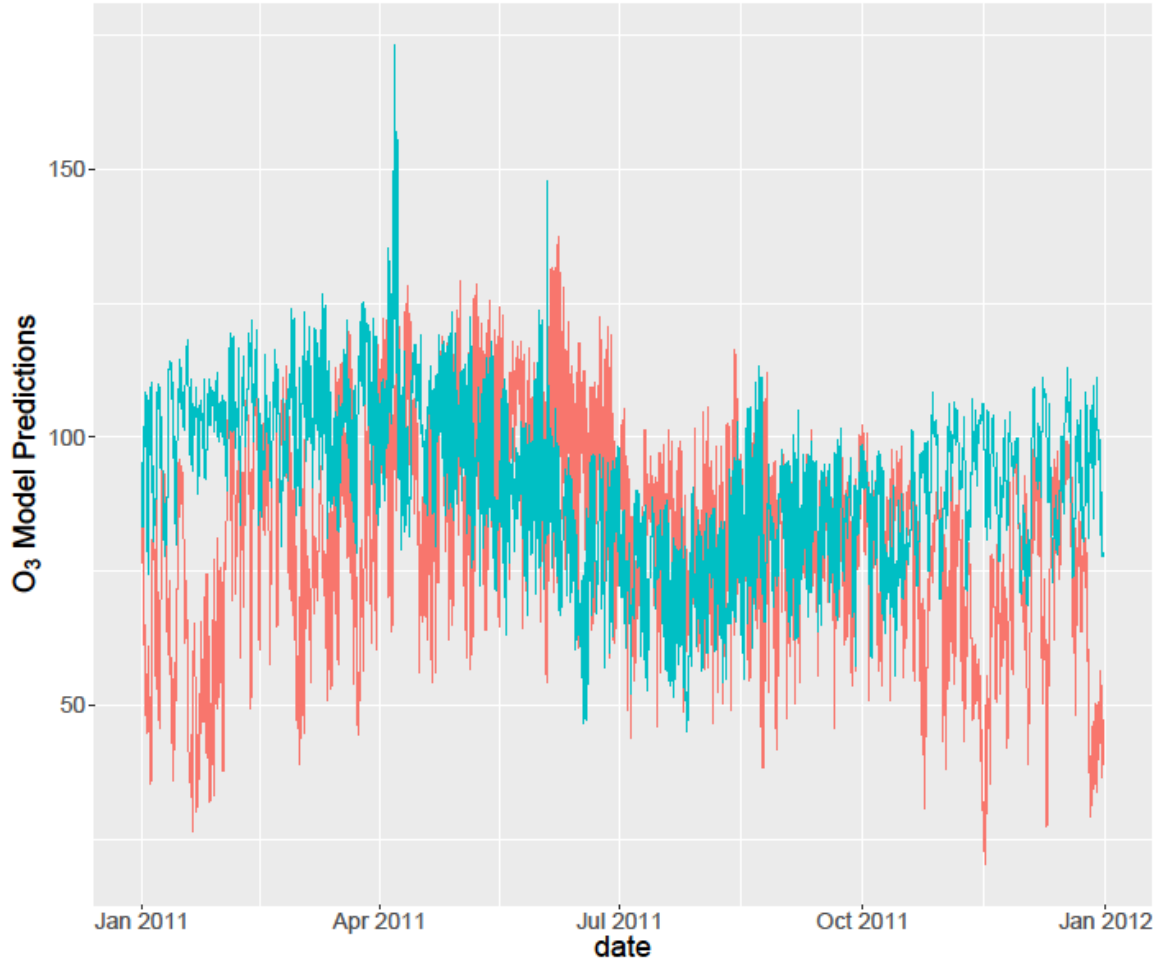
Increased biomass (wood) burning could lead to large increases in primary PM_{2.5} concentrations



Exposure to NO₂/deprivation stratified by Ward



Future ozone concentrations



Peak hourly ozone concentrations may decrease

But long-term average ozone will increase – how important is this for public health?

— 2011_BASE
— 2050_LGHC

Indoor Air Quality

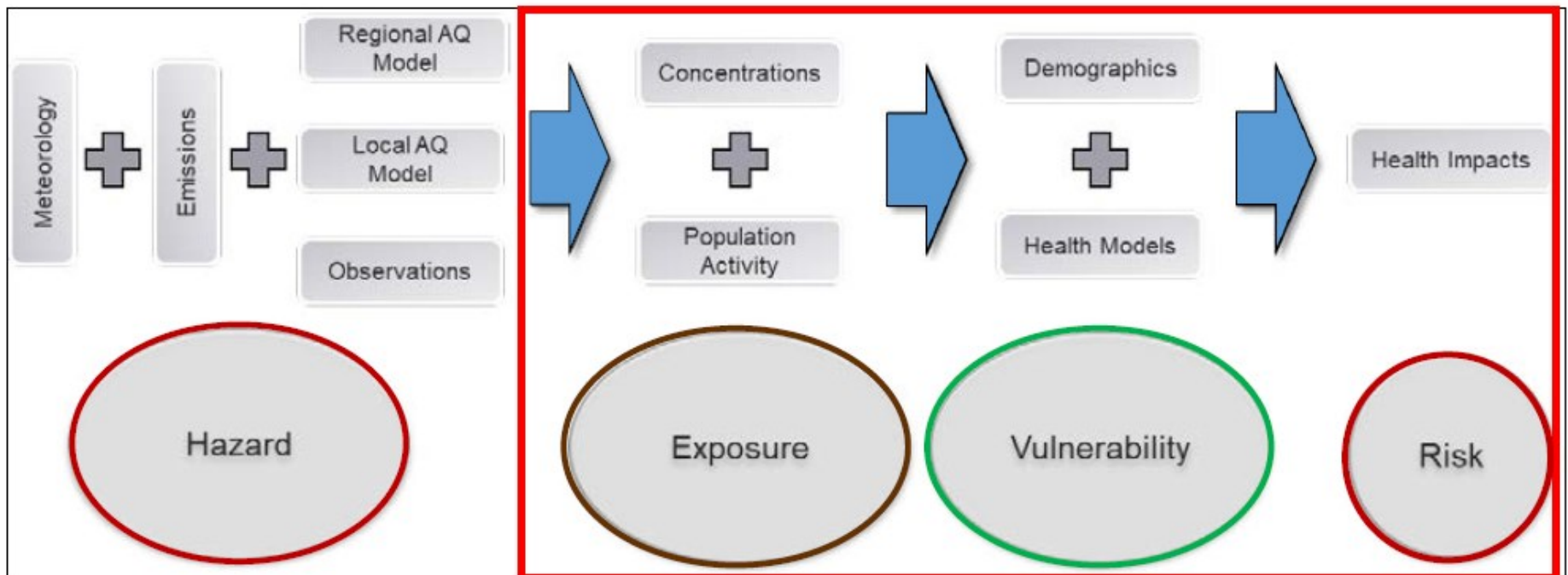
- Considerable current interest, including from the private sector
- Future research needs to answer the ‘So What?’ question
- Little point in simply cataloguing concentrations in a range of micro-environments
- There needs to be associated health studies
- Microenvironments will differ in PM composition – need we worry about ‘burnt toast’?
- Policy options will be limited
- Antagonisms between CC and IAQ e.g. as ‘tight houses’ are built

- UKRI Strategic Priorities Fund: Clean Air Programme** – NERC/MetOffice/CleanAir Champions
 Multi-disciplinary Programme
 Wave 1 under way; Wave 2 announced

Atmospheric Science



Health and Medical Sciences



Achievement of the CAS Commitment for the WHO Guideline for PM_{2.5}

We will progressively cut public exposure to particulate matter pollution as suggested by the World Health Organization. We will set a new, ambitious, long-term target to reduce people's exposure to PM_{2.5} and will publish evidence early in 2019 to examine what action would be needed to meet the WHO annual mean guideline limit of 10 µg/m³.

By implementing the policies in this Strategy, we will reduce PM_{2.5} concentrations across the UK, so that the number of people living in locations above the WHO guideline level of 10 µg/m³ is reduced by 50% by 2025.

Defra funded two studies

Annex 1. Imperial College London report



**PM2.5 exposure and reduction towards
achievement of WHO standards**

SNAPCS contract Report

H. ApSimon, T. Oxley, H. Woodward, D Mehlig Centre for

Environmental Policy, Imperial College London

in collaboration with

the Centre for Ecology and Hydrology, Wood Plc. & EMRC

Annex 2. King's College London report

The WHO Air Quality Guideline for PM_{2.5} -
CMAQ Modelling of future scenarios

March 2019

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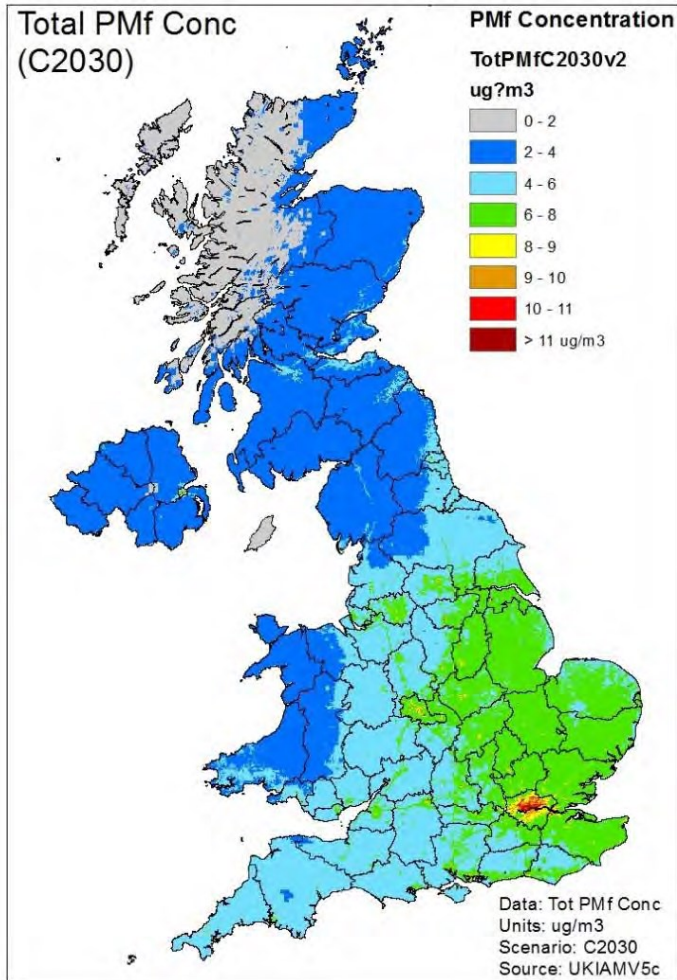
Nutthida Kitwiroon, Sean Beevers and Martin Williams

Achievement of the WHO Guidelines

- The studies at KCL and Imperial College London, found:
- actions set out in *the Clean Air Strategy take us a substantive way towards achieving the WHO guideline level for PM_{2.5}* across the country. However, this evidence shows that there will be localised areas, in particular in central London, where higher levels are likely to persist
- not all benefits are delivered through UK emission reductions; part of the benefit will be *dependent on EU Member States meeting their own emission reduction commitments*, due to transboundary transport of PM
- in all cases, population exposure to PM_{2.5} will be *substantially lower in 2030*, relative to now

BUT! There are still uncertainties in the emission inventories – notably PM emissions from cooking, non-exhaust emissions, wood/solid fuel burning....

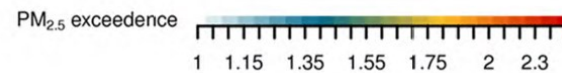
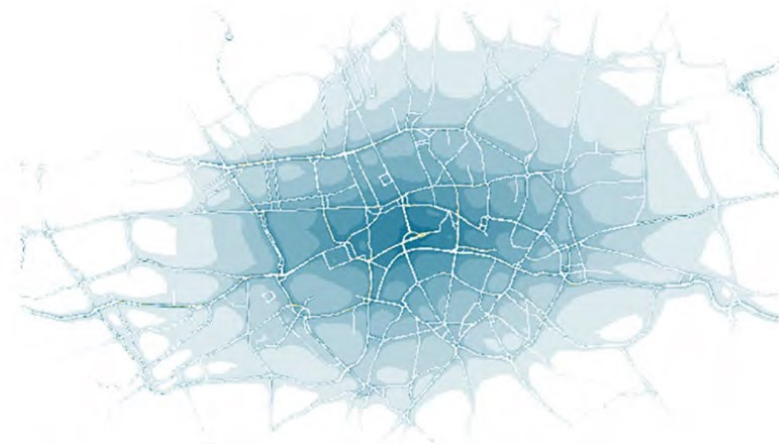
Imperial study



KCL Study

Note results expressed as ratio to the WHO number

London (20m): 2030Ct+



**Update of the
WHO Global Air Quality Guidelines:
process and progress**



**World Health
Organization**

WHO guideline process: groups involved

1. WHO Steering Group:

- Technical staff from Regions, IARC & Headquarters
- Oversees project
- Drafts proposal, advises on composition of expert groups

2. Guideline Development Group (GDG):

- External panel
- Covers all perspectives needed
- Helps define the scope
- Develops final recommendations

3. External Review Group (ERG):

- Broader external group of experts/stakeholders on different aspects of the topic
- Peer review of the guideline at different stages (early/final), as required

Updated
WHO Global
AQGs

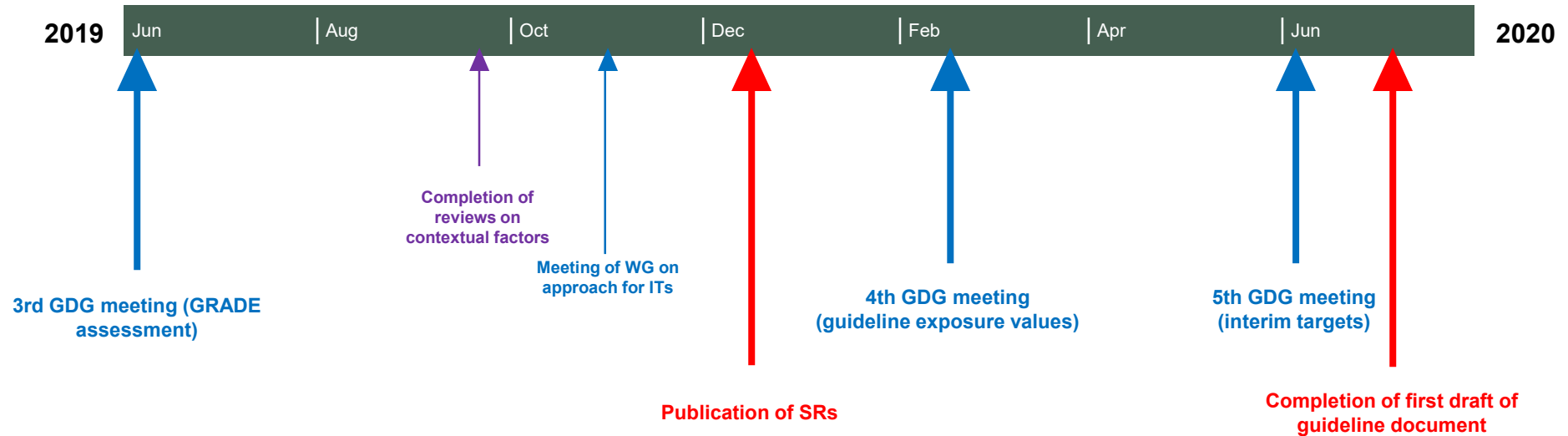
External collaborators:

- Guideline methodologist
- Others experts as needed

4. Systematic Review Team (SRT)

- Develops the systematic reviews (SR) according to the established methods

WHO guidelines: what's next?



Revised WHO Guidelines

- Will there be Guidelines for PM components – Black Carbon? Ultrafines?
- Will the PM_{2.5} Guideline change?
- Will the evidence result in changes in the NO₂ Guideline?!
- In this round of Guidelines production there will be a more systematic commentary on the level of confidence in the health effect studies
- This should guide/inform the risk management phase of formulating legal standards

Thank you!