



UNIVERSITY OF BIRMINGHAM

# WM-NET ZERO

A Health-centred Systems Approach Towards Net-Zero:  
Transforming Regional Climate Mitigation Policies

## Modelling the impacts of net zero policies on air quality and health equity in the West Midlands, UK

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The WM-NetZero project is supported by Wellcome Trust (227150\_Z\_23\_Z) under the Advancing climate mitigation policy solutions with health co-benefits in G7 countries scheme.

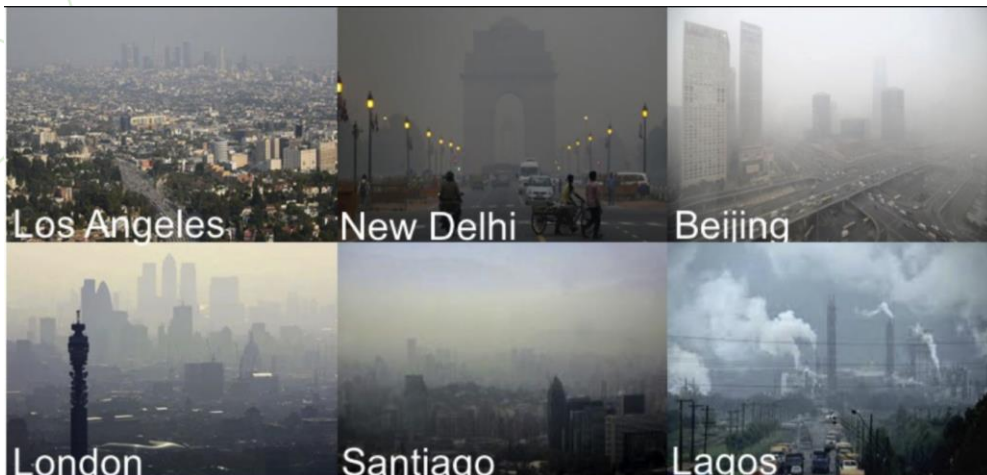


# Air pollution and Net Zero

WM-NET ZERO

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- Air pollution: Biggest environmental risk to human health
- Cities: typical hotspots
- Climate change and air pollution are closely interlinked
- Net Zero policies: air quality and associated health co-benefits.
- National and regional (WM2041) Net Zero strategy



<https://ral.ucar.edu/pressroom/features/air-pollution-a-global-problem>

nature portfolio

nature > collection

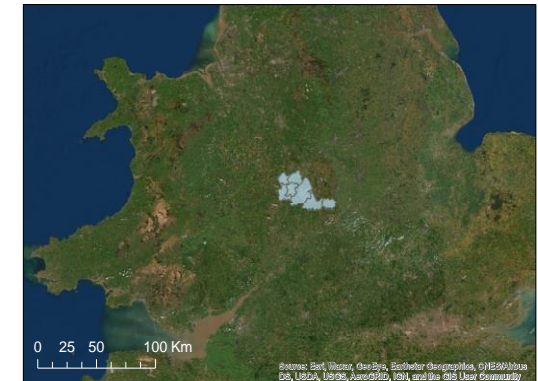
Collection | 07 November 2023

**Air pollution and global solutions**



<https://www.nature.com/collections/ebbadffjfc>

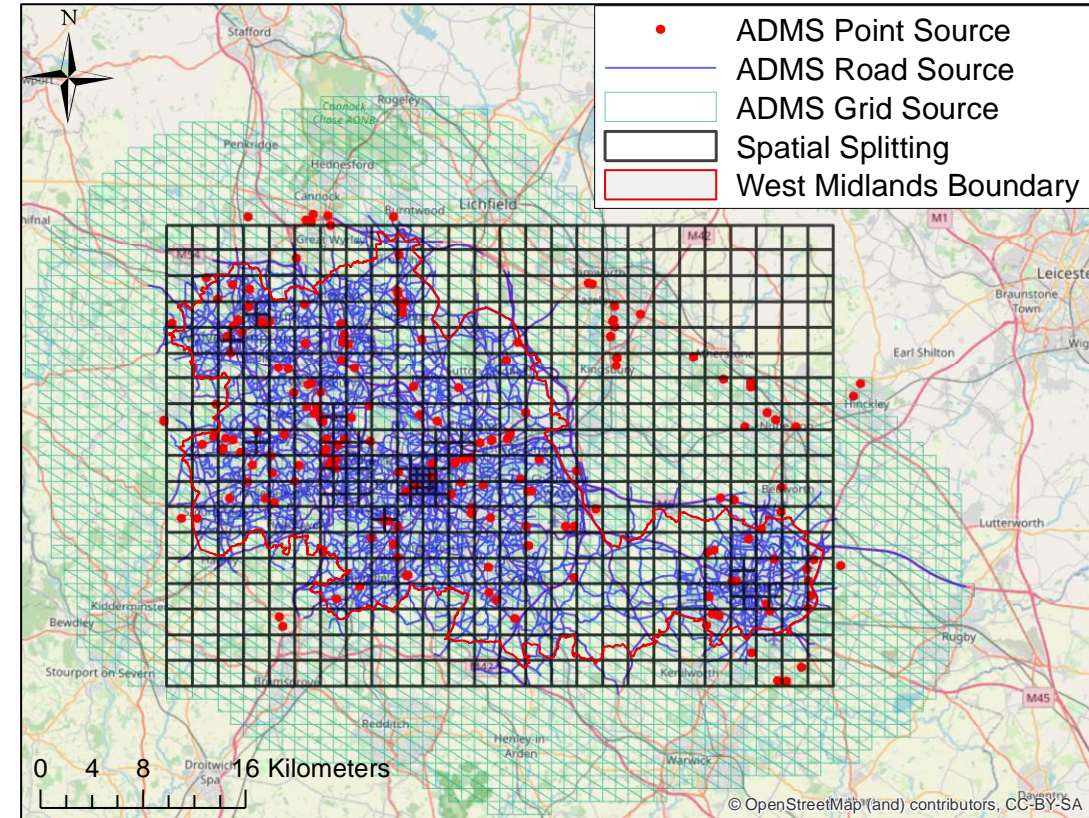
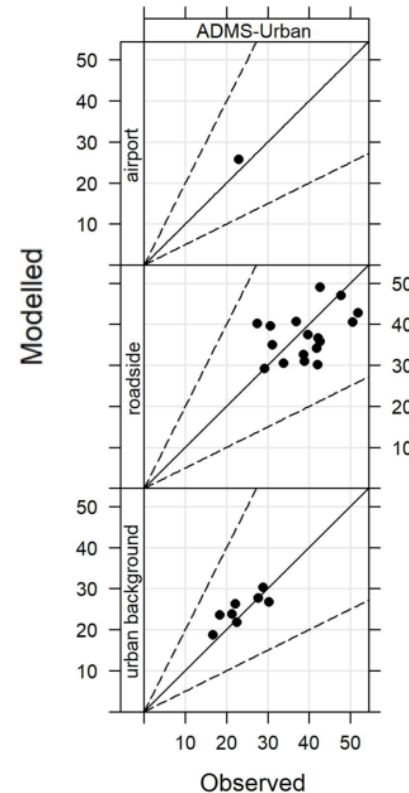
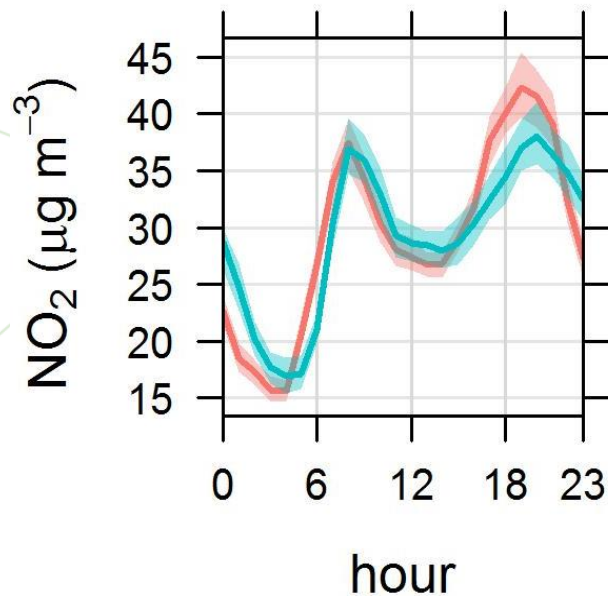
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## WM-Air model configuration

- ADMS-Urban model (CERC).
- Model baseline year: 2016 & 2019.
- Meteorology, background levels as observed.
- Advanced canyon and urban canopy.
- Emissions: Point, Road, and Grid.
- CERC Model Evaluation Toolkit.

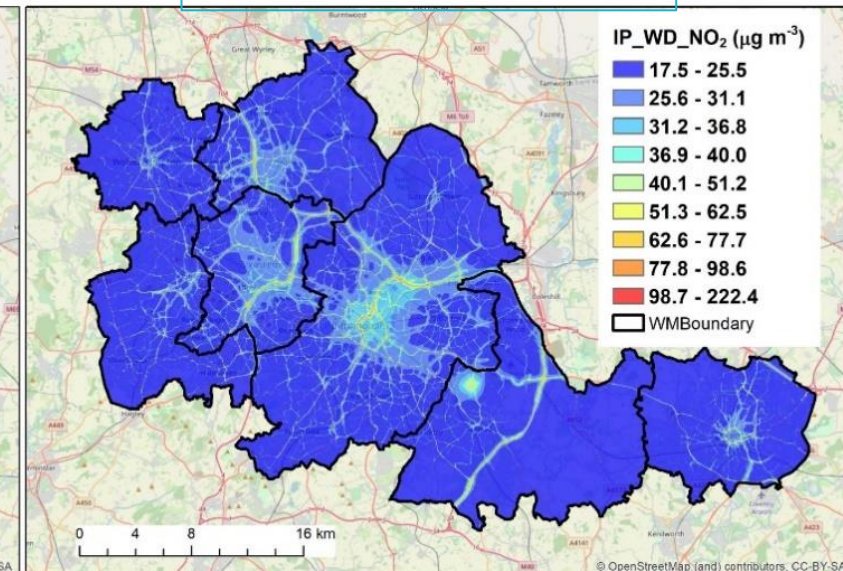
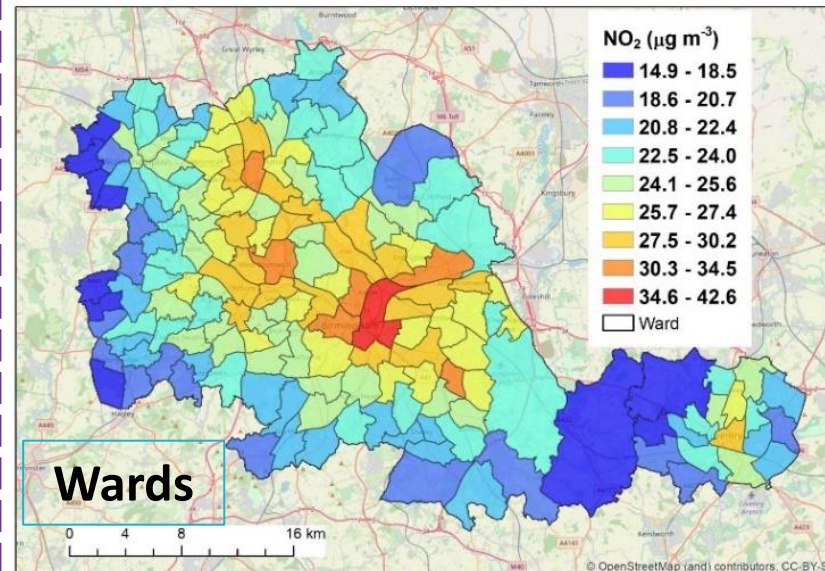
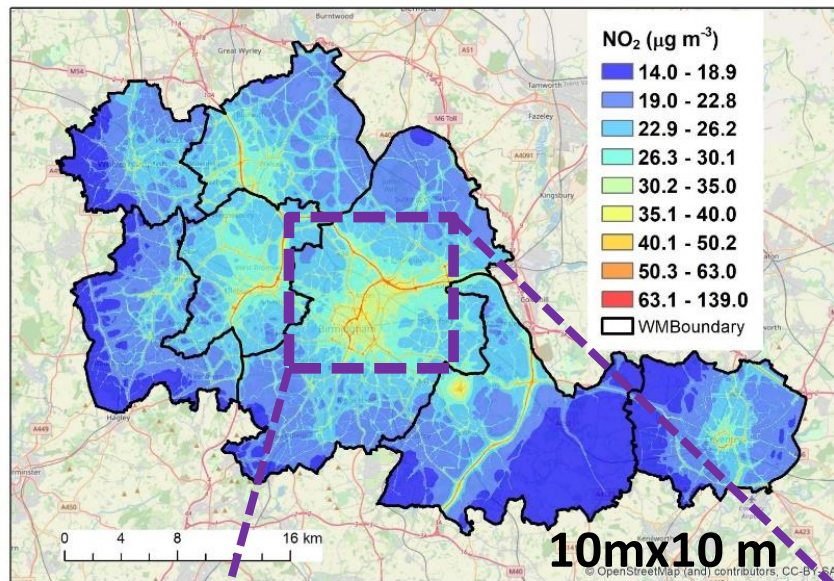
### Bristol Road (Roadside)



(Zhong et al, 2021, <https://doi.org/10.3390/atmos12080983>,  
Zhong et al, 2024, <https://doi.org/10.1016/j.uclim.2024.101961>)

## WM-Air model capability

- 'Raw' high resolution concentration contours
- Spatially aggregated to LSOA and Wards
- Averaged over different diurnal subsets e.g. peak hours
- Assessment of health impact
- Evaluation of interventions



# Scenarios: Clean Air / Net Zero

WM-NET ZERO

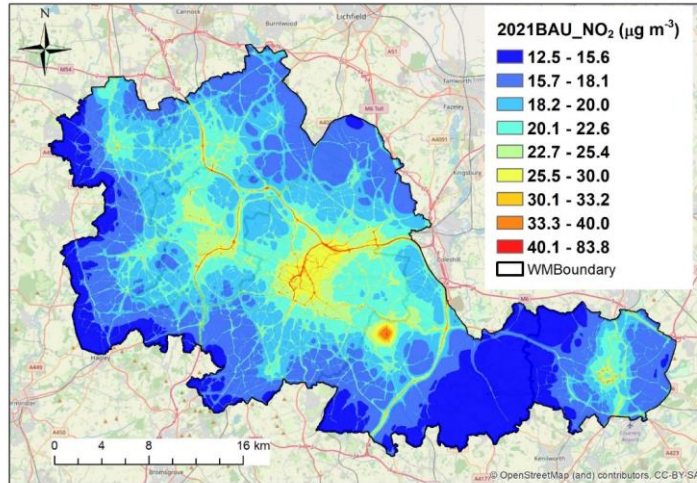
A Health-centred Systems Approach Towards Net-Zero:  
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- 2021 BAU Business-as-usual: no covid impacts on activity (updated from the baseline model)
- 2030 BAU Business-as-usual: Anticipated emissions reductions in line with NECD commitments  
<https://www.eea.europa.eu/data-and-maps/data/necd-policies-and-measures-database>
- 2030 NZS Emission reductions estimated in line with the UK Net Zero Strategy; Assume a change in technology and therefore emissions (rather than behavioural change etc..)
- 2030 EV Transport-sector only changes in line with the above 2030 NZS (24% car; 9% HGV; 25% bus/Coach=EV)

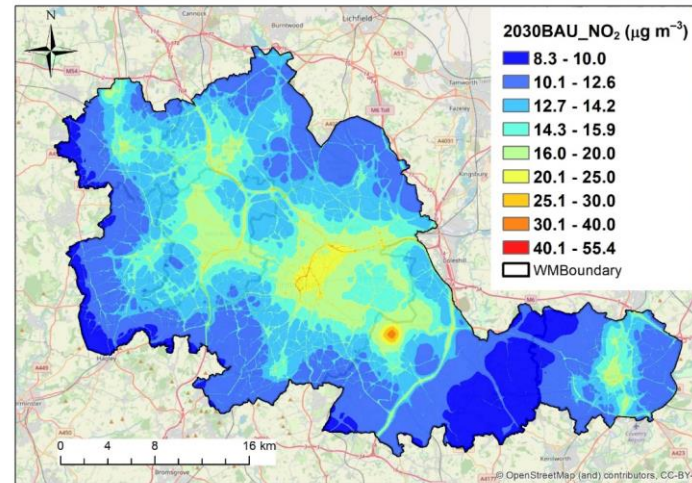
...these are all really quite substantial approximations...

# Air quality: 2021 BAU vs 2030 BAU

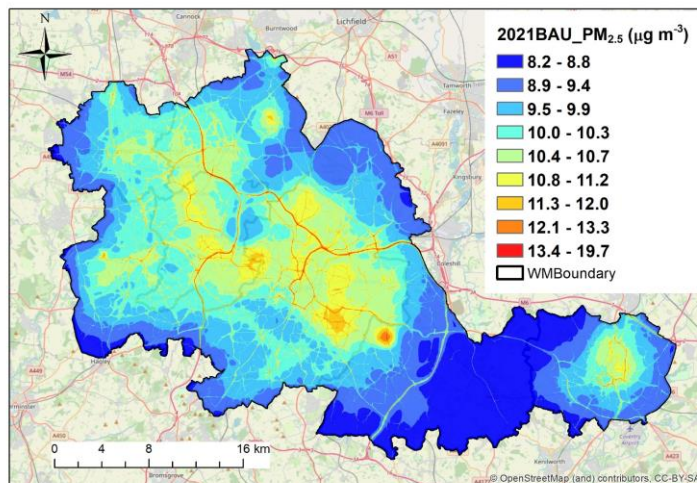
(a) NO<sub>2</sub> for 2021 BAU



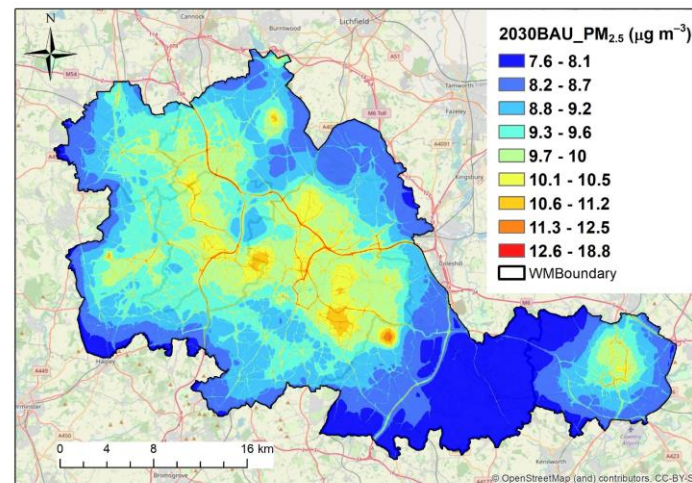
(b) NO<sub>2</sub> for 2030 BAU



(c) PM<sub>2.5</sub> for 2021 BAU

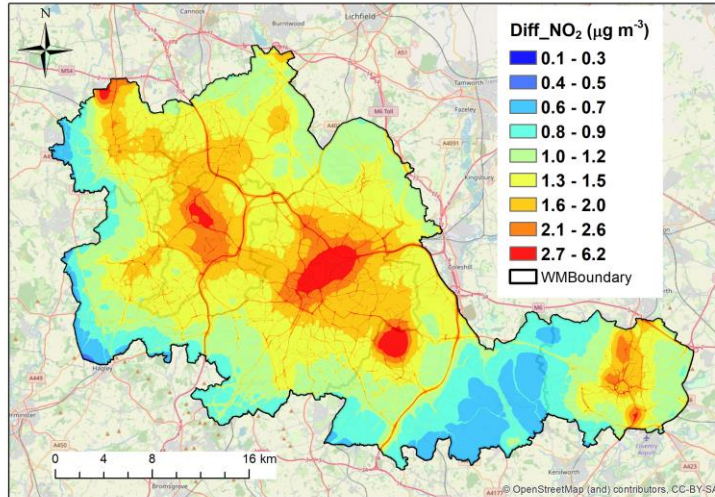


(d) PM<sub>2.5</sub> for 2030 BAU

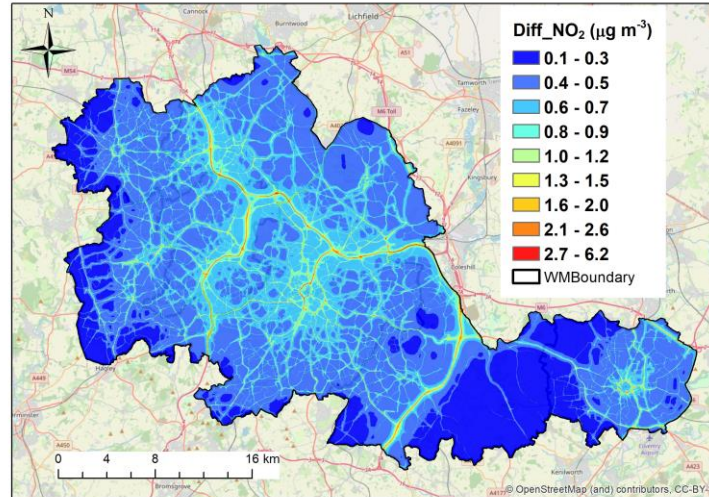


# Impact of NZ policies on NO<sub>2</sub>

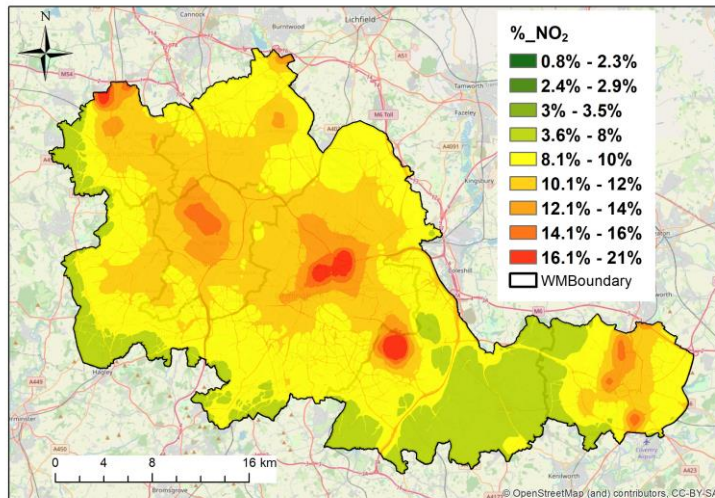
(a) 2030 BAU-2030 NZS



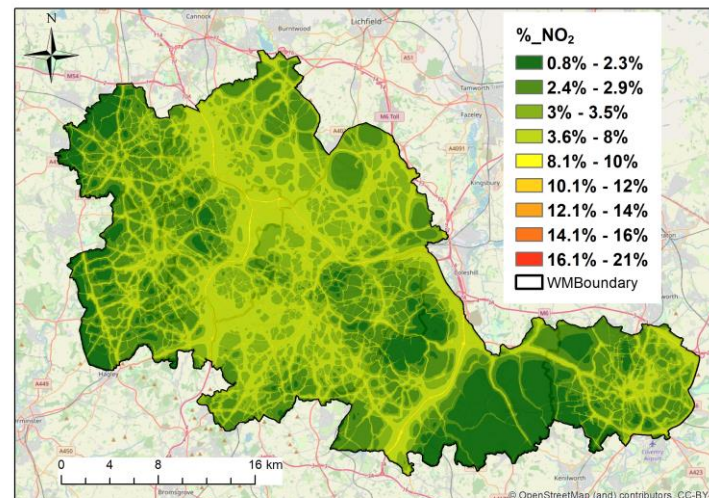
(b) 2030 BAU -2030 EV



(c) (2030 BAU -2030 NZS)/2030 BAU



(d) (2030 BAU -2030 EV)/2030 BAU



Net Zero Scenario

EV only Scenario

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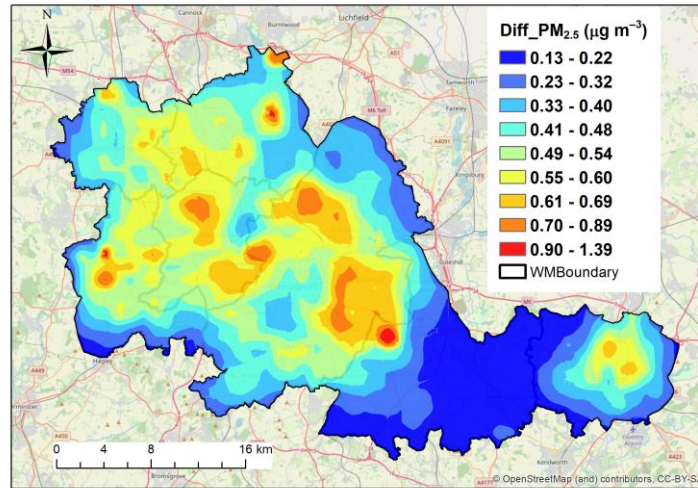


# Impact of NZ policies on PM<sub>2.5</sub>

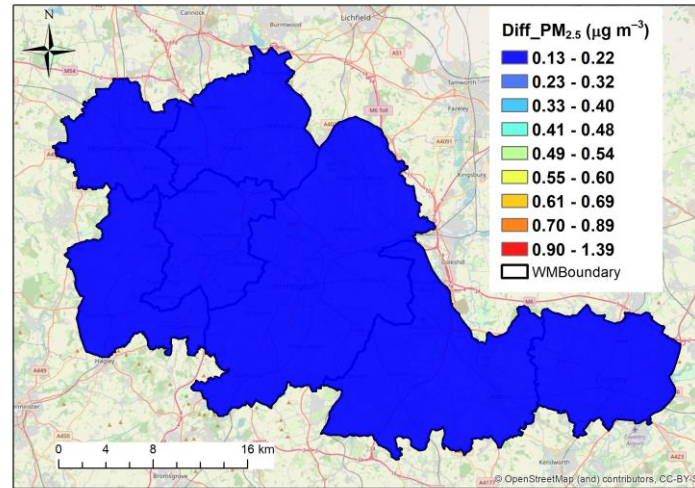
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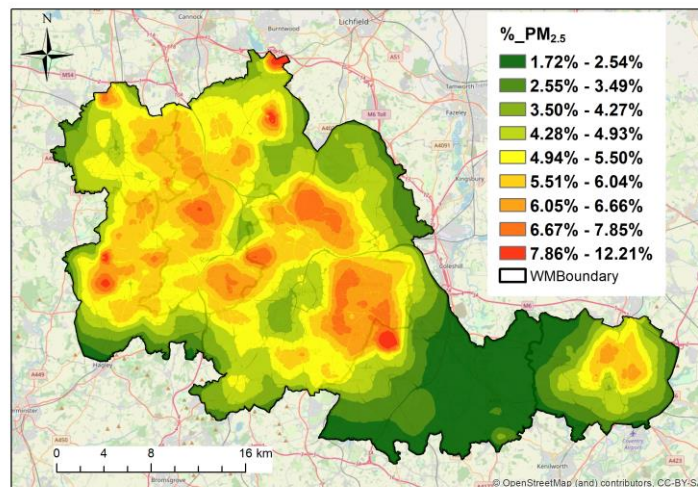
(a) 2030 BAU-2030 NZS



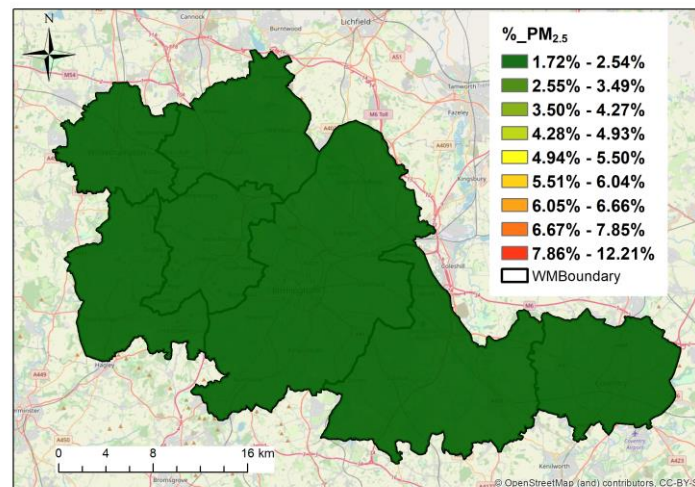
(b) 2030 BAU -2030 EV



(c) (2030 BAU -2030 NZS)/2030 BAU



(d) (2030 BAU -2030 EV)/2030 BAU



Net Zero Scenario

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# Air quality Life Assessment

Air quality Life Assessment Tool (AQ-LAT) (Hall et al. 2024):

- Improved air quality under 2030 Net Zero scenario would have significant public health benefits with an estimated 2,853 lives saved and 16,751 less diseases cases over the next 20 years.

**Net Zero Scenario**

**EV only Scenario**

	<b>Disease</b>	<b>Deaths</b>	<b>Disease</b>	<b>Deaths</b>
<b>Birmingham</b>	7032	1060	5819	706
<b>Coventry</b>	1674	299	1399	215
<b>Dudley</b>	1706	344	1401	231
<b>Sandwell</b>	2069	382	1686	251
<b>Solihull</b>	950	176	811	134
<b>Walsall</b>	1901	316	1608	215
<b>Wolves</b>	1419	276	1151	187
<b>WMCA</b>	<b>16751</b>	<b>2853</b>	<b>13875</b>	<b>1939</b>



Regional impact assessment of air quality improvement: The air quality lifecourse assessment tool (AQ-LAT) for the West Midlands combined authority (WMCA) area<sup>✱</sup>

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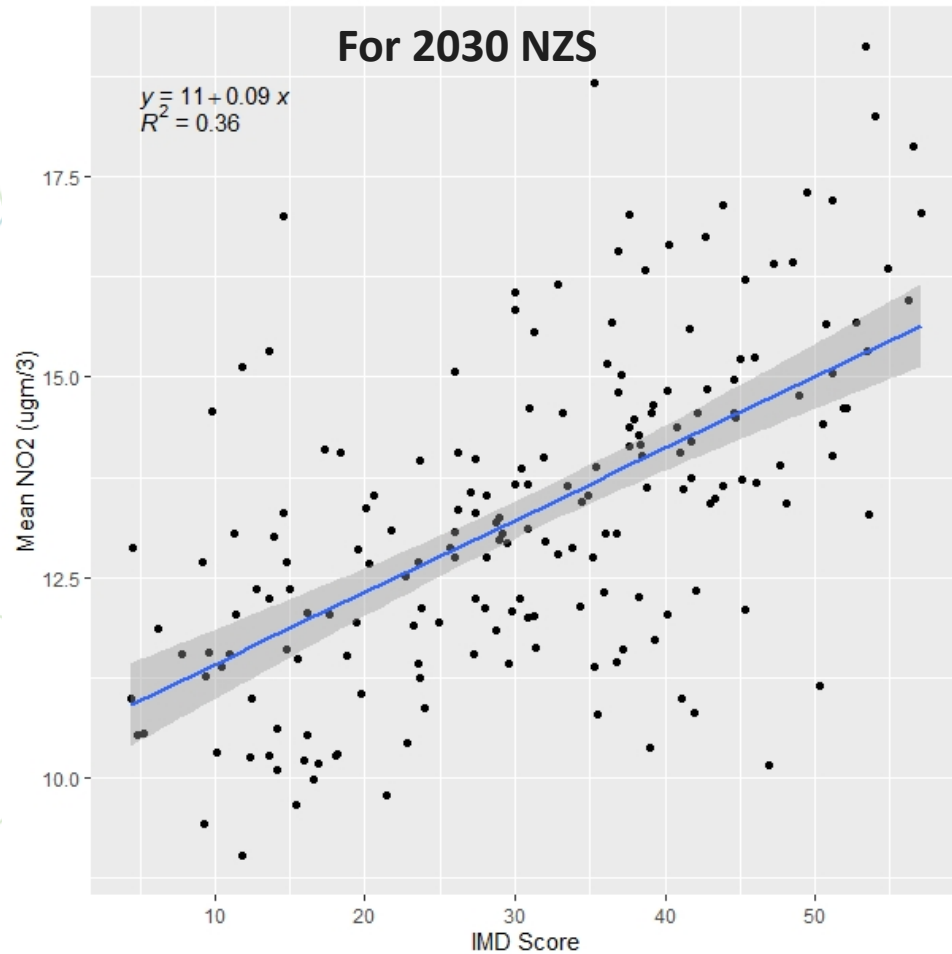
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## Impact on health inequality

- The most deprived areas of the region are exposed to the highest air pollution levels.
- Health inequality would be reduced under the 2030 NZS scenario.



Difference between the most and least deprived ward air pollution levels ( $\mu\text{g m}^{-3}$ )

Pollutant	2030 BAU	2030 EV	2030 NZS
NO <sub>2</sub>	4.1	4.3	3.62
PM <sub>2.5</sub>	1.42	1.42	1.17

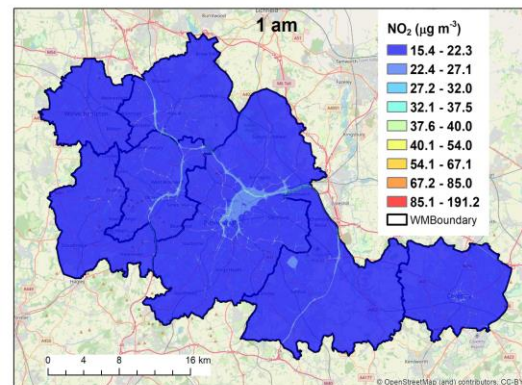
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Net-Zero: Transforming Regional Climate  
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## Thank you for your attention!

- NZS improves air quality.
- There are bigger benefits from NZS than from EV.
- NZS health benefits: 2,853 lives saved and 16,751 less diseases cases over the next 20 years.
- Health inequality is reduced.



Get involved and stay connected

X: <https://x.com/WMNetZero>

LinkedIn: [linkedin.com/company/wm-net-zero](https://www.linkedin.com/company/wm-net-zero)

E-mail: [wm-netzero@contacts.bham.ac.uk](mailto:wm-netzero@contacts.bham.ac.uk)

Website: <https://wm-netzero.org.uk/>

Mailing List: [eepurl.com/iN7L2U](https://eepurl.com/iN7L2U)

#WMNetZero



<https://www.youtube.com/watch?v=Z5C2p509thc>

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