


Traffic reduction and air quality: *How far can we go?*

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WM-AIR
CLEAN AIR SCIENCE FOR
THE WEST MIDLANDS

Traffic and air pollution emissions

- Road transport is one of the major sources for air pollution in urban areas.
- It was estimated that 35% of NO_x emissions and 13% PM_{2.5} emissions were generated by the transport sector in the UK. (Source: *Official Statistics, Transport and environment statistics: Autumn 2021*)
- Traffic control is an important measure in air quality management.
- This modelling study: Hypothetical experiment of traffic reduction applied to the within-WMCA only and air quality impacts



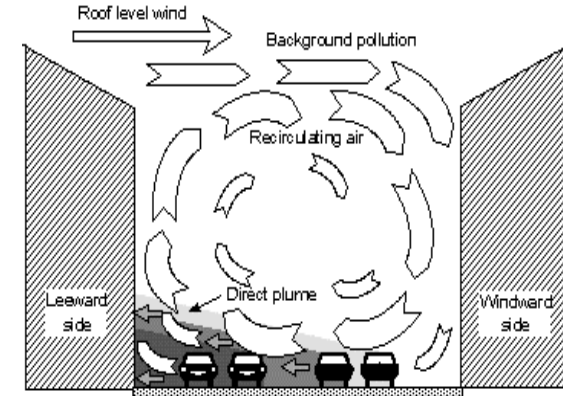
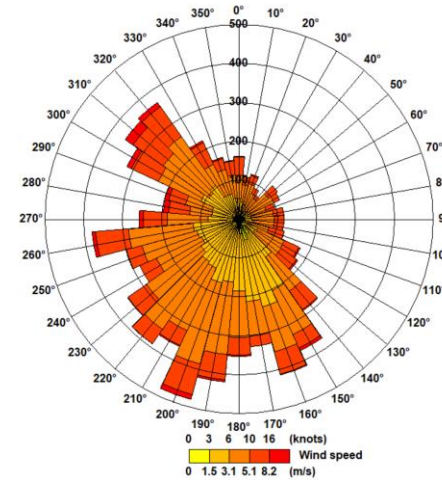
<https://www.corrconcepts.com/reduce-air-pollution-from-vehicles/>

Model Approach

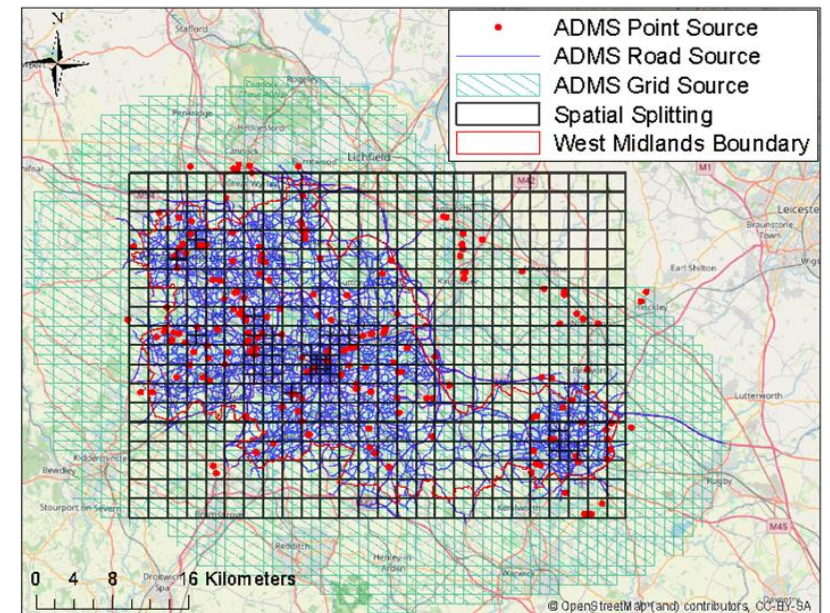
- WM-Air model:

ADMS-Urban model developed in collaboration with CERC

- Model baseline year updated to 2019. Meteorology, background levels as observed.
- Advanced canyon and urban canopy parameters calculated from explicit building footprints and heights
- Industrial emissions: NAEI, updated with BCC (Airviro) locations and stack properties
- Gridded emissions: NAEI, 1 km × 1 km resolution; 11 SNAP sectors.



(Berkowicz, 2000)



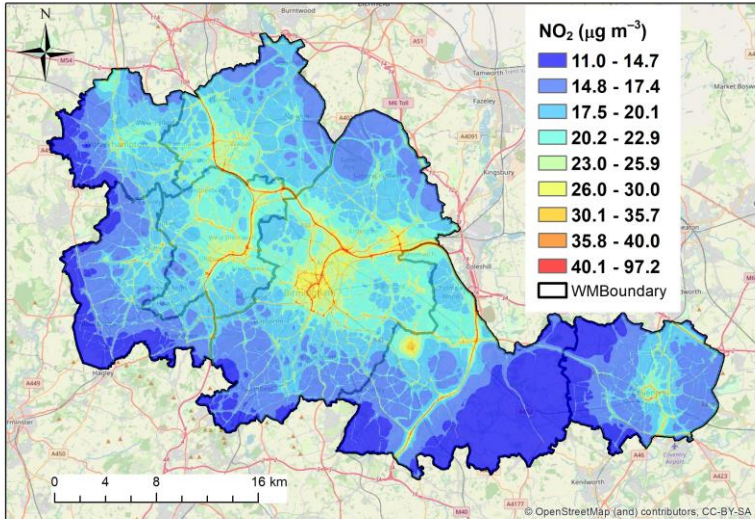
(Zhong et al, 2021, Atmosphere)

Modelling Scenarios: Hypothetical traffic reduction

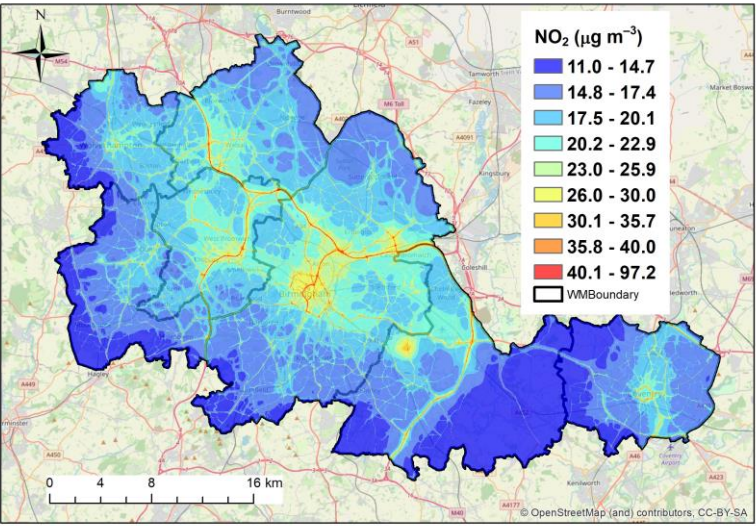
ADMS Modelling scenarios	Note
Base case (2019 BAU)	2019 NAEI emissions; traffic fleet and emission factors; Met; Background.
10% Traffic reduction	Traffic reduction by 10%; other conditions kept same as Base case
30% Traffic reduction	Traffic reduction by 30%; other conditions kept same as Base case
50% Traffic reduction	Traffic reduction by 50%; other conditions kept same as Base case
70% Traffic reduction	Traffic reduction by 70%; other conditions kept same as Base case
90% Traffic reduction	Traffic reduction by 90%; other conditions kept same as Base case

Impact of traffic reduction on NO₂ (absolute levels)

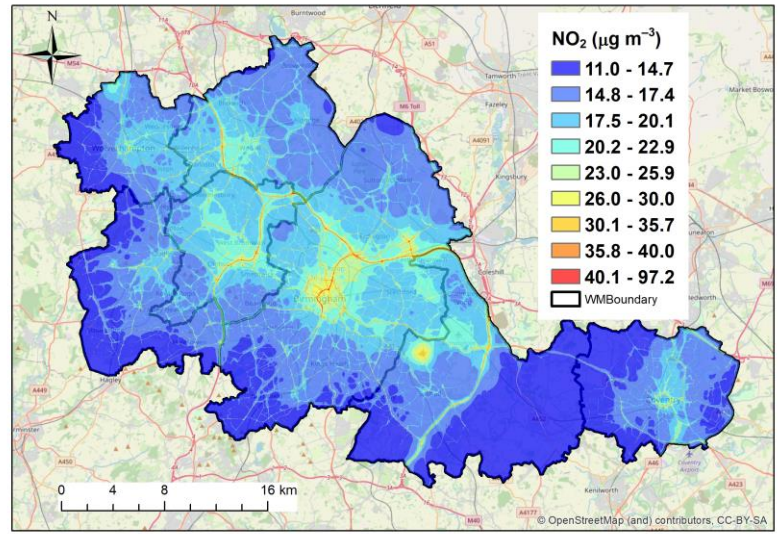
Base case (2019 BAU)



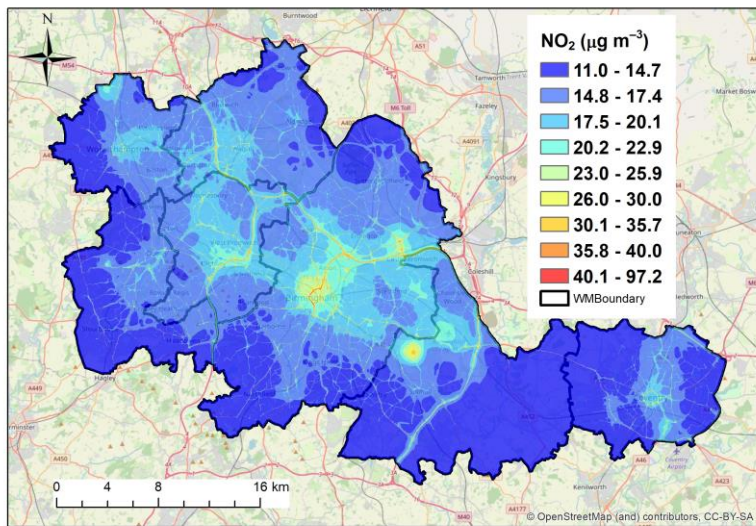
10% Traffic reduction



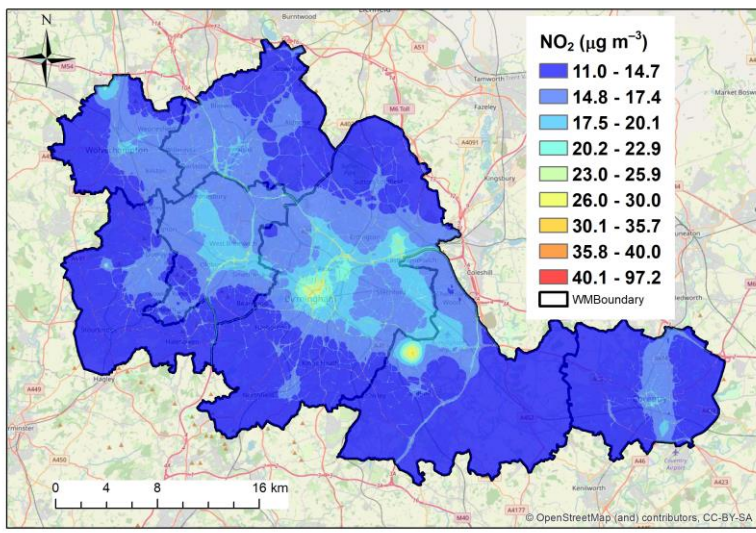
30% Traffic reduction



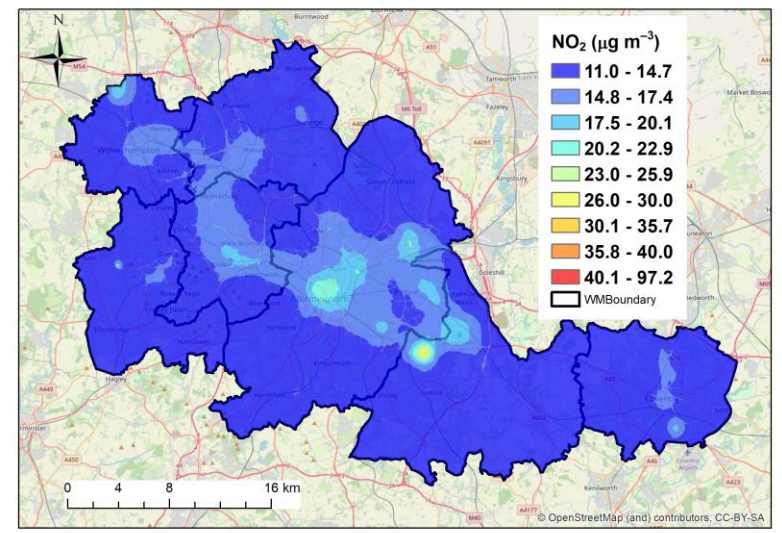
50% Traffic reduction



70% Traffic reduction

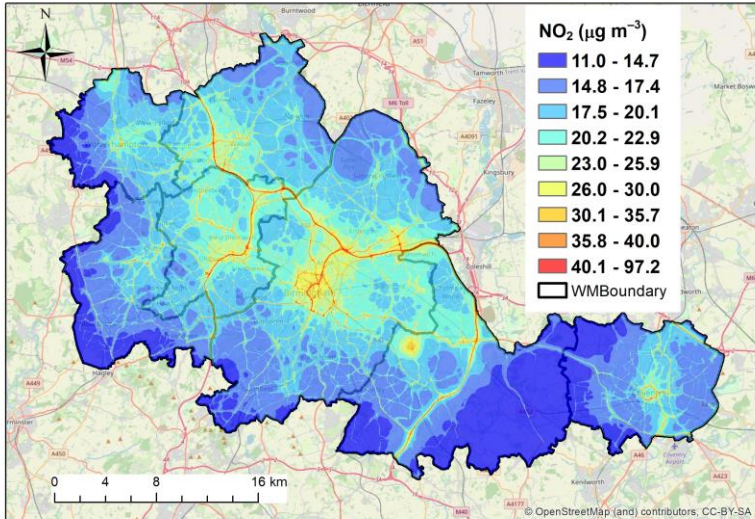


90% Traffic reduction

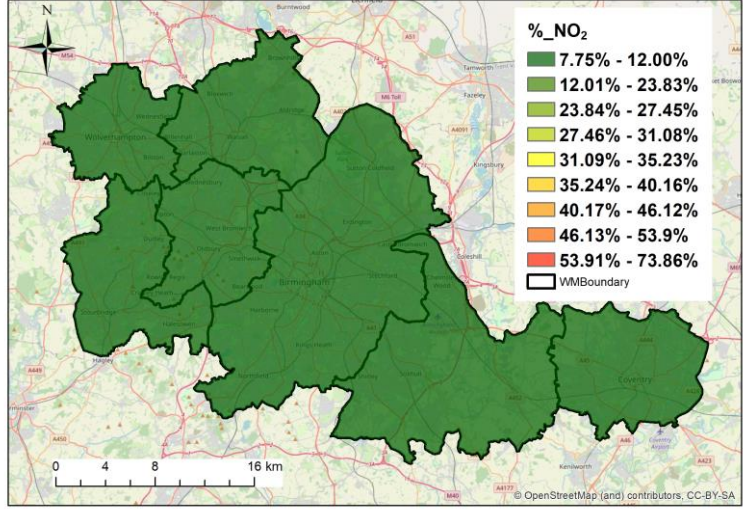


Impact of traffic reduction on NO₂ (Relative changes)

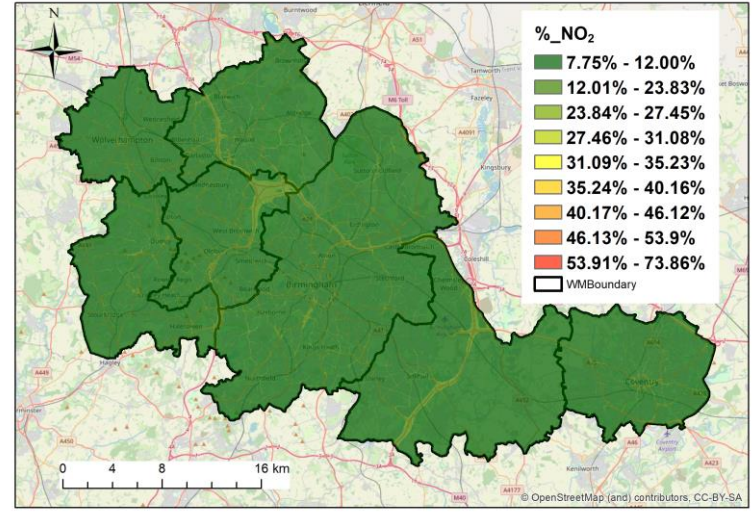
Base case (2019 BAU)



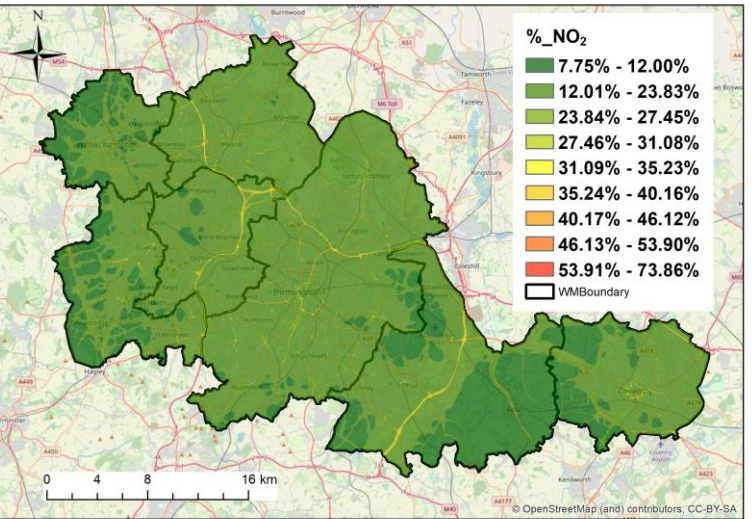
10% Traffic reduction



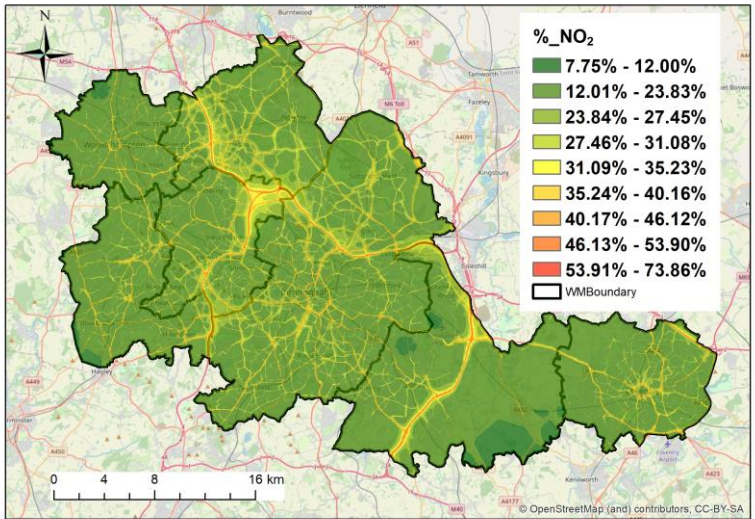
30% Traffic reduction



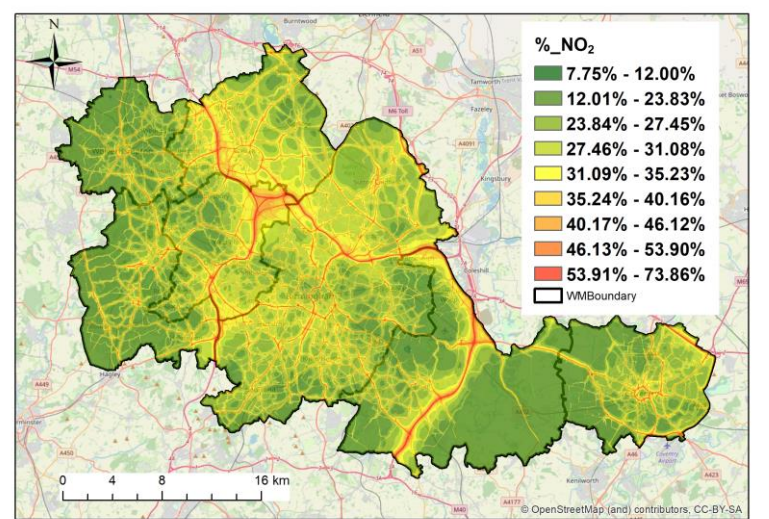
50% Traffic reduction



70% Traffic reduction

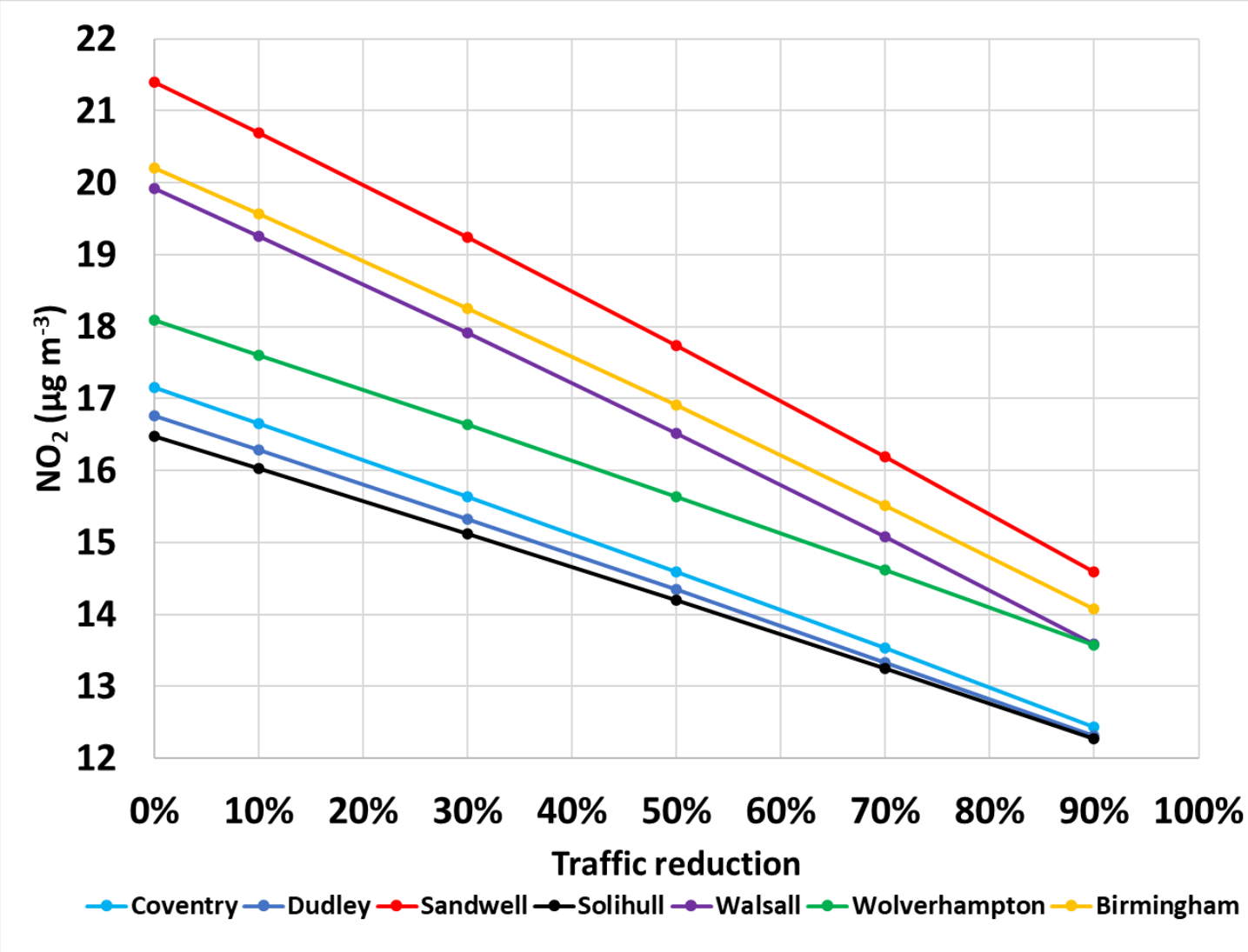


90% Traffic reduction



Impact of traffic reduction on NO₂ (local authority level)

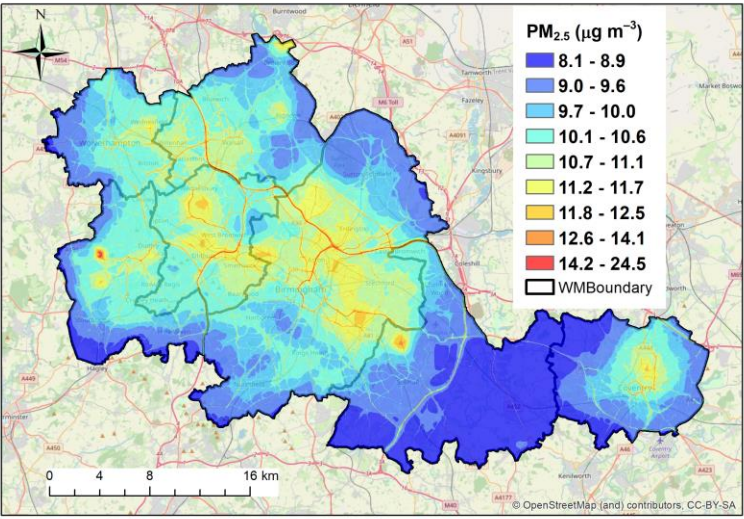
NO₂ concentrations aggregated at the local authority level



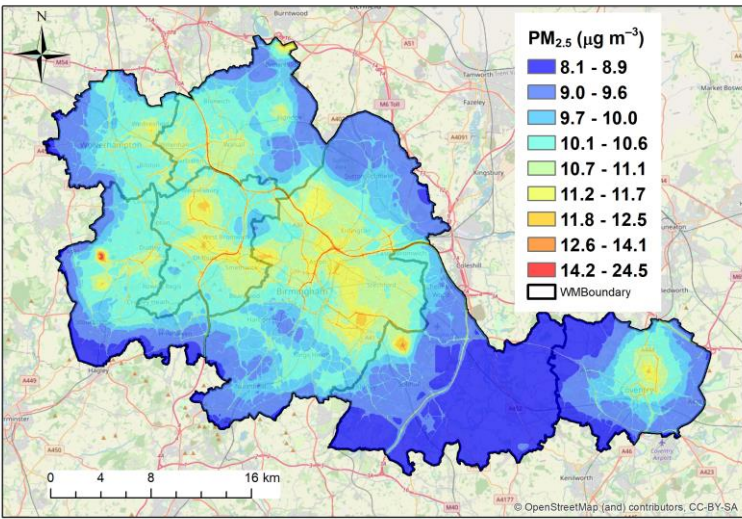
**Relative reduction:
up to 25-32 %**

Impact of traffic reduction on PM_{2.5} (absolute levels)

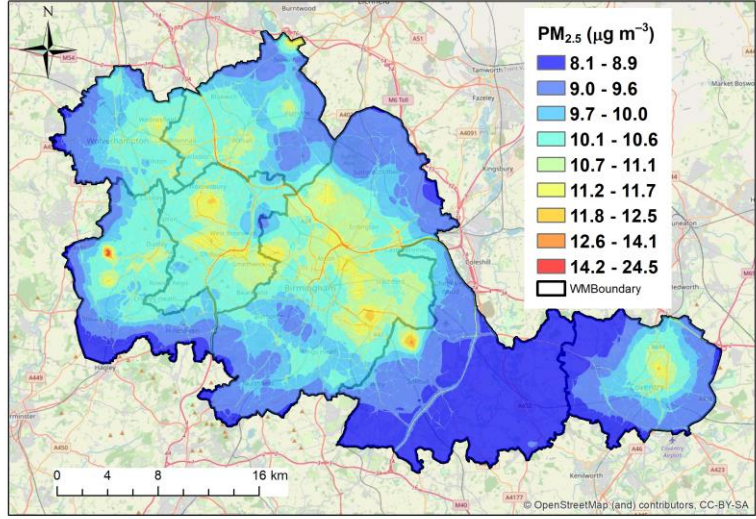
Base case (2019 BAU)



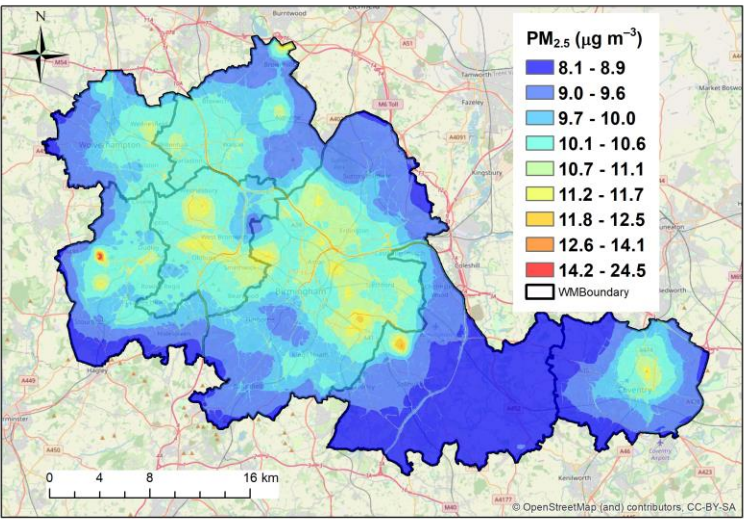
10% Traffic reduction



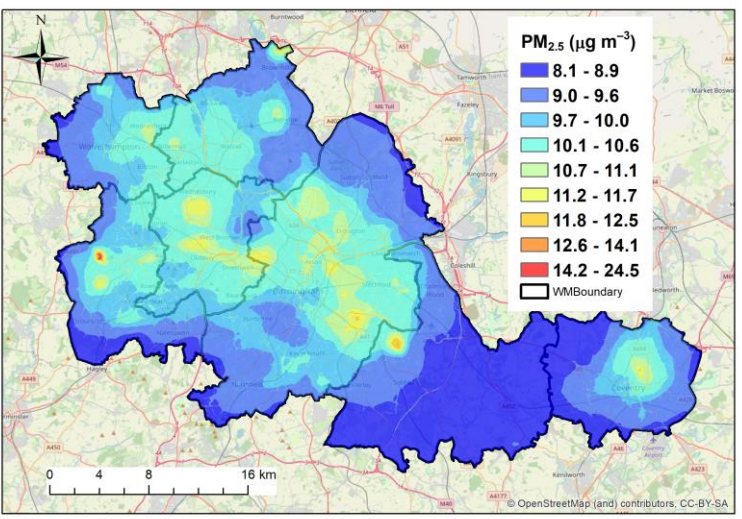
30% Traffic reduction



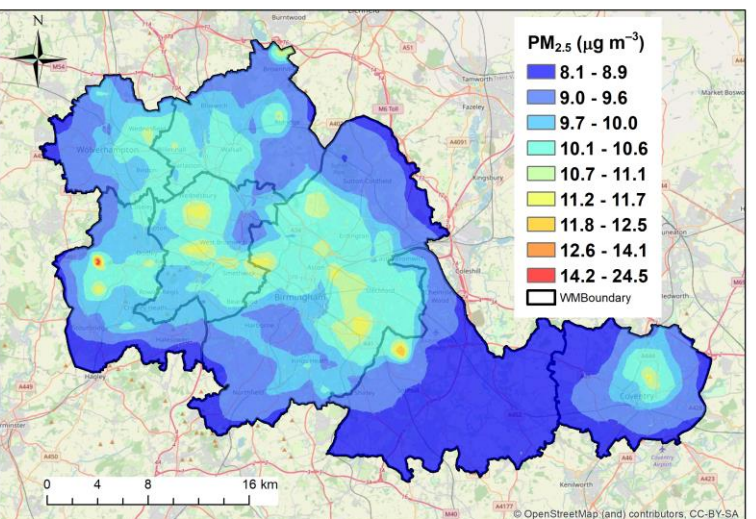
50% Traffic reduction



70% Traffic reduction

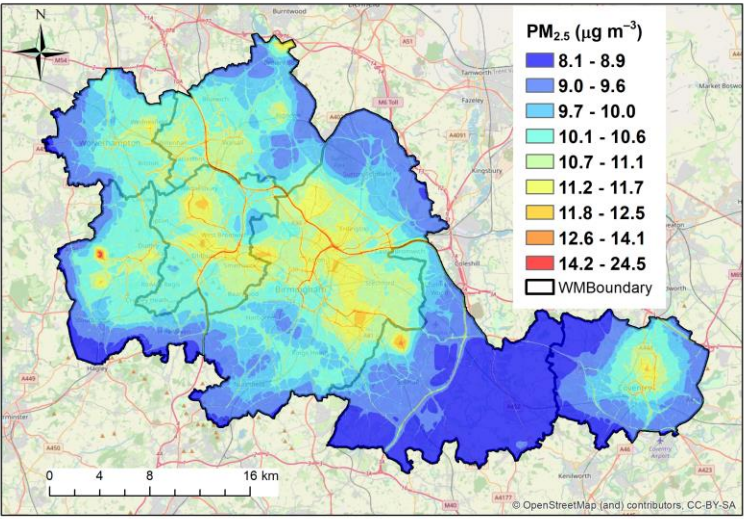


90% Traffic reduction

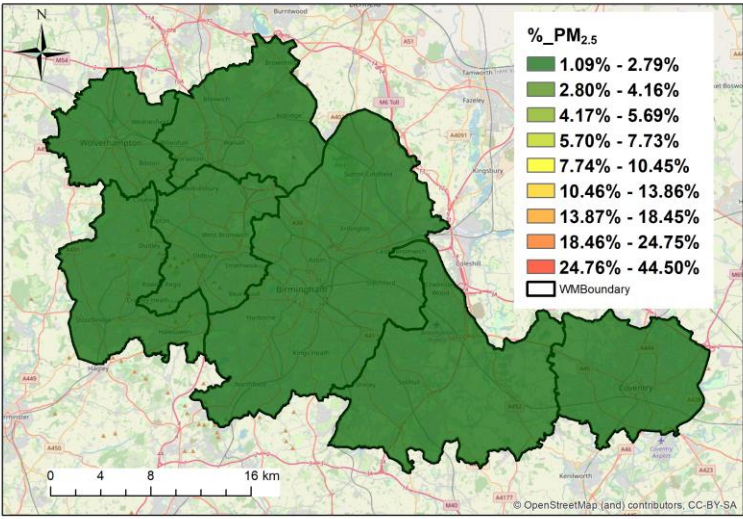


Impact of traffic reduction on PM_{2.5} (Relative changes)

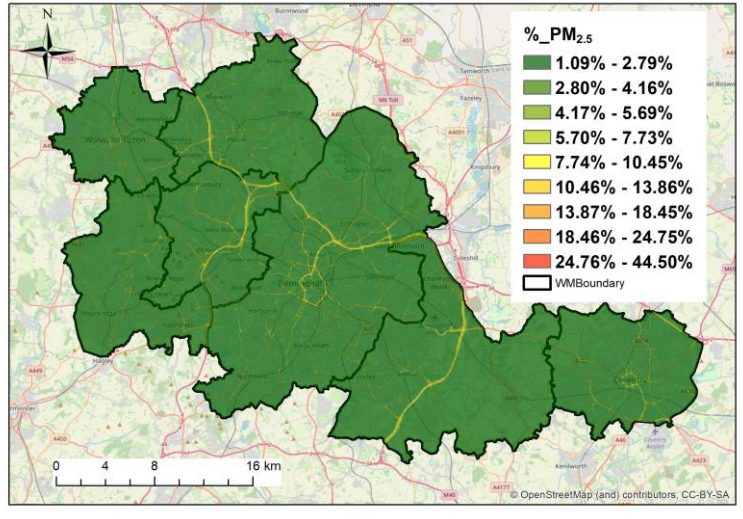
Base case (2019 BAU)



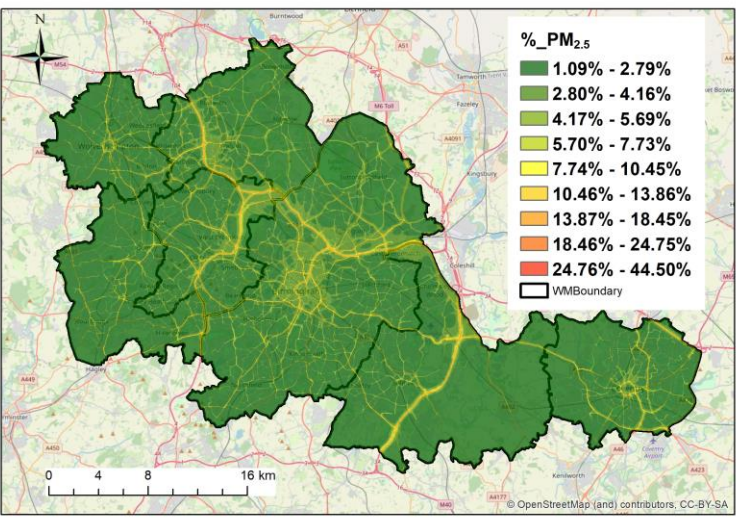
10% Traffic reduction



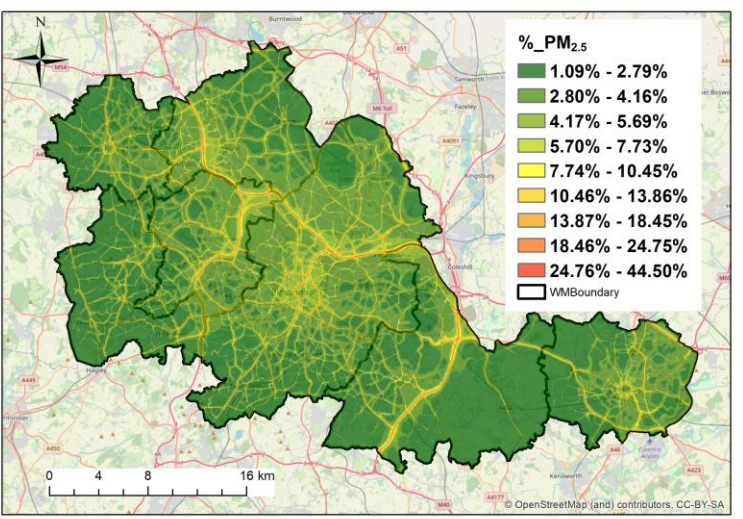
30% Traffic reduction



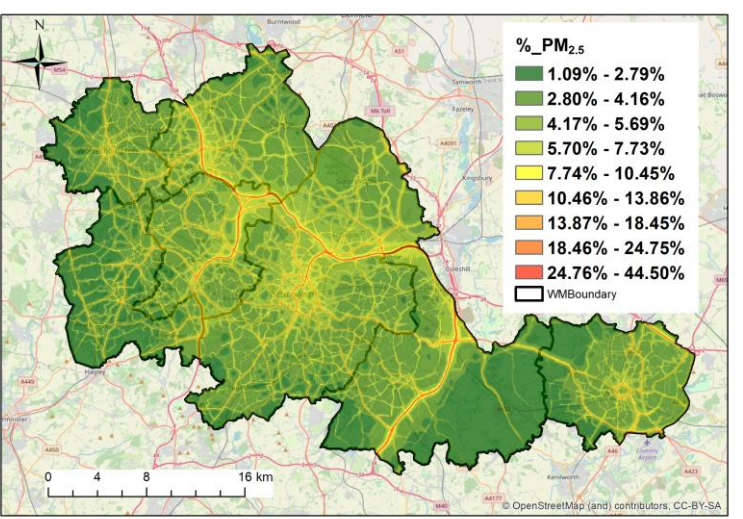
50% Traffic reduction



70% Traffic reduction

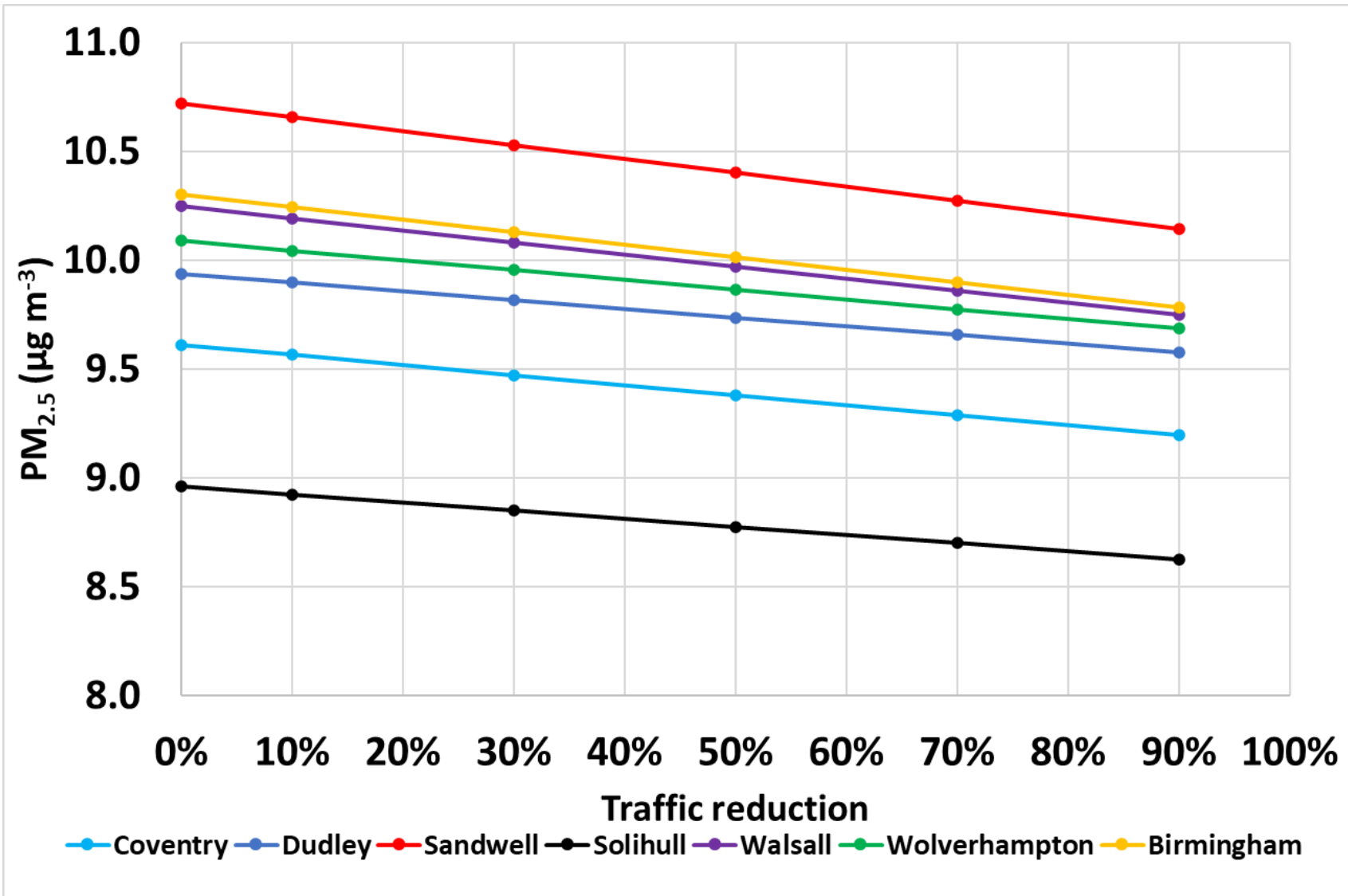


90% Traffic reduction



Impact of traffic reduction on PM_{2.5} (local authority level)

PM_{2.5} concentrations aggregated at the local authority level



**Relative reduction:
up to 3-5 %**

Summary

- Large hypothetical traffic reductions modelled
- Substantial decreases in NO_2 result (but we can also see the importance of non-traffic sources and long range transport)
- Changing traffic within region has limited impact on $\text{PM}_{2.5}$ (but neglects secondary $\text{PM}_{2.5}$ formation and out-of-region changes)

Opportunities: Modelling Scenarios

Scenario	Opportunities?
1. Transport decarbonisation	Fleet electrification; Pathway to Net Zero...
2. On-road vehicle behaviour	Consider speed reductions e.g. 20 mph on local roads and 60 mph on motorways...
3. Lane management	Road closure...
4. Local traffic management	CAZ; LTN; Net Zero neighbourhood...
5. Transport mode shift	Walk; Cycle; e-scooter...
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