Local, national and regional contributions to $PM_{2.5}$ pollution in Leicester

1st July 2021

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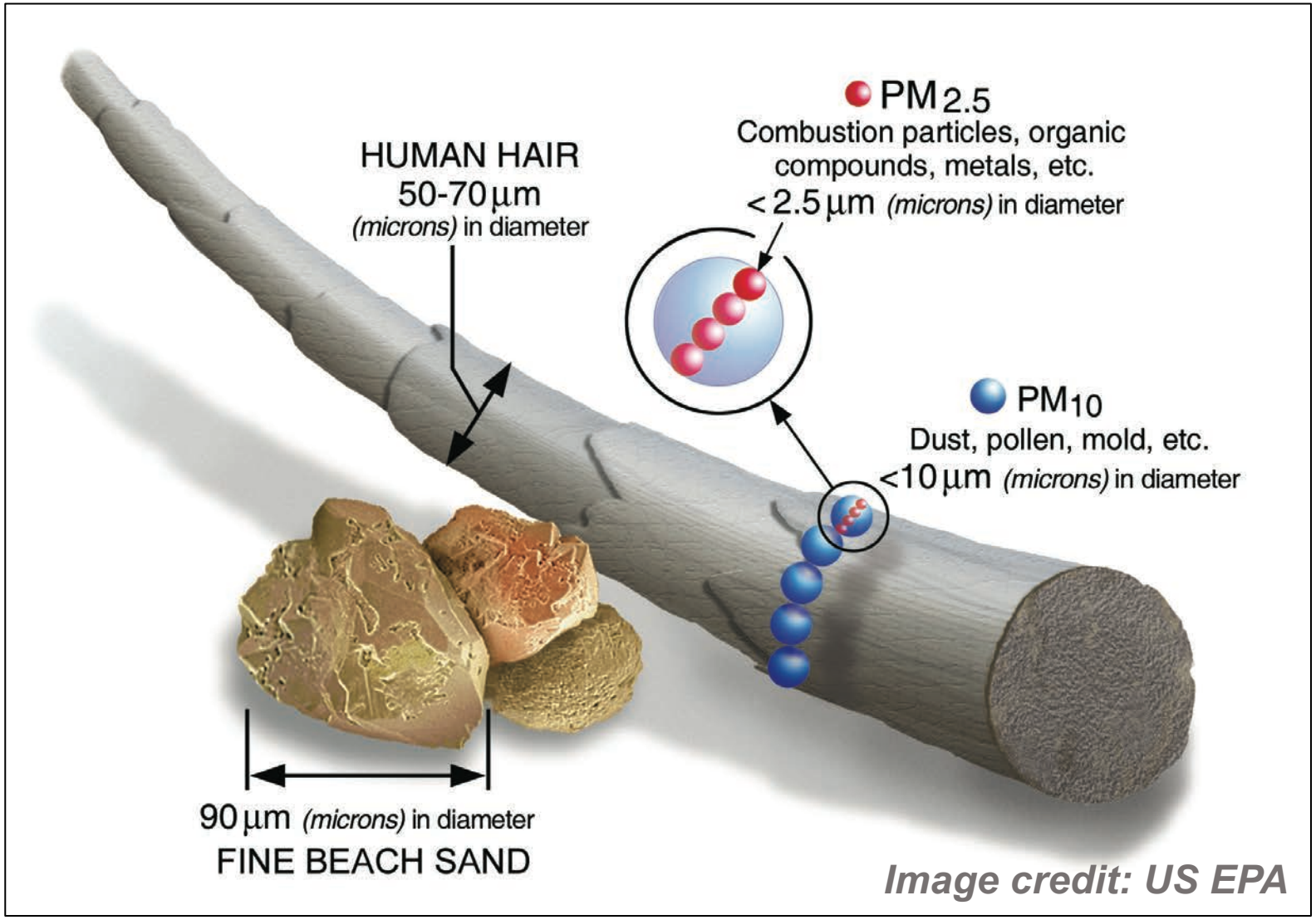
The impact of air pollution on health



Most hazardous is **fine particles**

Small particles penetrate **deep into our lungs**

Many health consequences from exposure to fine particles. Most severe is **premature mortality**

Fine particles last in the atmosphere for **1-2 weeks**, so can be transported long distances

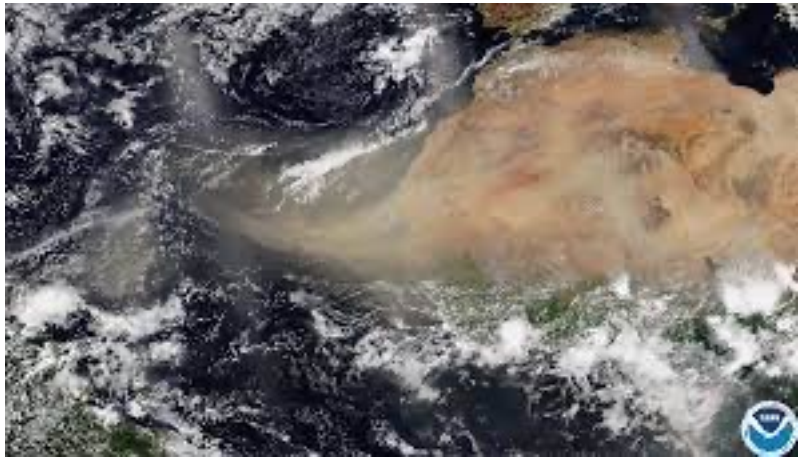
Many different emission sources of $PM_{2.5}$

Traffic

Construction

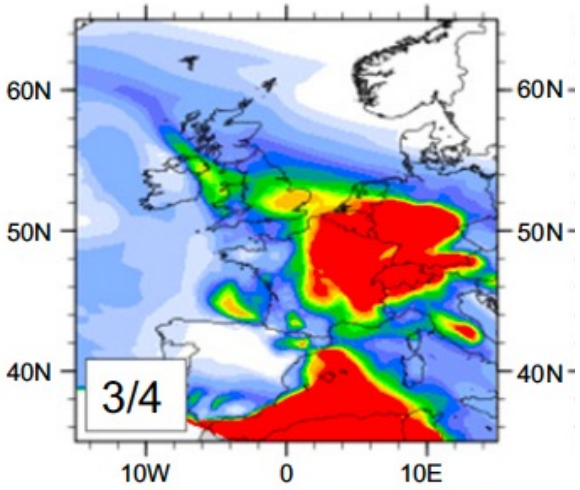
Agriculture

Saharan Dust



Shipping

European



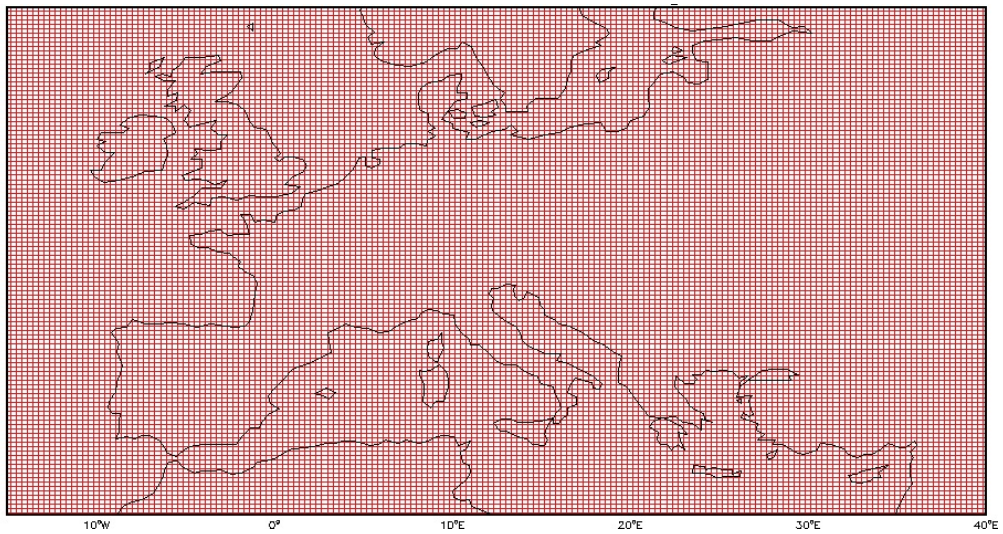
3D atmospheric chemistry transport model (GEOS-Chem)

Time period: January 2019 – December 2019

Emissions
(natural and human)

UK NAEI emissions
(with temporal information)

GEOS-Chem

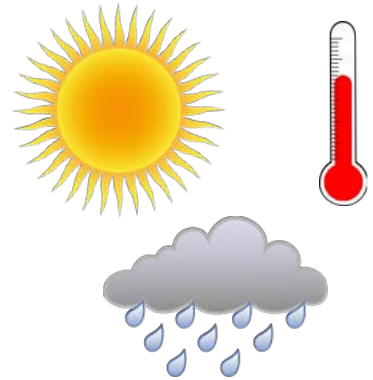


Europe Nested Domain:
0.25 x 0.3125 or ~25-30 km

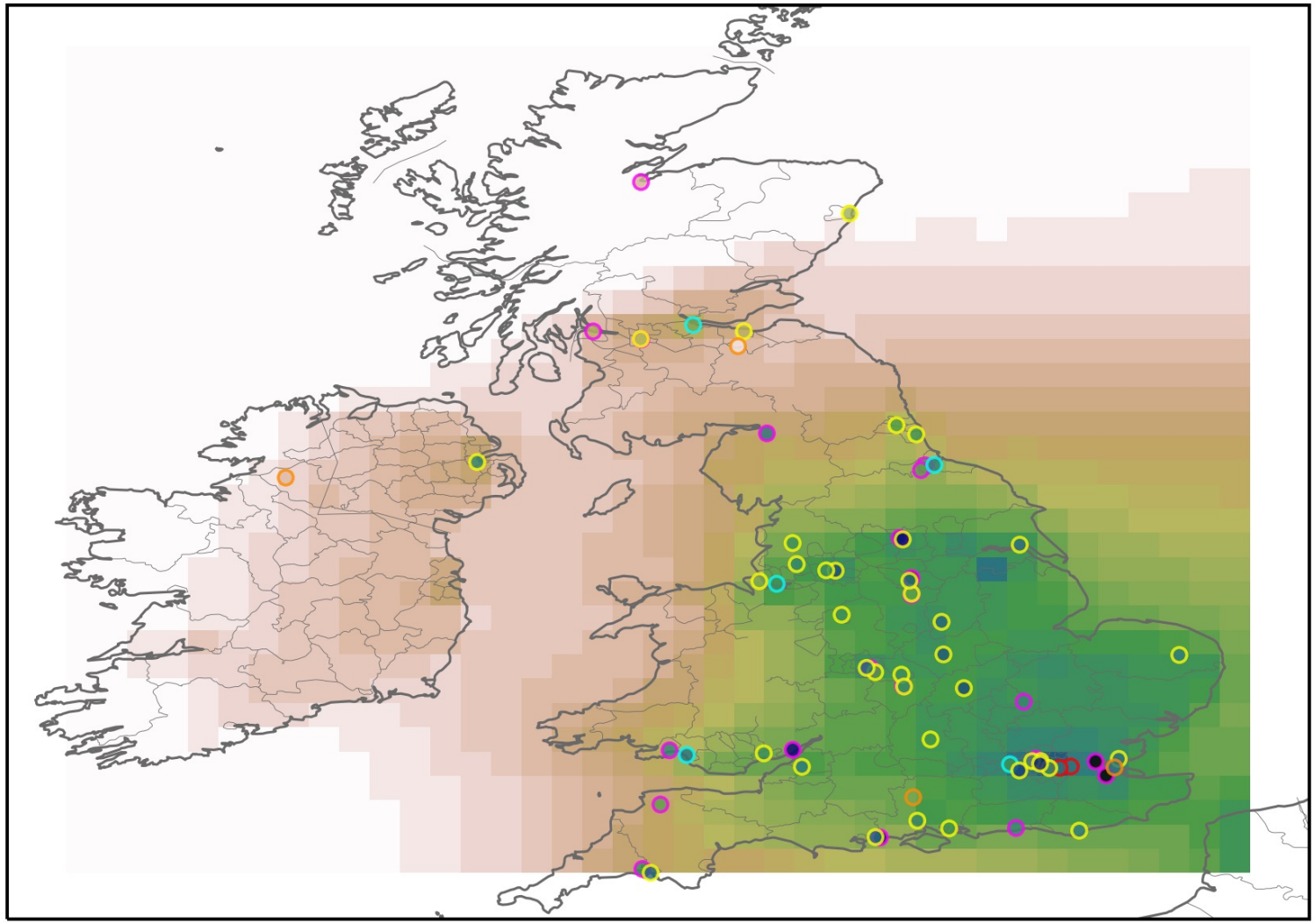
Chemistry, transport, wet/dry deposition

GEOS-Chem version 12.1.0
(doi:10.5281/zenodo.1553349)

Offline Assimilated
Meteorology



Annual-average $PM_{2.5}$ across the UK and guideline values



All sites:
Measured = 10.0 μg m^{-3}
Modelled = 8.4 μg m^{-3}
Normalised mean bias = -16 %

Leicester:
Measured = 11.4 μg m^{-3}
Modelled = 9.4 μg m^{-3}

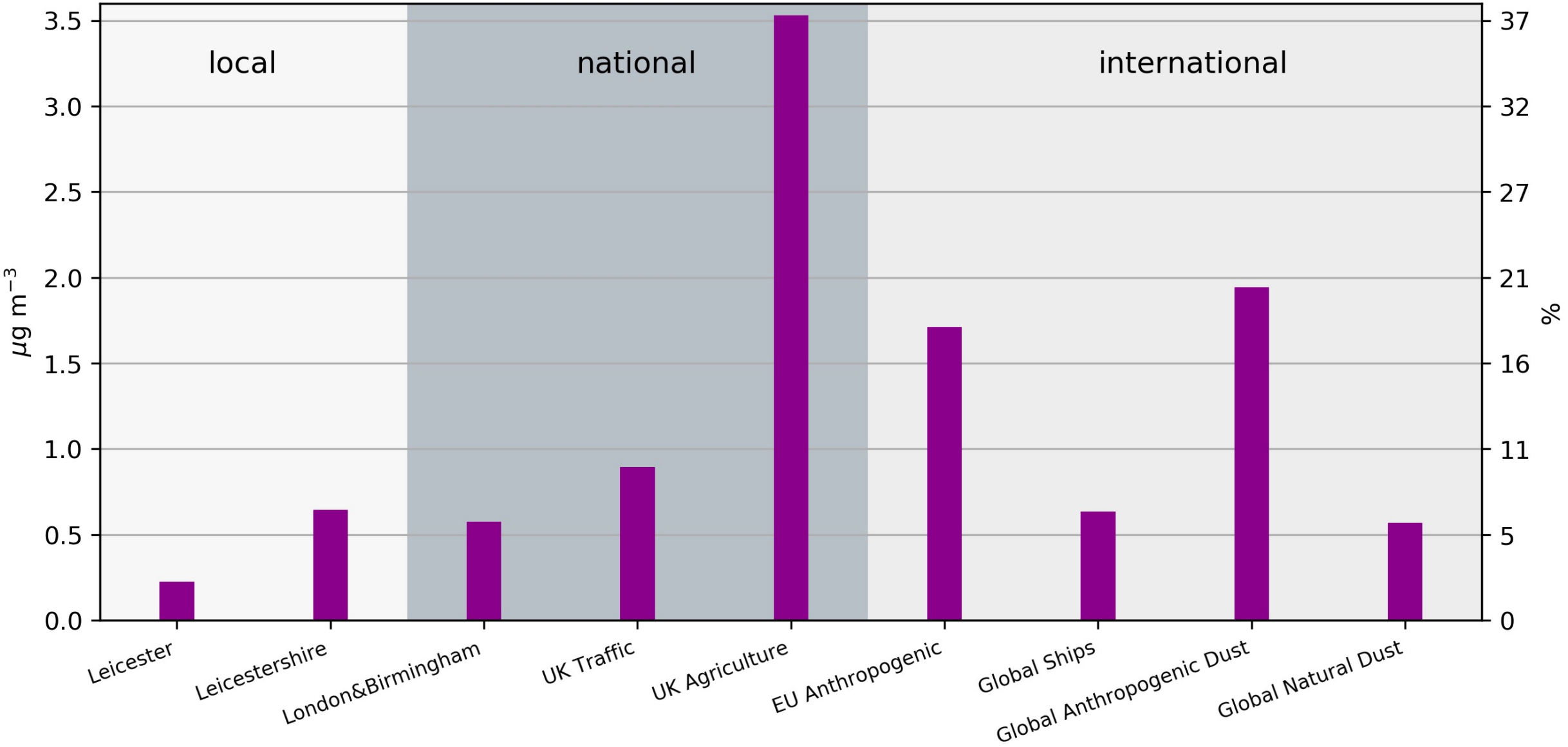
Department for Environment Food & Rural Affairs

National guideline: 25 μg m^{-3}

World Health Organization

WHO guideline: 10 μg m^{-3}

Contributors to $PM_{2.5}$ in Leicester



$PM_{2.5}$ is controlled by agriculture, as opposed to local emission sources within the city/county

Validating against a sensor network (EarthSense®)

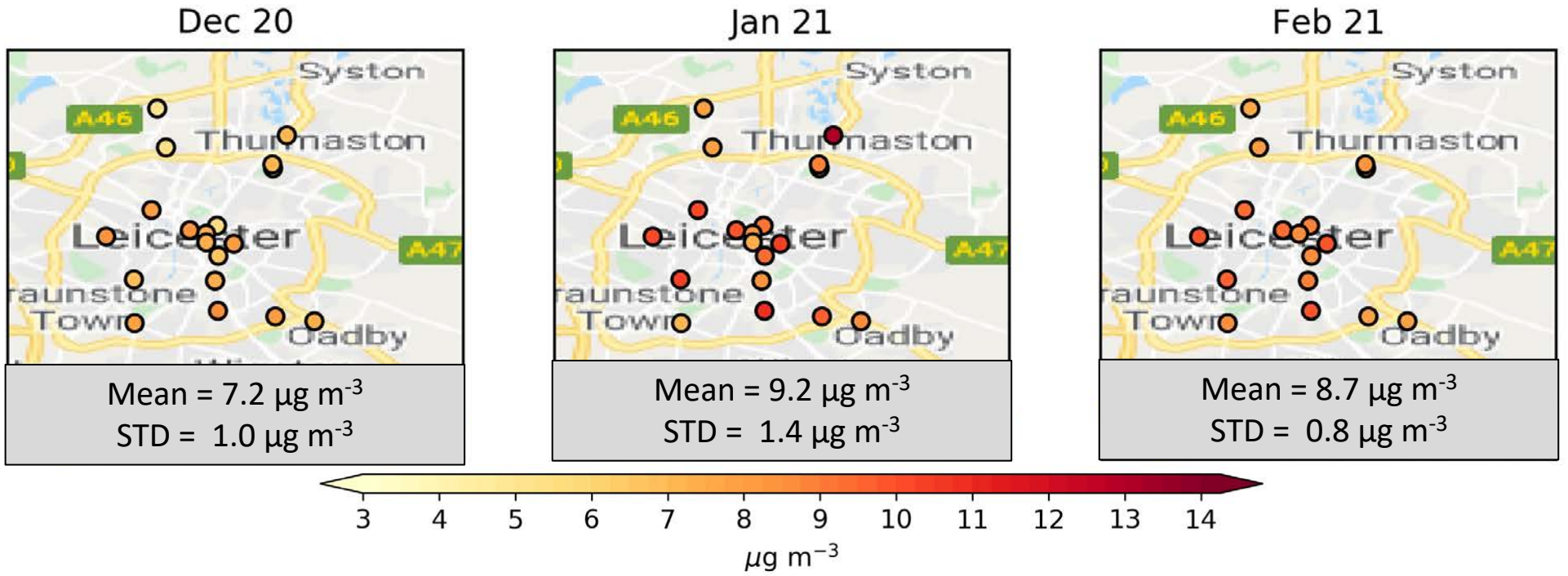
Our study

Local contribution = 3-5 %

EarthSense®

Local contribution = 5-11 %

Jan 19 — Jul 19 — Dec 19/Jan 20



Both the model and sensors agree that local emissions have a low contribution to $PM_{2.5}$ in Leicester

Concluding remarks

☺ Thanks for listening ☺

1. UK **agricultural** emissions have a **large (37 %)** influence on $PM_{2.5}$ in Leicester

2. **Transboundary** emissions from continental **Europe** have a **large (18 %)** influence on $PM_{2.5}$ in Leicester

3. **Local** emissions have **small (< 5 %)** influence on $PM_{2.5}$ in Leicester

4. UK **traffic** emissions both have **small (10 %)** influence on $PM_{2.5}$ in Leicester

LRTAP
Long-range Transboundary Air Pollution