
Leicester City Council PM 2.5 study using portable air quality monitors and near real time dispersion model

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Leicester

- Leicester is a city and unitary authority area in the East Midlands
- Population:357,394



Air Quality Legislation UK

Environment Act 1995, Part IV

Detailed Review and Assessment of Air Quality (2000)



Breach of statutory Objectives identified



Declaration of Air Quality Management Area (AQMA) (2000)



Air Quality Action Plan

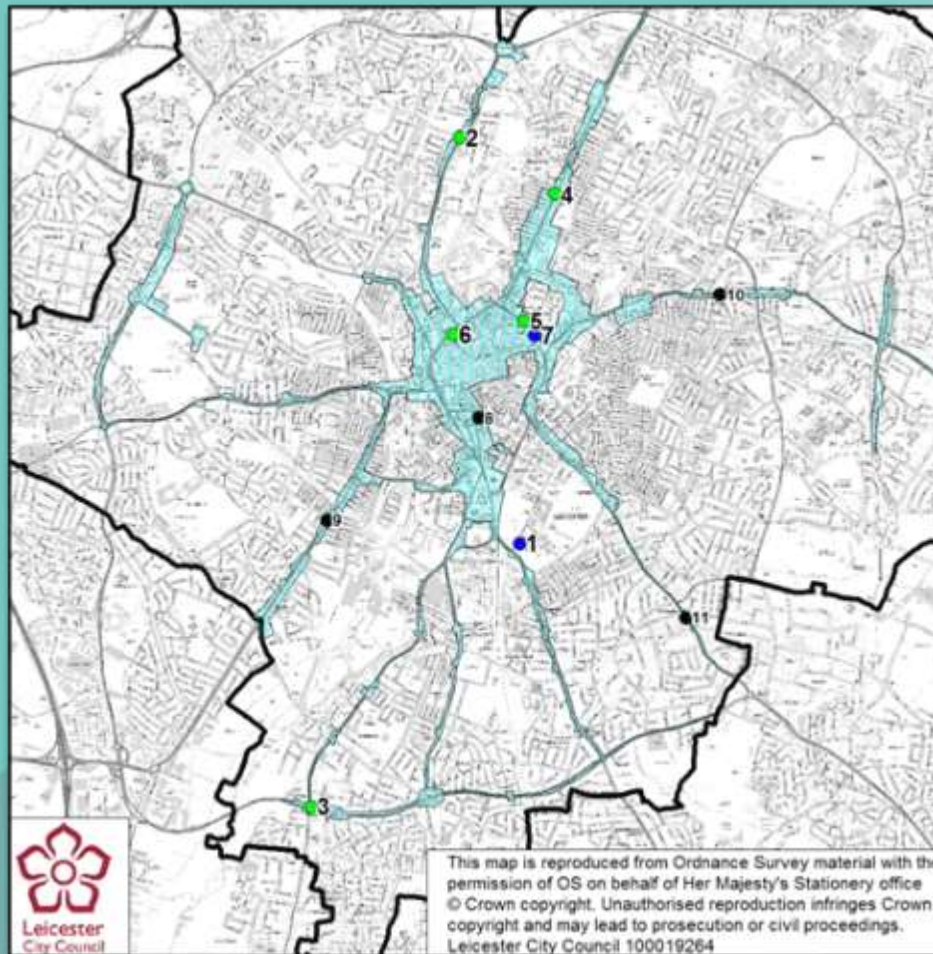


Annual Status Report

Air Quality Objectives

- NO₂ annual mean
❖ 40 µg/m³
- PM 10 annual mean
❖ 40 µg/m³
- NO₂ hourly mean (18 times per annum)
❖ 200 µg/m³
- PM 10 24 hour mean (35 times per annum)
❖ 50 µg/m³
- PM 2.5 annual mean
❖ 25 µg/m³

AQMA



Site Key:

- 1 = AURN (urban background)
- 2 = Abbey Lane
- 3 = Glenhills Way
- 4 = Melton Road
- 5 = St Matthews Way
- 6 = Vaughan Way
- 7 = AURN (roadside)
- 8 = AURN New Walk (Decommissioned)
- 9 = Imperial Avenue (Decommissioned)
- 10 = Uppingham Road (Decommissioned)
- 11 = London Road (Decommissioned)

 = Air Quality Management Area (AQMA)



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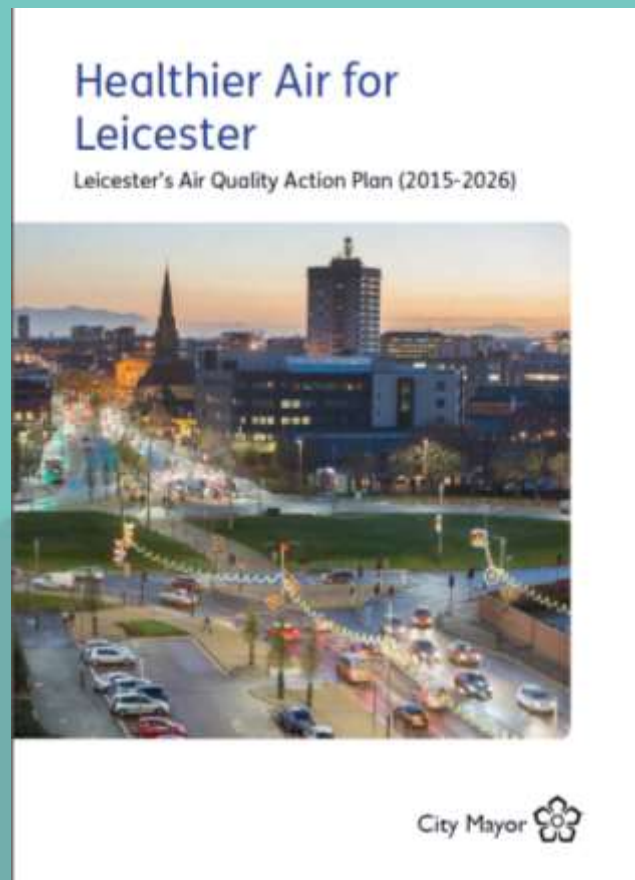
Air Quality Stations



- Network of five chemiluminescent NO_x analysers and 4 BAMs
- Two AURN stations

Air Quality Action Plan

<https://www.leicester.gov.uk/your-council/policies-plans-and-strategies/environment-and-sustainability/air-quality/>



Air Quality Action Plan

16 actions, grouped in 4 themes

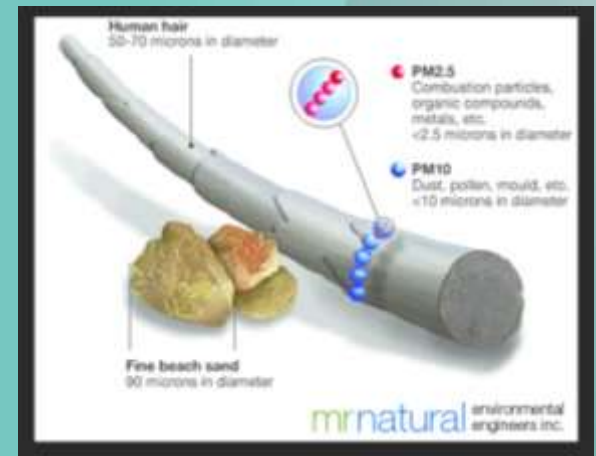


Smoke Control Area

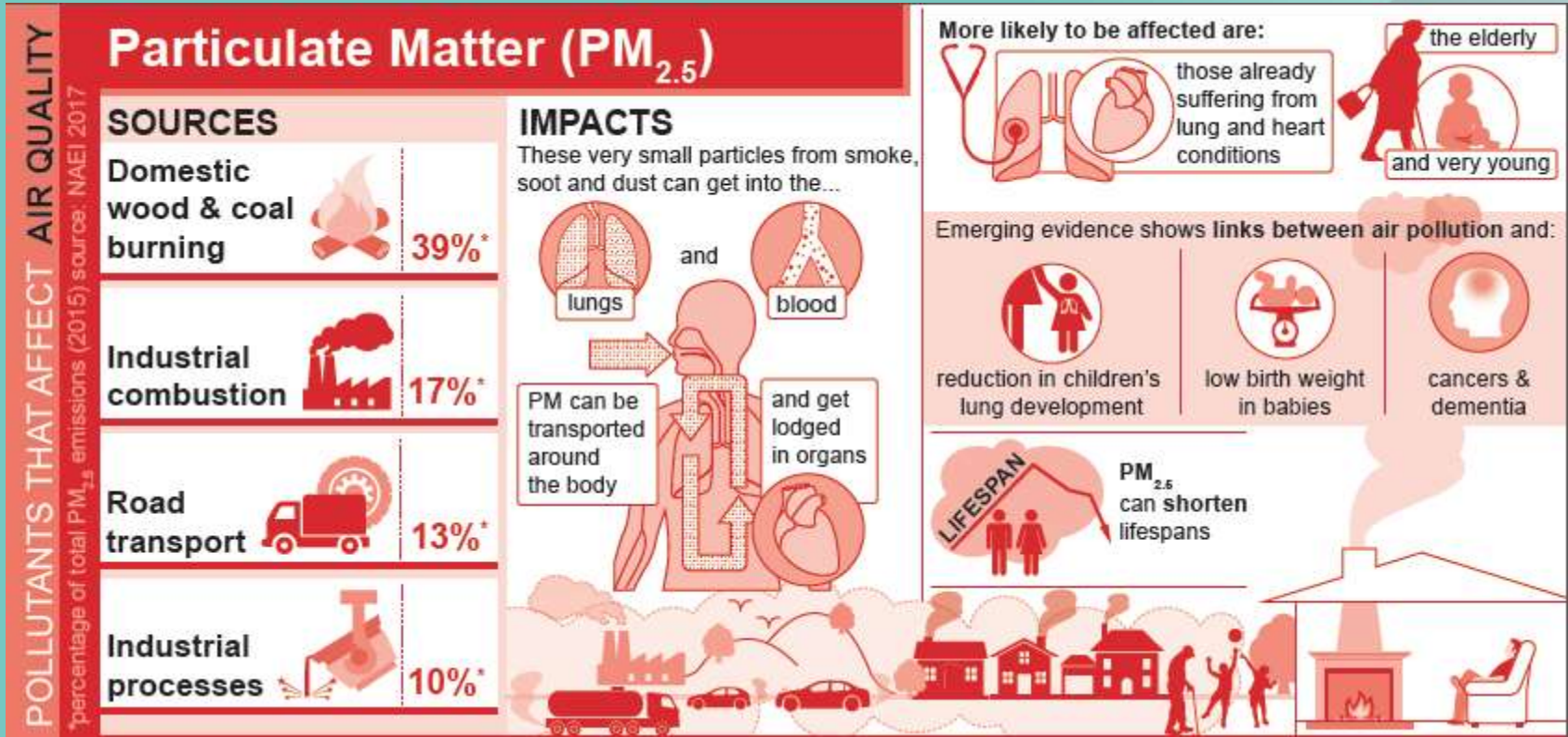
- Leicester was designated as a smoke control area back in 1975. To make residents and businesses aware of this, we will be issuing a single Smoke Control Order on 1 June 2018
- As a result of this, residents and businesses are only allowed to burn authorised fuels. You can be fined up to £1,000 if you break the rules.
- You are allowed garden bonfires in smoke control areas, but you need to follow certain rules.

PM 2.5

- Less than 2.5 micrometres
- Solid or liquid particles suspended in the air
- It is very often a mixture of organic and inorganic components such as dust, pollen, soot, smoke, and liquid droplets
- It forms as a result of combustion



Sources of PM 2.5 and Health Effects



Defra PM 2.5 monitoring and modelling Air Quality grant project

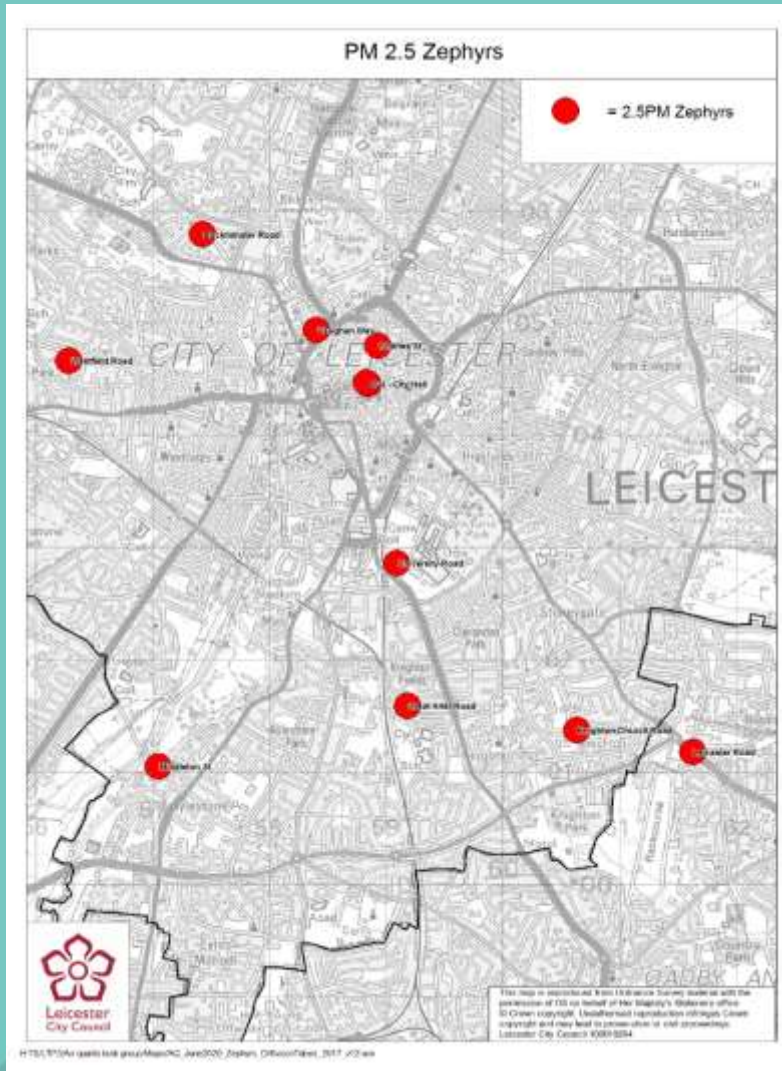
- To deliver a high resolution pollution map (10X10 metre resolution) Near Real Time air quality data
- Deploy 11 portable air quality monitors around the city:
 - 6 static within LCC AQMA
 - 2 mobile on LCC electric vehicles
 - 2 on volunteer cyclists 1
 - on A6 outside city boundary
- Provide behavioural change advice to public information systems, and encourage the use of alternative modes of transport or alternative fuels.
- Monitor actions within the AQAP, to assess the impact and if needed to enable to adjust the scope of the measures or add new ones
- Deliver a source-apportionment module to inform understanding of the various sources of PM_{2.5}

EarthSense Zephyrs



- Portable, compact and lightweight ambient air pollution monitor
- It provides detailed air quality measurements in real-time for PMs as well as Ozone, NOx and other species
- Powered by the mains or solar panels
- Can be mounted on street lights, building as well as being mobile used by the walkers or cyclists

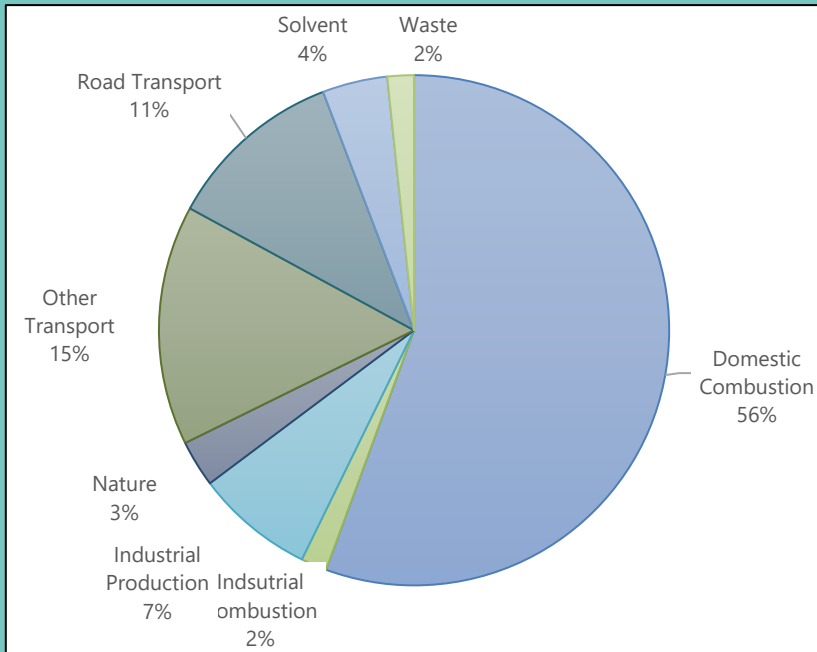
Development of the PM 2.5 network



- 6 static within LCC AQMA
- 2 mobile on LCC electric vehicles
- 2 on volunteer cyclists
- 1 on A6 outside city boundary

PM 2.5 Sources in Leicester

- Source Apportionment



PM _{2.5} Emissions Source	PM _{2.5} Emissions Contribution (tonnes per annum)	Percentage of PM _{2.5} Emissions Contribution (%)
Combustion from Energy Production & Transformation	0.000	0.0
Combustion in Commercial, Institutional, Residential & Agriculture	2.782	55.6
Combustion in Industry	0.082	1.6
Production Processes	0.376	7.5
Extraction & Distribution of Fossil Fuels	0.000	0.0
Solvent Use	0.206	4.1
Road Transport	0.564	11.3
Other Transport & Mobile Machinery	0.761	15.2
Waste Treatment & Disposal	0.084	1.7
Agriculture, Forestry & Land-Use Change	0.000	0.0
Nature	0.148	3.0
Total	5.003	100

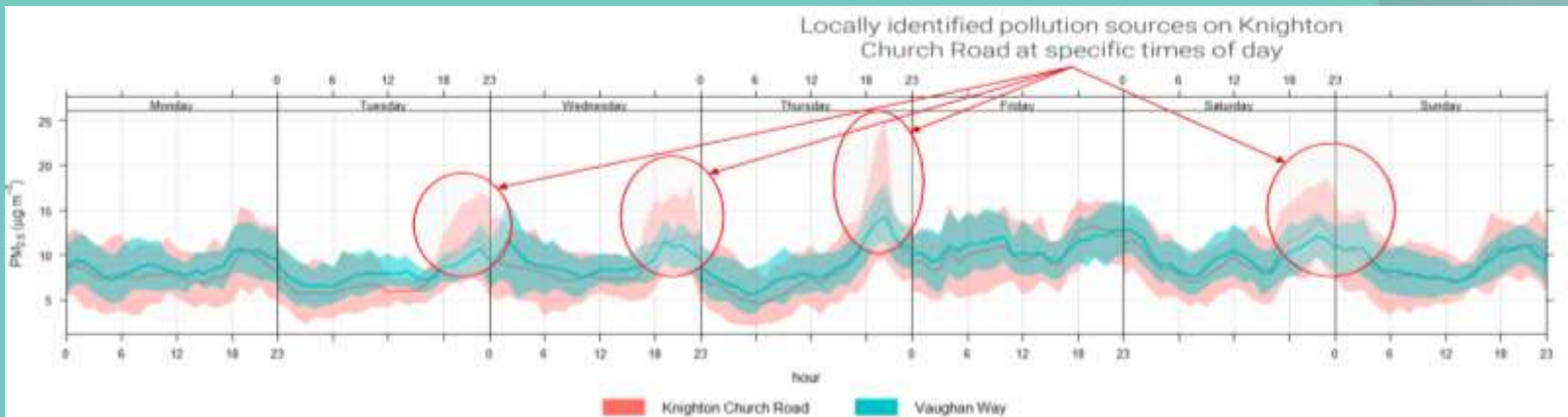
Data Analysis

- Consistent emission sources can be identified and quantified
- Weather impact on pollution levels can be identified and measured



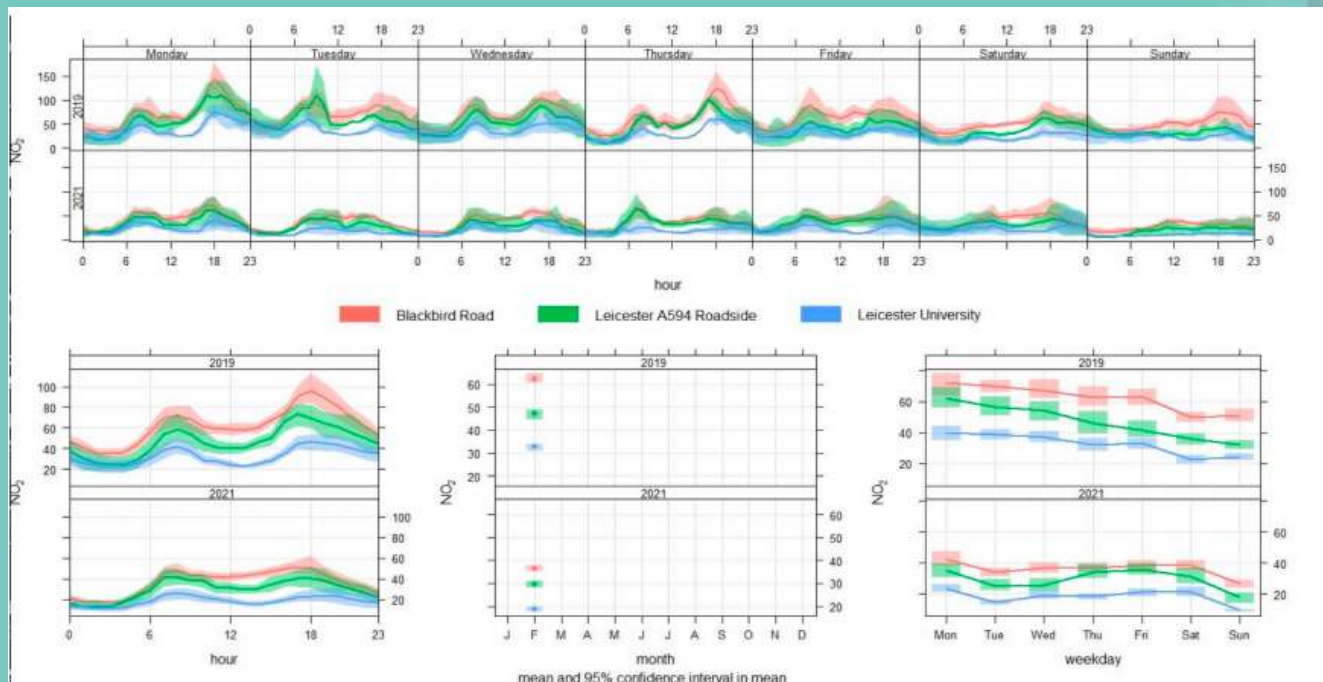
Data Analysis

- Domestic Emissions such as wood burning can be isolated from the urban background, it can contribute to the overall pollution levels in greater way than traffic emissions

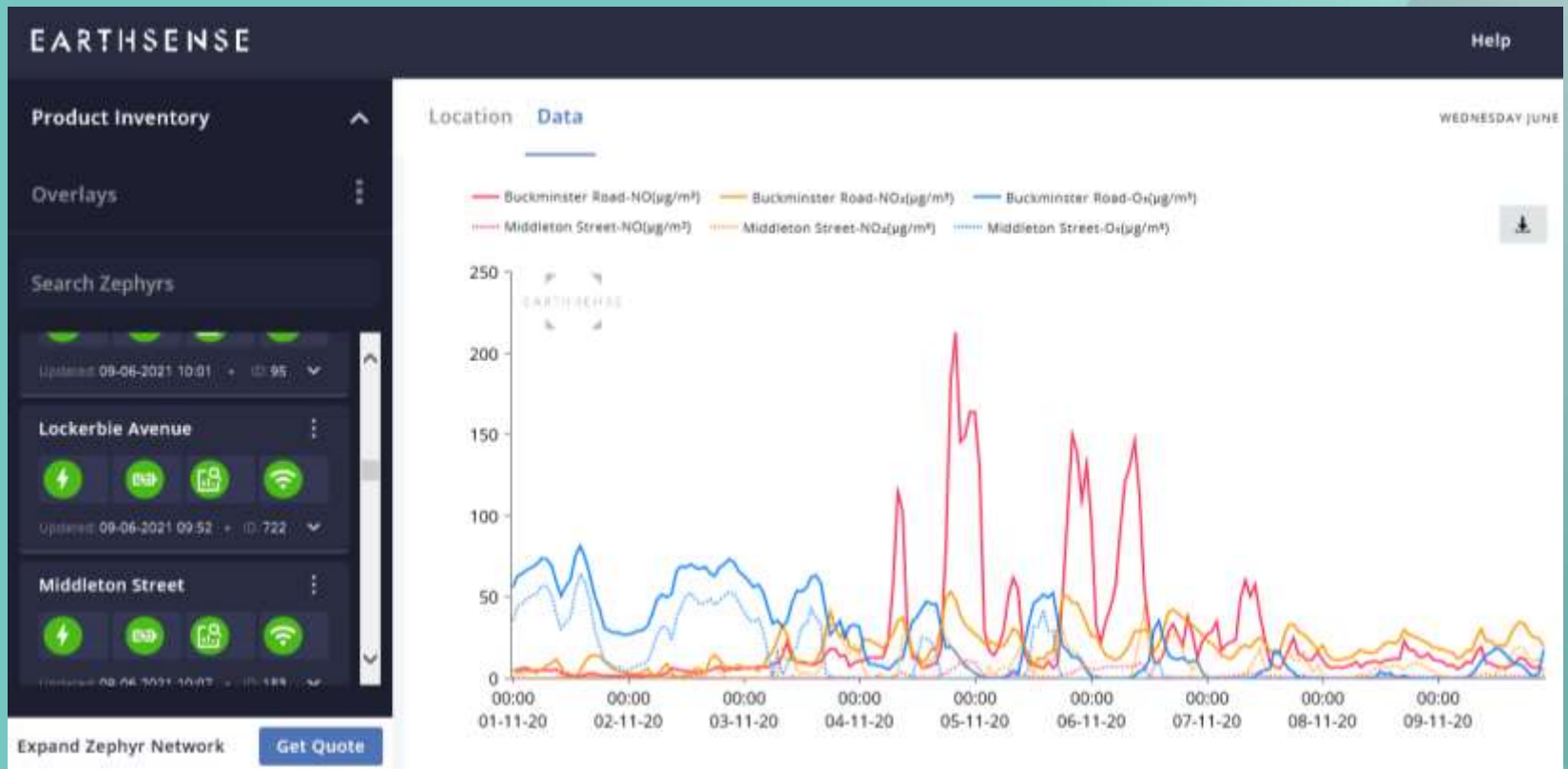


Data Analysis

- Junction remodelling resulted in significant improvements in air quality
- Monitoring of the junction shows a clear reduction in pollution levels compared to previous years



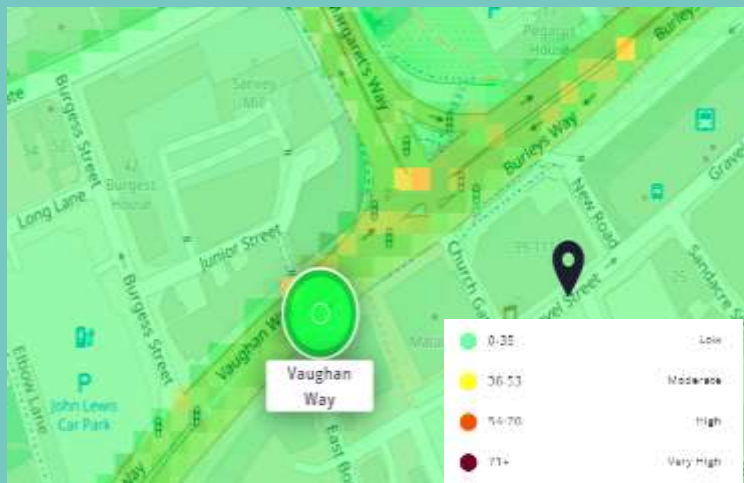
Bonfire Night



Modelling

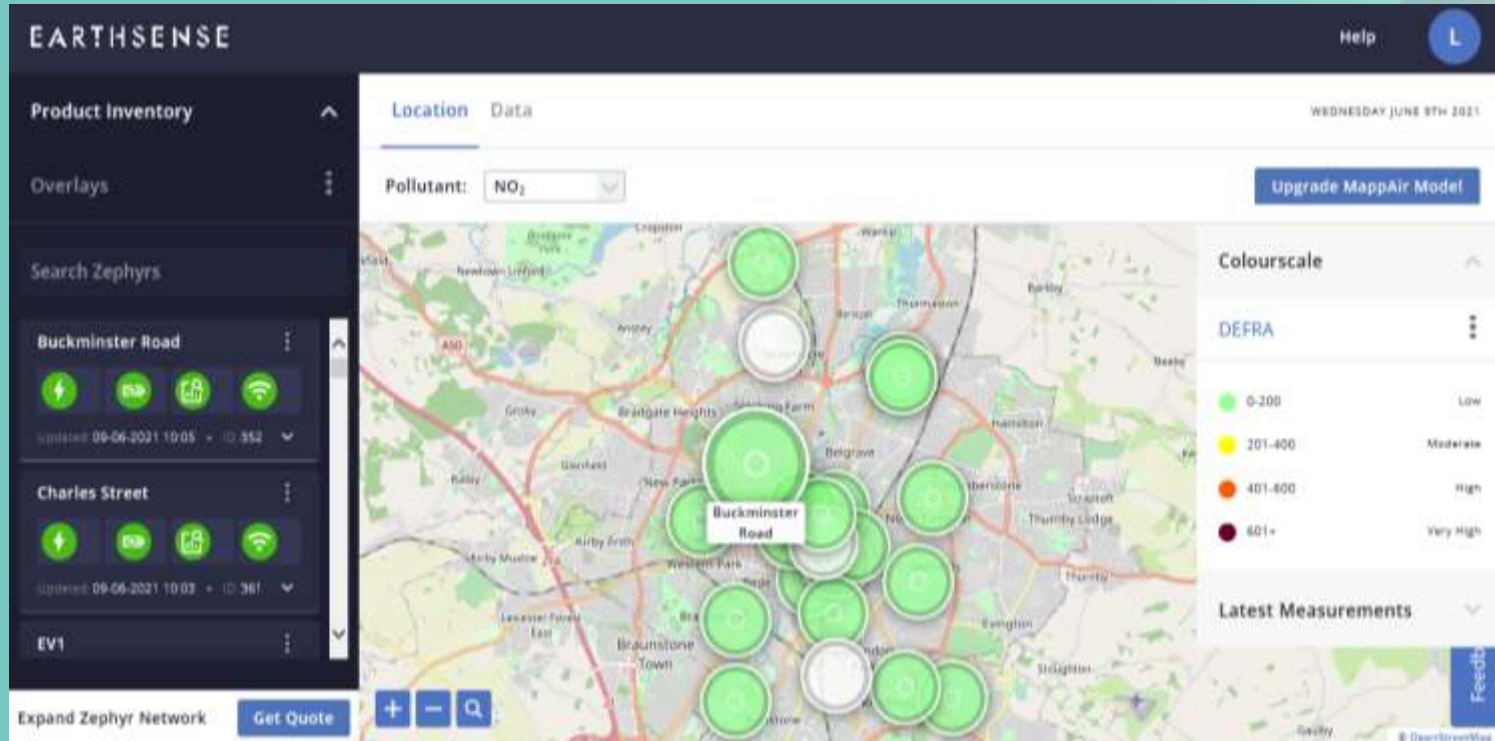


- Whole City model map



- Near real time model

MappAir



Conclusions

- Identify , target and manage local air pollution sources
- Build a greater understanding on pollution being exported and imported
- Create central database to hold all of the air quality data
- Lead the change
- Inform citizens and enable them to make informed decisions

Conclusions

- Target interventions:
 - Traffic interventions cycling/walking and green routing
- Greater awareness and understanding of the sources ,causes and effects of air pollution
- Reduced air pollution
- Healthier, happier citizens

Leaflet

Why is wood burning a problem?

The main problem caused by wood fuel burning is ultra-fine particulate matter, also known as PM2.5. This pollution is not visible to the naked eye, so often 'invisible' fumes and appliances may be causing pollution.

PM2.5 is widely acknowledged as being the air pollutant which has the greatest impact on human health. But short and long term exposure to PM2.5 increase the risk of early deaths from respiratory and cardiovascular diseases as well as increased hospital admissions.

Climate change as measured by PM2.5 are more likely to have reduced long lifetimes and can develop earlier. Current evidence suggests there is no safe level of PM2.5.

However, the World Health Organisation (WHO) set a guideline limit of 5 micrograms per cubic metre (µg/m³) to have there to reduce risk of mortality. This recommended guideline limit is an annual mean concentration of 10 micrograms per cubic metre (µg/m³) of air (approx).

How much of this PM2.5 is due to wood burning?

Wood burning is usually assessed as the contribution to pollution across the year. In summer months the amount of pollution caused by wood fuel burning can be very low, but in winter wood burning can contribute as to 70 per cent of local emissions in Leicestershire.

Climate 10 and woodburning: Pollution from woodburning stoves and garden burners can be damaging to people's health, particularly if they have an underlying respiratory condition which may be made worse by climate 10.

All wood fuel affects the health of everyone. Along with emissions from transport and construction, burning wood and other solid fuels can contribute to the air pollution problem.

Guidance for wood burning stoves

What should I do about it?

Stoves and Appliances:

Class 1 stoves are the most polluting way to burn solid fuels. Using a non-designed, poorly regulated stove or appliance can make a big difference.

As a minimum you should make sure that your stove meets the legal requirements. But even better, approved stoves can cut up to 90% of emissions. The most polluting stoves have recently introduced the 'Smokeless Ready' test.

An **Smokeless Ready** stove can emit up to 80 per cent less carbon than a non-class 1 stove. Using approved appliances. An up-to-date list of these stoves can be found on the [HETAS](#) website.

Buy stoves or appliances through a properly licensed, and your chimney should be swept regularly.

Flues

If you are using an open fireplace you should only burn approved fuels. For all fuels used in woodstoves, it is best to ask your supplier.

If you are using a stove or other appliance you must always use the correct fuel. It is best to ask your supplier. Wood fuel must never be dried or seasoned to burn a lower moisture content and to meet this criteria, as much as 50 per cent more moisture than wood fuel burning heat can. Other wood is also less efficient, producing more heat per log.

Wood that has the **Smokeless Ready** to Burn label is certified to meet a low moisture content. For a full list of suppliers see the list on the [Woodburning website](#).

You should not burn old carpets, plastics, or large wood as it may contain contaminants that can be harmful to your health and the environment.

...helping us build a clear picture of the sources of PM2.5 pollution*

Ready to help? Report to Action Climate

Barbecues and barbecues

Barbecues and barbecues are not covered by the Clean Air Act, but if you create a lot of smoke you may be causing a statutory nuisance.

Burning garden waste on a barbecue is unnecessary and unpleasant for your neighbours. There is a lot of smoke and ash. To avoid this, use a compost bin or a composting or mulching machine to break up garden waste. To find out more in details of your garden waste resources contact your local council.

Barbecues can also be substituted for other stoves. If you regularly have a barbecue in your garden you should think about using a gas barbecue.

What does the law say?

The Clean Air Act says that you must not emit 'black smoke' from your chimney if you use a smoke control area. The Clean Air Act applies to certain towns and rural towns in the same way as to smokeless air zones.

The law also allows the Government to carry out smokeless areas and 'smokeless equipment' which are regulated up to avoid smoke and ash can be used to reduce smoke areas.

EARTH SENSE

Leicester City Council

Reports

- Several reports and information leaflets have been prepared as part of this project:
 - Leicester City Council: Solid Fuel Modelling Report
 - Defra Health Advice 1 page information leaflet
 - Guidance for wood burning stoves leaflet
 - Final project report – being prepared

Overall Conclusions

- Air Quality is a national and international issue and of high public interest
- Pollution contributions are a complex mix of different sources such as transport ,industry but also significant contribution from activities by the public
- We need public support in reducing pollution levels
- Monitoring and modelling of pollution enables the authority to make informed decisions and to plan for the future
- It enables to evaluate local interventions in

Future Developments

- Defra Air Quality Grant funded project investigating Transboundary PM 2.5 levels using computer models
- Defra Air Quality Grant funded project looking at local interventions at discrete location and their impact on PM 2.5 levels and behaviour change

THANK YOU

