

# CAFS National Modelling Framework & Glasgow Low Emission Zone

Vincent McNally



# Glasgow one of the most polluted cities in the UK, says watchdog

ALISTAIR GRANT

GLASGOW has been named one of the UK's most polluted cities, according to the World Health Organisation.

Scotland's biggest city was found to have a higher concentration of dangerous sooty particles than London, Leeds, Manchester and Birmingham.

It comes after the city's Hope Street was found to be in breach of the European legal limit for nitrogen dioxide earlier this year, as it was branded the most polluted road in the UK.

Out of 51 UK cities and towns listed in an air-quality database, 44 fail the WHO's test for fine sooty particles smaller than 2.5 microns across that have been linked to heart disease and premature death.

Exposure to the particles, known as PM2.5s, should not exceed 10 micrograms per cubic metre of air, according to the health organisation. But in numerous

British population centres annual average levels are higher – sometimes by a significant degree.

Glasgow emerged as one of the polluted cities, with a PM2.5s concentration of 16 micrograms per cubic metre.

London and Leeds both had 15 micrograms of the particles in every cubic metre-sized parcel of air, Cardiff and Birmingham 14, and Manchester 13.

Perhaps surprisingly, the seaside resort of Eastbourne and port city of Southampton equalled London's exposure level, while the dreaming spires of Oxford were surrounded by air as polluted by fine particles as Cardiff.

Each year, outdoor air pollution is estimated to cause 40,000 premature deaths in the UK – up to 9,000 in London alone – and cost the country £22.6 billion.

Dr Toby Hillman, one of the report's authors from the Royal College of Physicians, said: "There isn't a safe limit for the amount of pollution that's been defined as

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yet and we know the effects of poor air quality run from cradle to grave. It's a lifetime threat to human health.

"This is a really direct and tangible impact on UK health from the drivers of climate change, and taking action on air quality should be a priority."

The impact of air pollution in UK cities forms part of a major investigation looking at the health and social costs of climate change around the world led by a top medical journal.

The Lancet Countdown on Health and Climate Change brought together 24 institutions and inter-governmental organisations including the WHO and World Meteorological Organisation.

It found that global exposure to dangerous levels of air pollution caused by burning fossil fuels had increased by 11.2 per cent since 1990 with more than 70 per cent of cities exceeding WHO PM2.5 limits.

Many British cities and towns also broke the WHO limits for PM10s, slightly larger

sooty specks considered less of a hazard than ultra-fine particles but still harmful to health.

The authors acknowledged that European Union air quality guidelines were far less stringent than those of the WHO, with an upper safety limit for PM2.5s of 25 micrograms per cubic metre.

However, they said the WHO limits represented a "safer threshold".

The report added that 802 London schools and a high proportion of the capital's hospitals and clinics were located in highly polluted areas "potentially putting some of society's most vulnerable people at risk".

Diesel-powered vehicles, which generate pollution particles, were one of the "key drivers" of poor air quality in towns and cities in the UK, said Dr Hillman.

"Unfortunately previous policies about encouraging diesel adoption have led to an increase in the amount of diesel related pollution," he said.

# Glasgow among UK's most polluted towns and cities, finds WHO

● Toxic air linked to heart disease, stroke, cancer and premature death

By ELONA AMOS

Millions of people living in dozens of cities across the UK are inhaling air considered too dangerous to breathe by the World Health Organisation (WHO), a report has shown. Out of 51 UK cities and towns listed in an air quality database, 44 fail the WHO's test for fine sooty particles smaller than 2.5 microns across that have been linked to heart disease, stroke, cancer and premature death.

Exposure to the particles, known as PM2.5s, should not exceed 10 micrograms per cubic metre of air, according to the United Nations agency. But in numerous British population centres annual average levels are higher, sometimes by a significant degree, it is claimed.

Glasgow has emerged as one of the most polluted cities in the country, with a PM2.5s concentration of 16 micrograms per cubic metre. The seaside town of Preston in East Lothian also had

## CITY LEVELS

City	Annual AQI	Annual PM10
Aberdeen	9	13
Edinburgh	8	14
Glasgow	16	23
Gloucestershire	9	14
Inverness	6	12
Prestonpans	12	16

dangerously high levels, with 12 micrograms per cubic metre – higher than in cities such as Aberdeen, Edinburgh and Inverness.

London and Leeds both had 15 micrograms of the particles in every cubic metre-sized parcel of air, while Cardiff, Oxford and Birmingham had 14 and Manchester 13.

Each year, outdoor air pollution is estimated to cause 40,000 premature deaths across the UK – 2,500 of them in Scotland alone – and cost the country £22.6 billion.

Report author Dr Toby Hillman, from the Royal College of Physicians, said: "There isn't a safe limit for the amount of pollution that's been defined as yet and we know the effects of poor air quality run from cradle to grave, it's a lifetime threat to human health. "This is a really direct and tangible impact on UK health

from the drivers of climate change, and taking action on air quality should be a priority."

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Many British cities and towns also broke the WHO limits for the slightly larger PM10s, which are harmful to health but less so than ultra-fine particles.

The authors acknowledged that European Union air quality guidelines were far less stringent than those of the WHO, with an upper safety limit for PM2.5s of 25 micrograms per cubic metre. However, they claim WHO limits represent a "safer threshold".

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## Glasgow most polluted city in the UK as Friends of the Earth Scotland warn on health risks of faulty monitoring equipment

# No clean city: Glasgow is worst in UK for deadly traffic emissions

JULIA HORTON

GLASGOW is the most polluted city in the UK – and the fifth worst in Europe – for key traffic-related emissions, according to a new report.

It was the only city in Britain, except London, shown to be failing European standards on nitrogen dioxide, which is caused by exhaust fumes and industrial pollution.

The report from the European Environment Agency (EEA) ranked Glasgow at No 5 for the toxic gas out of nearly 400 cities assessed.



pollution record. WWF Scotland director Dr Richard Dixon said: "This report identifies that nitrogen dioxide is causing health problems for people in Glasgow and bringing forward their deaths. It is killing people."

"A significant change for Glasgow has been proposed before and is working well in reducing pollution in London. I would like to see it introduced here."

Scottish Green Party leader and MSP for Glasgow Patrick Harvie criticised a "culture of delay and inaction".

He said: "At the heart of the

# MOST POLLUTED STREET IN SCOTLAND

By DAVE LEMK Chief Reporter

THE MOST POLLUTED street in Scotland is Glasgow's George Street, according to a new report. The report, published by the European Environment Agency (EEA), shows that George Street is the most polluted street in the UK, with levels of nitrogen dioxide (NO2) exceeding the legal limit by a significant margin. The report also shows that Glasgow is the most polluted city in the UK, with levels of NO2 exceeding the legal limit by a significant margin. The report is a warning to the Scottish Government to take action to reduce air pollution in Glasgow and across Scotland.

# THE TRUTH



# Glasgow

- Fewer than half of all households own a car
- Excellent public transport provision
- Air quality generally good – but pollution hotspots within the city remain
- Canyons + older diesel fleet
- Air pollution mortality impact contributes to 300 premature deaths per year.



# Air Quality Action Plans

- Actions include :
  - LEZ – feasibility works
  - Emission + Idling enforcement
  - Awareness raising
  - Cycling infrastructure
  - Electric vehicle promotion
  - Eco-stars Fleet Management Program
  - Car Clubs
  - Travel planning
  - City Trees
  - Planning Guidance
  - Monitoring network
- Over £1m invested over the past 3 years



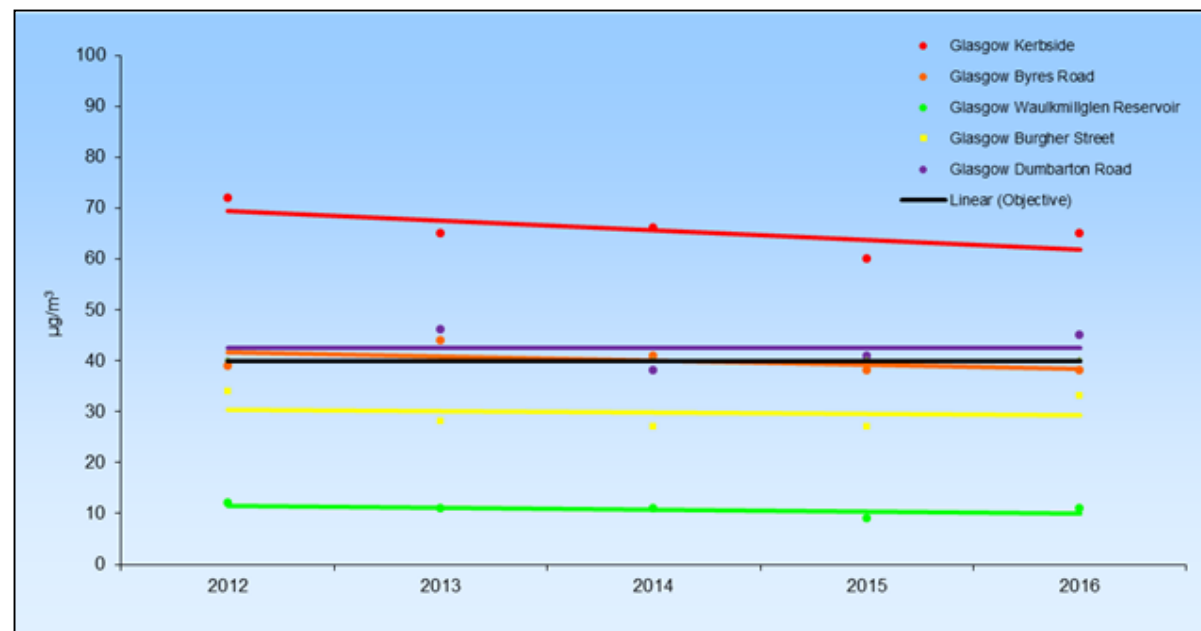
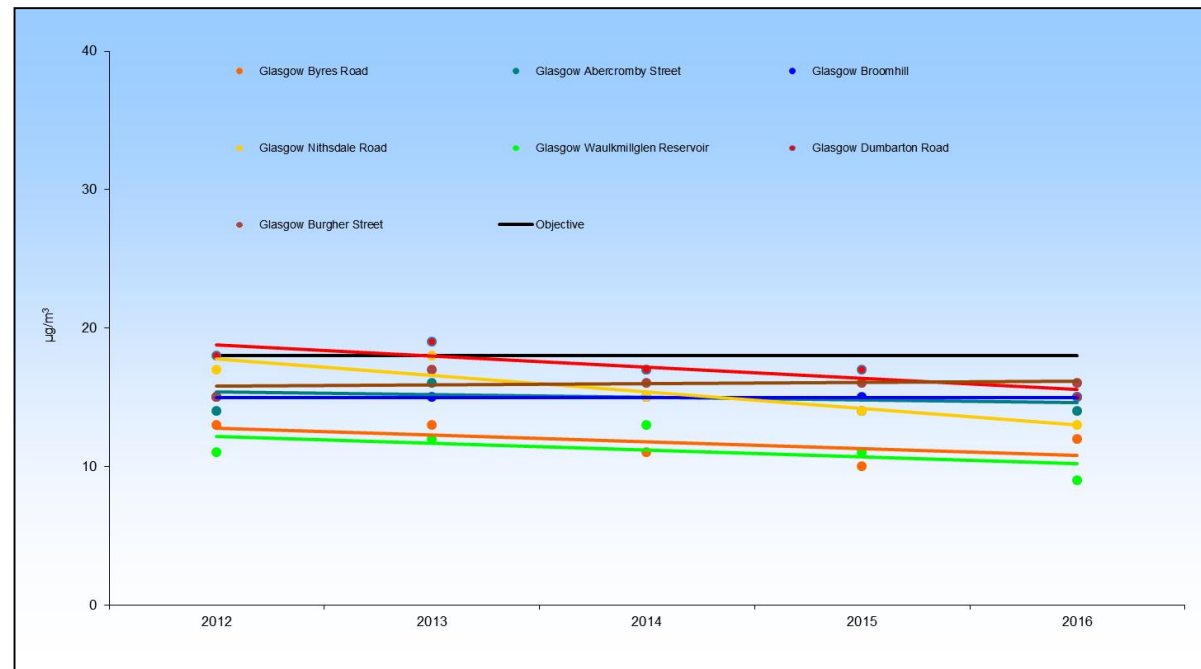


# Future roads and public spaces



# Air Quality 2016

- PM10 levels not exceeded.
- NO2 1 Hour Mean was not exceeded.
- NO2 Annual Mean Objective exceeded in parts of city centre and small part of Dumbarton Road.
- The trend across the city is generally of air quality continuing to improve, but.....
- NOT QUICK ENOUGH!





# Low Emission Zones

- National Program for Govt / City Council Committee
- Defined geographical area in which vehicle entry is restricted based on the level of engine emissions.
- Euro VI/6 diesel IV/4 petrol – needed for NO2 reduction.
- Various control options – (ANPR)
- Fixed Penalty Notice for driver / Traffic Commissioner re buses.
- Not revenue generating / road user charging



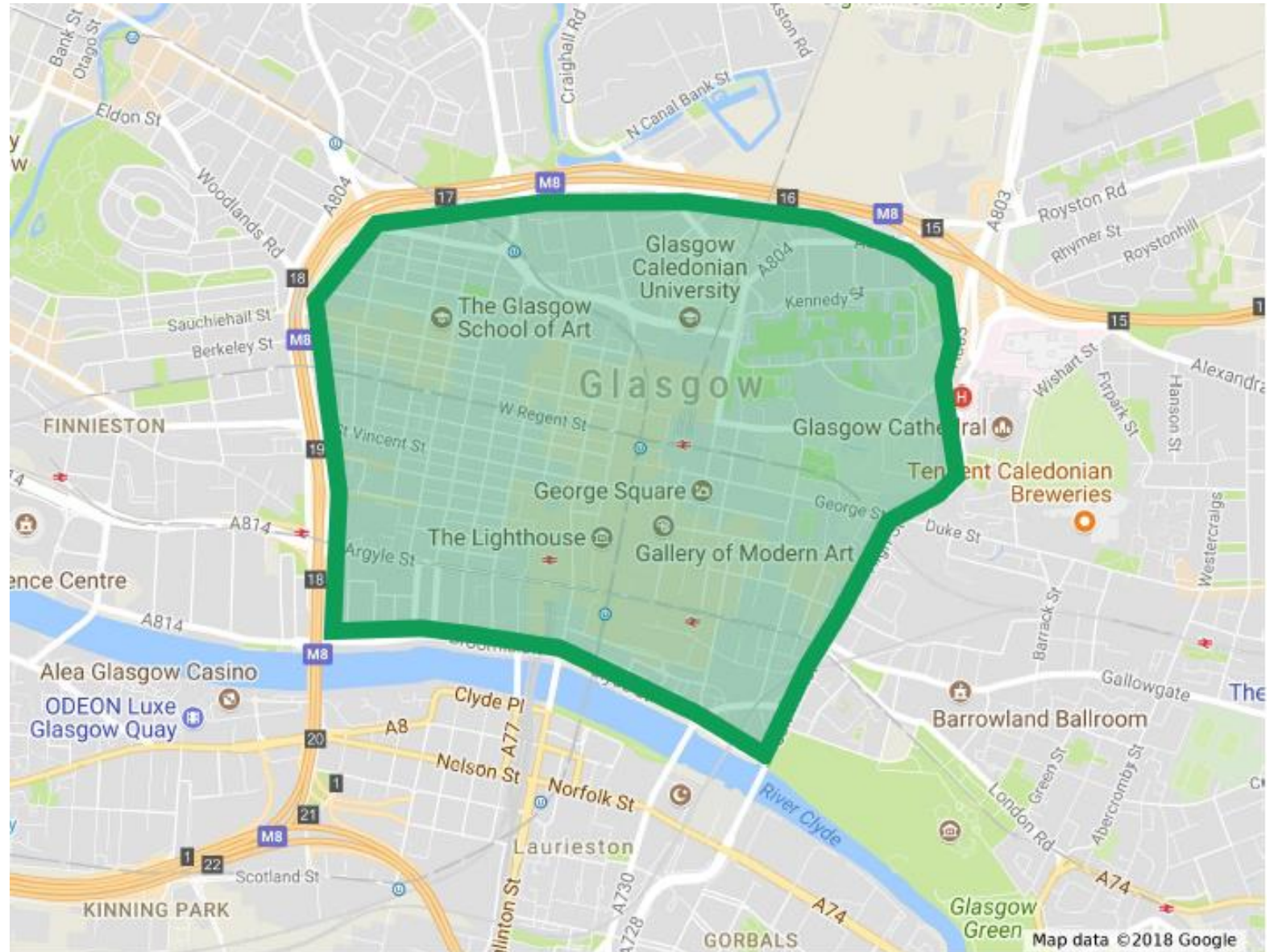
First Minister Nicola Sturgeon and Environment Secretary Roseanna Cunningham with vehicles whose engines would be clean enough for the low emission zones. Picture: John Devlin

# LEZ location

Approx. City  
Centre AQMA

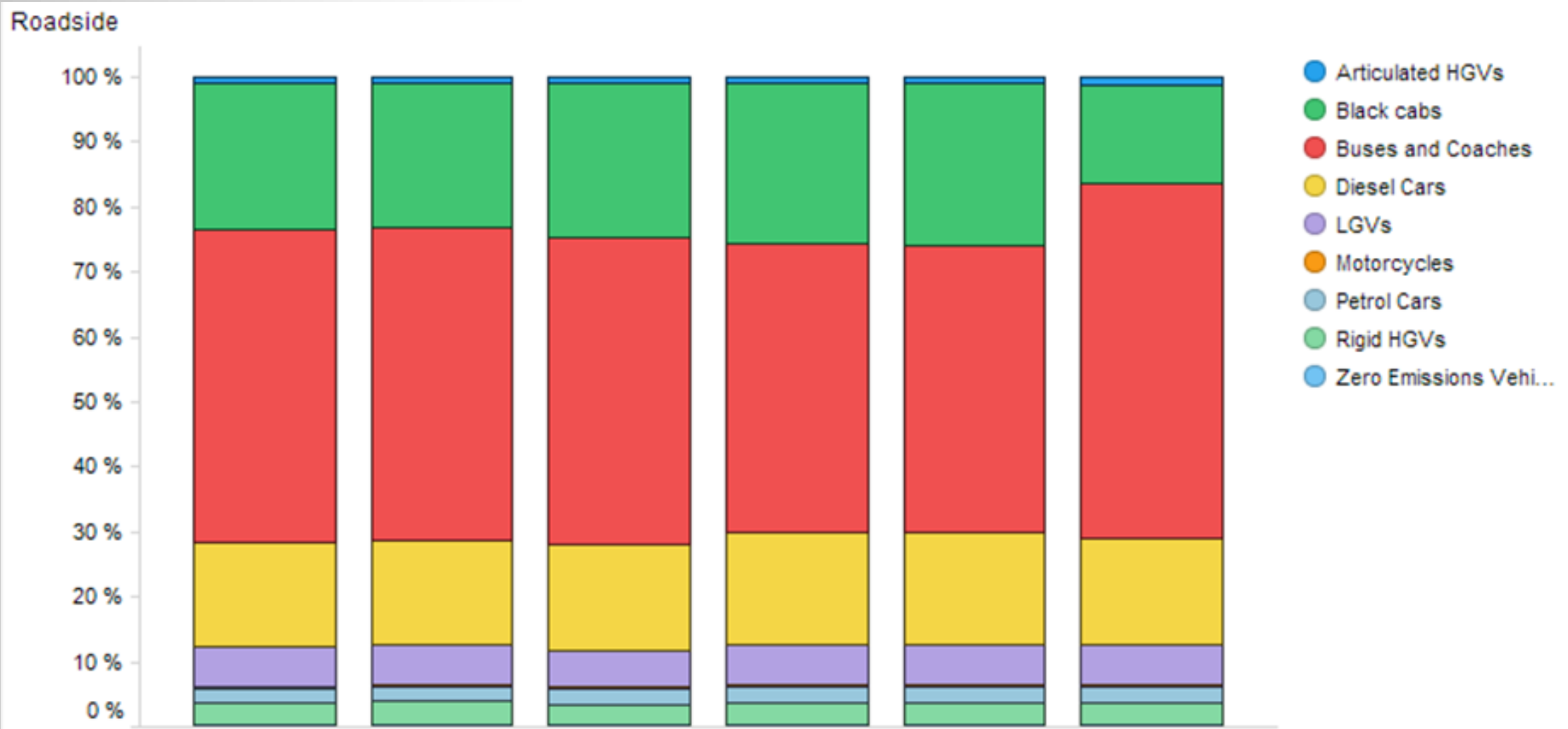
AQ data  
collection  
/modelling and  
traffic analysis  
undertaken and  
ongoing by SEPA  
and GCC

NOx source  
apportionment  
undertaken for  
zone



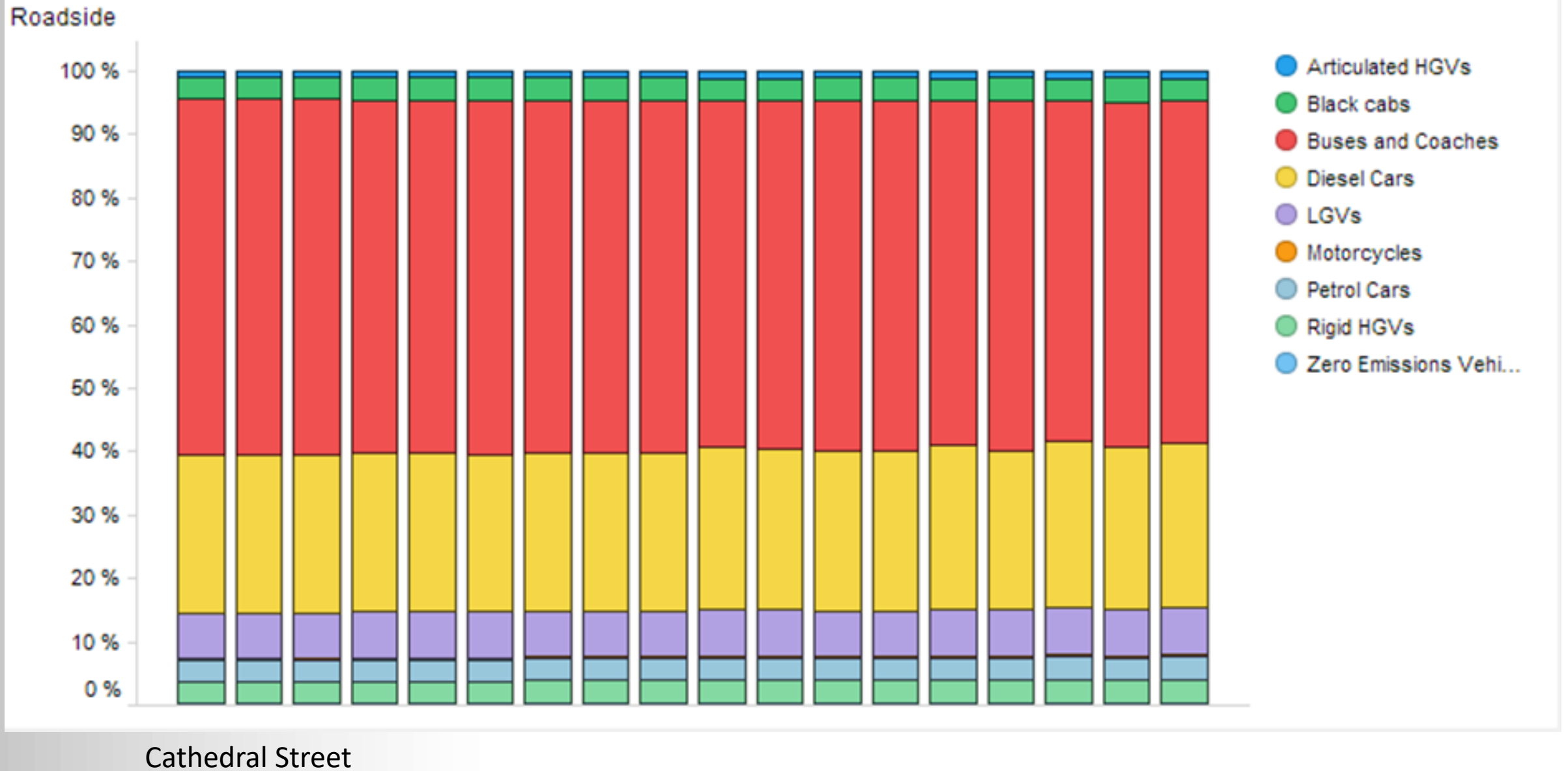


# Source apportionment



Gordon Street

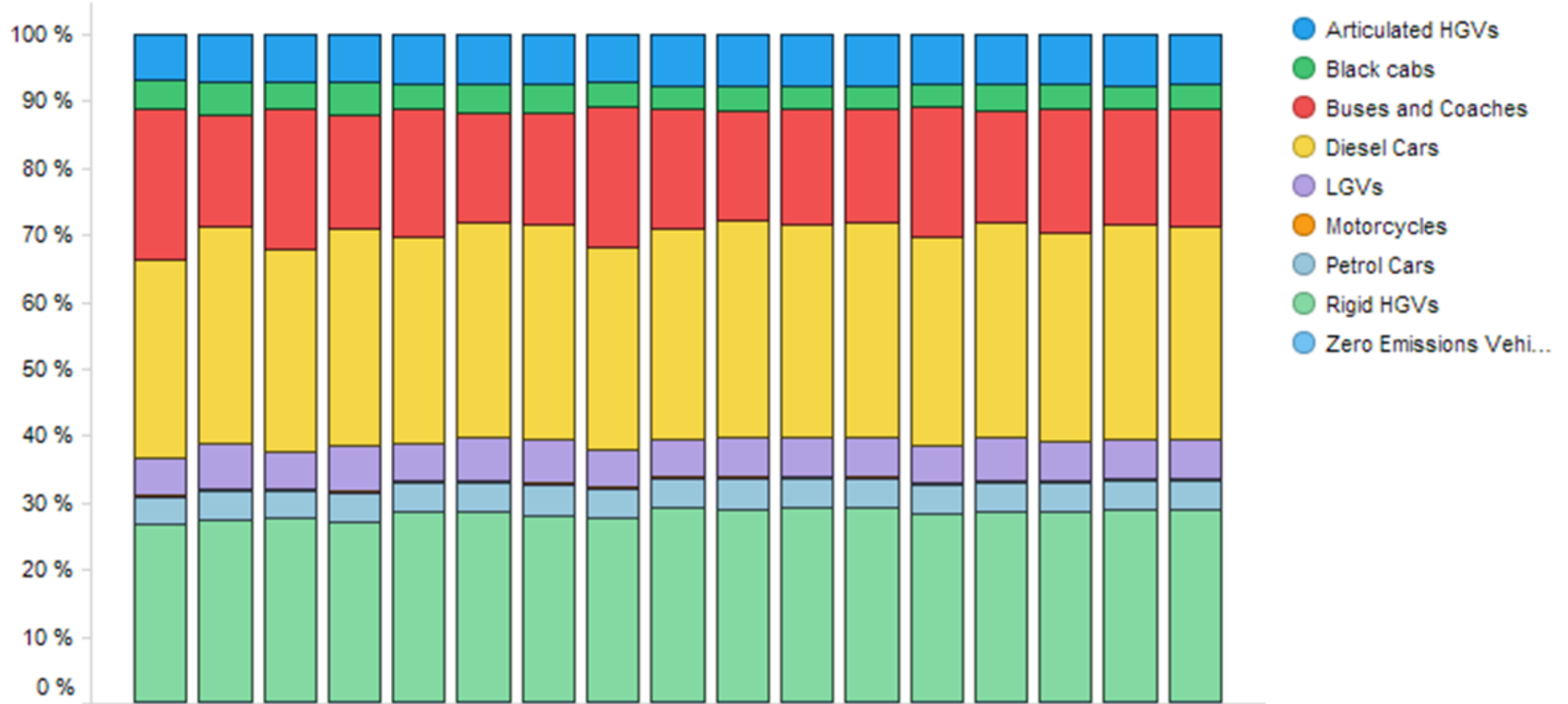
# Source apportionment





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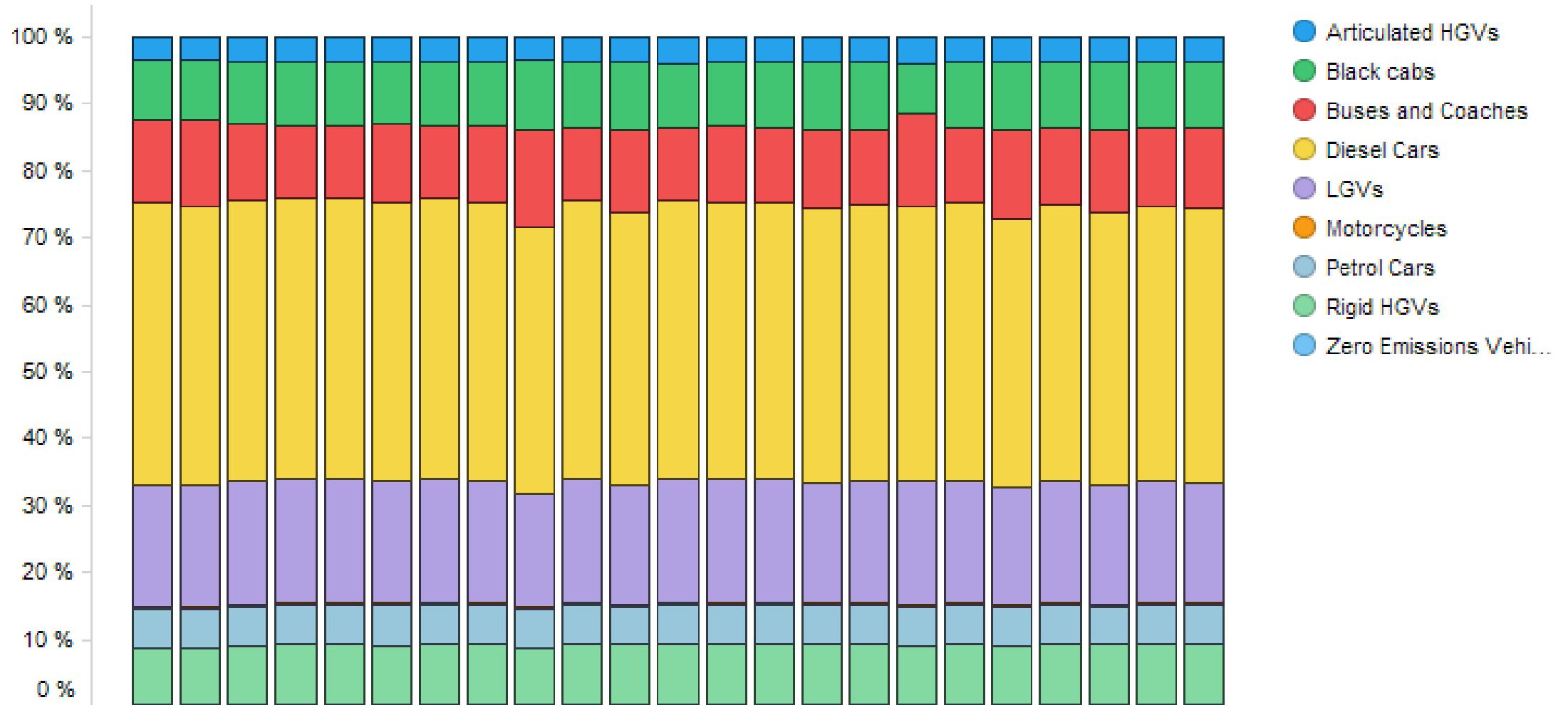
Roadside



Bath Street

# Source apportionment

Roadside

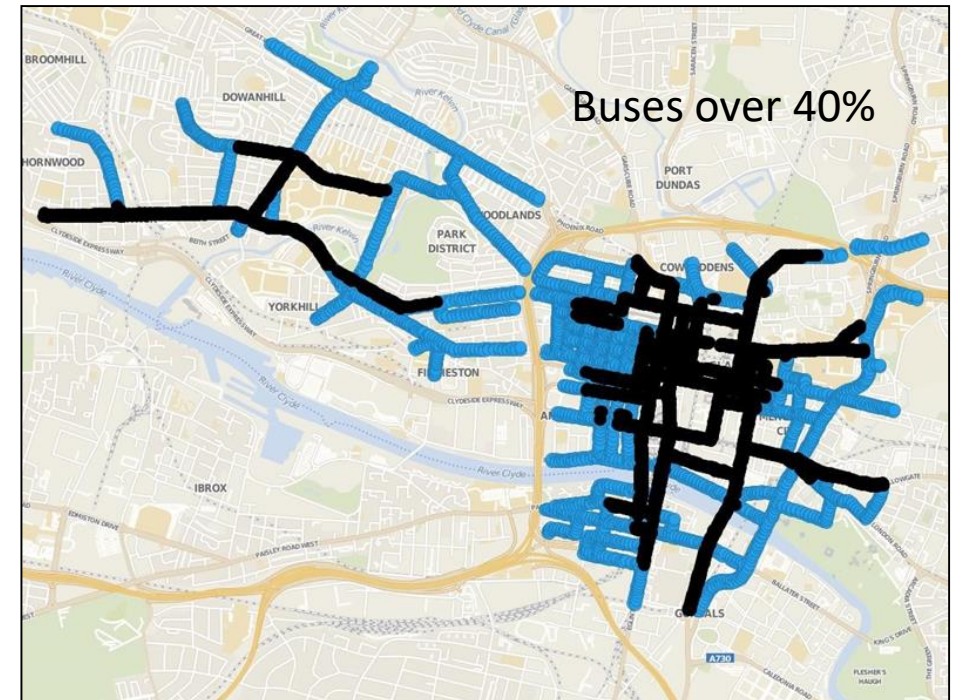
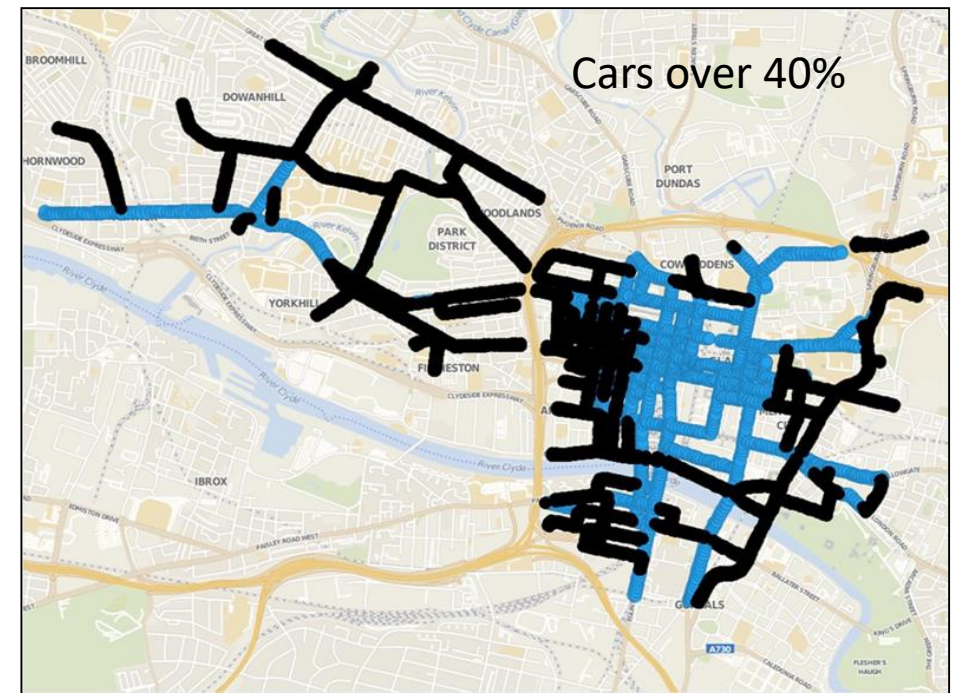


Elmbank Street



# Emissions split

- Defined split within city centre (Bus vs Car)
- Great Western Road, around 70% of NO<sub>x</sub> emissions from cars.
- Hope St, 70-80% of NO<sub>x</sub> emissions from buses/coaches.
- Light Goods Vehicles (LGV) - average contributions of around 15%,
- Rigid HGV – average contributions of around 8%
- Artic. (HGV) – average contributions of around 5%.

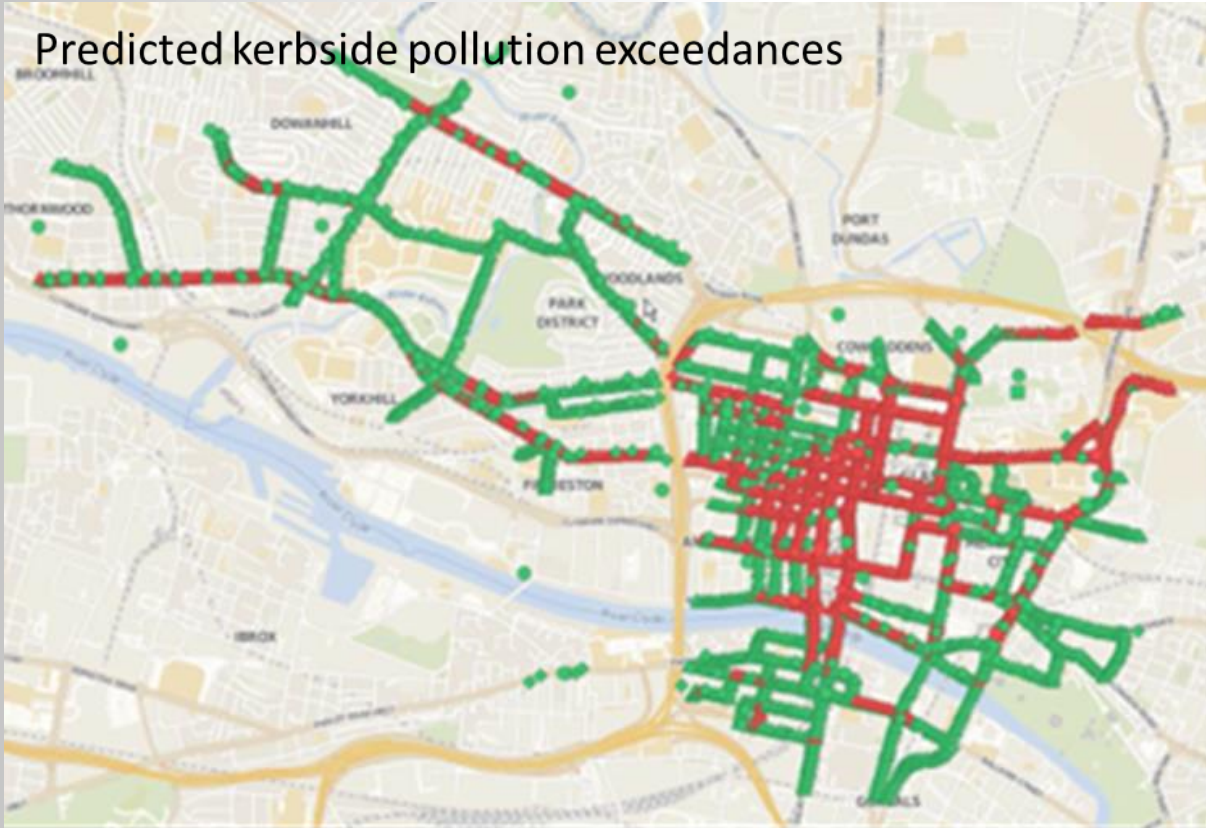




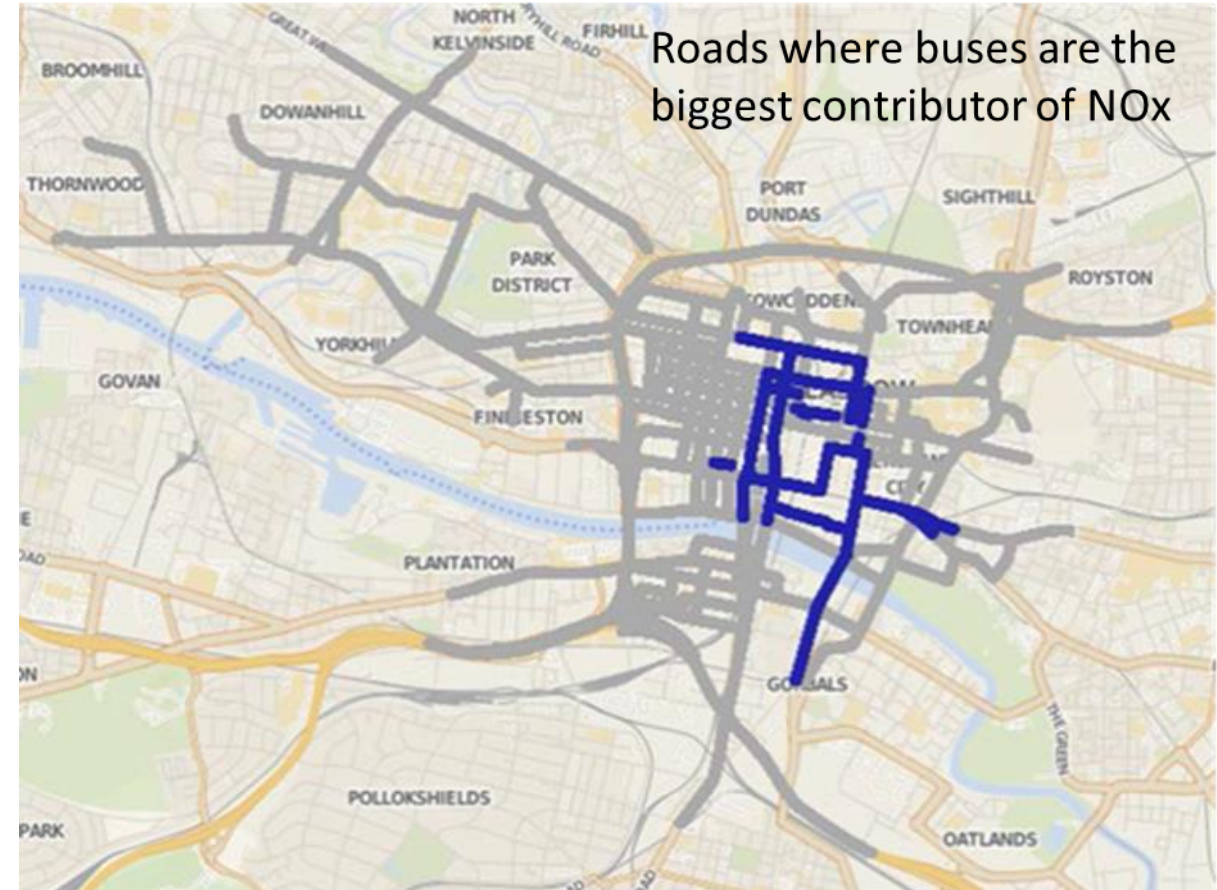
# Concentration link

There is a clear link between areas of increased bus traffic and higher levels of city centre air pollution exceedances

Predicted kerbside pollution exceedances



Roads where buses are the biggest contributor of NOx





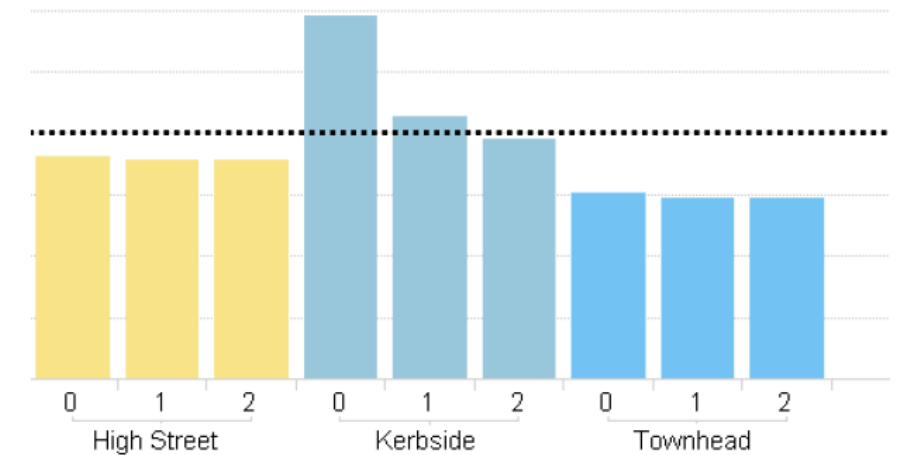
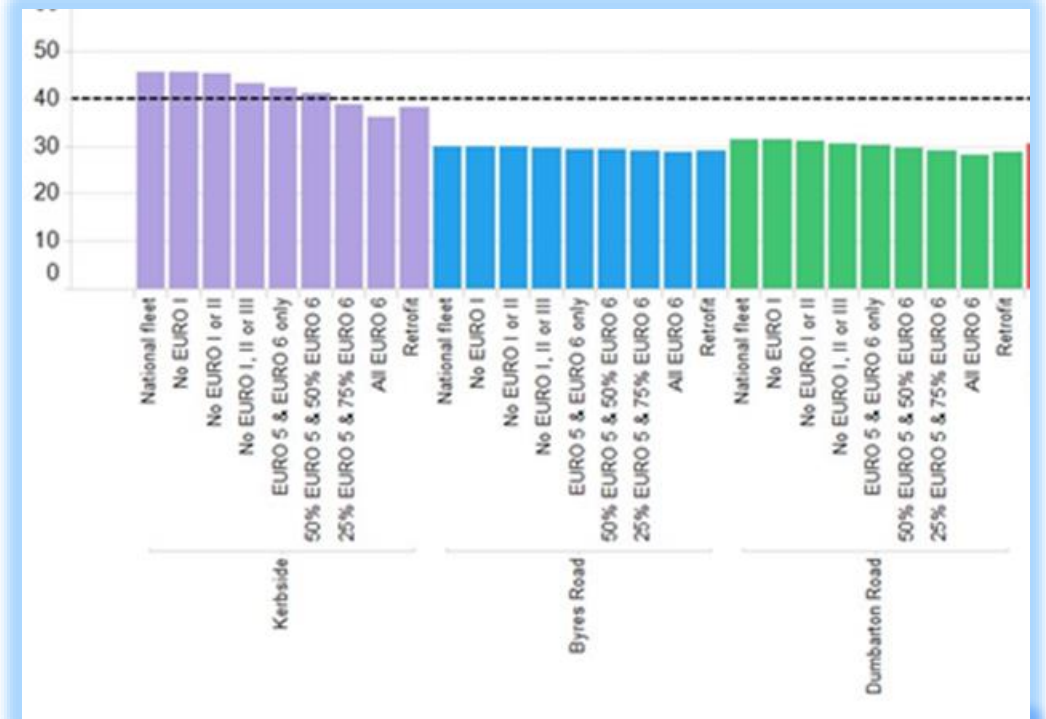
# Scenario testing

Significant improvements in areas with high levels of pollution possible.

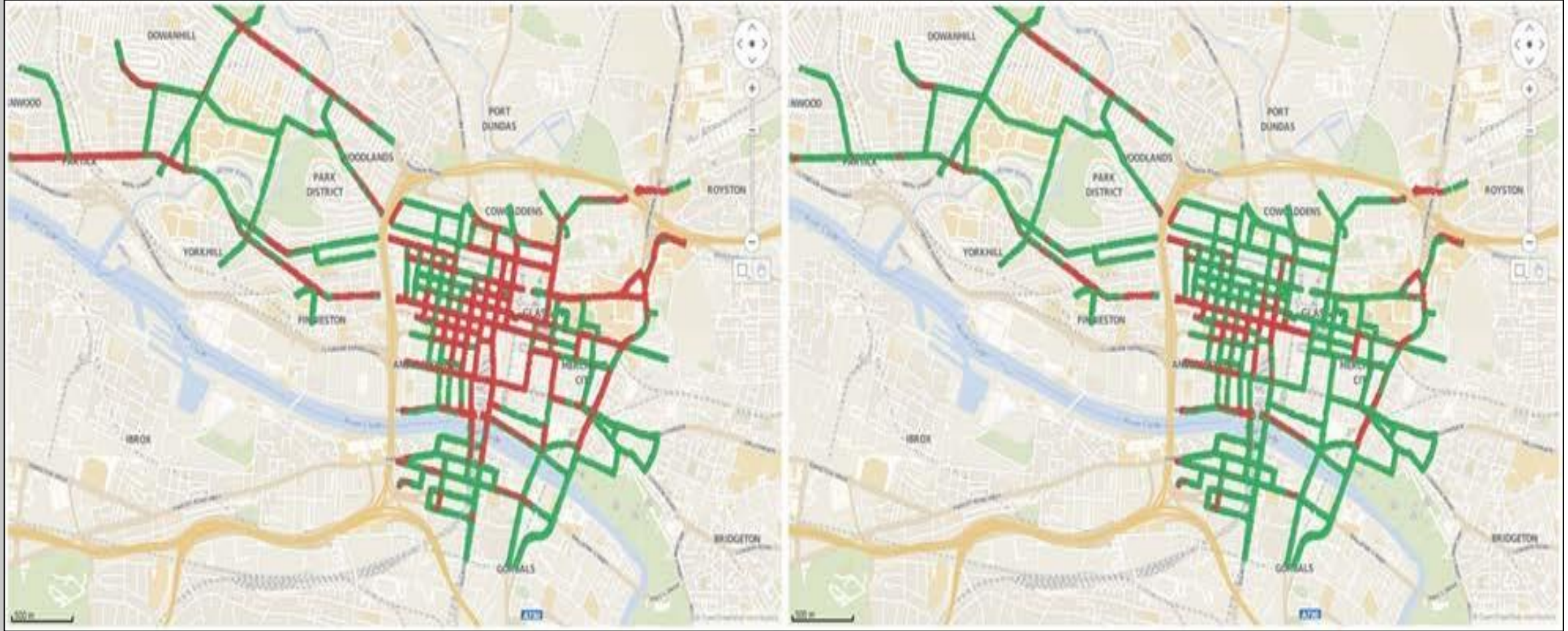
Improving bus emissions phase will have most immediate and significant impact in the worst areas.

Improving buses only will not reduce pollution enough to meet targets.

Further reductions may be possible with reduced congestion.



# Modelled impact



Comparison in the changes to modelled NO2 for different traffic scenarios, visualised for all kerbside points. The 2 maps compare kerbside concentrations for the National Fleet, and for improvements if all buses were EURO 6 or retrofit.



# Further modelling

- Evolving with more recent and detailed traffic counts.
- Updated transport model will integrate with the NMF model and allow the more detailed outcomes - for LEZ and other traffic interventions



# LEZ consideration/discussion?

## Phasing timescales

- First phase 2018 – buses incremental compliance over 5 years (subject to funds)
- 2nd phase HGVs
- 3rd phase LGVs  
Taxis
- 4th phase private cars

## Costs

- Grant system (bus)
- Loans (taxi)
- Alternatives?
- 
- 
- 

## Hours of operation

- 24/7 currently being modelled
- Daytime only
- Weekdays only
- 
- 
- 
- 

## Exemptions

- Emergency vehicles
- Charities

## Sunset periods

- Local businesses
- Residents

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