Local Air Quality & Effects of Air Pollution on Health

MBCG 13th February 2019

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Chair, The Kew Society

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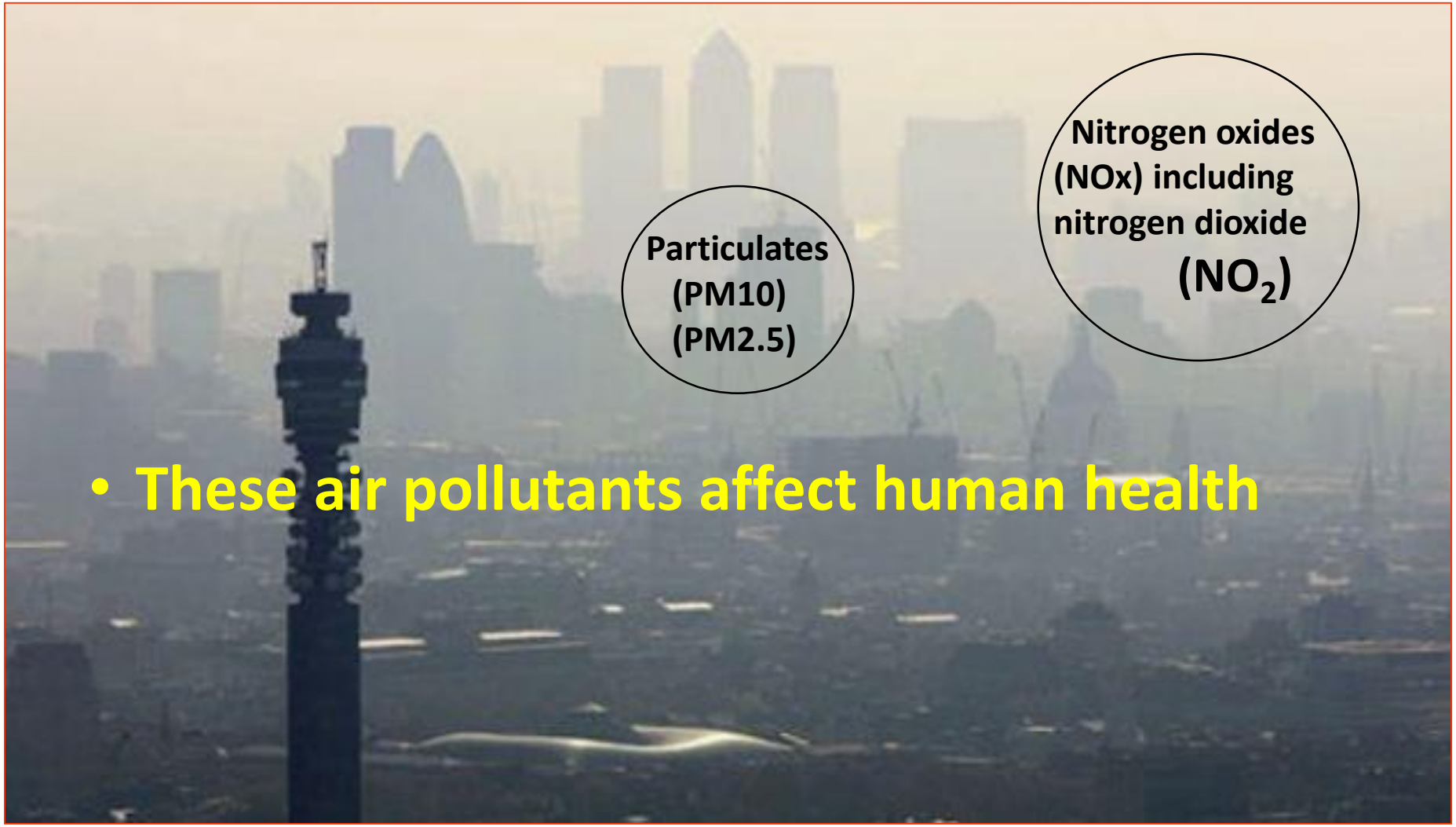
What is air pollution?

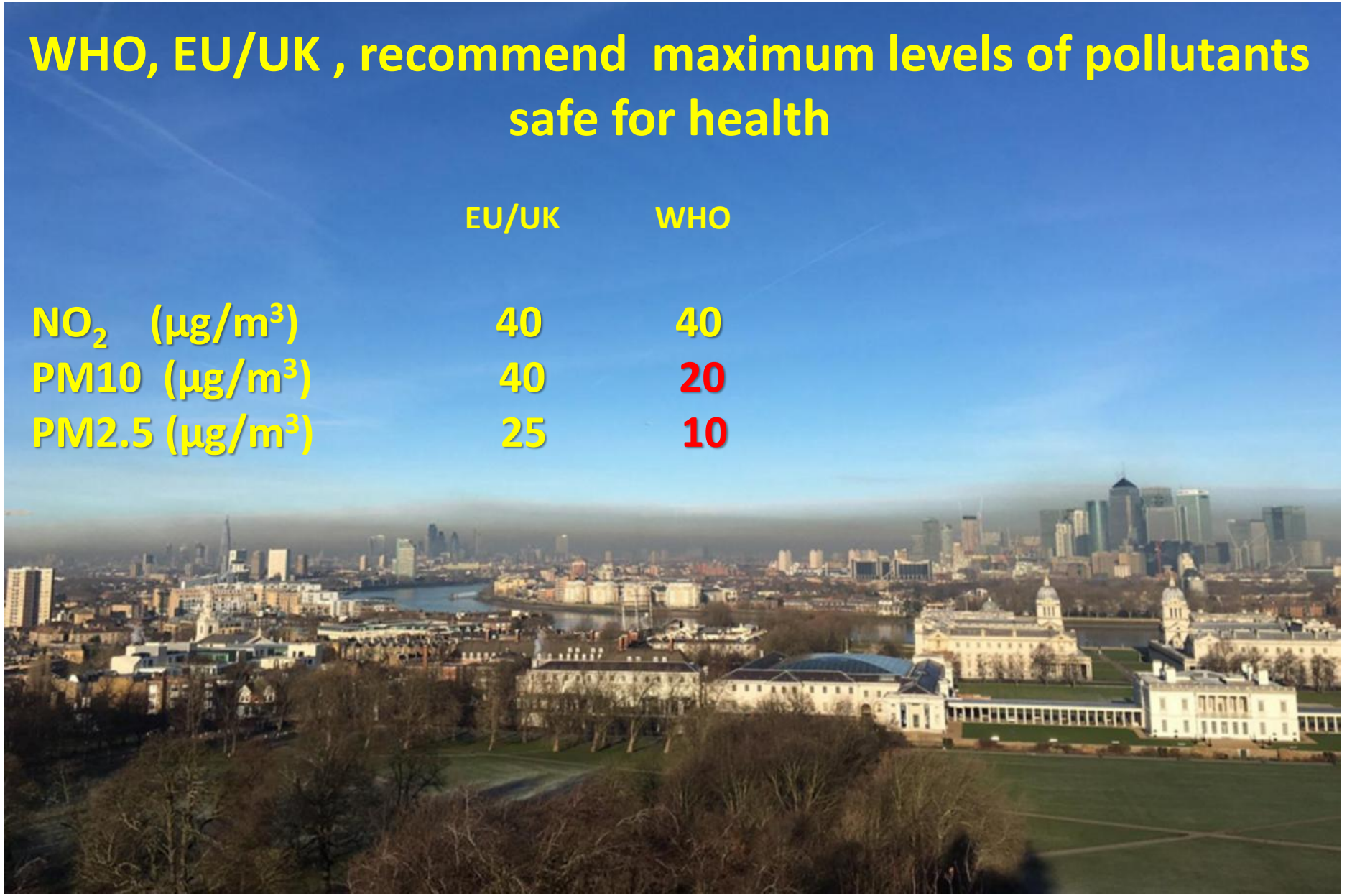
- **WHO definition. *C*ontamination of the environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere.**



London March 2014: Photograph /nextgreencar.com

WHO, EU/UK , recommend maximum levels of pollutants safe for health

	EU/UK	WHO
NO_2 ($\mu g/m^3$)	40	40
PM10 ($\mu g/m^3$)	40	20
PM2.5 ($\mu g/m^3$)	25	10



Smog over London January 19th 2017
London Evening Standard

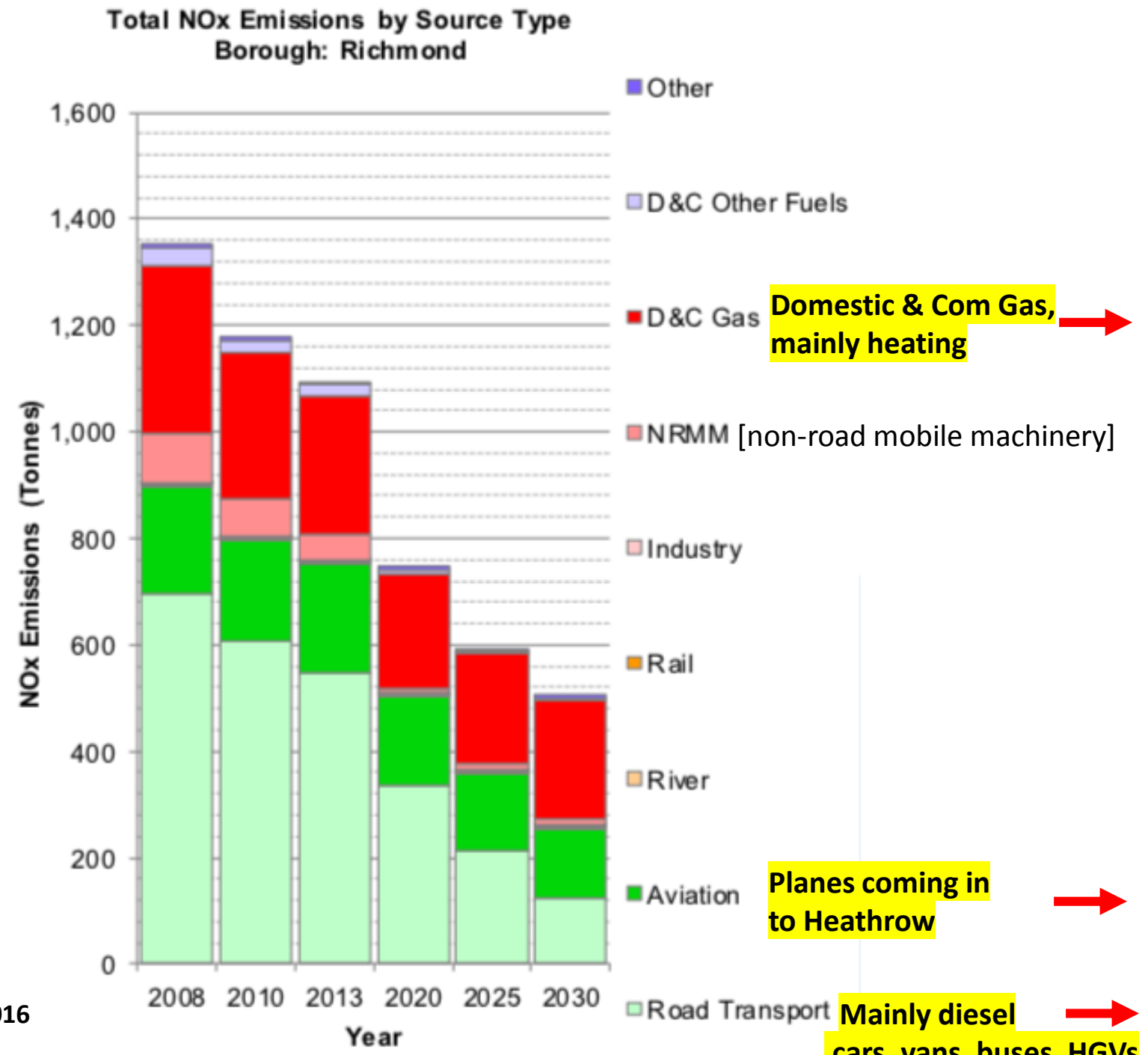
Is poor air quality a problem where we live?

Air pollution data, London Borough of Richmond, 2017

- 65 sites monitored by LBRuT for NO_2. 75% of sites exceed 40 µg/m^3 *annual mean* legal limit
- 13.2% of residents are exposed to over 40 µg NO_2/m^3 where they live – risking health
- 5 sites exceed *short term* I hour Air Quality Objective for NO_2 – risks health of all present
- PM10 concentration exceeds annual mean objective on main roads and in town centres

Source: LBRuT Air Quality Action Plan 2017-2022. published summer 2017

Where does our pollution come from?



Domestic & Com Gas, mainly heating →

Planes coming in to Heathrow →

Mainly diesel cars, vans, buses, HGVs →

% total NOx	
2013	2020
23.7	28.9
18.6.	22.5
50.0.	45.1

Source:
London Atmospheric Emissions Inventory 2016
GLA/ Mayor of London

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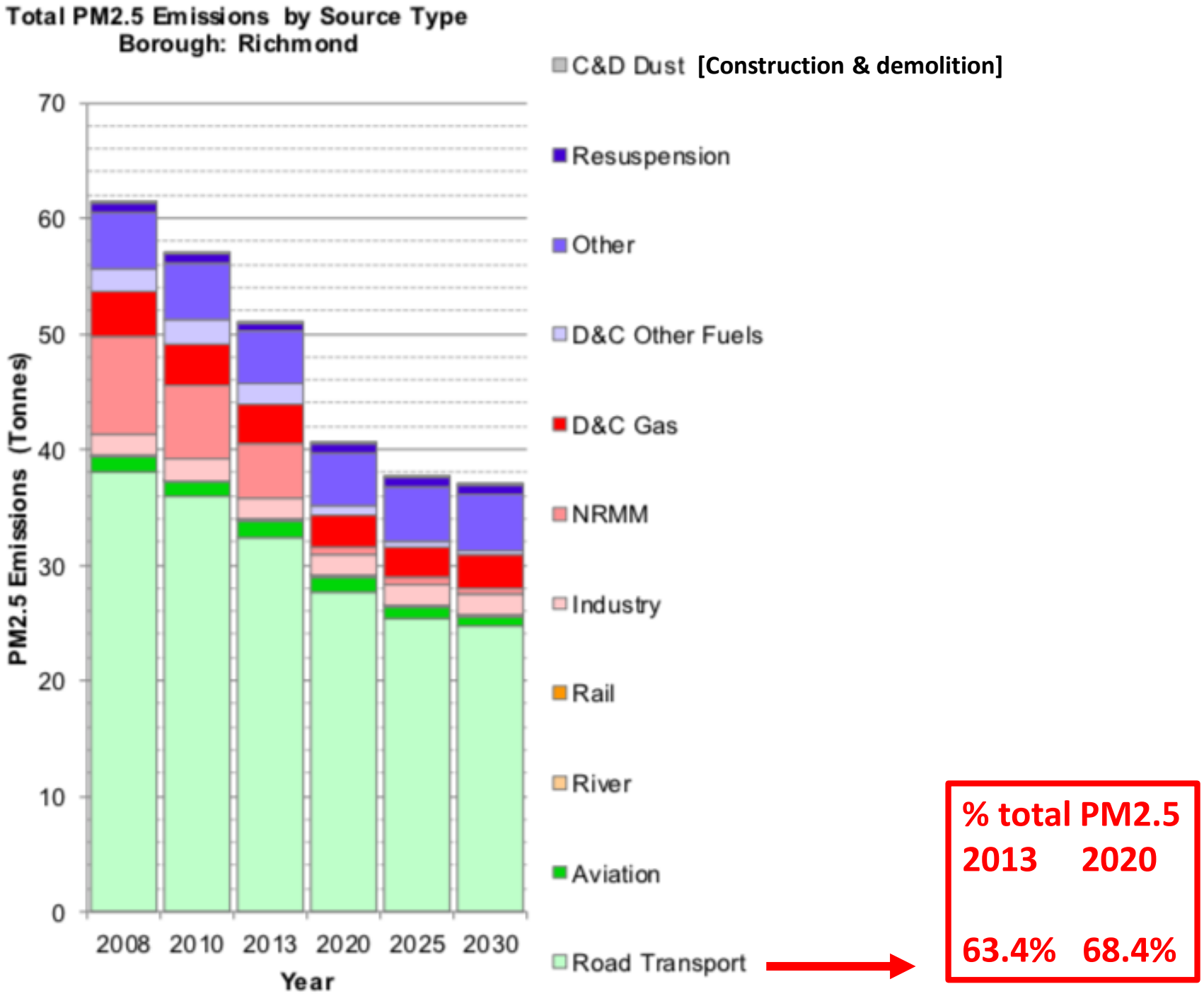


% total PM2.5	
2013	2020
63.4%	68.4%

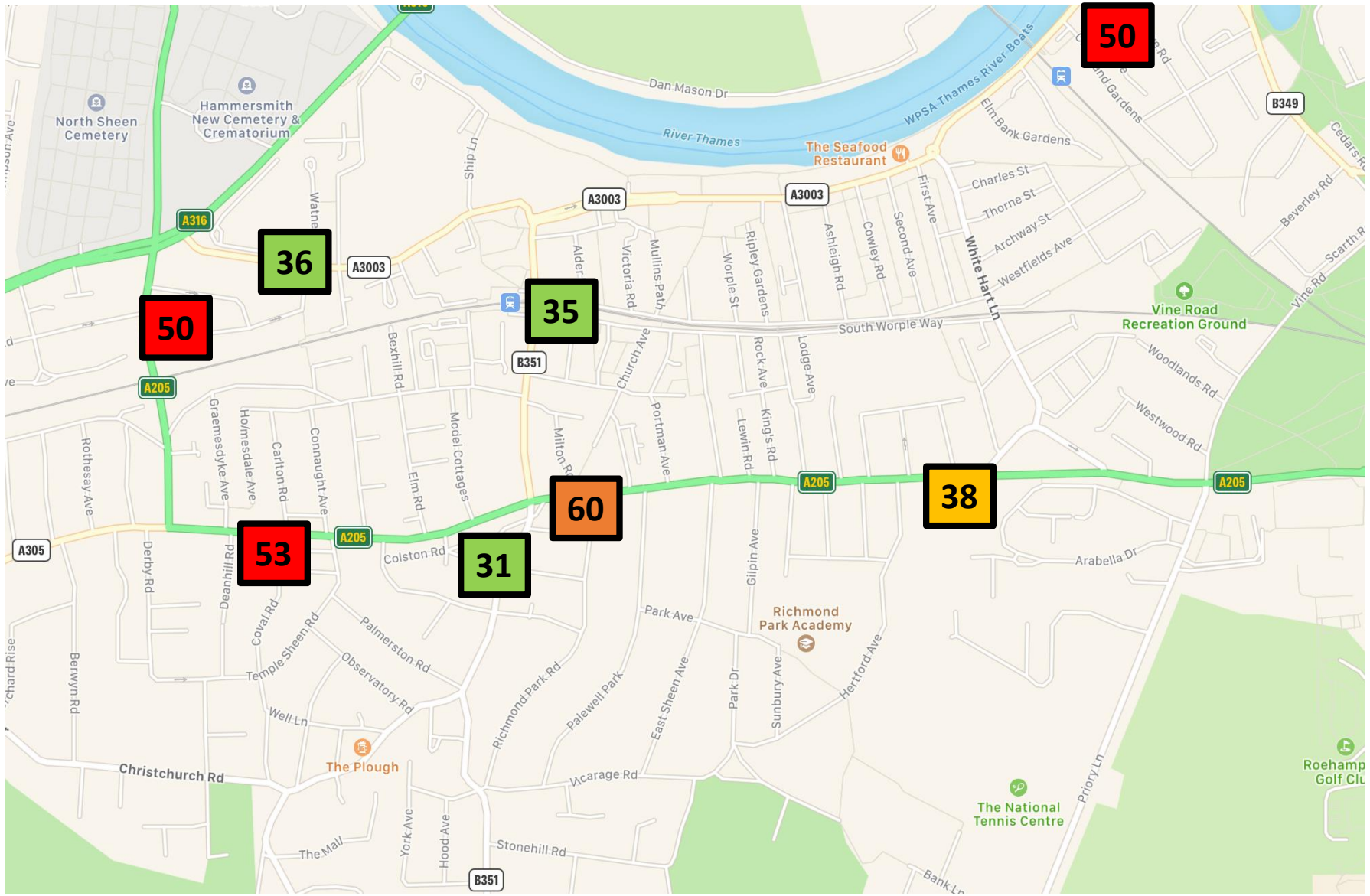
Source:
London Atmospheric Emissions Inventory 2016
GLA/ Mayor of London

Where are the air pollution hotspots in Richmond ?

LBRUT Air Quality Action Plan 2016

East Sheen 2017

Annual Mean NO_2 Concentrations (ug/m^3)



UK legal limit 40ug/m³

Source: London Borough Richmond upon Thames Air Quality Annual Status Report for 2017

Adverse effects of air pollution begin in the womb

- **INCREASED PM2.5 EXPOSURE IN PREGNANCY ASSOCIATED WITH LOW BIRTH WEIGHT BABIES AT FULL TERM [<2.5kg]**

- **Low birth weight complications**
  - **difficulty with feeding / gaining weight**
  - **difficulty maintaining body temperature**
  - **infection**
  - **neurological , respiratory complications, etc.**

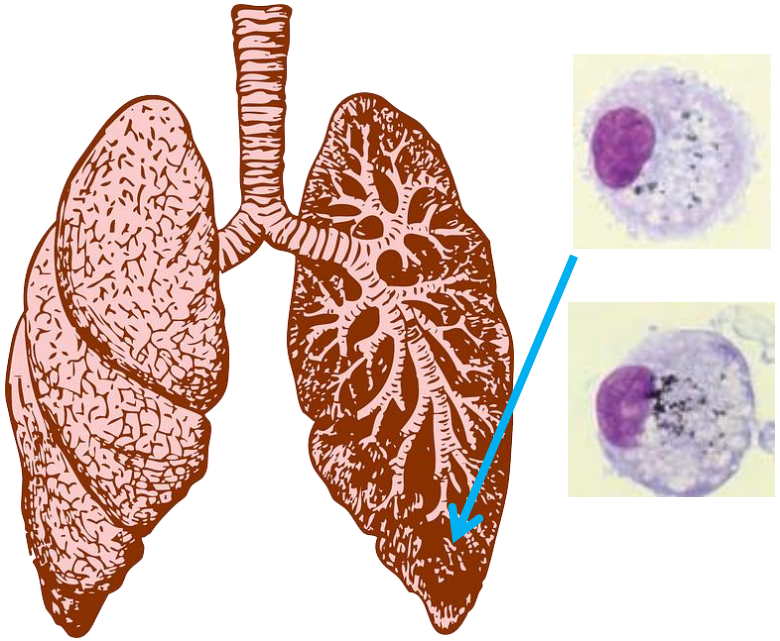
- **Low birth weight babies need special care units (£)**

- **Reducing PM2.5 to 10µg/m^3 would decrease low birth weight at term by 22% in UK**

Pedersen M et al. Ambient air pollution and low birthweight: a European cohort study (ESCAPE). Lancet Respir Med 2013;

Adverse effects of air pollution on lungs in childhood

Pollution reduces lung growth and function



Macrophage cells recovered from lower airways of children living in Leicester

Black spots = PMs

[Kulkarni N et al. *N Engl J Med* 2006;355:21–30]

- Increased PMs in lungs of "healthy" children associated with decreased lung growth and lung function [FEV_1]
- Exposure to elevated NO_X exacerbates complications

Complications

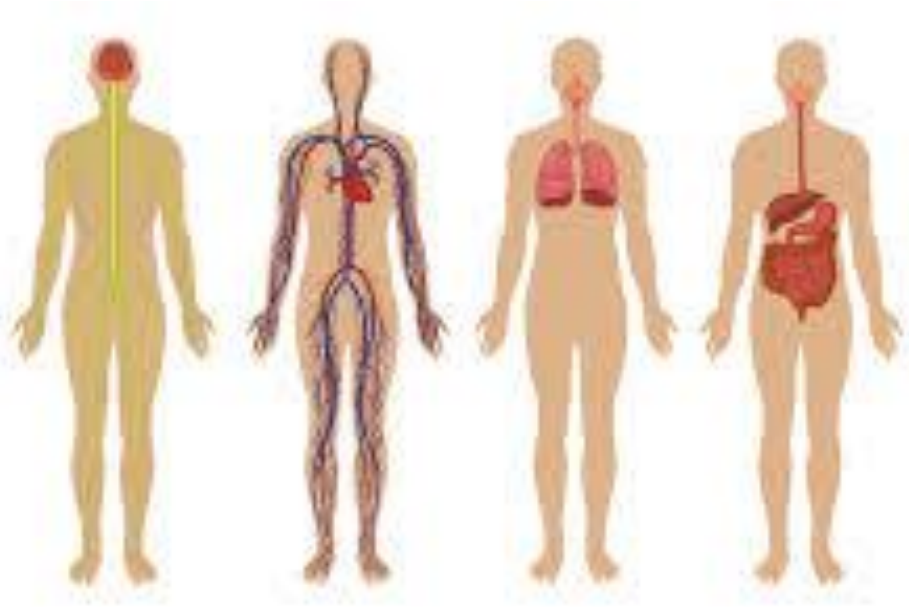
- **Increased wheezing**
- **Increased severity of asthma attacks**
- **Increased respiratory infections (e.g . bronchitis, pneumonia)**

Royal College of Physicians Report 2016

Air pollution affects multiple organs and systems

Brain

- **Pregnancy** : severe air pollution → reduction in baby's brain growth → slowing of speech and movement (RCP report 2016)
- **Adults** : prolonged living in polluted areas → decreased cognitive function (RCP report 2016)
- **Elderly**: women exposed to high PMs → 2x more likely to develop Alzheimer's Disease



Metabolism

- **Adults:** long term exposure to traffic pollution → increase in Type 2 diabetes

Blood vessels and heart

- **Pregnancy:** increased risk of pre-eclampsia (Pedersen et al (2017) Epidemiology)
- **Adults:** long term exposure to PM2.5
  → 12-13% increase in heart attacks (MI)
  → 19% increase in strokes
  (Cesaroni et al (2014) Brit Med J)
- **Adults:** on day of exposure to air pollution → Increased heart failure
  (Shah et al (2013) Lancet)

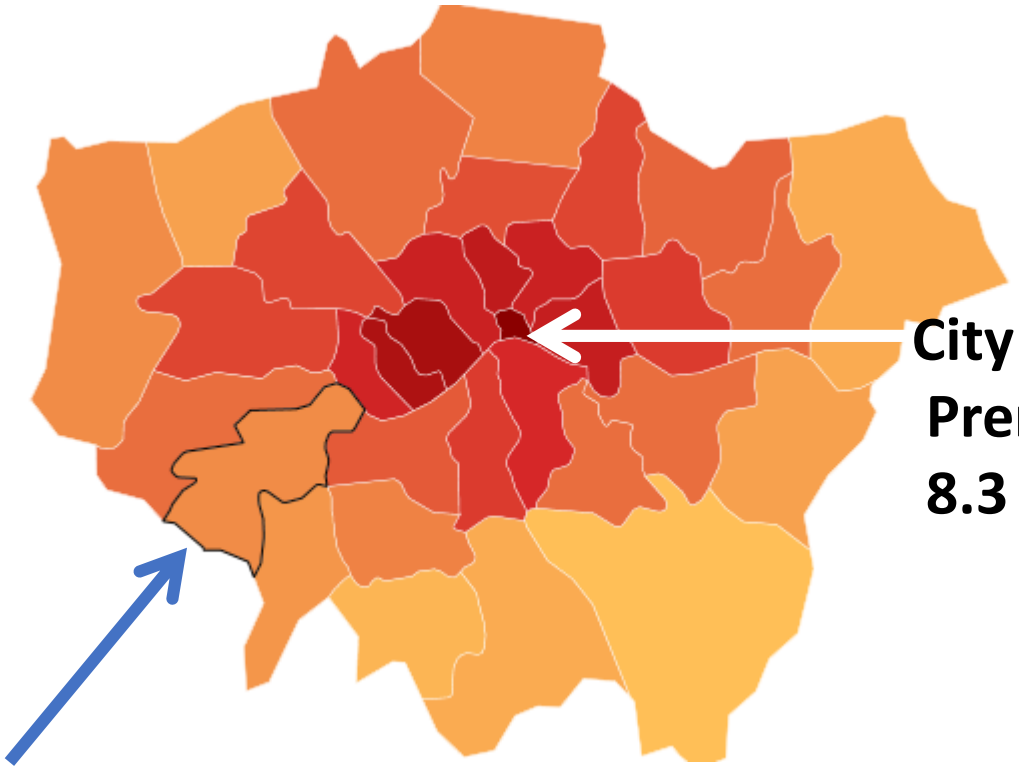
Lungs

Children and adults: air pollution
→ exacerbates pre-existing asthma.
→ may induce new onset asthma (RCP report 2016)

Adults: air pollution exposure
→ can cause lung cancer
(*International Agency for Research on Cancer (2013)Monograph*

Can air pollution actually kill you?

Premature deaths (%) attributed to PM2.5 pollution
Public Heath England data for years 2013 & 2014



City of London
Premature deaths
8.3 - 8.4 % of total

Borough Richmond upon Thames
Premature deaths 6.0 - 6.3 % of total
[≡ 100 people pa]

Chart: London Evening Standard graphic

Is there anything we can do?

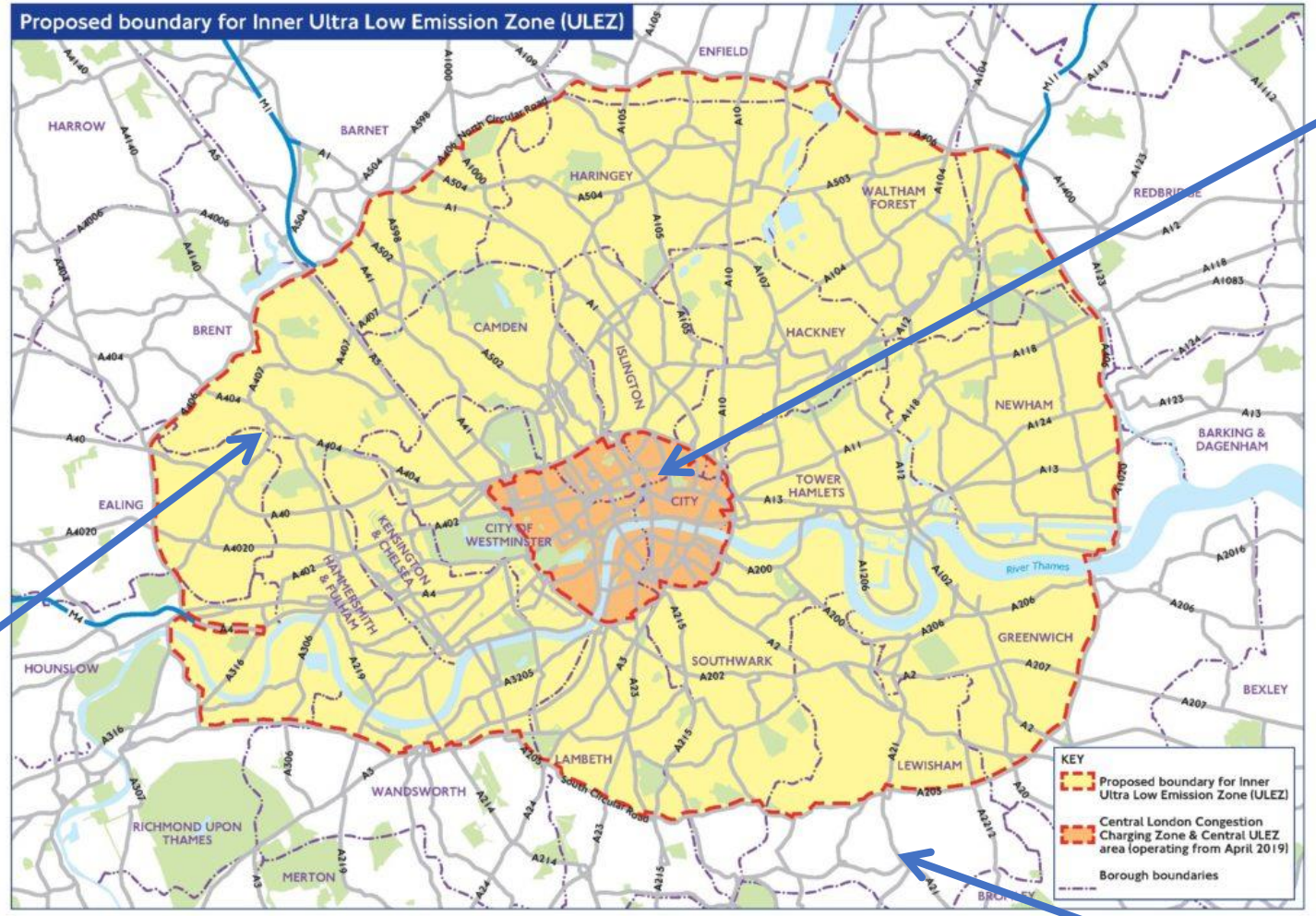
BIG SCHEMES

e.g. The Ultra Low Emission Zones (ULEZ)

Vehicles must meet exhaust emission standards – or pay to enter a ULEZ

2019
Central ULEZ
Cars, Vans
£12.50/day
Coach,Bus,HGV
£100/day

2021
Inner London ULEZ
Cars, Vans
£12.50/day
Coach, Bus, HGV
£100/day

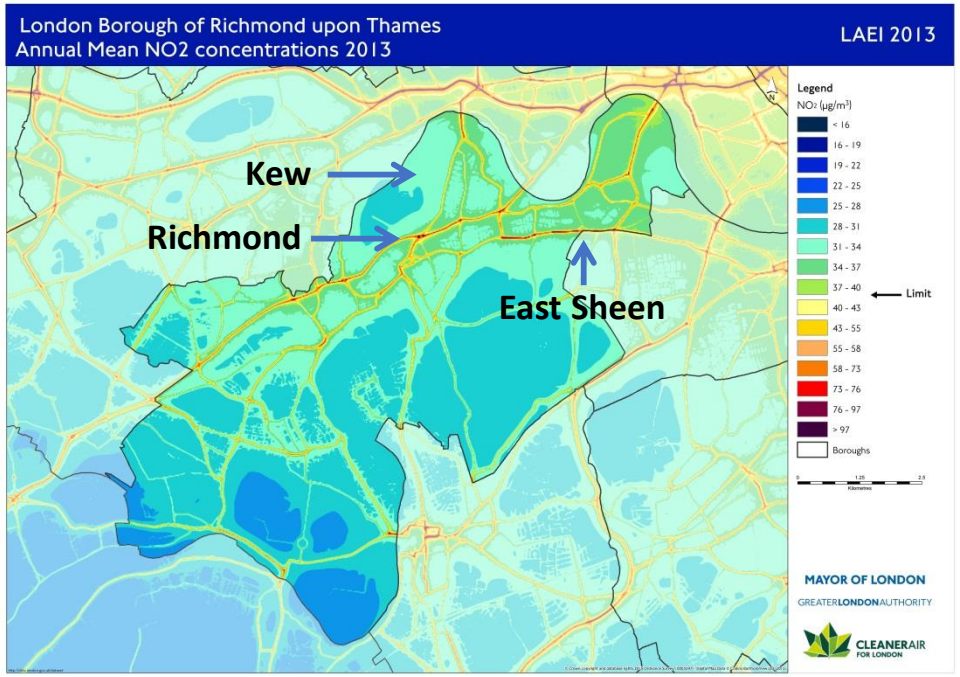


2020
Whole of
Greater London ULEZ
[to outer boundary of all London Boroughs]
Only Coach, Bus, HGVs
£100/day

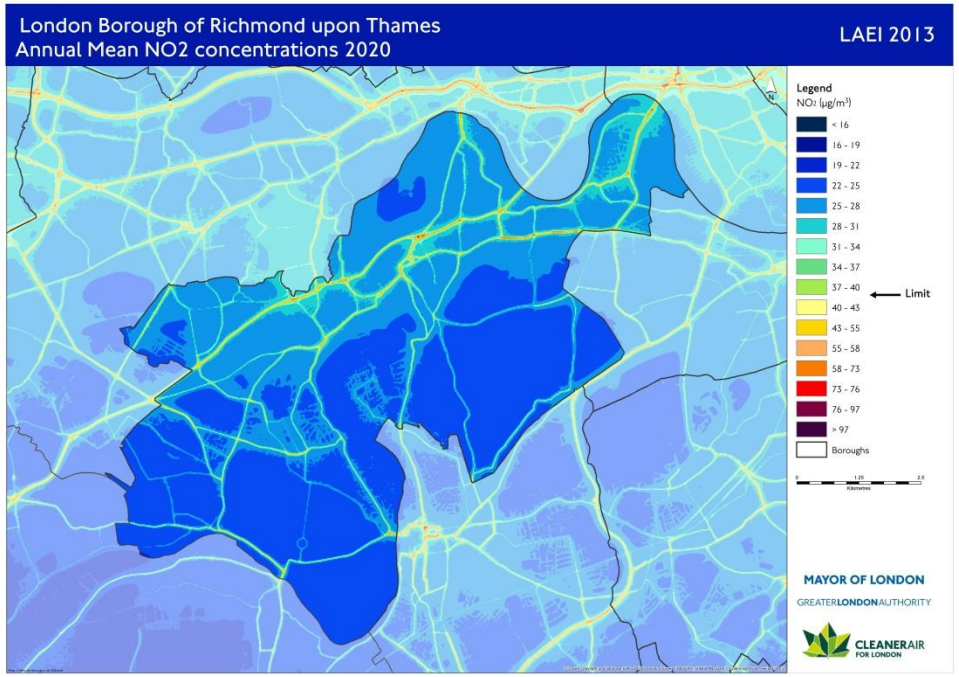
Source: London Environment Strategy

What effect will ULEZ have on NO_2 levels in our area?

NO2 in 2013



Predicted NO2 in 2020



Mayor predicts ULEZ will decrease Nox London-wide by 20% in 2020 and 30% by 2030

Source: London Atmospheric Emissions Inventory _update April 2017/GLA

Airqualitynews.com 30/11/17

PERSONAL ACTIONS TO IMPROVE AIR QUALITY, OR AVOID ADVERSE EFFECTS

- **Use sustainable transport**

  walk, cycle, scoot, use public transport – has implications for provision of walking routes, cycle paths, good public transport, etc.

- **Leave the car at home for the school run**

  NO_2 concentration inside cars is 2X greater or more than on the pavement
  Plan a route away from main roads if possible

- **Switch off your engine when stationary**

  e.g. at level crossings, in traffic jams, at traffic lights, encourage others to do the same

- **When you change your car, buy electric, hybrid, or petrol rather than diesel.**

  Diesel purchase down from 45% to 30% in last quarter. Charge points are increasing

- **Use only DEFRA – approved wood burning stoves and fuels at home**

- **Have your on-line orders delivered to a pickup point, not to home**