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Centre for Environment & Health



Imperial College  
London



# Impacts of construction on air quality in London

18<sup>th</sup> March 2015

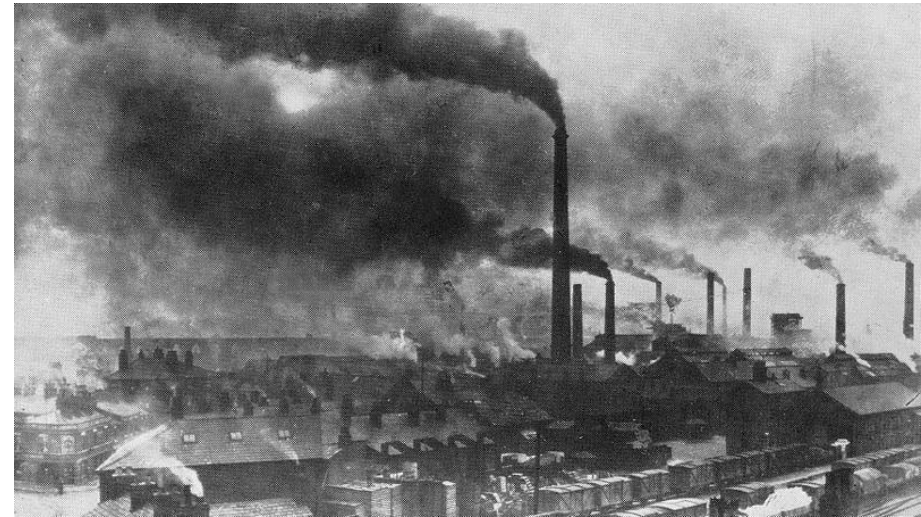
Gary Fuller

[gary.fuller@kcl.ac.uk](mailto:gary.fuller@kcl.ac.uk)

# Overview

- London's air pollution
- Construction in the London emissions inventory
- What do we know from measurements?
- How to address the knowledge gaps

# London no longer looks like this



<http://www.garreteer.co.uk/2012/08/18/the-hidden-violence-of-smog/>

# Or like the London air as painted (and breathed) by Monet

Claude Monet. *London. The Waterloo Bridge*. 1903. Oil on canvas. The Carnegie Institute, Museum of Art, Pittsburgh, USA.





# Nor like 1952



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# London's air today

## Pollution

### Nearly 9,500 people die each year in London because of air pollution - study

Counting impact of toxic gas NO2 for the first time suggests more than twice as many people as previously thought die prematurely from pollution in UK capital

Adam Vaughan

@adamvaughan\_uk

Wednesday 15 July 2015 11.04 BST



This article is 8 months old

Shares 6,534 Comments 665

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An air pollution episode in London in 2015. There were 9,416 early deaths caused by the pollutants NO2 and PM2.5 in 2010, according to King's College London. Photograph: Nick Ansell/PA

Nearly 9,500 people die early each year in London due to long-term exposure to air pollution, more than twice as many as previously thought, according to new research.

#### Understanding the Health Impacts of Air Pollution in London

For: Transport for London and the Greater London Authority

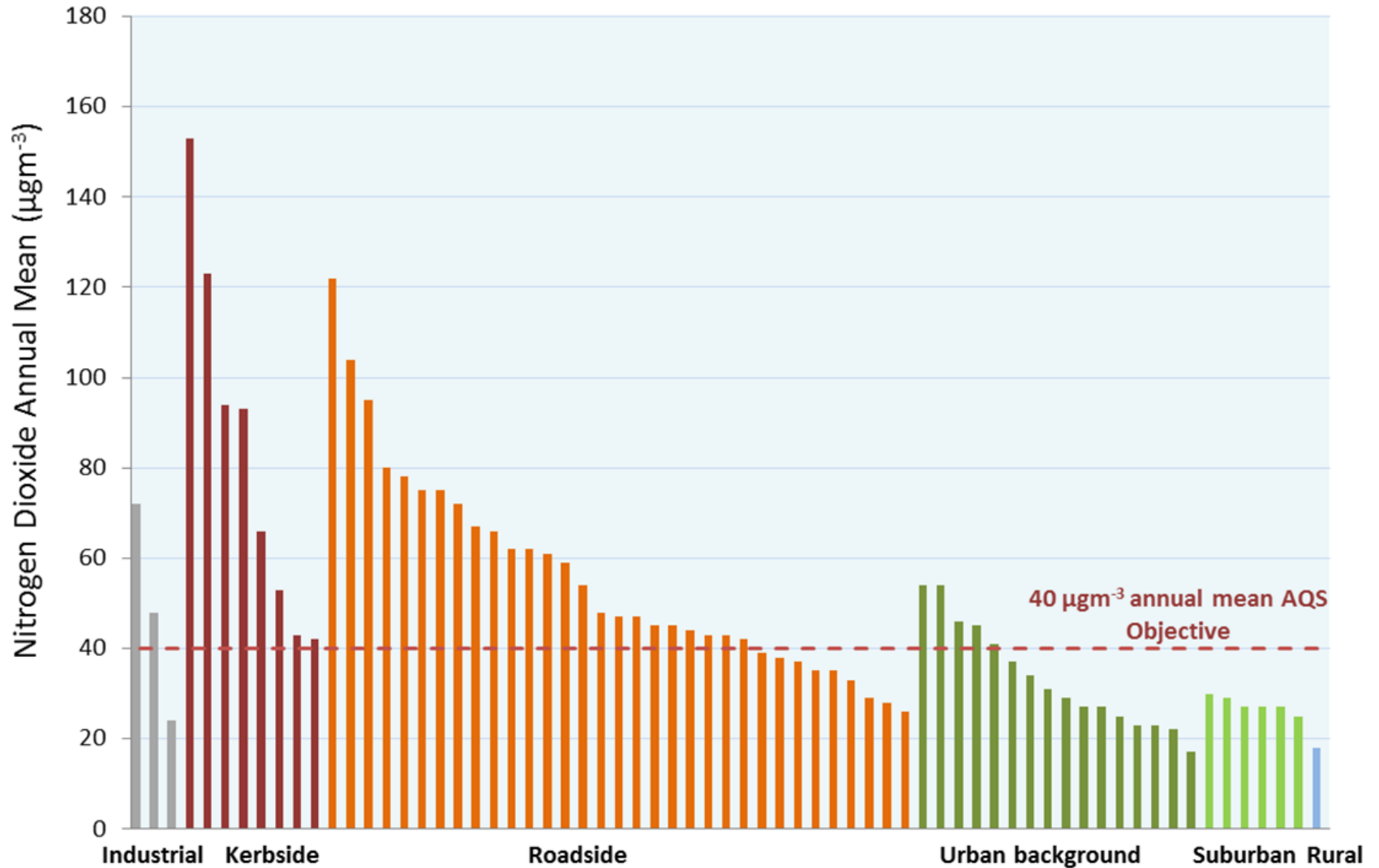
By: Heather Walton, David Dajnak, Sean Beever, Martin Williams, Paul Watkiss and Alistair Hunt

Date: 14<sup>th</sup> July 2015 FINAL



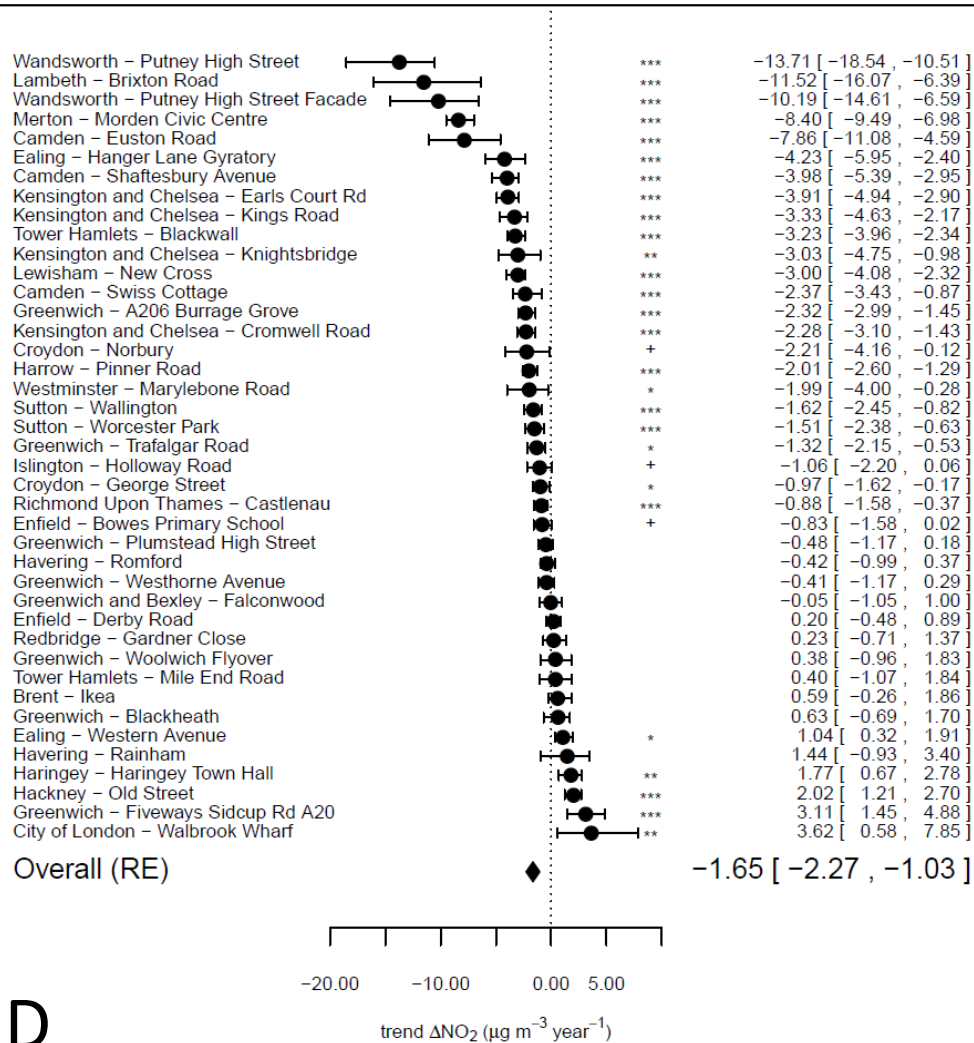
Address: Environmental Research Group, School of Biomedical Sciences, King's College London, Franklin-Wilkins Building, 150 Stamford Street, London, SE1 9NH, United Kingdom.  
Tel: +44 207 848 4009, email: Heather.Walton@kcl.ac.uk  
Web: <http://www.kcl.ac.uk/biohealth/research/divisions/aes/research/ERG/index.aspx>  
London monitoring: <http://www.londonair.org.uk/LondonAir/Default.aspx>

# NO2 2014



### Trends 2010 – 2014

**B**



**D**



## Pollution

# UK faces fresh legal challenge over weak plans to tackle air pollution

High court challenge could force government to rewrite measures to address illegal levels of toxic NO2 gas in cities that kills about 25,000 people each year

John Vidal

Friday 18 March 2016 11.23 GMT



Shares Comments

56

49

Save for later

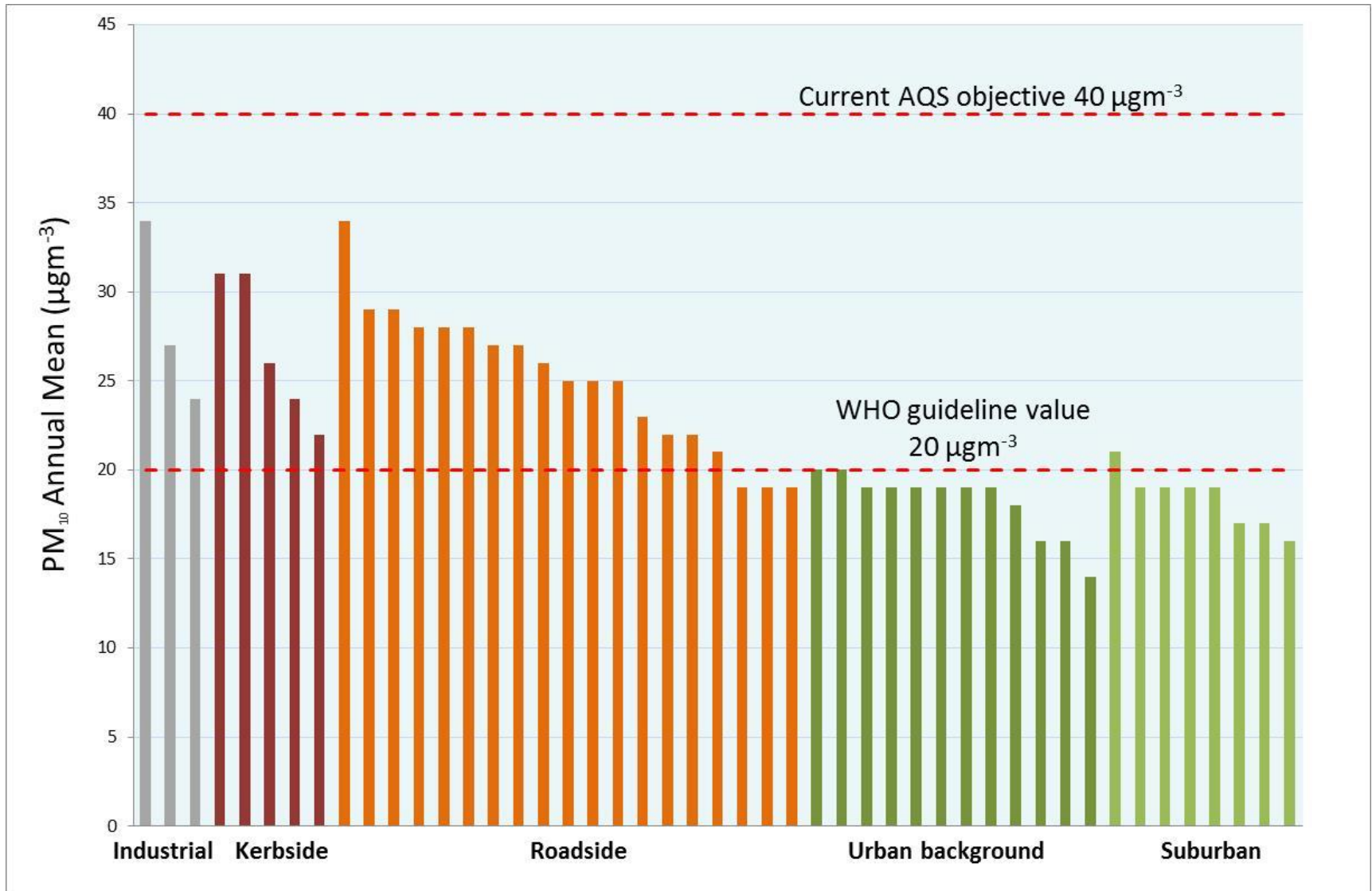


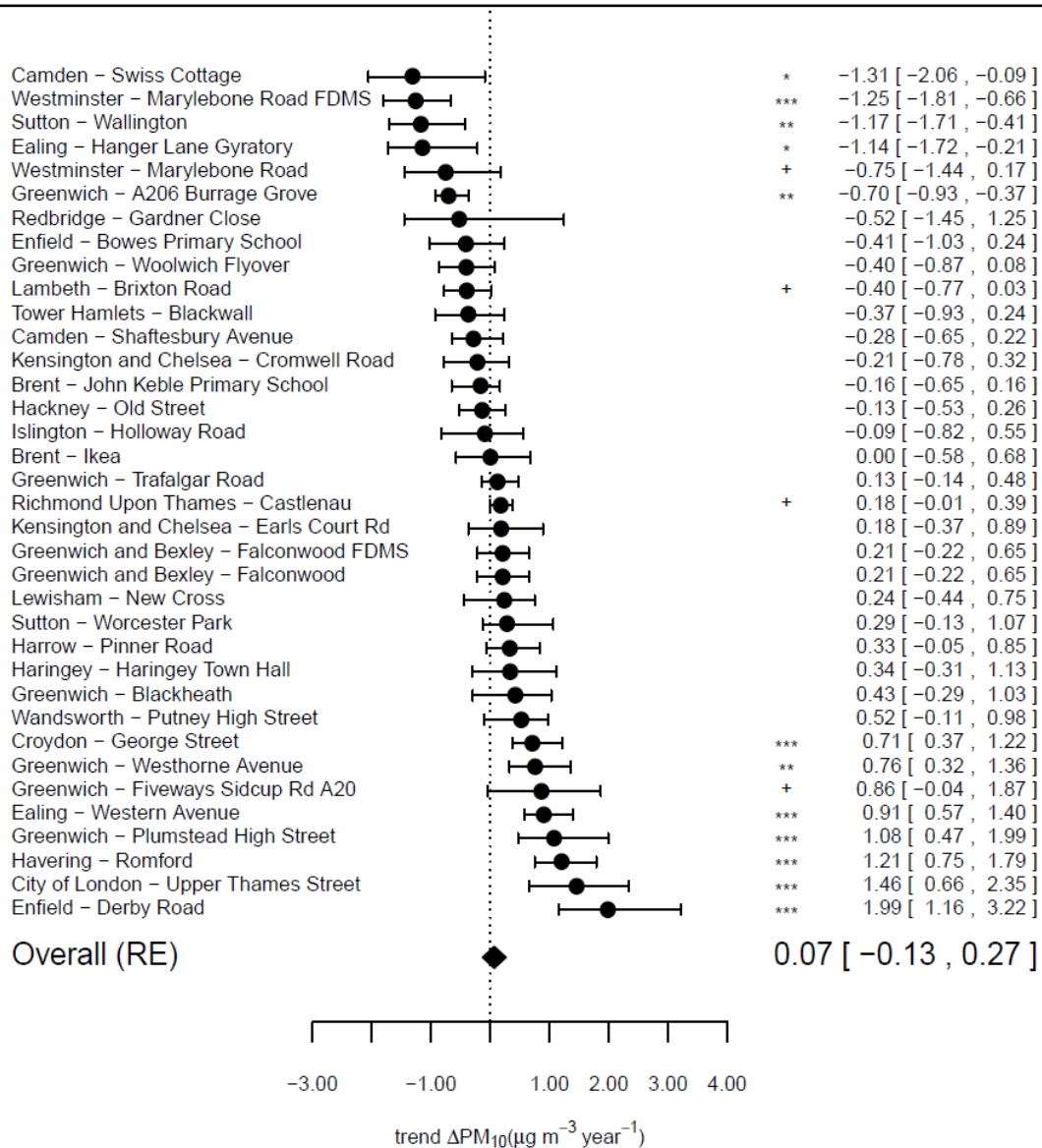
A clean air bus in Oxford. Photograph: Jon Bower Oxford/Alamy

The government faces a new legal challenge to force it to speed up and improve

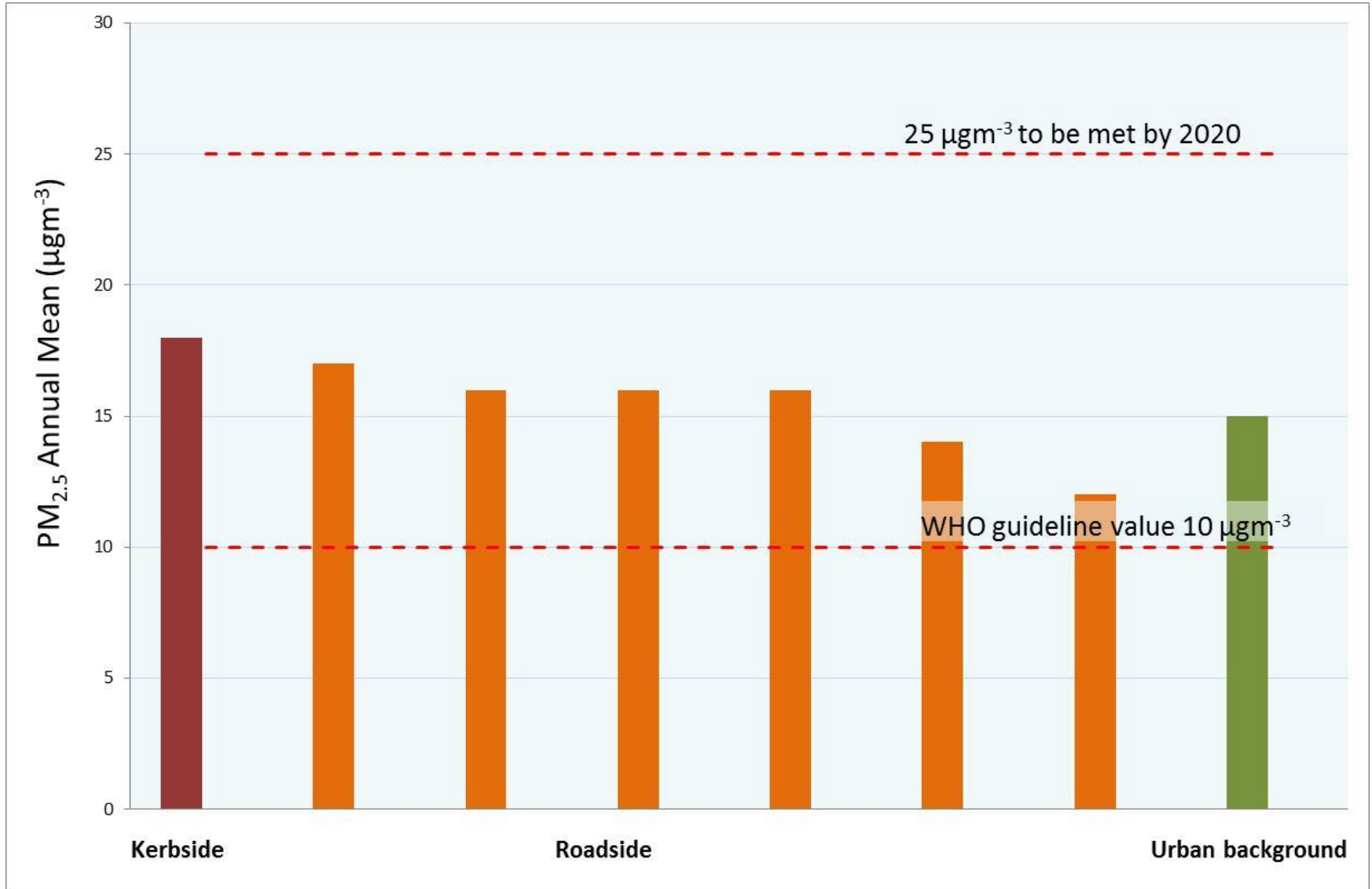
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# PM10 2014



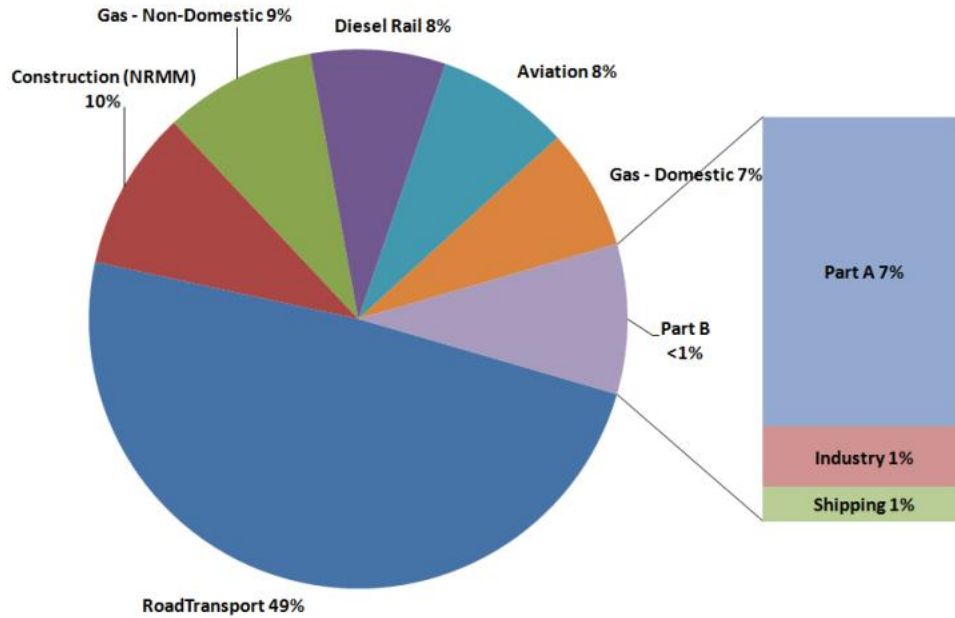


# PM2.5 2014



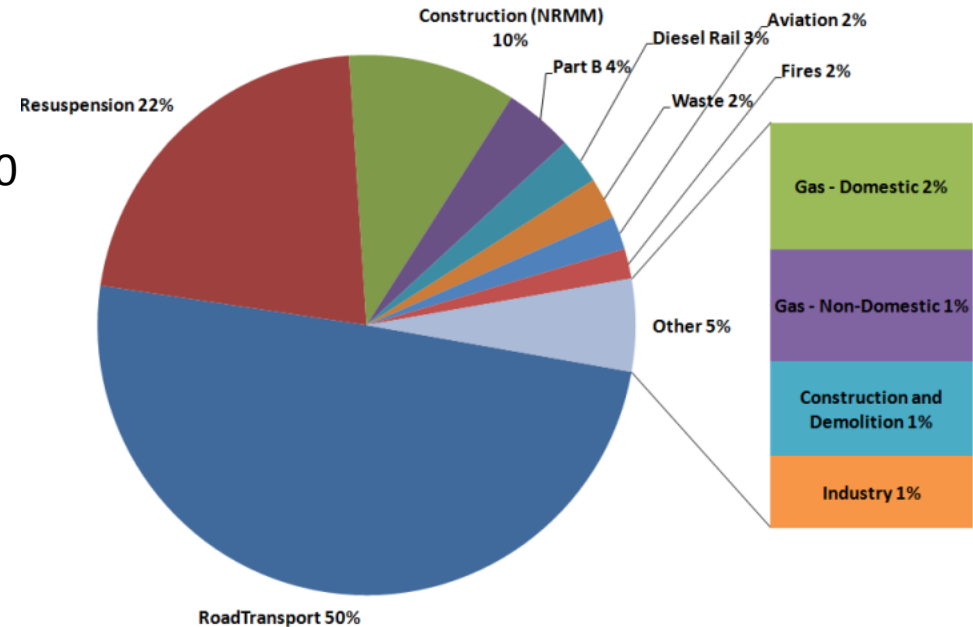


# Estimated construction emissions in London



NOx, 2010

PM10, 2010





# NRMM is mainly diesel powered

Real-world emissions from diesel traffic - NOX

Euro 3  
2000



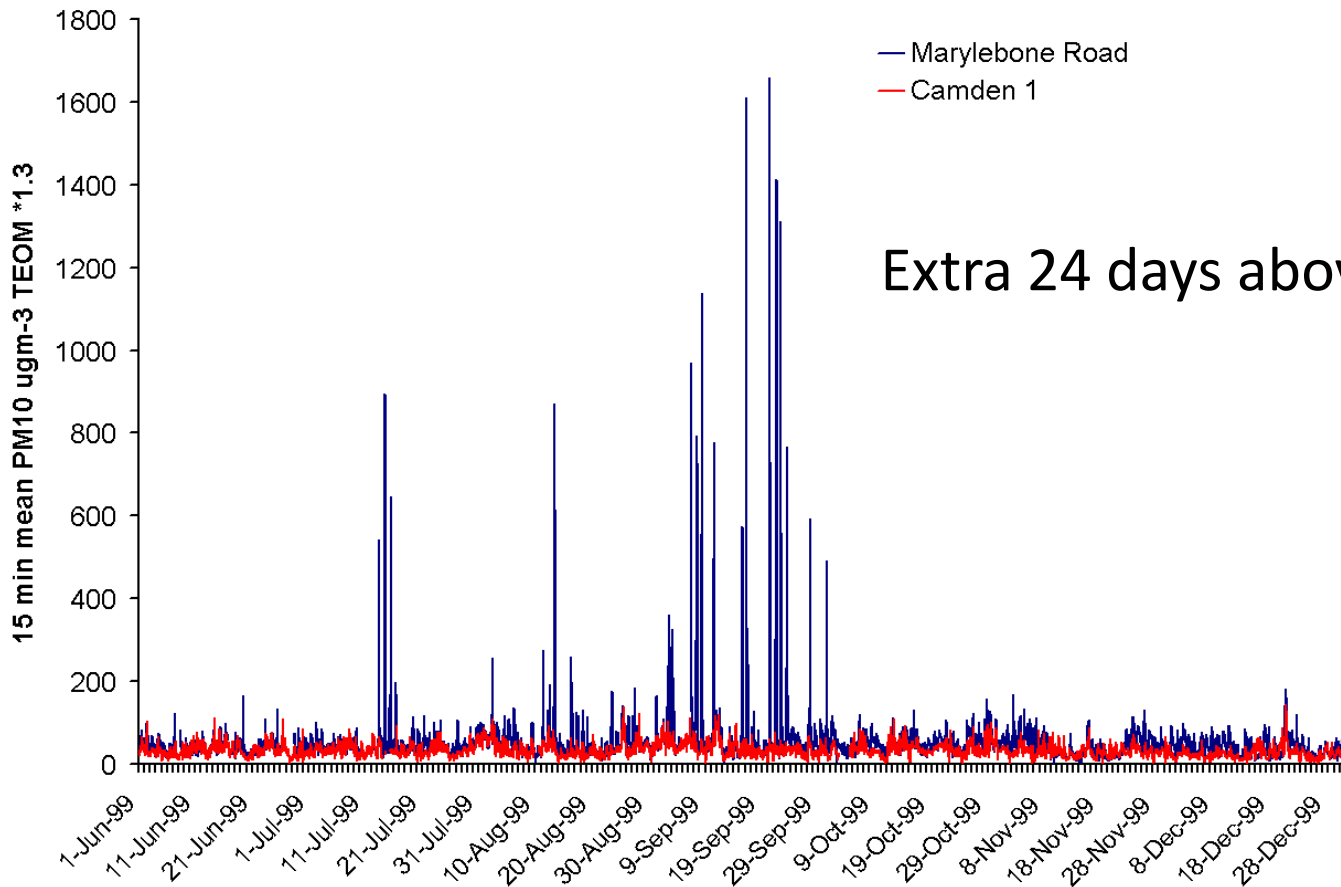
Euro 4  
2005



Euro 5  
2009



# Looking at measured data, back in 1999 we noticed this....



Extra 24 days above EU Limit Value

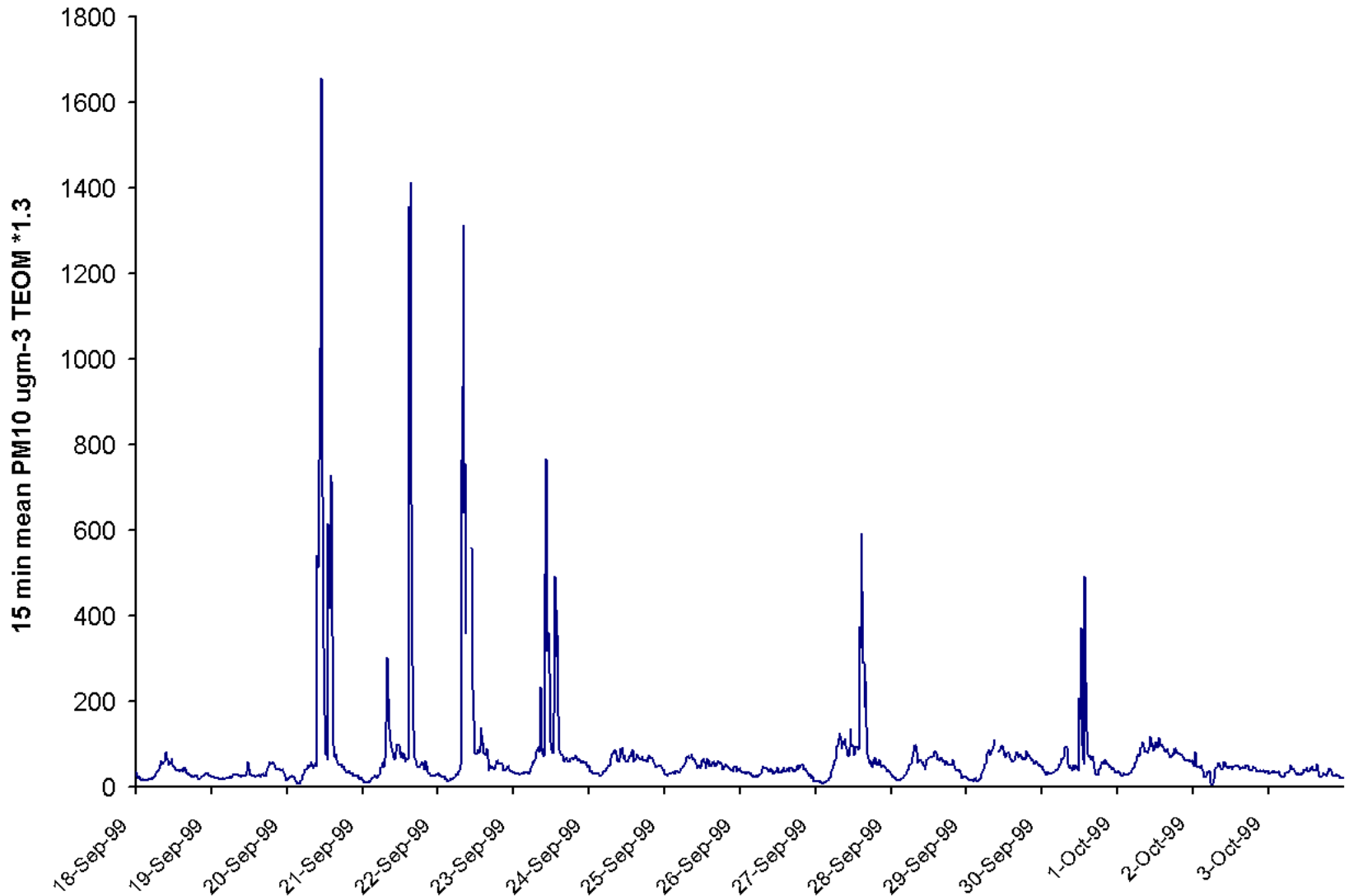


# Measured evidence of emissions



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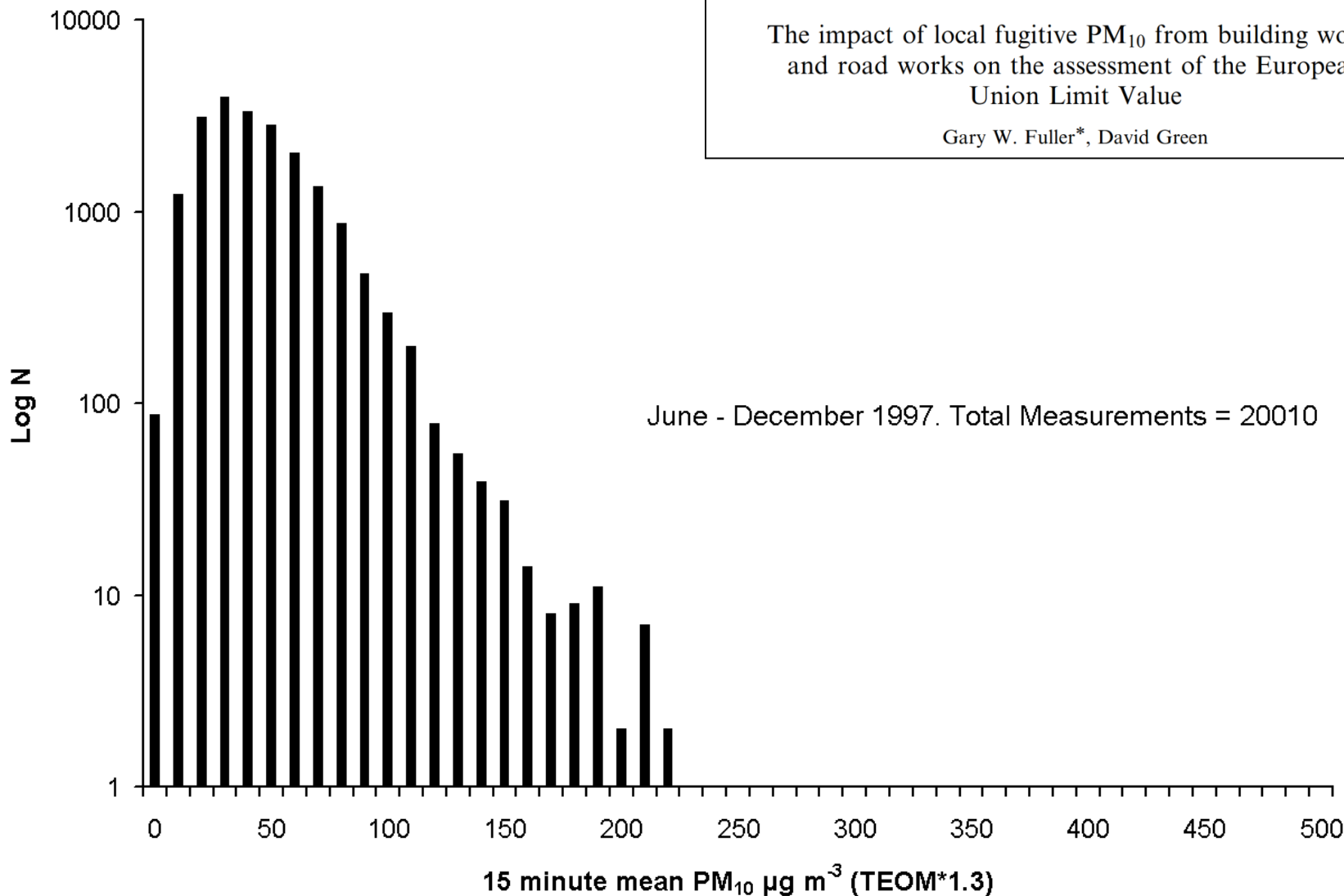
# Measured evidence of emissions

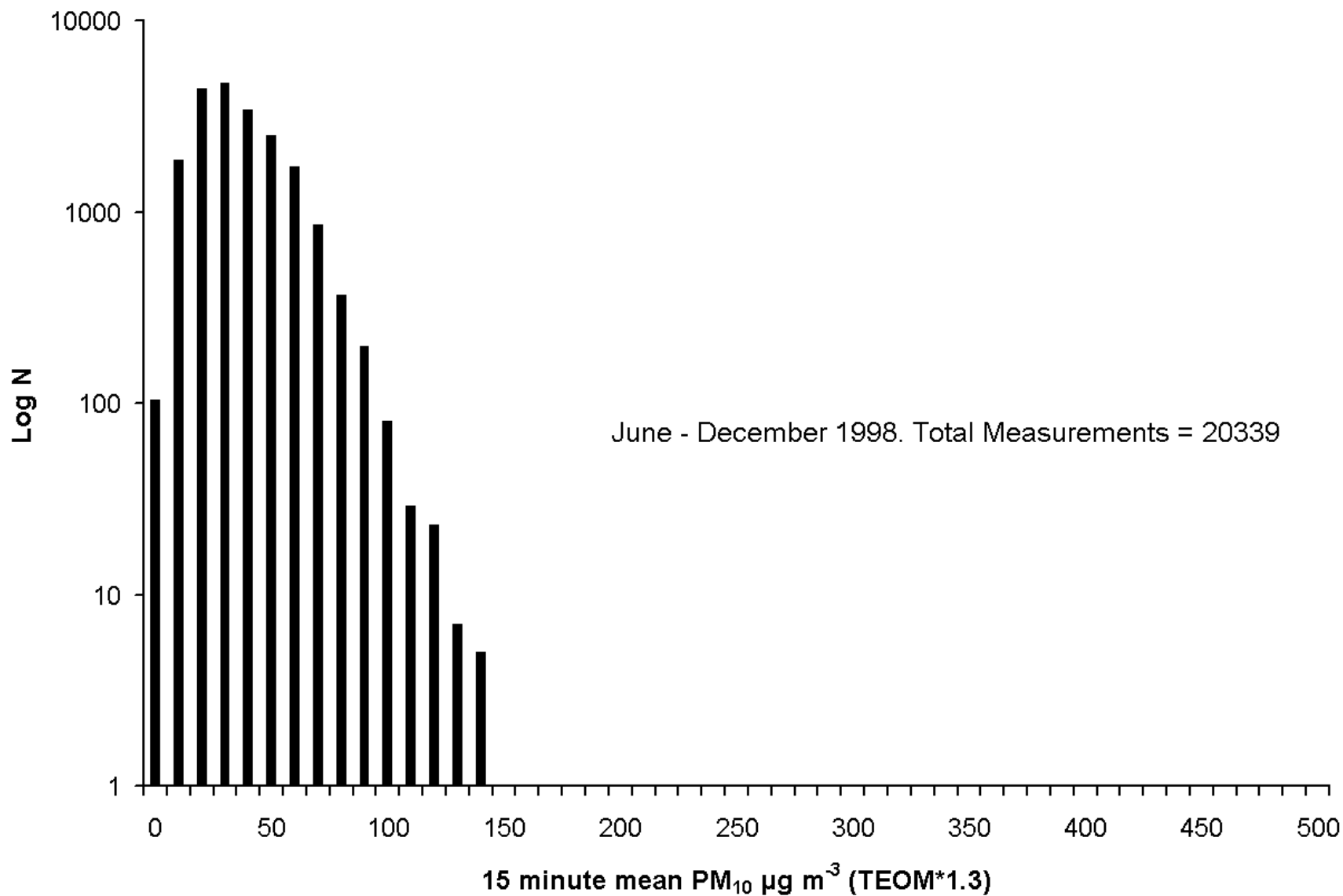




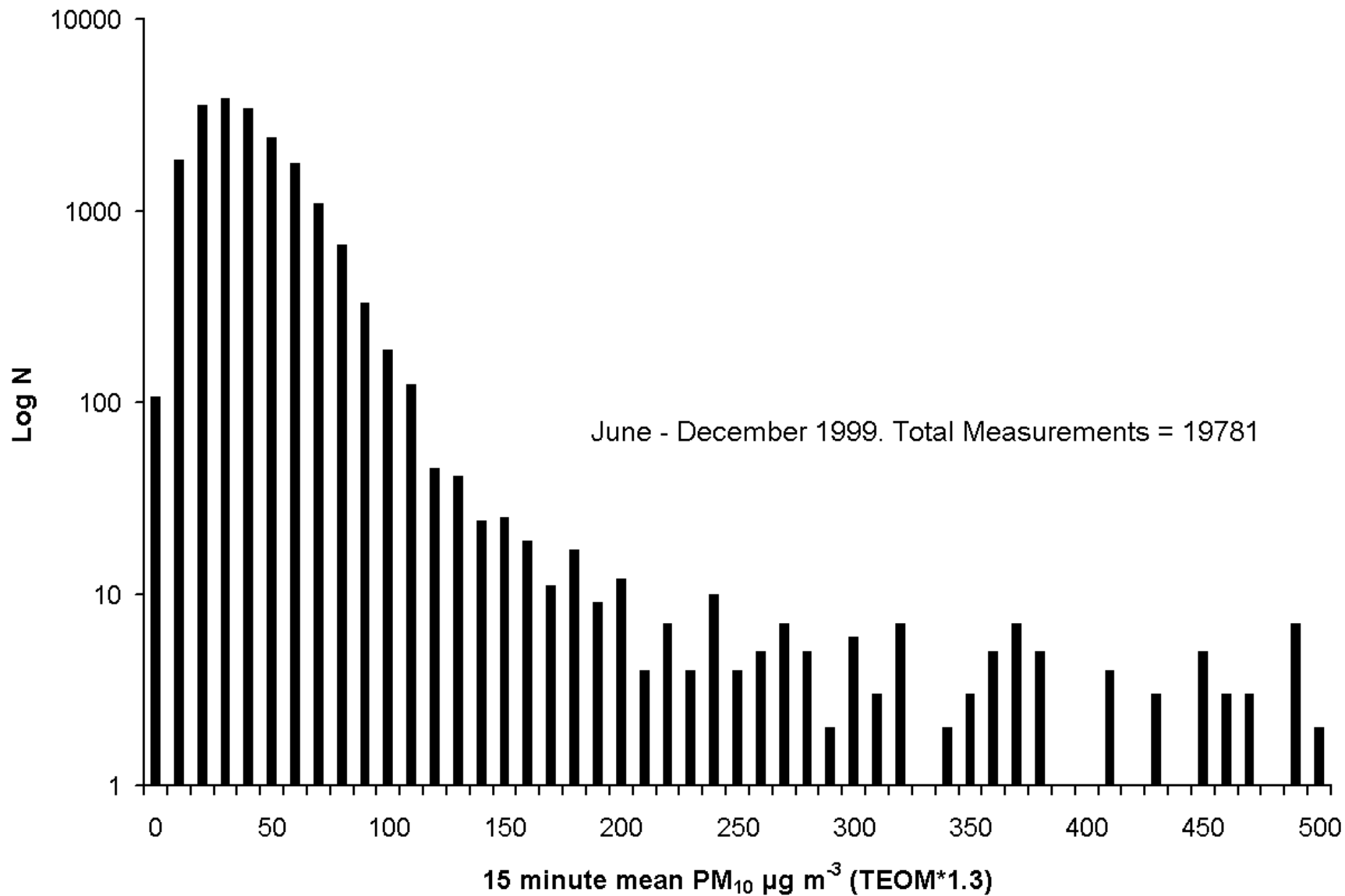
The impact of local fugitive PM<sub>10</sub> from building works  
and road works on the assessment of the European  
Union Limit Value

Gary W. Fuller\*, David Green

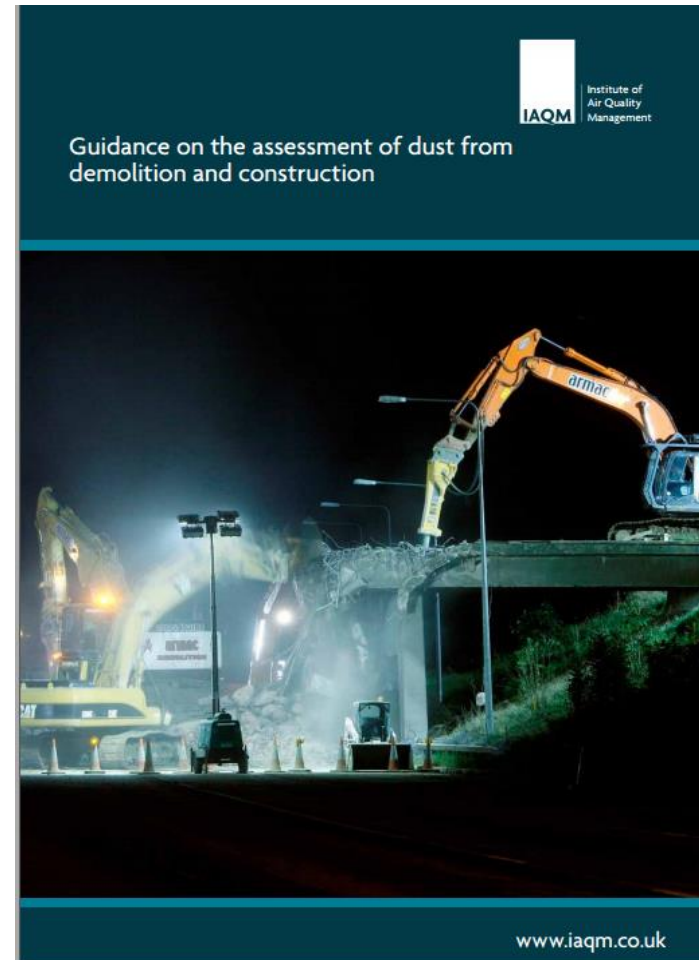








# 250 $\mu\text{g m}^{-3}$ trigger



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# Data mining

to search for construction causing breaches of EU Limit Value concentration in London

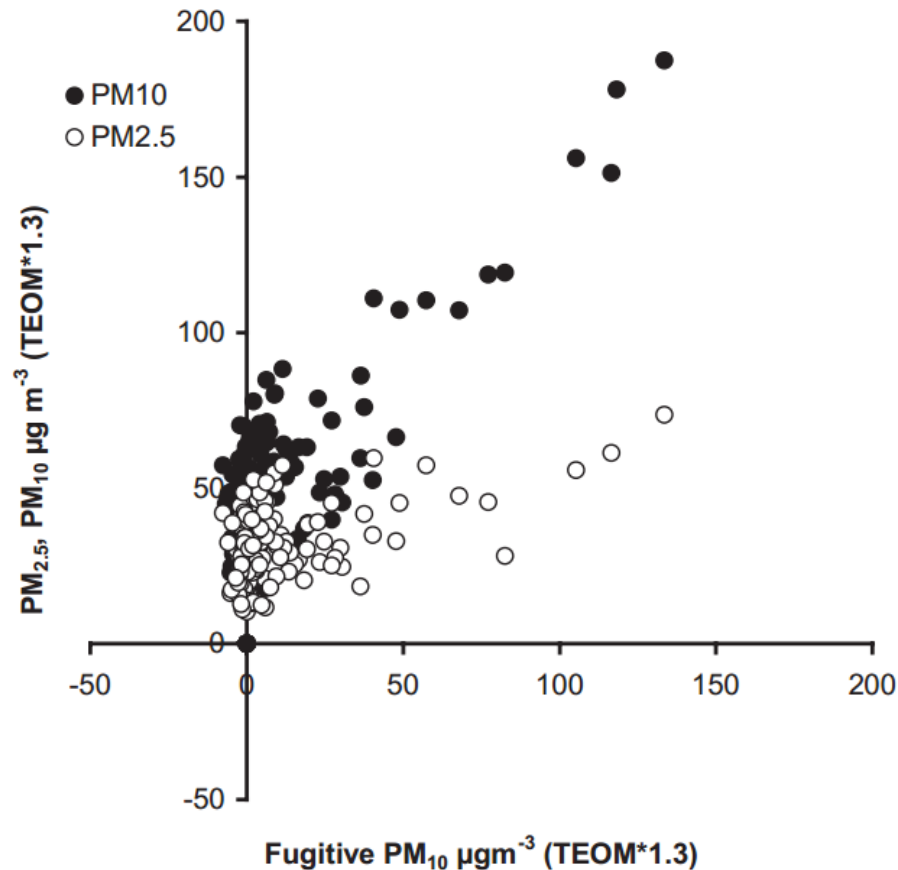
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Days identified by screening method	No. of sites
<i>1999 (57 sites screened)</i>	
0	43
1	8
2-4	3
5-7	1
>7	2
<i>2000 (68 sites screened)</i>	
0	51
1	12
2-4	3
5-7	2
>7	1
<i>2001 (75 sites screened)</i>	
0	58
1	10
2-4	7
5-7	0
>7	1

---

The number of sites screened in each year increases reflecting the expansion of air quality monitoring in South East England.

# But no NRMM PM2.5 was detected



## Was any NRMM used?



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N



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Project

Thames Road Improvement

Drawing

Thames Road Aerial Photograph 2002 and Proposed Road Layout

Drawing No.

TRIS/Aerial101A

Scale

1:5000 @ A3

CAD File

Date

23.12.04

Drawn

RJC

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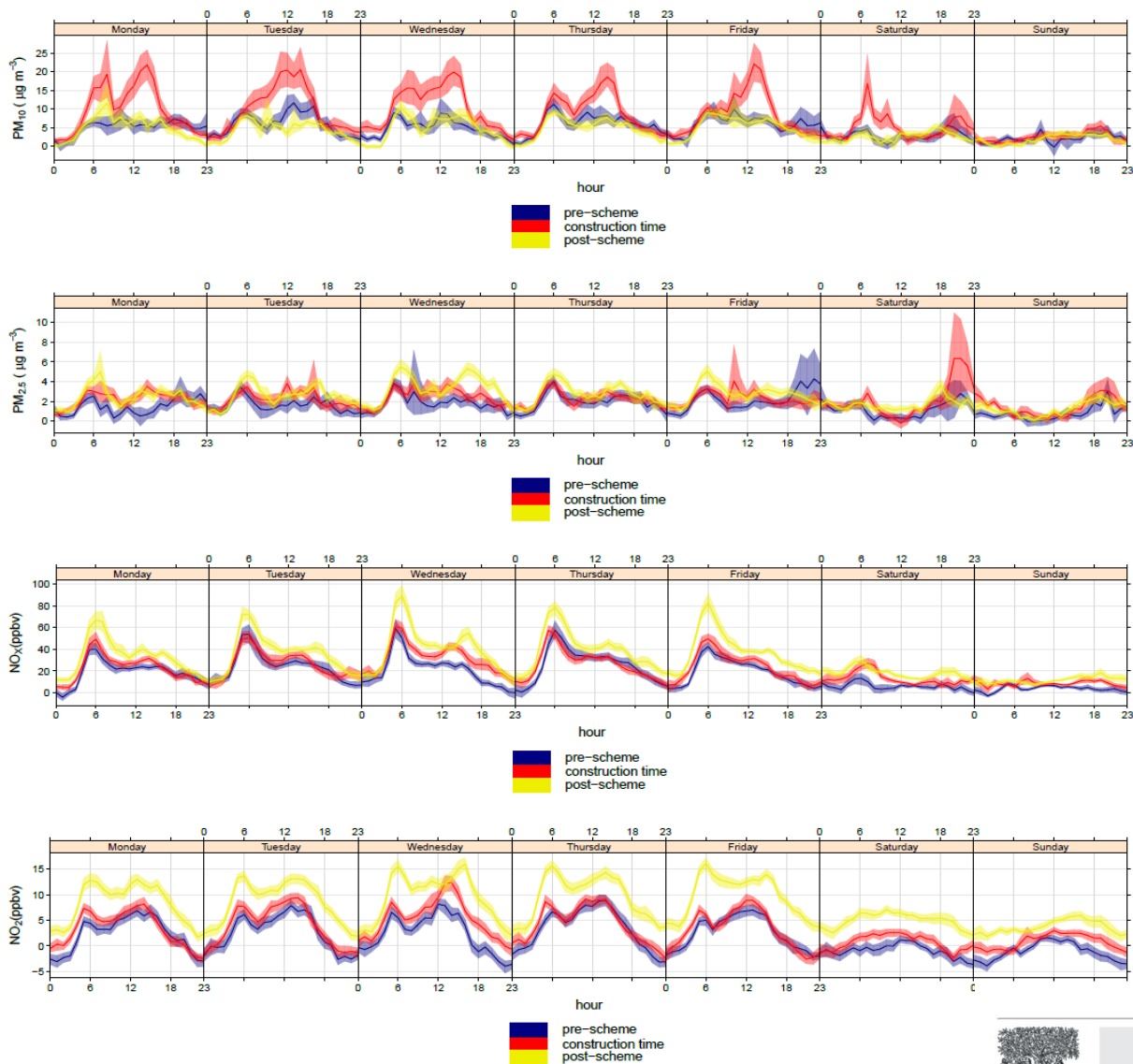












Science of the Total Environment 497–498 (2014) 123–132



Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: [www.elsevier.com/locate/scitotenv](http://www.elsevier.com/locate/scitotenv)



29 No obvious NRMM, but road remained open during the widening, with lots of diesel traffic

Degradation in urban air quality from construction activity and increased traffic arising from a road widening scheme

Anna Font\*, Timothy Baker, Ian S. Mudway, Esme Purdie, Christina Dunster, Gary W. Fuller

MRC PHE Centre for Environment and Health, King's College London, 150 Stamford Street, London SE1 9NH, United Kingdom







# In Germany.....

Aerosol particle and trace gas emissions from earthworks, road construction, and asphalt paving in Germany: Emission factors and influence on local air quality

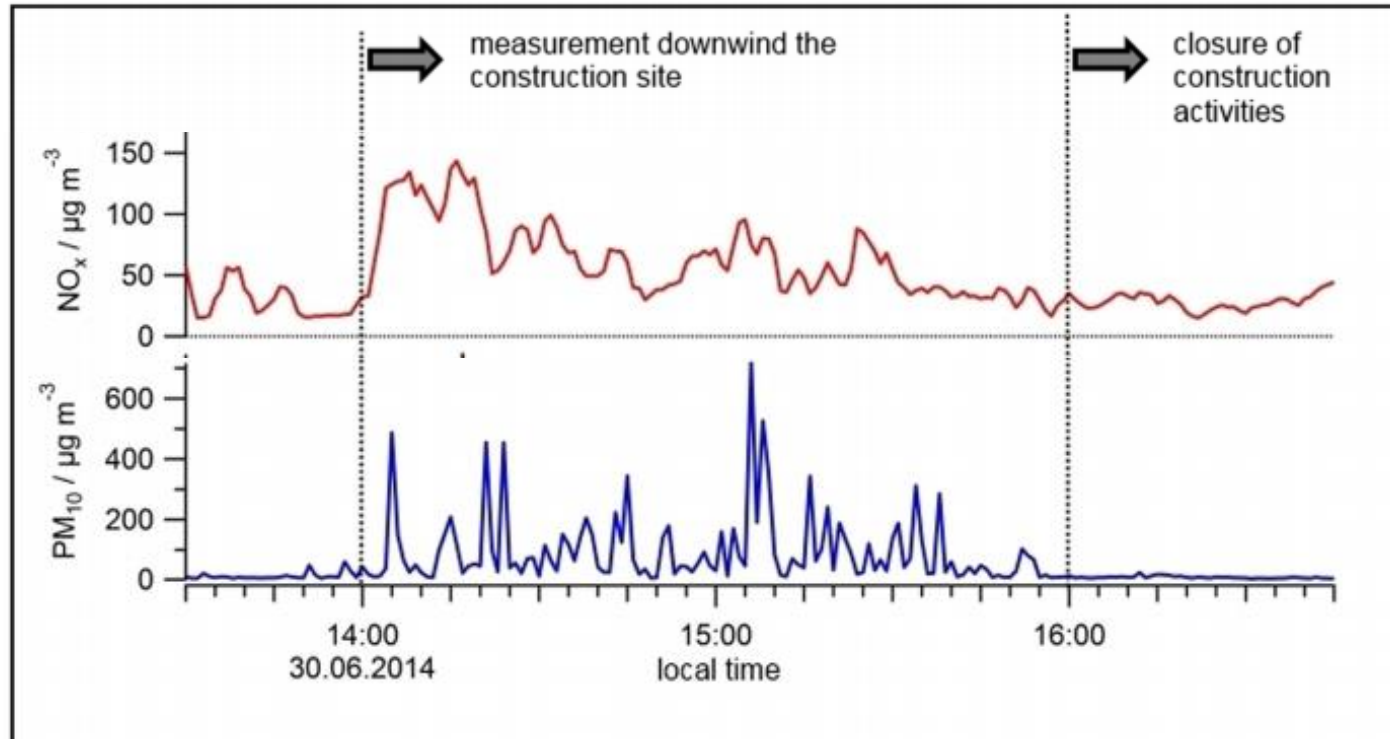


Peter Faber<sup>a,\*</sup>, Frank Drewnick<sup>a,\*\*</sup>, Stephan Borrmann<sup>a,b</sup>

<sup>a</sup> Max Planck Institute for Chemistry, Particle Chemistry Department, Hahn-Meiner-Weg 1, D-55128 Mainz, Germany  
<sup>b</sup> Johannes Gutenberg University, Institute for Atmospheric Physics, J-J-Becherweg 21, D-55128 Mainz, Germany



And here's the some NOX from NRMM....



# What do we know about the quality impacts of construction in London?

- Emissions *estimates* suggest about 10% of London's PM10 and NOX comes from construction.
- Construction gives rise to PM10, mainly as short term spikes but these can add up to breaches of the EU Limit Value.
- → *GLA Code of practice.*
- → *HS2 is sponsoring an assessment of the latest evidence and measurement techniques.*





# What do we know about the quality impacts of construction in London?

- NRMM emissions standards are weaker / lag those for HGVs. There are questions about real-world emissions from diesels. NRMM might be hard to detect in an environment full of diesels, such as London.
- → *Need real-world emissions testing and bespoke experiments at construction sites.*
- We know little about what NRMM is being used and where.
- → *The GLA NRMM register will be a great asset to be mined.*

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