

# Modelling Air Quality Scenarios in London

**Are the EU limit values for NO<sub>2</sub> and PM<sub>10</sub> achievable?**

by

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at Harmo 9, Garmisch, June 2004

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**CERC**

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# Model Introduction and Input Data

- ADMS-Urban

ADMS dispersion model including street canyon effects, nested within an urban area trajectory model.

- Input data

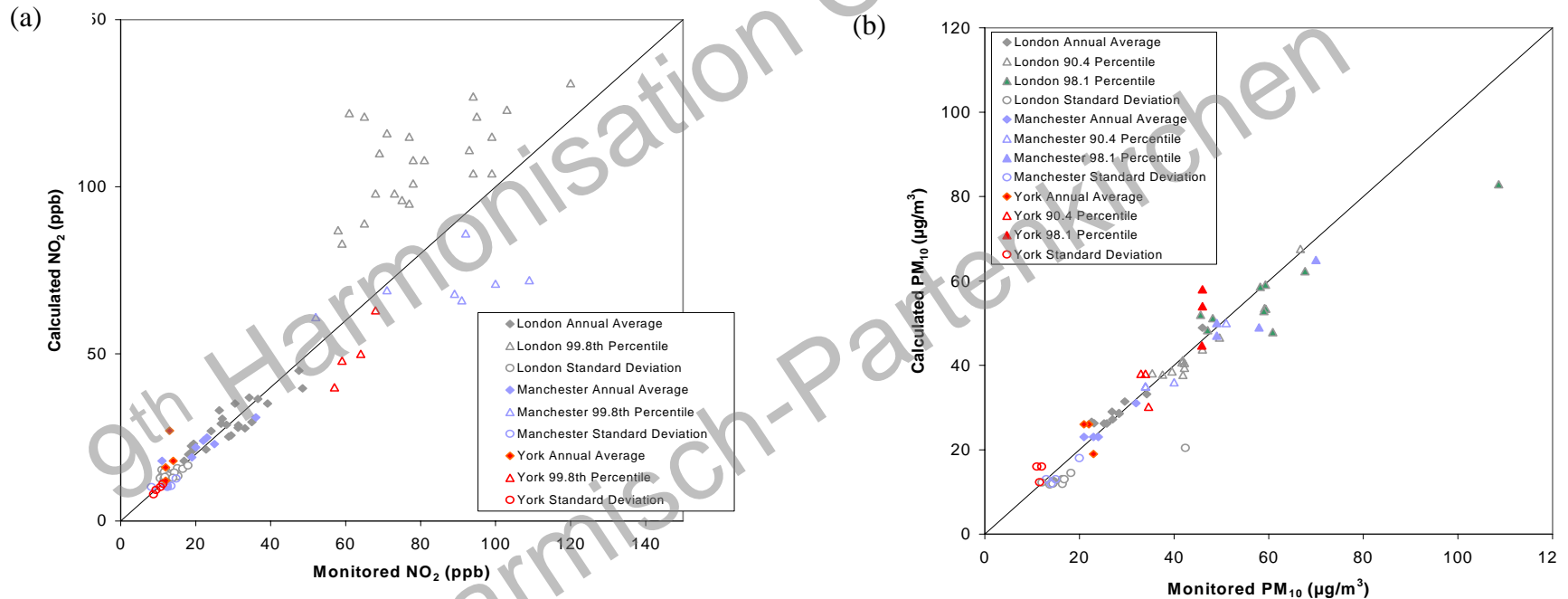
Emissions – London Atmospheric Emissions Inventory (LAEI for 1999, 2004 and 2010)

Meteorology – Hourly sequential Heathrow Airport 1999 (base year) and 1996 (worst case year)

Background – Rural monitoring from monitoring sites around London. Future projections based on EMEP calculations. Constant coarse contribution.



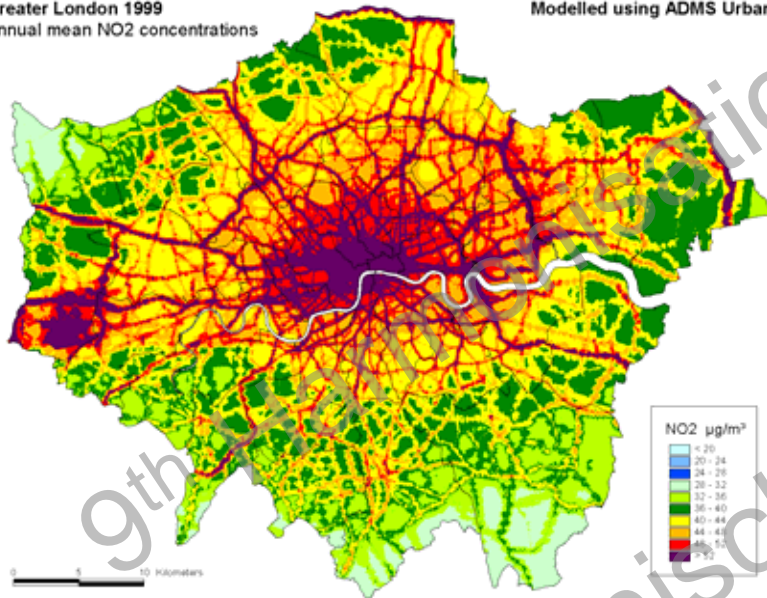
# Comparison of Measured and Calculated Annual Average, Percentile and Standard Deviation Data Pairs calculated using ADMS-Urban (a) $\text{NO}_2$ , (b) $\text{PM}_{10}$



# Calculated Annual Average NO<sub>2</sub> Concentrations

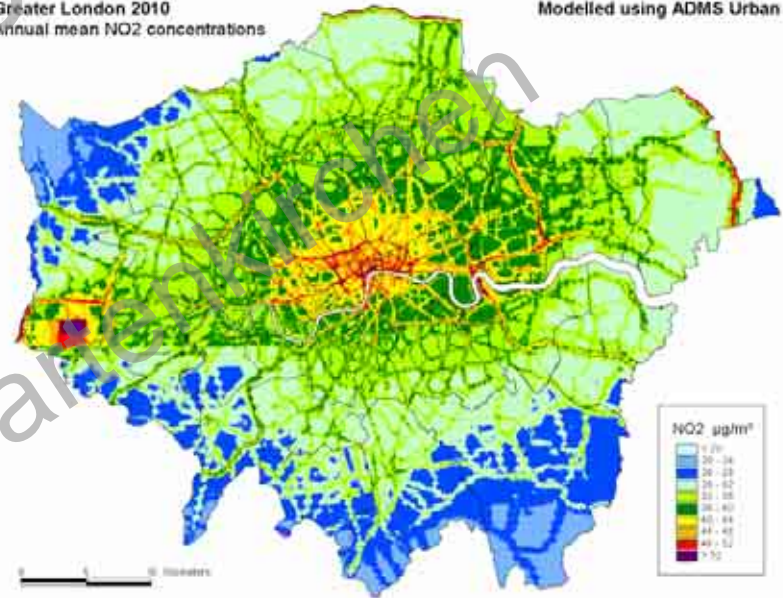
Greater London 1999  
Annual mean NO<sub>2</sub> concentrations

Modelled using ADMS Urban

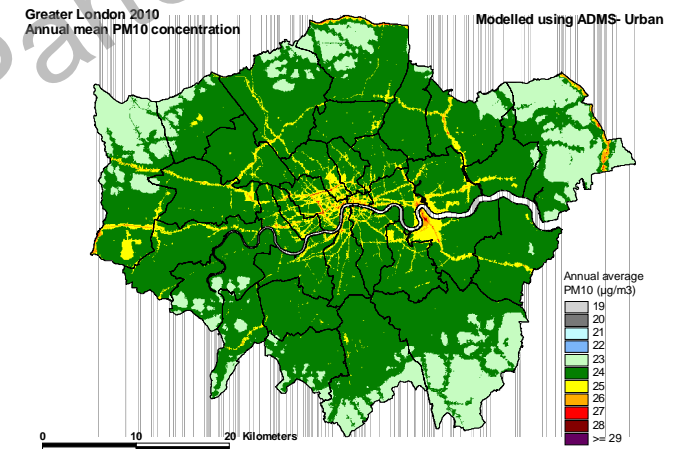
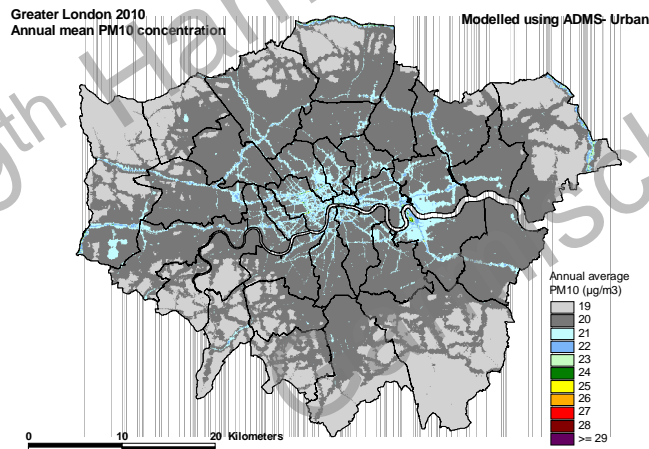
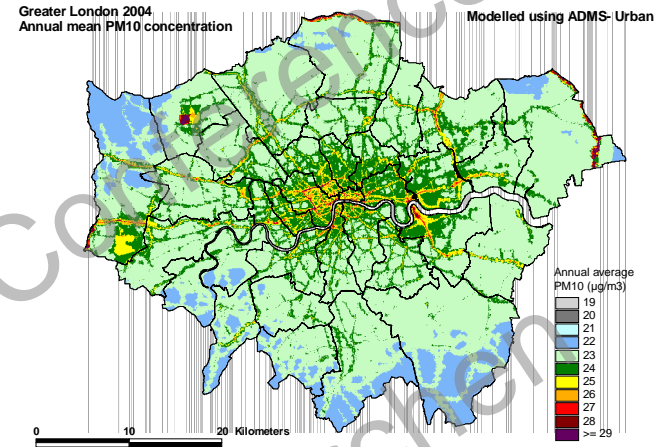
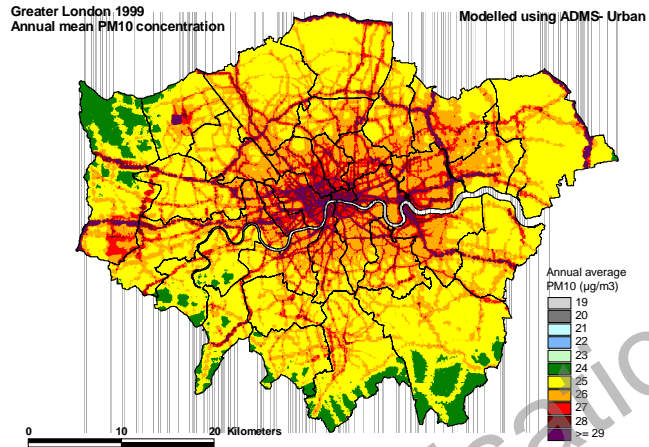


Greater London 2010  
Annual mean NO<sub>2</sub> concentrations

Modelled using ADMS Urban

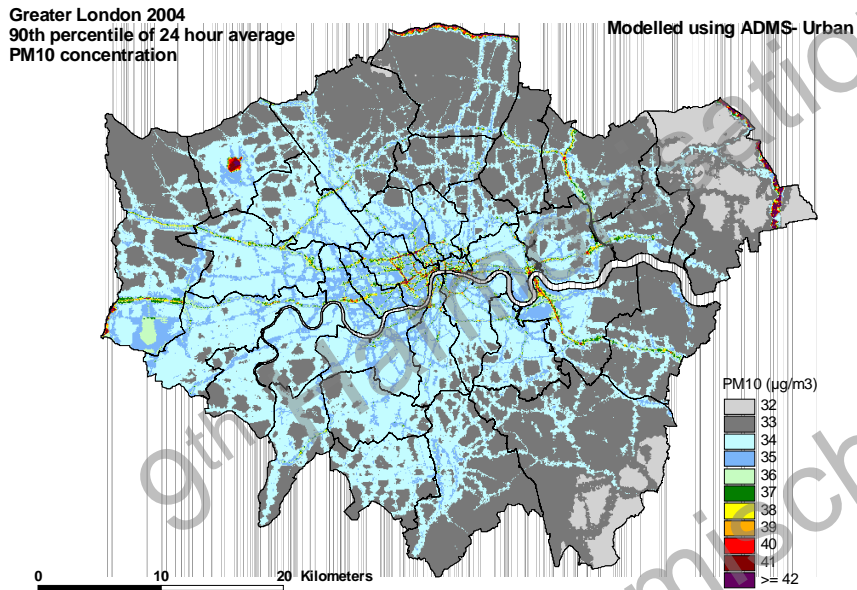


# Annual Average PM<sub>10</sub> concentration calculated using ADMS-Urban

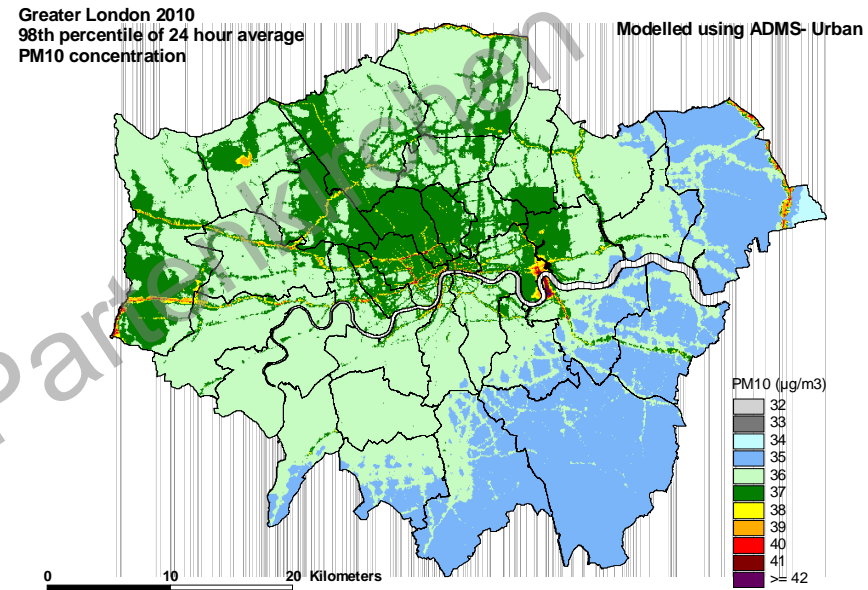


# Daily average PM<sub>10</sub> concentrations calculated using ADMS-Urban

(a) 35 exceedences



(b) 7 exceedences



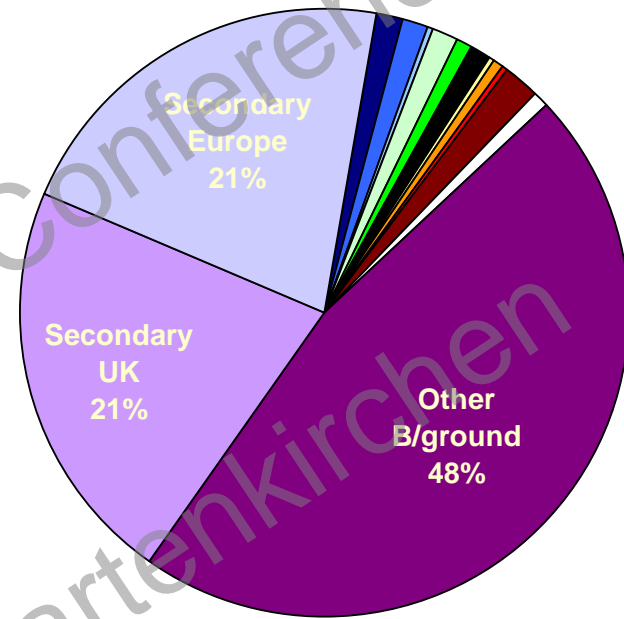
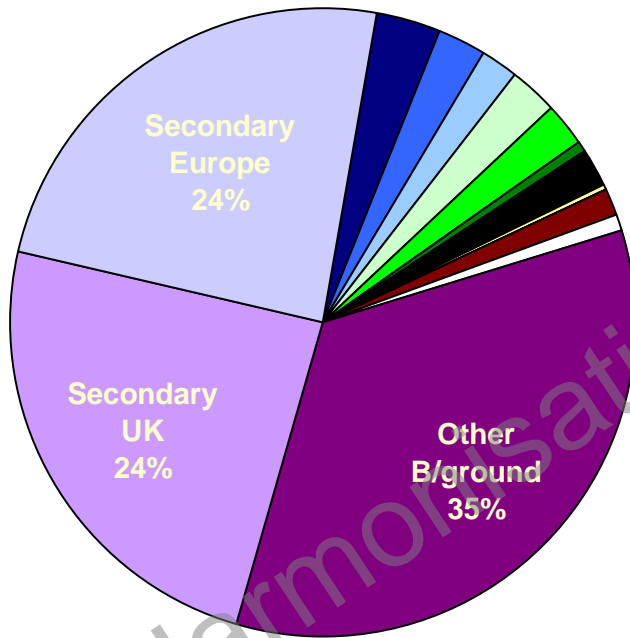
**Calculated pollutant concentrations corresponding to the EU limit values for 2005 and 2010; exceedence of the limit are shown in bold.**

Site	NO <sub>2</sub> 1999 Meteorology		PM <sub>10</sub> 1999 Meteorology				PM <sub>10</sub> 1996 Worst case meteorology			
	2010 Annual Mean	2010 1 hour mean 18 exceedences	2005 Annual Mean	2005 Daily average 35 exceedences	2010 Annual Mean	2010 Daily Mean 7 exceedences	2005 Daily mean 35 exceedences	2010 annual mean	2010 Daily mean 7 exceedences	
A3	<b>48</b>	143	27	37	<b>22</b>	39	48	<b>26</b>	<b>54</b>	
Roadside	Camden	<b>55</b>	178	28	38	<b>23</b>	41	48	<b>26</b>	<b>55</b>
	Harringey	<b>42</b>	157	25	36	<b>21</b>	38	47	<b>25</b>	<b>52</b>
	Marylebone Road	<b>71</b>	191	37	<b>50</b>	<b>28</b>	47	<b>58</b>	<b>30</b>	<b>62</b>
Sutton roadside	29	128	24	34	<b>20</b>	37	46	<b>24</b>	<b>52</b>	
Background	Bexley	31	172	24	34	<b>20</b>	35	45	<b>24</b>	<b>52</b>
	Bloomsbury	<b>46</b>	172	25	35	<b>21</b>	37	47	<b>25</b>	<b>53</b>
	Eltham suburban	32	176	24	34	<b>21</b>	35	45	<b>24</b>	<b>52</b>
	Hillingdon	<b>48</b>	168	26	36	<b>21</b>	41	47	<b>25</b>	<b>53</b>
North Kensington	<b>40</b>	151	24	35	<b>21</b>	37	46	<b>25</b>	<b>53</b>	





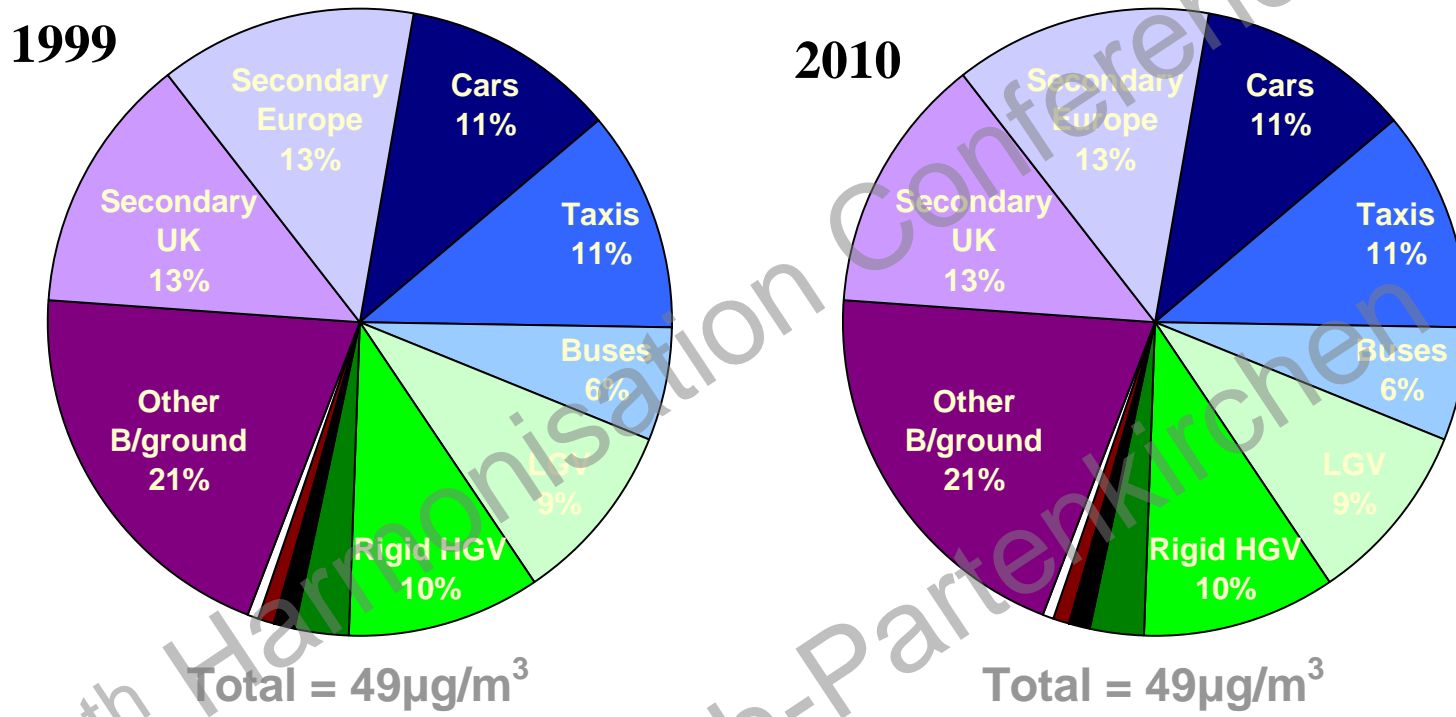
# Source apportioned PM<sub>10</sub> at Bloomsbury monitoring station



- |                  |                |                    |
|------------------|----------------|--------------------|
| ■ Cars           | ■ Taxis        | ■ Buses            |
| ■ LGV            | ■ Rigid HGV    | ■ Articulated HGV  |
| ■ Other Road     | ■ Rail         | ■ Domestic Gas     |
| ■ Commercial Gas | ■ Industry     | ■ Other Sources    |
| ■ Other B/ground | ■ Secondary UK | ■ Secondary Europe |



# Source apportioned PM<sub>10</sub> at Marylebone Road monitoring station

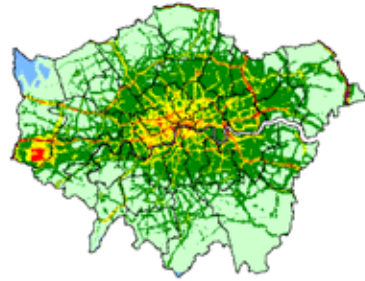


- |                  |                |                    |
|------------------|----------------|--------------------|
| ■ Cars           | ■ Taxis        | ■ Buses            |
| ■ LGV            | ■ Rigid HGV    | ■ Articulated HGV  |
| ■ Other Road     | ■ Rail         | ■ Domestic Gas     |
| ■ Commercial Gas | ■ Industry     | ■ Other Sources    |
| ■ Other B/ground | ■ Secondary UK | ■ Secondary Europe |



# London 2005 Annual Mean NOx Concentrations by Source Category

(a) Total NOx



(b) Traffic (Major and minor roads)



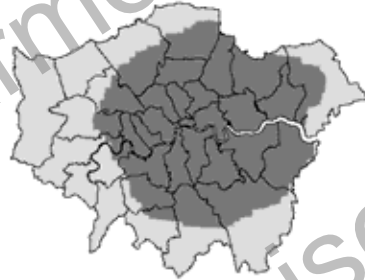
(c) Rail



(d) Shipping



(e) Domestic Gas



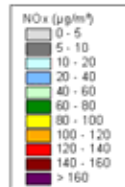
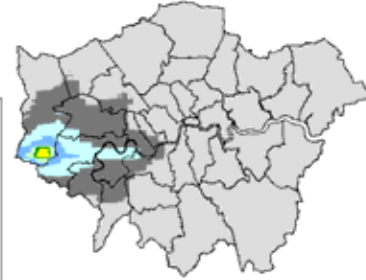
(f) Commercial Gas



(g) Industrial



(h) Other



# London 2005 Annual Mean NOx Concentrations by Traffic Category

(a) Major Roads



(b) Other Roads



(c) Car



(d) Taxi



(e) Bus and Coach



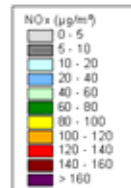
(f) LGV

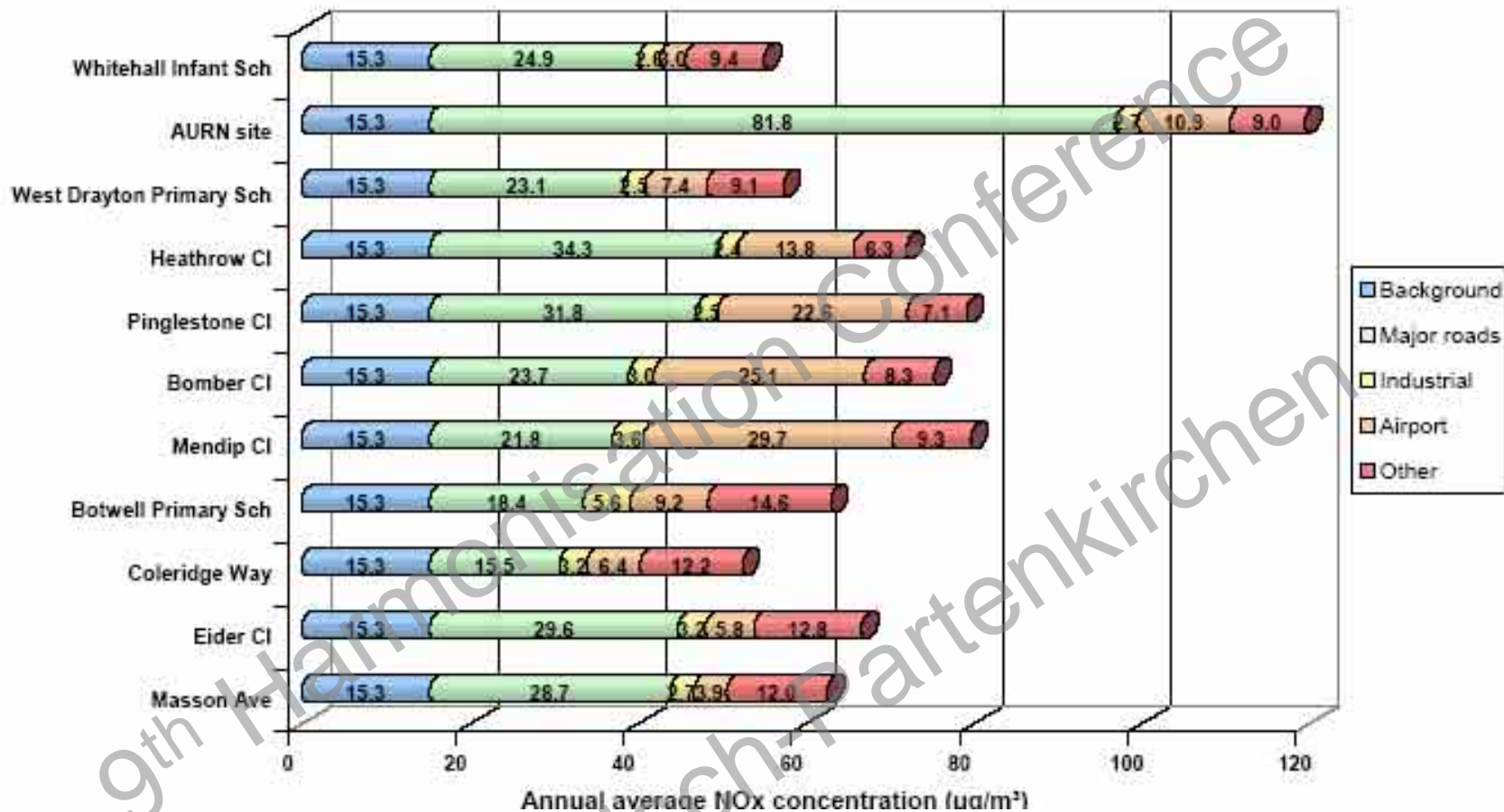


(g) Rigid HGV



(h) Articulated HGV

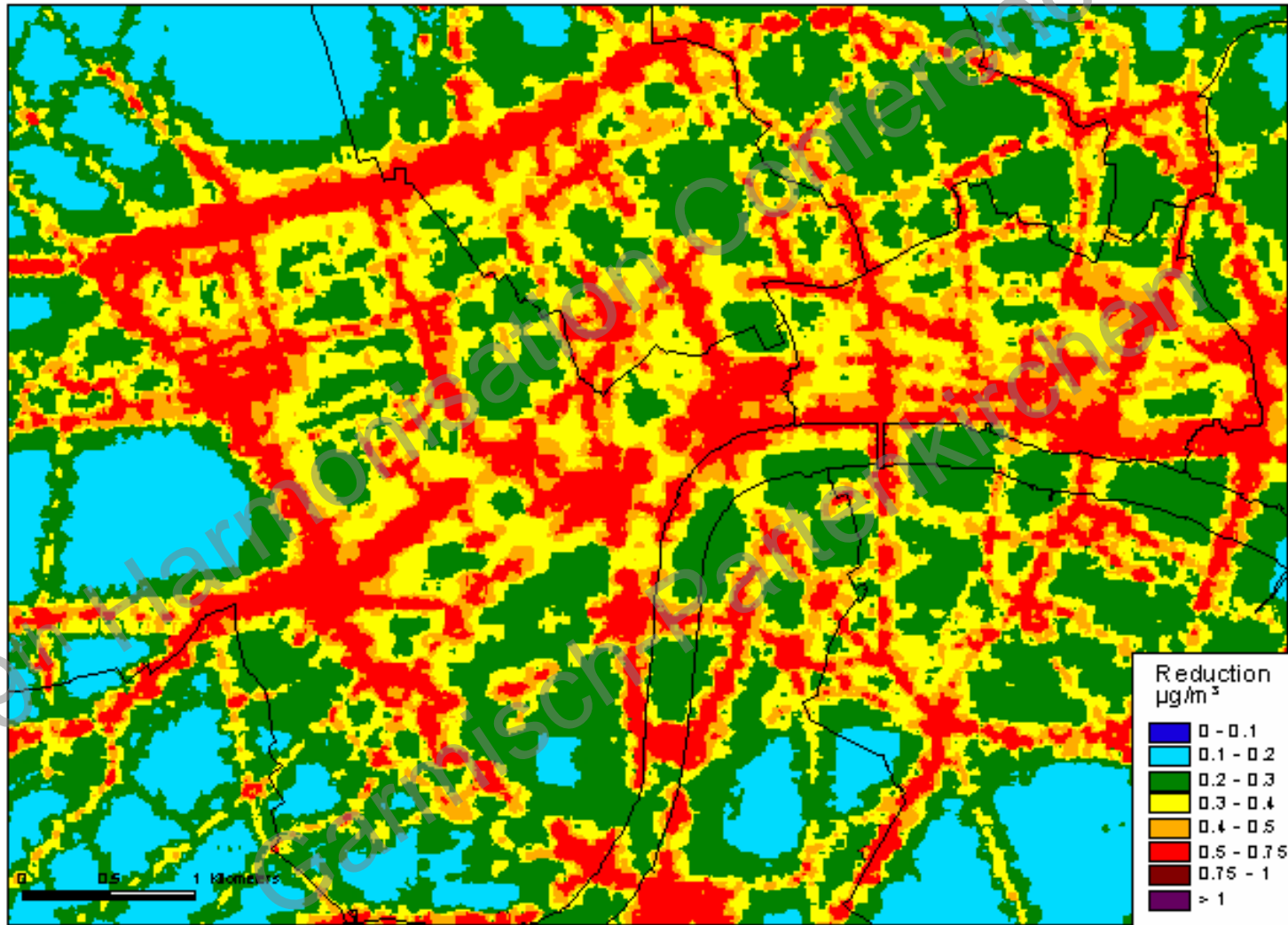




Modelled contribution of major source groups to annual average NO<sub>x</sub> concentrations in the neighbourhood of Heathrow Airport (2005)



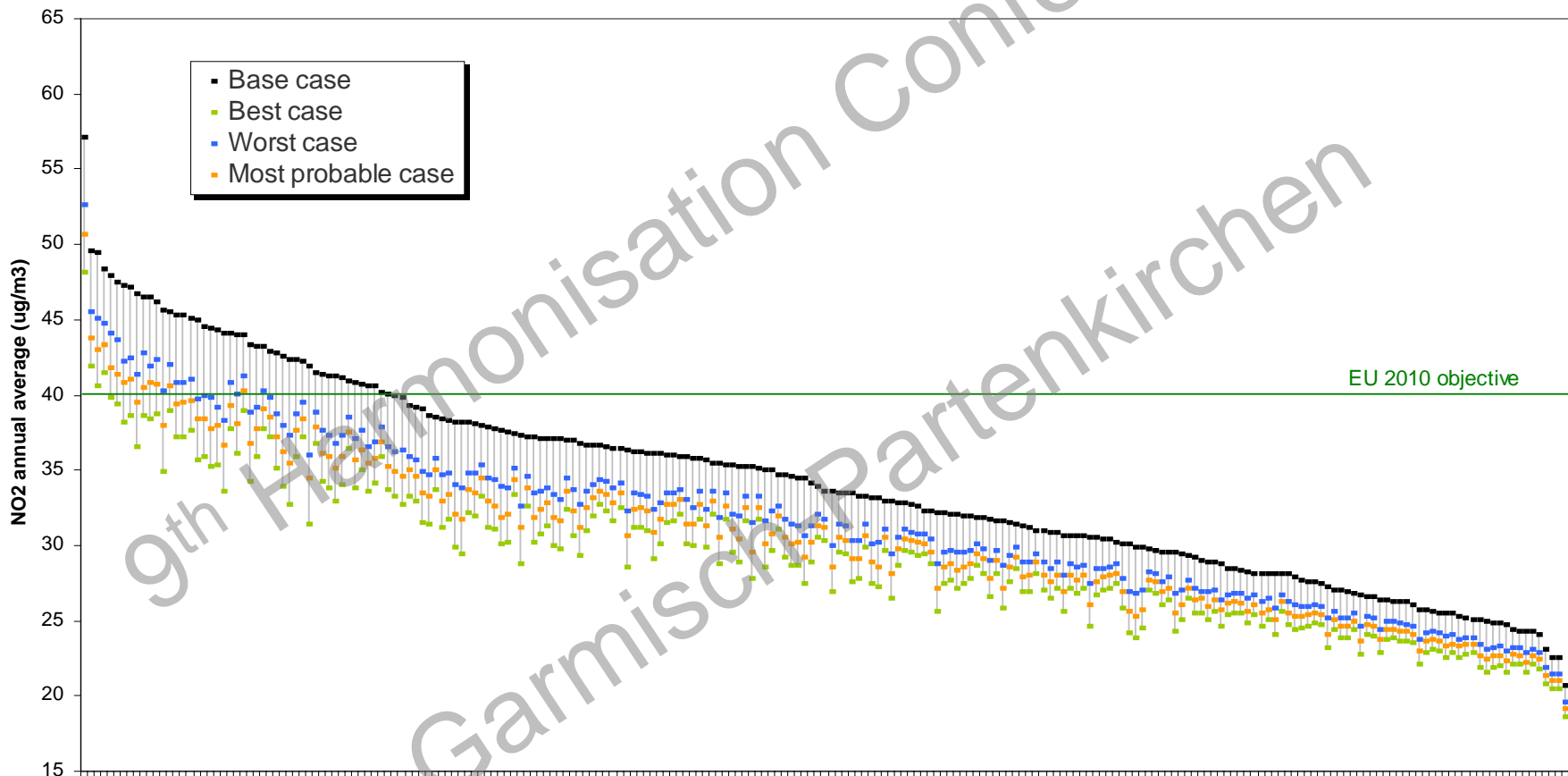
# 2010 LEZ 2 Reductions in PM<sub>10</sub>



# Effect of the proposed Euro V type scenarios on annual average NO<sub>2</sub> concentrations at a range of receptor points across London in 2020.

Comparison of results at 226 London receptor points in Euro V scenario tests, Feb 2004

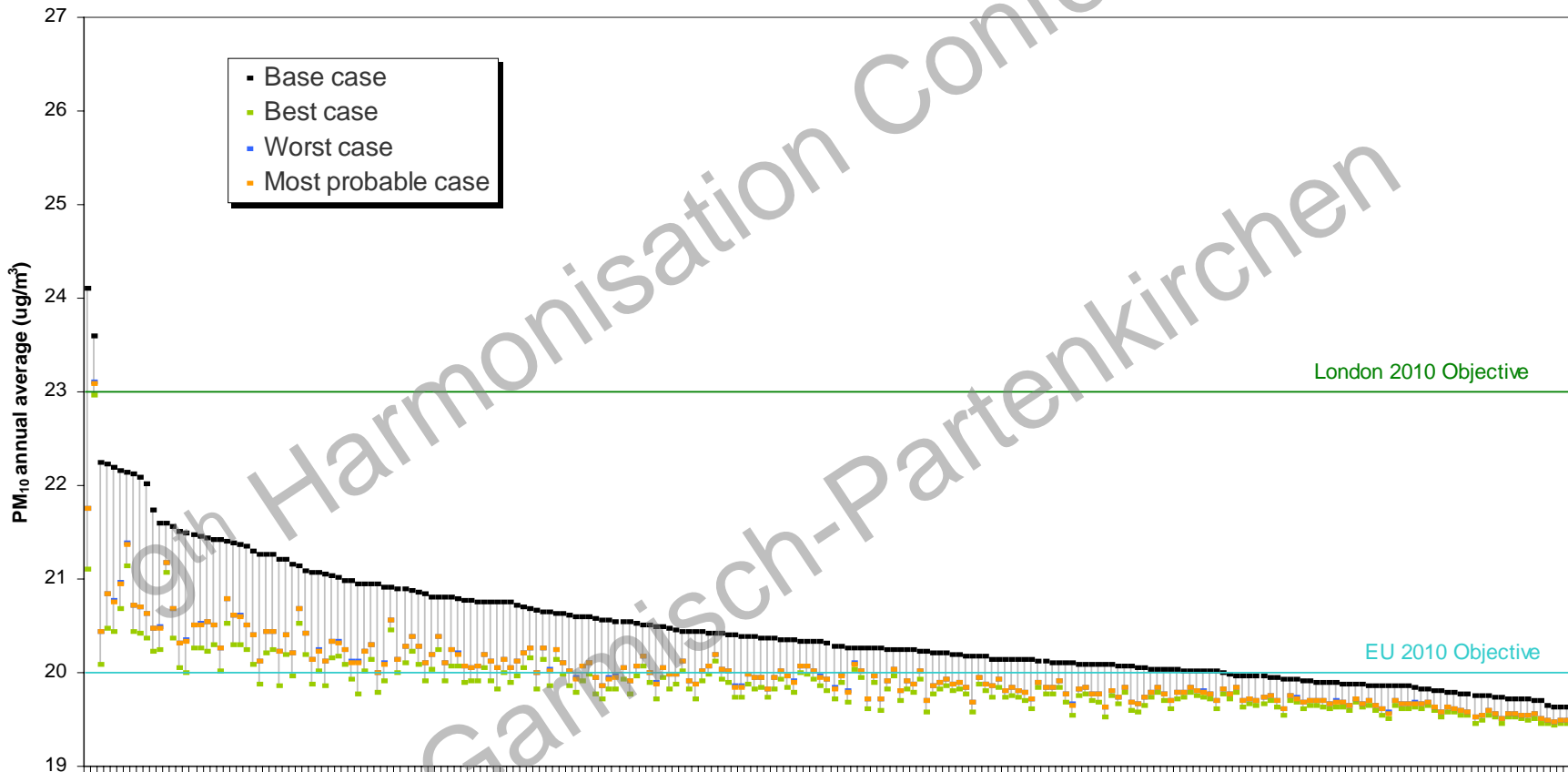
Annual average NO<sub>2</sub>, 2020



# Effect of the proposed Euro V type scenarios on annual average PM<sub>10</sub> concentrations at a range of receptor points across London in 2020.

Comparison of results at 226 London receptor points in Euro V scenario tests, Feb 2004

Annual average PM<sub>10</sub>, 2020





# Conclusions

Without further action the following limits will be widely exceeded in London.

NO<sub>2</sub> annual average in 2010 (40µg/m<sup>3</sup>)

PM<sub>10</sub> daily average limit value 35 exceedences of 50µg/m<sup>3</sup> in 2005  
(adverse meteorology)

PM<sub>10</sub> annual average in 2010 (40µg/m<sup>3</sup>)

Source apportionment allows effective targeting of mitigation measures.

Mitigation measures

LEZ – little impact

Additional technological improvements – Euro V, Euro VI – more  
impact

