

# Policies driving the use of DPFs in Europe

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Nanoparticles

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# Talk Overview

- Brief introduction to AQ legislation in the EU
- DPF drivers
  - LEZs
  - Financial incentives
  - Construction schemes
  - Other mechanisms
- Other PM measures
- Conclusions

# EU Ambient Air Quality legislation

- Pollution kills
  - Heard about health effects yesterday
  - Pollution kills ~ 2 million people/yr worldwide
  - PM claims 8.6 months from every person in the EU
- Structure of EU Air Quality Legislation
  - WHO: Advice on air quality standards
  - EU: Sets AQ Limit Values & implements EU-wide measures
  - Member States, regional/local/city authorities implement measures & incorporate EU laws into National Law

# EU Air Quality Regulations

Pollutant	Concentration	Averaging period	Legal nature	Permitted exceedences/yr
SO <sub>2</sub>	350 µg/m <sup>3</sup>	1 hour	LV: 2005	24
	125 µg/m <sup>3</sup>	24 hours	LV: 2005	3
NO <sub>2</sub>	200 µg/m <sup>3</sup>	1 hour	LV: 2010	18
	40 µg/m <sup>3</sup>	1 year	LV: 2010	n/a
PM <sub>10</sub>	50 µg/m <sup>3</sup>	24 hours	LV: 2005	35
	<del>50 µg/m<sup>3</sup></del>	<del>24 hours</del>	<del>Indicative: 10</del>	<del>7</del>
	40 µg/m <sup>3</sup>	1 year	LV: 2005	n/a
PM <sub>2.5</sub>	25 µg/m <sup>3</sup>	1 year	LV: 2015	n/a *
Lead (Pb)	0.5 µg/m <sup>3</sup>	1 year	LV: 2005 **	n/a
CO	10 mg/m <sup>3</sup>	8 hr	LV: 2005	n/a
Benzene	0.5 µg/m <sup>3</sup>	1 year	LV: 2010	n/a
Ozone	120 µg/m <sup>3</sup>	8 hour	TV: 2010	25 days averaged over 3 yrs
Arsenic (As)	6 ng/m <sup>3</sup>	1 year	TV: 2012	n/a
Cadmium (Cd)	5 ng/m <sup>3</sup>	1 year	TV: 2012	n/a
Nickel (Ni)	20 ng/m <sup>3</sup>	1 year	TV: 2012	n/a
PAHs #	1 ng/m <sup>3</sup>	1 year	TV: 2012	n/a

\* still under negotiation, & is “unlikely to impose additional burden except in the most polluted areas”, together with (**un-binding**) exposure reduction of 20% between 2010 and 2020

\*\* or 1.1.2010 in specific places

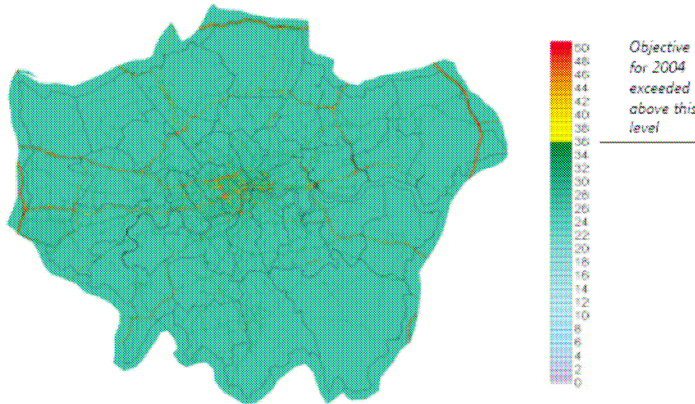
# as Benzo(a)pyrene

# For Particulate Matter

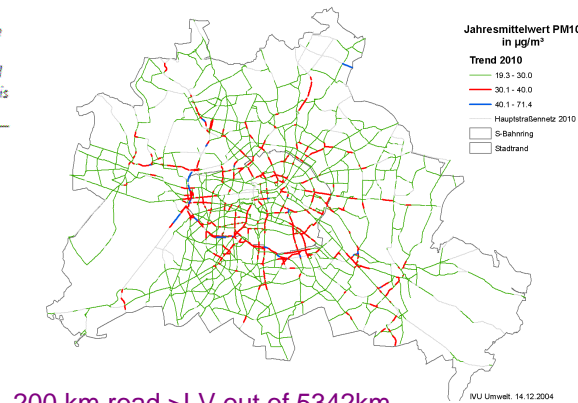
- Recent WHO review for EU CAFÉ recommended
  - a PM<sub>2.5</sub> metric (now under negotiation)
  - ‘Coarse particles’ (PM<sub>10-2.5</sub>) still have health impact - still be regulated
  - Particle size, surface, number, composition affect toxicity
  - Sources of most concern: vehicles & coal, oil & wood combustion
  - Re-evaluated black smoke as traffic pollution indicator
  - Additive effects: PM & O<sub>3</sub>, PM (esp diesel particles) and allergens
- Vehicle ‘Euro Standards’ have PM emissions limits
- The last few Euro standards have tried to force DPFs
- Euro 5/6 Euro Standards (should) have particle number limits

# Air Quality Problems & Strategies

London daily exceedences 2004

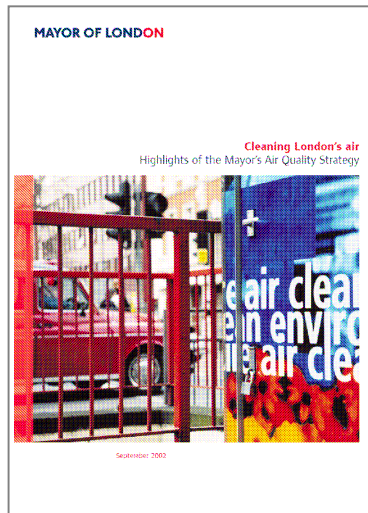
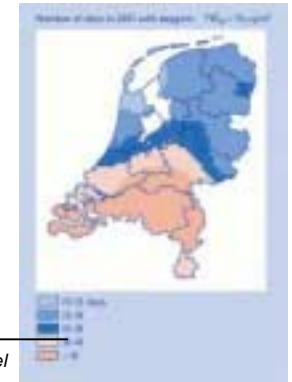


Berlin annual ave PM<sub>10</sub> 2010



200 km road >LV out of 5342km

Dutch daily exceed. PM<sub>10</sub> 2001



# LEZs in Europe

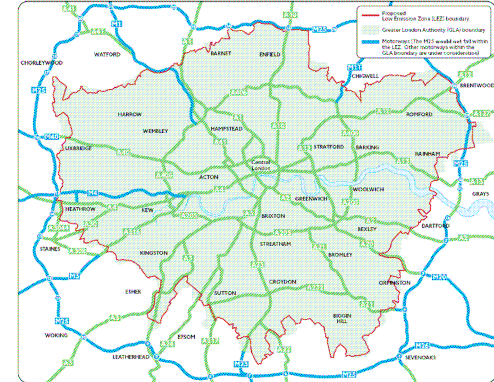
There are around 60 LEZs in place or planned in the EU

- Sweden - 4 in operation
- Germany - 20 planned, ~15 further considered
- The Netherlands - 10+ planned
- Denmark - 5 planned, in 4 conurbations
- UK - London planned
- Norway - 3 under consideration
- Spain - 2 under consideration
- Italy - 3 regional schemes in operation
- Most have at least 2 stages - 2<sup>nd</sup> stage more impact
- Euro Standard used for limits
- Most focus on PM

# LEZs range from

- London

- pop 7 million, area 1600km<sup>2</sup>
- HDVs in 2008 Euro 3 (PM)  
2012 Euro 4 (PM)  
heavier vans in 2010 Euro 3 (PM)
- camera enforcement, charged (300 €/day) if not comply



- Mühlacker (Germany)

- pop 26 000
- all diesel vehicles in 2010 Euro 2 (PM)  
2012 Euro 3 (PM)
- manual enforcement





# Explicitly requiring DPFs

- Netherlands

- Starting from July-Dec 2007
- 10+ cities
- 2007-2010 HDVs: Euro 1 banned, Euro 2 & 3 require DPF (50%  $\downarrow$ PM<sub>10</sub> or closed)
- 2010 onwards HDVs: Euro 2 banned, Euro 3 require DPF



- Denmark

- Starting July 2008
- 5 cities
- 2008-2010 HDVs: >7yrs fit DPF (80%  $\downarrow$ PM<sub>10</sub>) or Euro 3(PM)
- 2010 HDVs: >4 yrs fit DPF or Euro 4 (PM)

# Allowing DPFs to comply

- Germany

- 20+ cities, starting between 2008 & 2010

- Class 2: All diesel vehicles Euro 1; Euro 2 (PM)
- Class 3: All diesel vehicles Euro 2; Euro 3 (PM)
- Class 4: All diesel vehicles Euro 3; Euro 4 (PM) + petrol Euro 1

- DPF retrofitting: LDV >30%, HDV >50% or HDV >65% to achieve Class 4

- eg Berlin Class 2 from 2008, Class 4 from 2010

- Freiburg Class 2 from 2010, Class 3 from 2012



- London

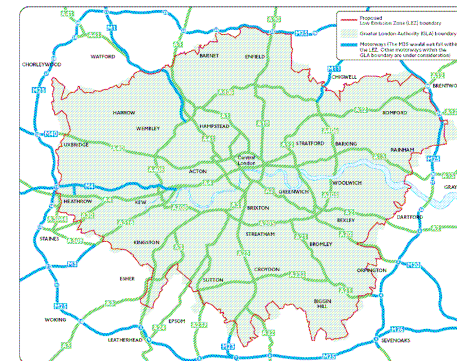
- Feb 2008: Euro 3 (PM) for heavy goods vehicles over 12T

- July 2008: Euro 3 (PM) for HGVs 3.5T – 12T, buses & coaches

- October 2010: Euro 3 for heavier LGVs & minibuses

- January 2012: Euro IV (PM) for HGVs, buses & coaches

- DPFs for all Euro standards to meet  
Euro 3 (PM) or 4 (PM)

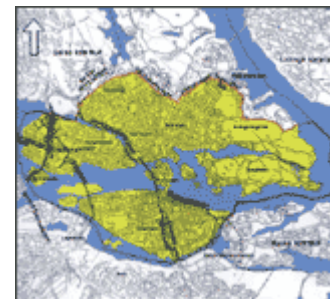


# Allowing DPFs to comply (2)

- Italy
  - 3 regional schemes, time dependent, implementation varies
  - all vehicles, including motorcycles
  - eg Turin:
    - 9am-7pm: cars = Euro 3  
motorcycle-based = Euro 1
    - 9am-1pm: HGV = Euro 1  
diesel LGV = Euro 2 (Euro 3 from Sept 07)  
petrol LGVs = Euro 1
  - Retrofits to achieve relevant Euro standard
- Spain - being considered
  - Madrid, Barcelona
  - From 2008 HGV: Euro 2, Taxis & LDV: Euro 1
  - From 2010 HGV, Taxis & LDV: Euro 3

# Currently no DPFs

- Sweden
  - 4 cities since 1996
  - Current
    - Vehicles < 6 years old or 6-8 years = Euro 2
  - From 2010
    - Vehicles < 6 years old or 6-8 years = Euro 3
    - Euro 4 allowed until 2016, Euro 5/EEV until 2020
- Norway being considered
  - Charge for Euro 3 and earlier vehicles
    - Euro 2&3 = 20 k€, Euro 1 = 34 k€, pre-Euro = 60 k€/ year



# Financial incentives



- Grants

- Many countries have grants towards cost of retrofit, eg Netherlands, Germany, Denmark... (UK used to)

- Tax incentives

- Many countries also have road tax incentives for cleaner vehicles including retrofit, Germany.... (UK used to)

- Road tolling

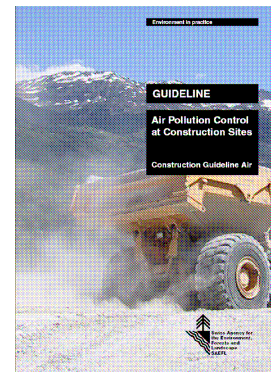
- Countries such as Germany & Switzerland have lower road tolls for Euro 5 vehicles

- DPF allowances in tenders

- Set allowance/charges for DPFs on construction machines, eg Switzerland..

# Construction schemes

- Switzerland requires VERT verified DPFs for construction schemes under certain conditions eg
  - machines over 19kW
  - in tunnel building
  - in polluted areas...
  - Also have requirements for other dust mitigation
- Parts of Austria & Italy have similar schemes
- London similar separate scheme for vehicles over 37kW on large sites
  - Also requirements to reduce other dust emissions
- Germany
  - Cities often have an encouragement for cleaner construction activities including fitting DPFs



# Some other mechanisms...

- Emissions standards

- London: all taxis = Euro 3 by mid-2008  
new vehicles, DPF & SCR retrofit, gas
- London: all refuse vehicles Euro 3 (PM)
- Heathrow airport airside vehicle standards



- Cleaner buses

- Through public authorities where buses are publicly
- Where not public owned, through emissions standards, negotiation, tenders, other regulation....



- (Public) Procurement - leading by example

- London Mayor's procurement guide so work undertaken is done cleanly
- Requiring or preferential treatment in tenders
- DPFs on trains and ships

# PM retrofit certifications

- VERT

- Swiss, developed for construction vehicles, now used more widely

## LEZ-based certifications:

- Germany & Netherlands similar certifications
  - LDV >30%, HDV >50%. German also HDV >65%
- Denmark & Italy each have separate certifications
  - Denmark: 80%
  - Italy to meet the required Euro PM standard
- UK certification
  - National to meet Euro 4 PM level
  - Additional London to meet the required Euro PM standard



# Euro 5 / 6 ...

We hope (again)  
will force DPFs on new vehicles.....

# Some other PM mechanisms

- National Emissions Ceiling Directive
- IPPC - filters/scrubbers on large industry etc
- Sulphur limits on fuels
- Smokeless Zones, bonfire bans.....
- Emissions limits smaller boilers
- Traffic reduction & 'soft transport' measures
- Low Emission (Planning) Schemes
  - Planning system → vehicle emissions standards for construction **& use** of new developments
- Auxiliary power units for ships & aircraft
- Energy efficiency measures
- Measures to reduce wind erosion on agricultural land

# Conclusion

- Air Quality regulation
  - significant action to reduce emissions
- Still not enough to meet EU Limit Values
- Long range secondary emissions is significant issue
- Regulation is - by definition - behind science
- Action rarely happens unless legally required or cheaper !

# Further information

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