Clean Air
IN LONDON

Emissions policy and air pollution

Blame every government since 1990 for 'diesel'

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Speaking to the Environmental Chemistry Group of the RSC
on 1 March 2017

Summary

1. Mission and opportunity
2. Jargon
3. Historical perspective
4. Prime Ministers…
5. Margaret Thatcher – This Common Inheritance
6. Myopic focus on CO_2
7. Policies, impacts including health
8. Solutions

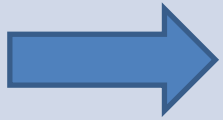
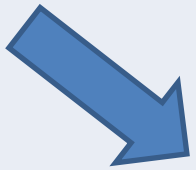
Mission

"To achieve urgently and sustainably <u>full</u> compliance with World Health Organisation guidelines for air quality throughout London and elsewhere"

The London Matrix – ‘One Atmosphere’

	Air pollution	Climate change
London		
Rest of world		

The London Matrix – ‘One Atmosphere’

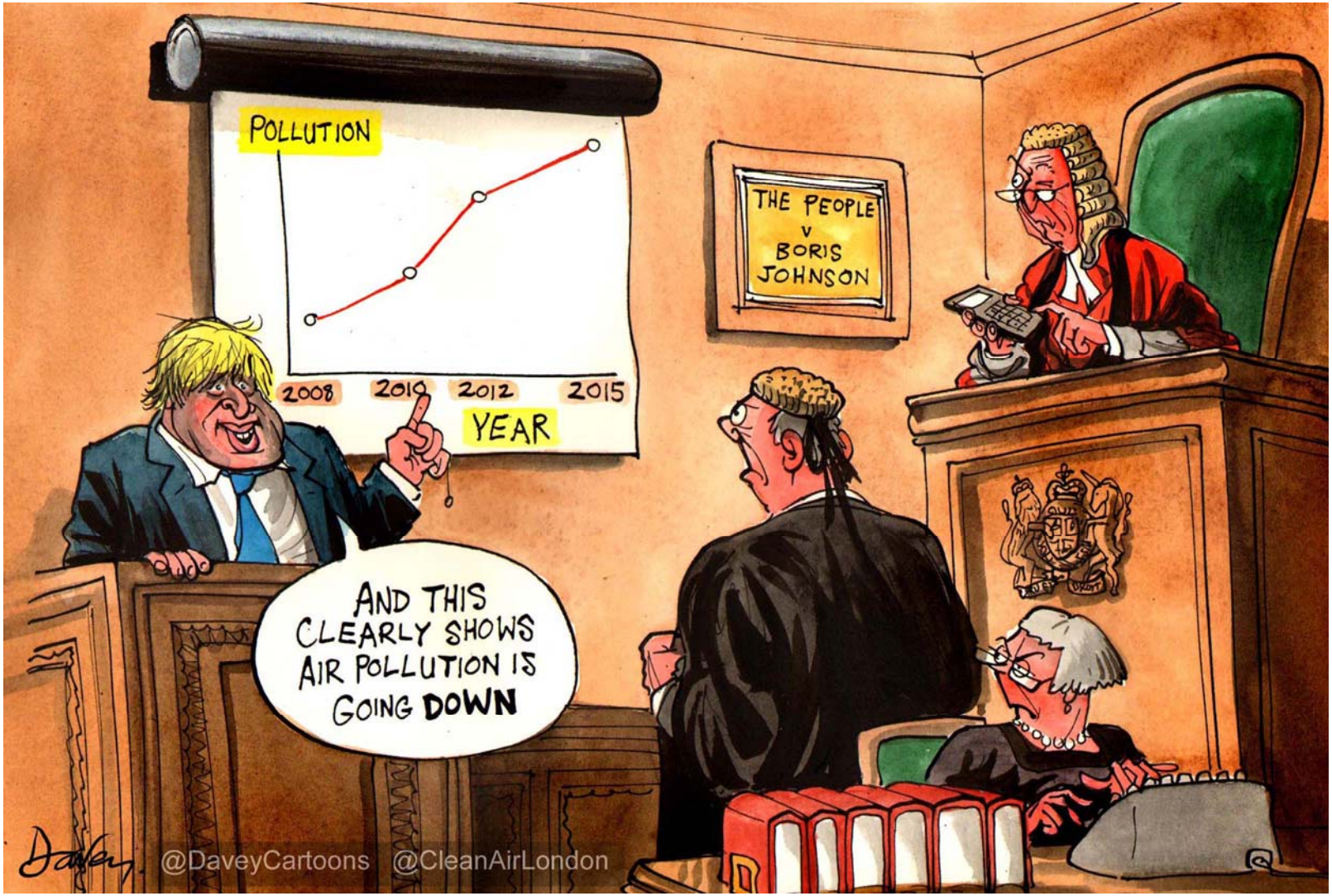
	Air pollution	Climate change
London	**Success**	
Rest of world		

Jargon

- Particles ($PM_{2.5}$ and PM_{10}) and gases (NO_2)
- Short (e.g. PM_{10}) and long-term (e.g. $PM_{2.5}$) health effects. Mortality and morbidity. Overlapping effects
- Emissions and concentrations. Health exposures, impacts and outcomes. Visible and invisible
- All affected. Many outcomes. Deaths mainly cardiovascular. 4,300 $PM_{2.5}$. 5,900 NO_2 in London versus 8,500 from smoking. Second biggest public health risk
- Local (NO_2), regional ($PM_{2.5}$) and transboundary pollution e.g. tropospheric ozone (O_3)

Building public understanding

Easier to warn the general public than…


POLLUTION
2008
2010
2012
2015
YEAR
THE PEOPLE
v
BORIS
JOHNSON
AND THIS CLEARLY SHOWS AIR POLLUTION IS GOING DOWN
@DaveyCartoons @CleanAirLondon

Historical perspective

- Great Smog 1952 and Clean Air Act 1956
- Scientific focus on short-term respiratory effects despite evidence of cardiovascular deaths in ‘time series’ studies
- ‘Cohort studies’ identified long-term effects of $PM_{2.5}$
- Myopic focus in UK since 1990 on CO_2 and fuel efficiency
- Many roads in Central London tend (today) to have the highest NO_2 concentrations in the world. Blame diesel
- Europe Union’s ‘Clean Air Policy Package’ in 2013
- 68th World Health Assembly. First debate on air pollution!
- Back where we <u>thought</u> we were 60 years ago

Prime Ministers

- 4 May 1979 – 28 November 1990 Margaret Thatcher
- 28 November 1990 – 2 May 1997 John Major
- 2 May 1997 – 27 June 2007 Tony Blair
- 27 June 2007 – 11 May 2010 Gordon Brown
- 11 May 2010 – 13 July 2016 David Cameron
- 13 July 2016 – To date Theresa May

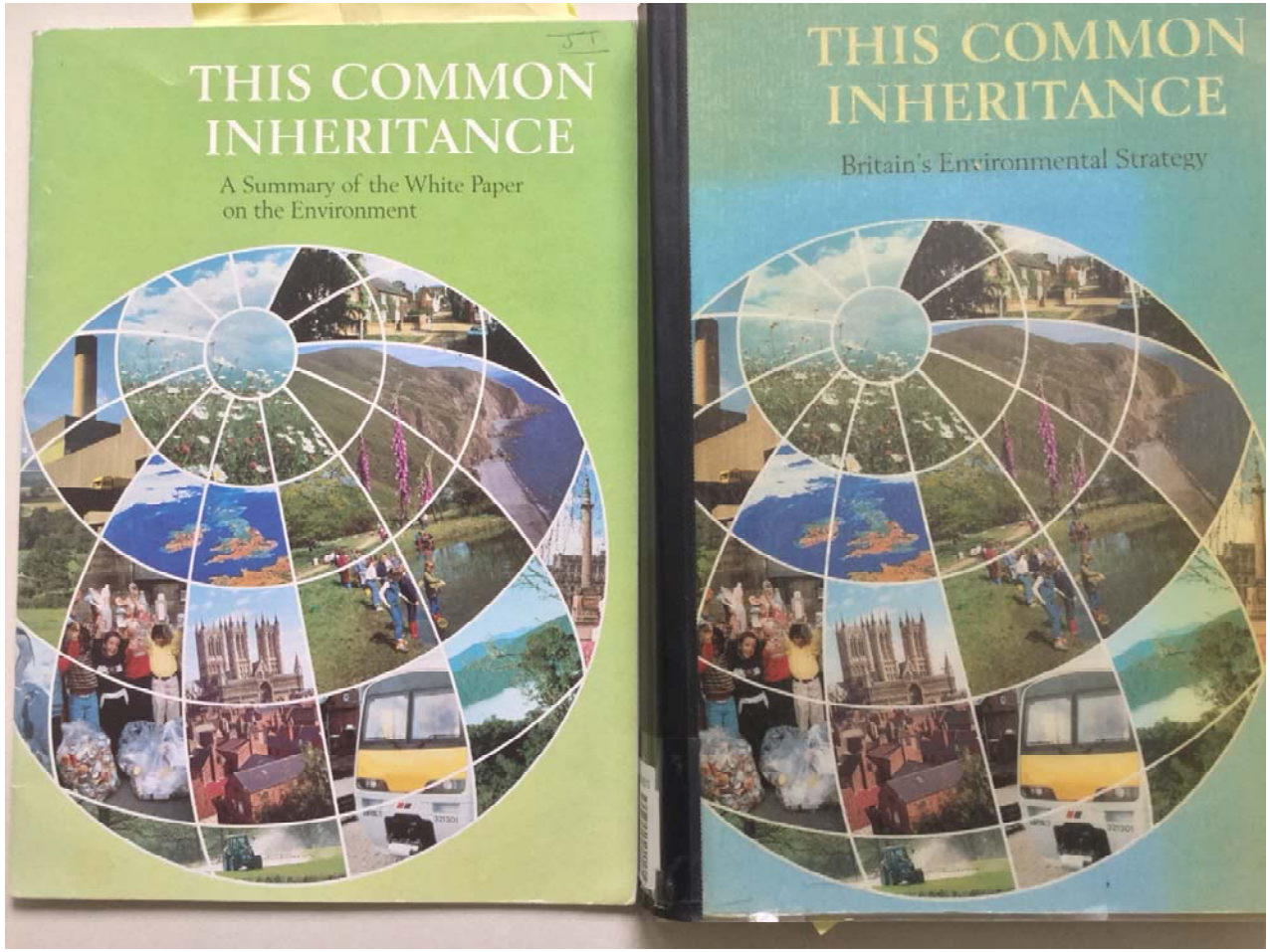
Margaret Thatcher

Mid-1980s	Unleaded petrol
8 November 1989	Speech to UN General Assembly on ‘our global environment’…‘alone’ subtitled ‘*Vast increase in carbon dioxide*’
27 June 1990	Speech to ‘Second Meeting of Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer’
September 1990	‘This Common Inheritance’
28 November 1990	Gone but still here…

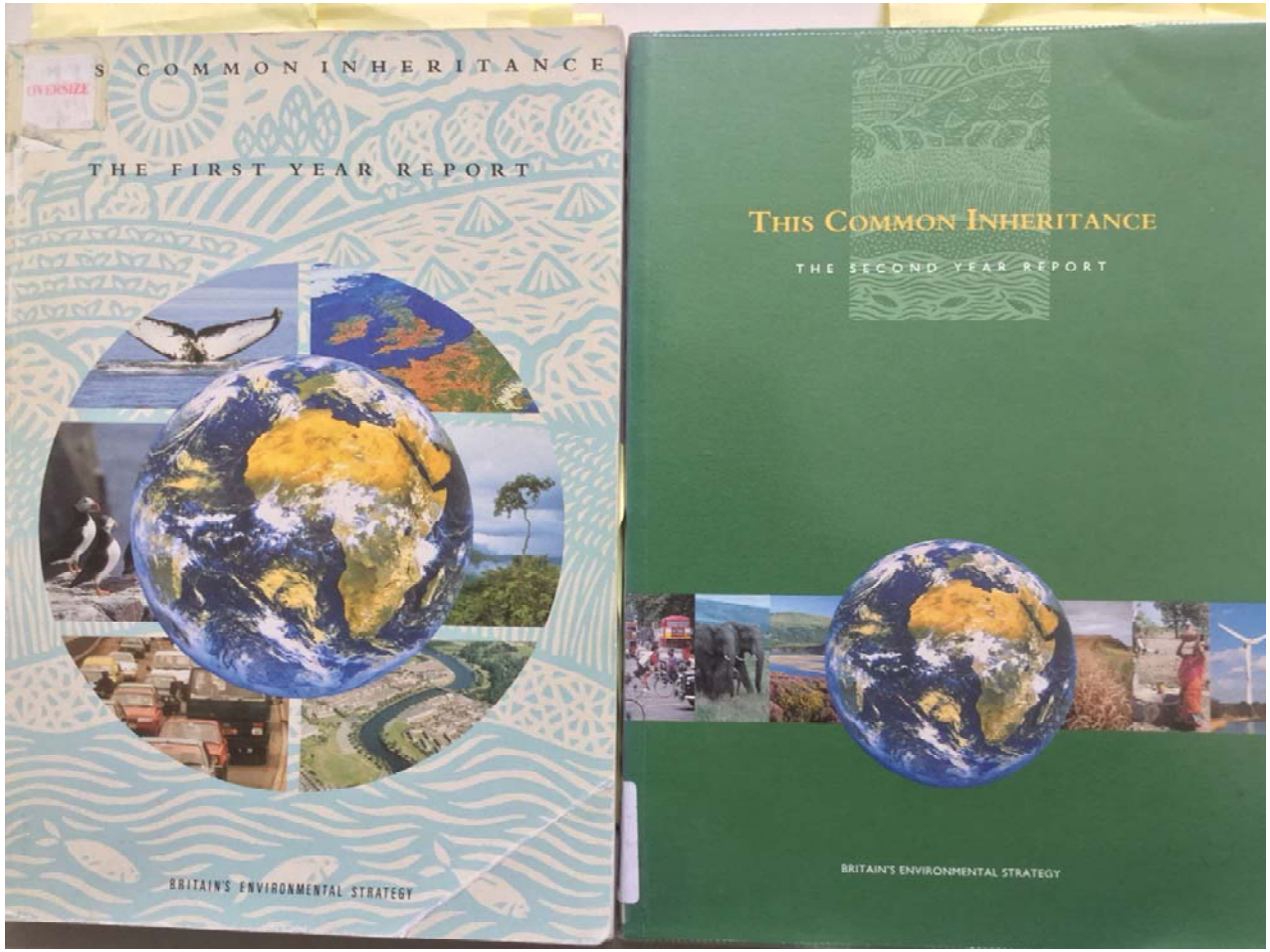
Britain’s Environmental Strategy

September 1990	This Common Inheritance: Britain’s Environmental Strategy
September 1991	This Common Inheritance: First year report
October 1992	This Common Inheritance: Second Year Report
January 2013	First report of the Quality of Urban Air Review Group

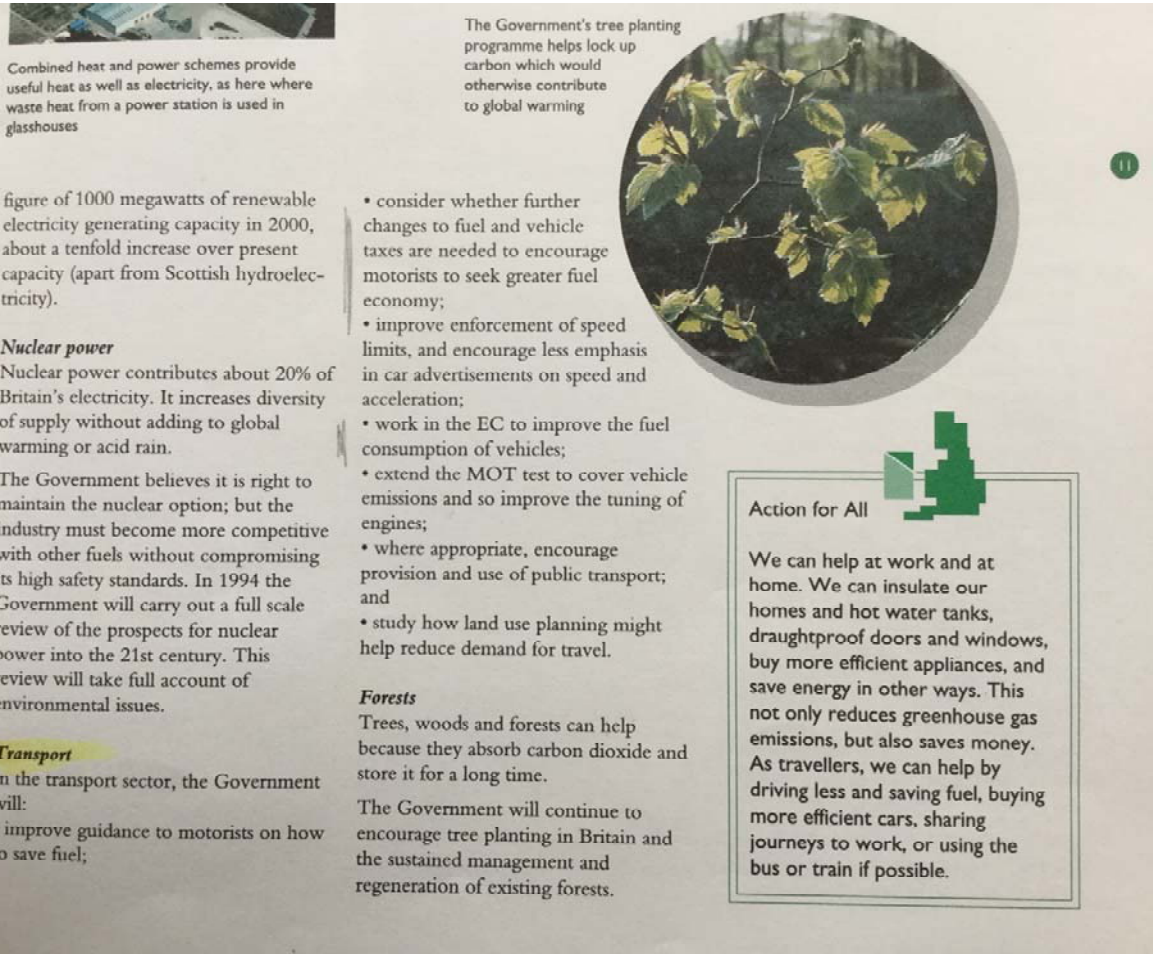
Examples from ‘This Common Inheritance’ including subsequent reports



Examples from ‘This Common Inheritance’ including subsequent reports



Examples from ‘This Common Inheritance’ including subsequent reports (Summary 1990)



Combined heat and power schemes provide useful heat as well as electricity, as here where waste heat from a power station is used in glasshouses

The Government's tree planting programme helps lock up carbon which would otherwise contribute to global warming

figure of 1000 megawatts of renewable electricity generating capacity in 2000, about a tenfold increase over present capacity (apart from Scottish hydroelectricity).

Nuclear power

Nuclear power contributes about 20% of Britain's electricity. It increases diversity of supply without adding to global warming or acid rain.

The Government believes it is right to maintain the nuclear option; but the industry must become more competitive with other fuels without compromising its high safety standards. In 1994 the Government will carry out a full scale review of the prospects for nuclear power into the 21st century. This review will take full account of environmental issues.

Transport

In the transport sector, the Government will:

- improve guidance to motorists on how to save fuel;
- consider whether further changes to fuel and vehicle taxes are needed to encourage motorists to seek greater fuel economy;
- improve enforcement of speed limits, and encourage less emphasis in car advertisements on speed and acceleration;
- work in the EC to improve the fuel consumption of vehicles;
- extend the MOT test to cover vehicle emissions and so improve the tuning of engines;
- where appropriate, encourage provision and use of public transport; and
- study how land use planning might help reduce demand for travel.

Forests

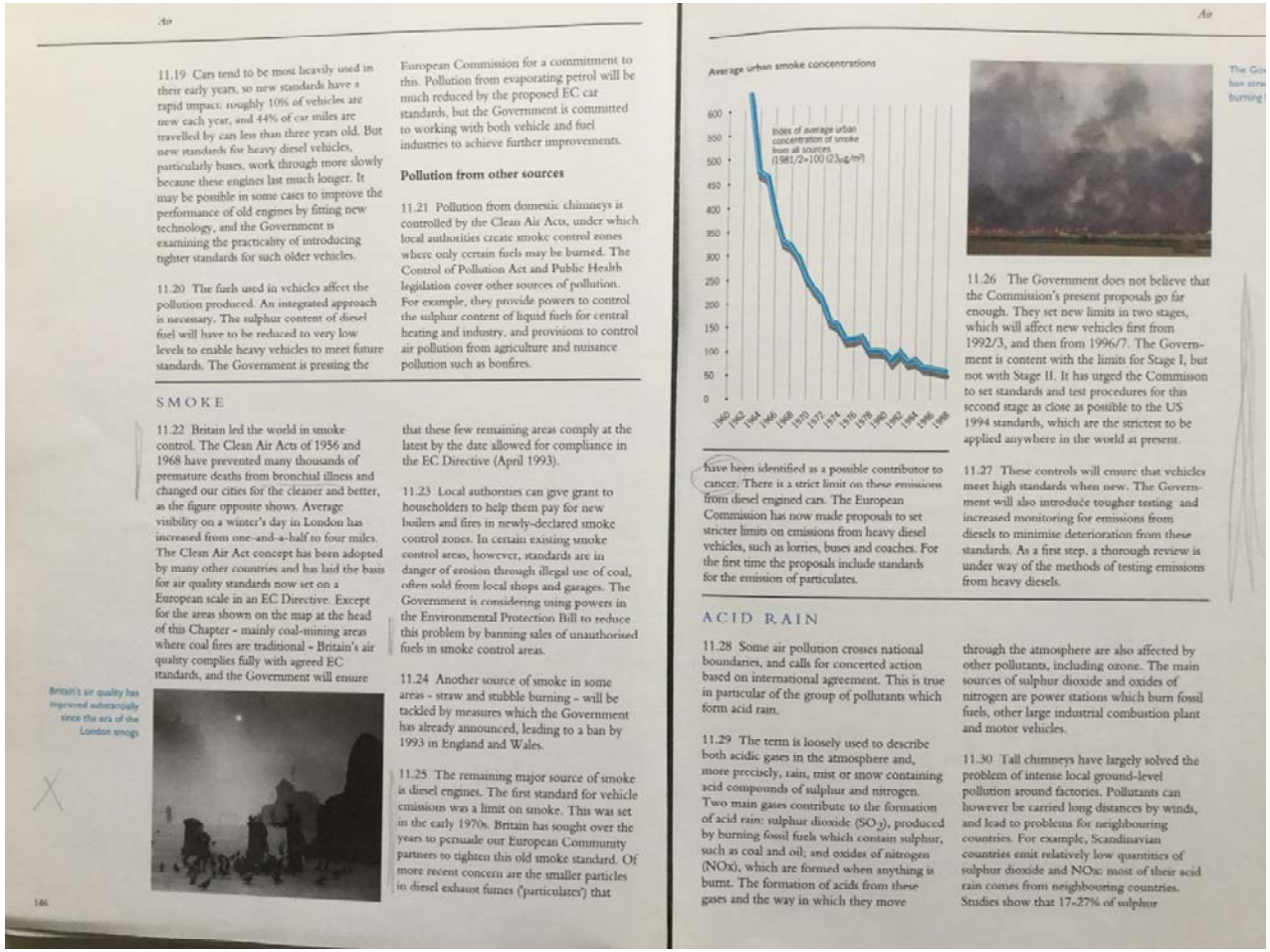
Trees, woods and forests can help because they absorb carbon dioxide and store it for a long time.

The Government will continue to encourage tree planting in Britain and the sustained management and regeneration of existing forests.

Action for All

We can help at work and at home. We can insulate our homes and hot water tanks, draughtproof doors and windows, buy more efficient appliances, and save energy in other ways. This not only reduces greenhouse gas emissions, but also saves money. As travellers, we can help by driving less and saving fuel, buying more efficient cars, sharing journeys to work, or using the bus or train if possible.

Examples from ‘This Common Inheritance’ including subsequent reports (1990)



Air

11.19 Cars tend to be most heavily used in their early years, so new standards have a rapid impact: roughly 10% of vehicles are new each year, and 44% of car miles are travelled by cars less than three years old. But new standards for heavy diesel vehicles, particularly buses, work through more slowly because these engines last much longer. It may be possible in some cases to improve the performance of old engines by fitting new technology, and the Government is examining the practicality of introducing tighter standards for such older vehicles.

11.20 The fuels used in vehicles affect the pollution produced. An integrated approach is necessary. The sulphur content of diesel fuel will have to be reduced to very low levels to enable heavy vehicles to meet future standards. The Government is pressing the European Commission for a commitment to this. Pollution from evaporating petrol will be much reduced by the proposed EC car standards, but the Government is committed to working with both vehicle and fuel industries to achieve further improvements.

Pollution from other sources

11.21 Pollution from domestic chimneys is controlled by the Clean Air Acts, under which local authorities create smoke control zones where only certain fuels may be burned. The Control of Pollution Act and Public Health legislation cover other sources of pollution. For example, they provide powers to control the sulphur content of liquid fuels for central heating and industry, and provisions to control air pollution from agriculture and nuisance pollution such as bonfires.

SMOKE

11.22 Britain led the world in smoke control. The Clean Air Acts of 1956 and 1968 have prevented many thousands of premature deaths from bronchial illness and changed our cities for the cleaner and better, as the figure opposite shows. Average visibility on a winter's day in London has increased from one-and-a-half to four miles. The Clean Air Act concept has been adopted by many other countries and has laid the basis for air quality standards now set on a European scale in an EC Directive. Except for the areas shown on the map at the head of this Chapter - mainly coal-mining areas where coal fires are traditional - Britain's air quality complies fully with agreed EC standards, and the Government will ensure that these few remaining areas comply at the latest by the date allowed for compliance in the EC Directive (April 1993).

11.23 Local authorities can give grant to householders to help them pay for new boilers and fires in newly-declared smoke control zones. In certain existing smoke control areas, however, standards are in danger of erosion through illegal use of coal, often sold from local shops and garages. The Government is considering using powers in the Environmental Protection Bill to reduce this problem by banning sales of unauthorised fuels in smoke control areas.

11.24 Another source of smoke in some areas - straw and stubble burning - will be tackled by measures which the Government has already announced, leading to a ban by 1993 in England and Wales.

11.25 The remaining major source of smoke is diesel engines. The first standard for vehicle emissions was a limit on smoke. This was set in the early 1970s. Britain has sought over the years to persuade our European Community partners to tighten this old smoke standard. Of more recent concern are the smaller particles in diesel exhaust fumes ('particulates') that

Britain's air quality has improved substantially since the era of the London smogs

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Air

Average urban smoke concentrations

11.26 The Government does not believe that the Commission's present proposals go far enough. They set new limits in two stages, which will affect new vehicles first from 1992/3, and then from 1996/7. The Government is content with the limits for Stage I, but not with Stage II. It has urged the Commisson to set standards and test procedures for this second stage as close as possible to the US 1994 standards, which are the strictest to be applied anywhere in the world at present.

have been identified as a possible contributor to cancer. There is a strict limit on these emissions from diesel engined cars. The European Commission has now made proposals to set stricter limits on emissions from heavy diesel vehicles, such as lorries, buses and coaches. For the first time the proposals include standards for the emission of particulates.

11.27 These controls will ensure that vehicles meet high standards when new. The Government will also introduce tougher testing and increased monitoring for emissions from diesels to minimise deterioration from these standards. As a first step, a thorough review is under way of the methods of testing emissions from heavy diesels.

ACID RAIN

11.28 Some air pollution crosses national boundaries, and calls for concerted action based on international agreement. This is true in particular of the group of pollutants which form acid rain.

11.29 The term is loosely used to describe both acidic gases in the atmosphere and, more precisely, rain, mist or snow containing acid compounds of sulphur and nitrogen. Two main gases contribute to the formation of acid rain: sulphur dioxide (SO_2), produced by burning fossil fuels which contain sulphur, such as coal and oil; and oxides of nitrogen (NOx), which are formed when anything is burnt. The formation of acids from these gases and the way in which they move through the atmosphere are also affected by other pollutants, including ozone. The main sources of sulphur dioxide and oxides of nitrogen are power stations which burn fossil fuels, other large industrial combustion plant and motor vehicles.

11.30 Tall chimneys have largely solved the problem of intense local ground-level pollution around factories. Pollutants can however be carried long distances by winds, and lead to problems for neighbouring countries. For example, Scandinavian countries emit relatively low quantities of sulphur dioxide and NOx: most of their acid rain comes from neighbouring countries. Studies show that 17-27% of sulphur

Examples from ‘This Common Inheritance’ including subsequent reports (1991)

gas. This will target the key problem areas in Devon and Cornwall. The Government is also considering whether to introduce separate protection measures for non-domestic properties.

8.15 The Government is introducing further controls over air quality as part of international agreements (see below).

Using the Market

8.16 Sales of unleaded petrol now account for over 40% of the total petrol market in Britain and should exceed 90% by the end of this decade. Sales have received a major boost from the progressive increase in duty differentials between leaded and unleaded over the past five years. Since October 1990 all new petrol cars have had to be capable of running on unleaded fuel. Average lead-in-air levels have already halved since the early 1980s and are only a small fraction of EC limit values.

Informing and Involving the Public

8.17 Since October 1990 air quality information has been made available through a telephone bulletin service and in weather forecasts as promised in the White Paper. In addition, a telephone helpline with health advice on ground level ozone episodes (photochemical smog) was set up in May 1991 using advice from the Advisory Group on the Medical Aspects of Air Pollution Episodes. Further guidance on sulphur dioxide will be ready in 1992.

8.18 The Government is issuing a leaflet giving guidance on the most effective means of segregating smokers and non-smokers in public places. This will help to avoid problems of passive smoking, a significant aspect of indoor pollution.

8.19 Air pollution in the home is an area where people can take action for themselves. The Government is publishing a leaflet advising householders of the potential risks and the action they can take. The Government has also launched a publicity campaign in Cornwall and Devon to increase awareness of the threat posed in the area by radon gas; 12% of homes in the target area took up the offer of free surveys in the first 3 months of the campaign. Radon concentrations will have been measured in about 100,000 homes by the end of 1991.

Action for All

8.20 The Department of Transport has published telephone contact numbers which members of the public can use to report heavy diesel vehicles which they consider to be smoking excessively. Complaints are pursued with vehicle operators and follow-up action taken as appropriate.

8.21 The choice and use of private cars can also reduce pollution. A car fitted with a three-way catalytic converter produces far less pollutant emissions than cars without one. And keeping cars properly in tune will not only reduce pollution substantially but also make them more economical to run.

8.22 Care at home and in the workplace can contribute significantly to reducing air pollution, especially from household products and smoking. Public pressure has already led to substantial increases in segregation of smokers and non-smokers.

Work in the International Community

8.23 Because many airborne pollutants cross national boundaries and since motor vehicles are a major aspect of European trade, action often needs to be agreed within Europe.

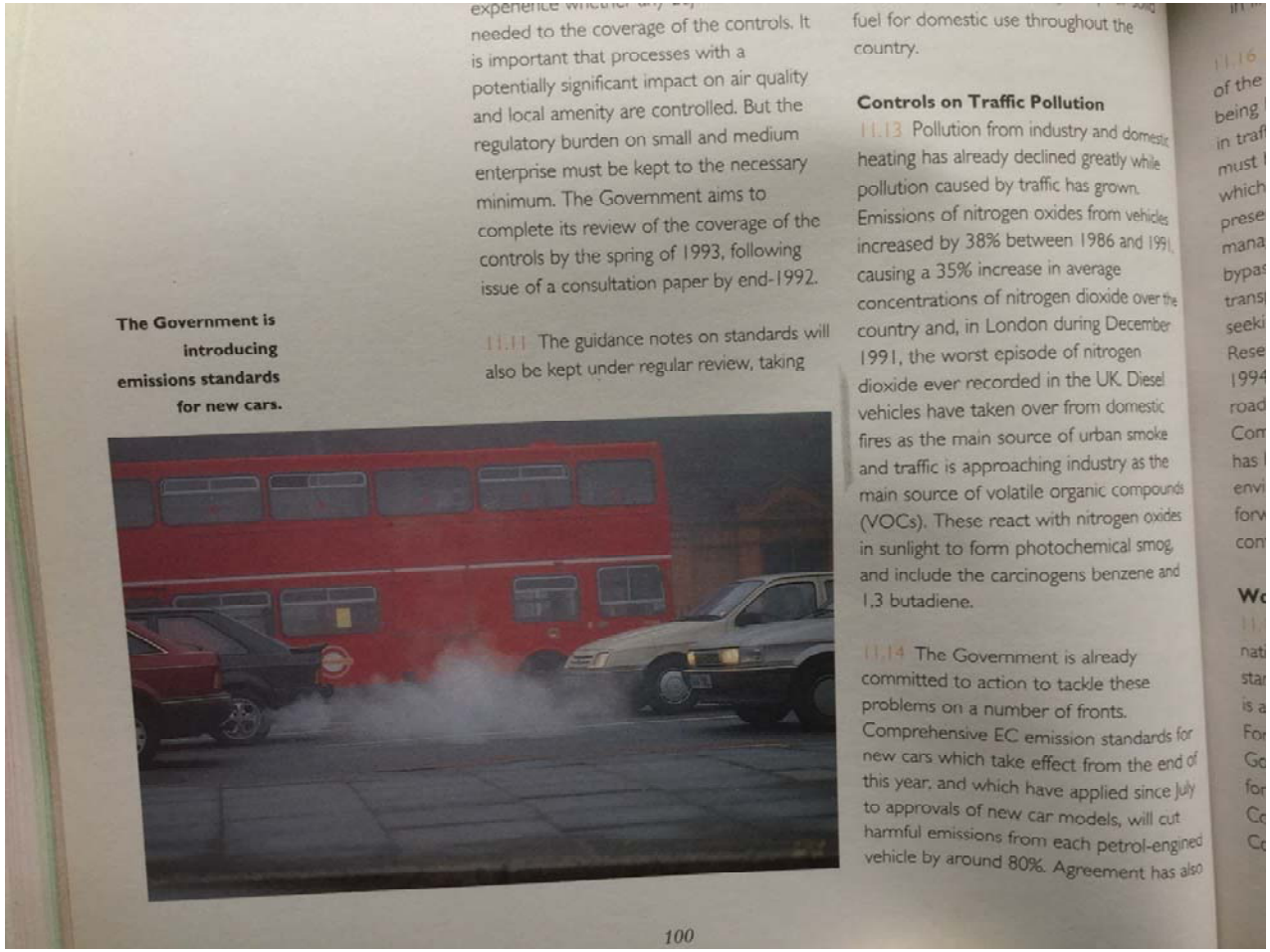
8.24 Sulphur dioxide and oxides of nitrogen are the main gases which contribute to acid rain. A major source of these gases – power stations burning fossil fuels – is controlled under the EC Large Combustion Plants Directive. In December 1990 Britain published its programme for achieving 60% reductions in SO_2 emissions from existing

pressing for exacting standards to be set in a forthcoming EC Directive on hazardous waste incineration.

8.27 In December 1990 Britain helped to secure EC agreement to comprehensive standards on exhaust emissions which will apply to all new cars from the end of 1992. These will reduce harmful emissions from each car by 80% and will require the fitting of catalytic converters to all petrol-engined cars. 16% of cars sold in the first quarter of 1991 were fitted with catalysts. In March 1991 agreement was also reached on new standards for heavy diesel vehicles which will be phased in in two stages by 1996/97. They are significantly tougher than originally proposed by the Commission and reflect the goals set in the White Paper. They will substantially reduce gaseous and particulate emissions from diesels. The Commission has also put forward proposals, following strong British pressure, for tougher standards on the sulphur content of diesel fuel to help to reduce particulates and sulphur in diesel exhaust emissions.

8.28 The Government has also worked successfully to ensure that EC building product controls reflect the potential impact of products on air quality indoors. The EC Construction Products Directive which sets the framework for product control will be given force in British Law later in 1991. Work is continuing on the development of relevant European technical specifications to support the Directive.

Examples from ‘This Common Inheritance’ including subsequent reports (1992)



needed to the coverage of the controls. It is important that processes with a potentially significant impact on air quality and local amenity are controlled. But the regulatory burden on small and medium enterprise must be kept to the necessary minimum. The Government aims to complete its review of the coverage of the controls by the spring of 1993, following issue of a consultation paper by end-1992.

11.11 The guidance notes on standards will also be kept under regular review, taking

The Government is introducing emissions standards for new cars.

fuel for domestic use throughout the country.

Controls on Traffic Pollution

11.13 Pollution from industry and domestic heating has already declined greatly while pollution caused by traffic has grown. Emissions of nitrogen oxides from vehicles increased by 38% between 1986 and 1991, causing a 35% increase in average concentrations of nitrogen dioxide over the country and, in London during December 1991, the worst episode of nitrogen dioxide ever recorded in the UK. Diesel vehicles have taken over from domestic fires as the main source of urban smoke and traffic is approaching industry as the main source of volatile organic compounds (VOCs). These react with nitrogen oxides in sunlight to form photochemical smog, and include the carcinogens benzene and 1,3 butadiene.

11.14 The Government is already committed to action to tackle these problems on a number of fronts. Comprehensive EC emission standards for new cars which take effect from the end of this year, and which have applied since July to approvals of new car models, will cut harmful emissions from each petrol-engined vehicle by around 80%. Agreement has also

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Myopic focus on CO_2

A very senior civil servant, now retired, who worked in the [Department of Environment in the late 1990s] and has asked not to be named, said that cost-benefit studies of a switch to diesel were done, but climate change was "the new kid on the block" and long-term projections of comparative technologies were not perfect. "I recall all the discussions had the health issue as a significant factor," he says. "We did not sleepwalk into this. ***To be totally reductionist, you are talking about killing people today rather than saving lives tomorrow.*** *Occasionally, we had to say we were living in a different political world and everyone had to swallow hard."*

John Vidal, Environment Editor, in The Guardian, 20 June 2015

Myopic focus on CO_2

"The Chairman, summing up the discussion, concluded that the points could be put to Ministers in a general way. It was important, however, not to allow the question of fiscal incentives to encourage the purchase of cars meeting lower emission standards than the mandatory ones to obscure the long-term need to encourage people to use fuel efficient [diesel] vehicles."

Department of Transport

Minute of meeting on 28 September 1990

Policies

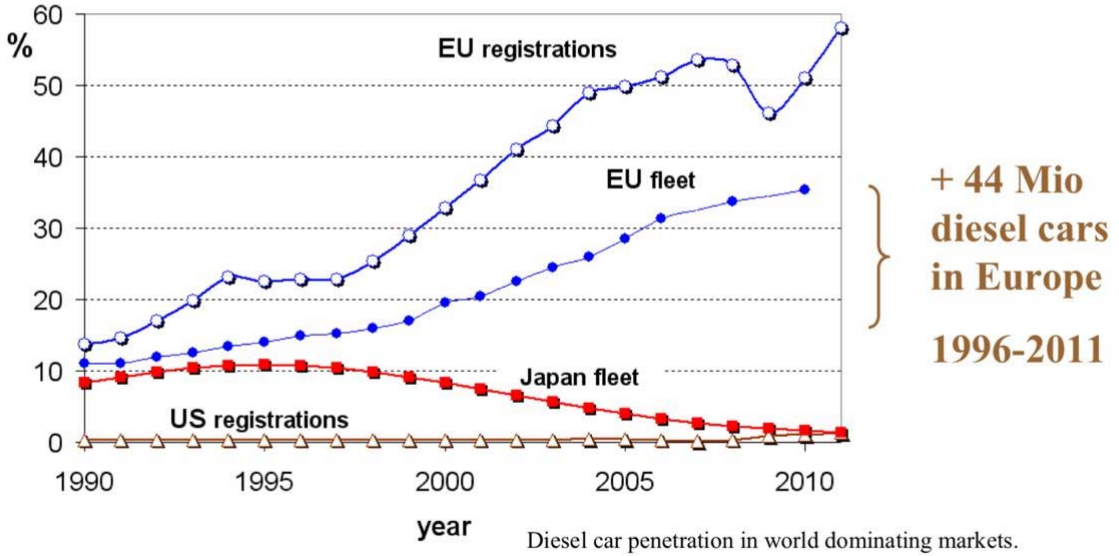
- Promote diesel
- Emission standards were not technology neutral (unlike the US)
- Tackle particles (DPF in Euro 5) and then NOx in Euro 6 (but not NO_2)
- Ultra low sulphur fuels

Critical evaluation of the European diesel car boom (Cames and Helmers 2013)

https://enveurope.springeropen.com/articles/10.1186/2190-4715-25-15

Until the mid 1990s: Europe followed technology leaps initiated in US with a certain delay

That changed in the mid 1990s:



Cames & Helmers (2013)

Diesel car penetration in world dominating markets.

All data are percentages, either annual new car registrations, or annual entire car fleet composition.

More questions

- Did petrochemical companies foresee spare capacity in late 1980s e.g. heating fuel in the dash for gas?
- Growth in market share of diesel cars since 1980
- Real world PM and NOx (and other) emissions for each Euro standard
- NO_2 as % of NOx
- Real world emission testing and maintenance costs for premium versus standard petrol and diesel
- Real world CO_2 emissions of vehicles since 1980
- Unpick the motives, methods and opportunities…

Health diesel

- Issues identified in ‘This Common Inheritance’
- Cross-departmental meetings
- QUARG 1993
- COMEAP
- June 2012 IARC classifies diesel exhaust as carcinogenic
- October 2013 IARC adds $PM_{2.5}$ and ambient air
- Inside versus outside vehicles

World Health Organisation declares…

London: 15 March 2012

Pollution Suppressor – 26 March 2012

London: 19 February 2013

Some consequences

- Diesel didn't reduce CO_2 as expected
- Fuel additives? Subnano TiO_2 particles from catalysts?
- NO_2 increased as % of NOx
- Real world NOx much higher than Euro standards
- VW and #dieselgate
- Problems with DPFs including removal and 'remapping'
- Beware particles from new petrol technologies
- Tyre and break wear largely unregulated
- We can't wait until 2033+ e.g. diesel taxis
- It ain't just diesel. CO_2 myopia is everywhere e.g. wood pellets, decentralised generation etc. etc. etc.

Lessons

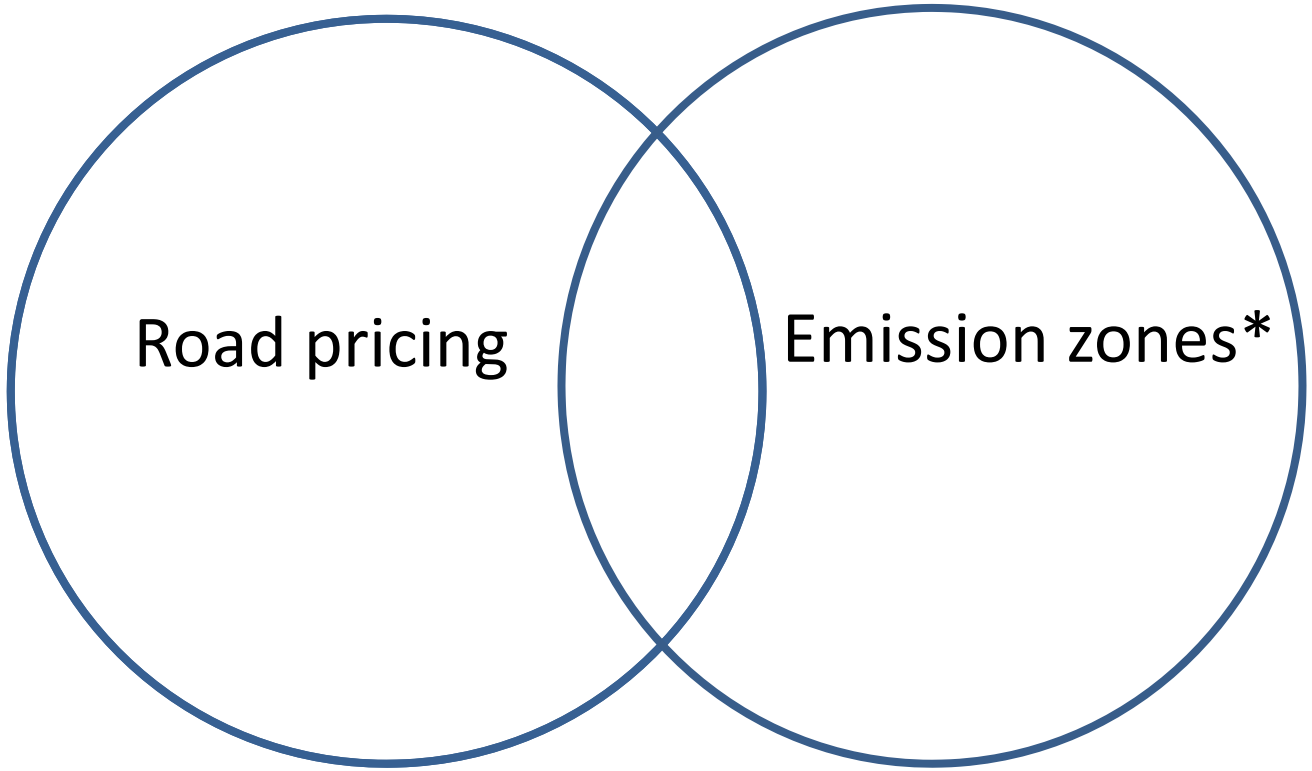
- ‘One Atmosphere’: air pollution and greenhouse gases. Policy disasters promoting diesel and biomass burning
- Government departments are not/never ‘joined-up’. Must maintain and build scientific and official expertise
- Short and long-term effects e.g. offsetting. NOx/O_3. SOx cooling effects from shipping. Black carbon. CH_4. Hg. NH_3
- Solutions: Governance. Political leadership, lifestyle changes and technology. Not just ‘Best available technical solutions’. Offsetting is never the answer. Green walls cost 40x exhaust abatement per kg of pollutant removed
- Indoor air quality: ventilation, air conditioning and filtration
- Communicate health impacts. Warn, protect and reduce
- Expect new health and natural environment impacts

The London Principle – 'One Atmosphere'

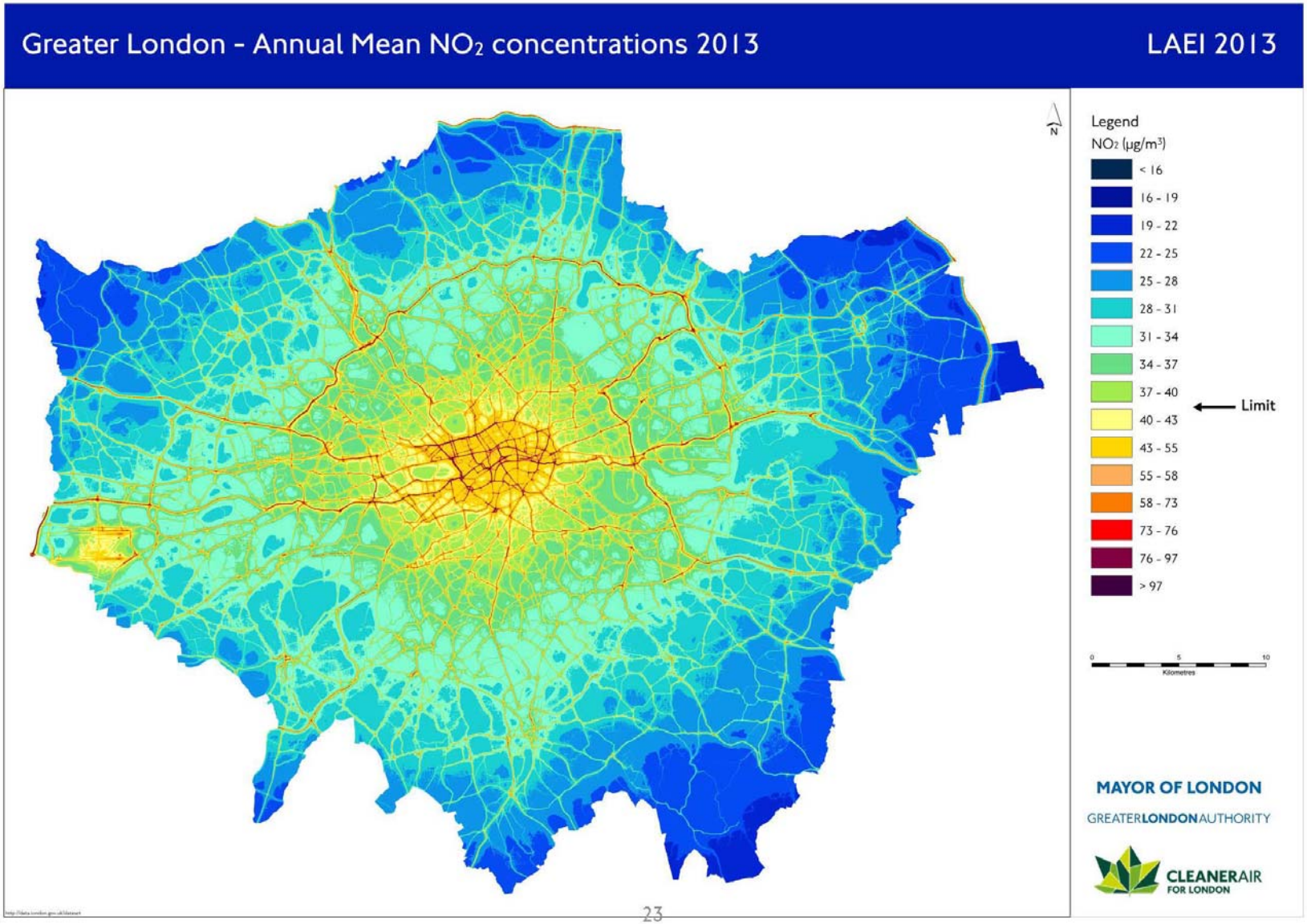
We must think in terms of 'One Atmosphere'. All obligations to reduce air pollution must be met. Any trade-offs between climate change and air quality should be made in an explicit and transparent way e.g. through the application of the 'London Principle'. This states that a 1% disbenefit in climate change terms (e.g. increased CO_2 emissions) should be accepted when there is an associated benefit of 10% in air quality terms (e.g. reduced emissions of particulate matter or oxides of nitrogen) (and vice versa) provided that legal breaches are not worsened

The London Circles

Transport measures address congestion and/or emissions



* ‘Clean Air Zones’


Greater London - Annual Mean NO2 concentrations 2013
LAEI 2013
Legend
NO2 (µg/m3)
< 16
16 - 19
19 - 22
22 - 25
25 - 28
28 - 31
31 - 34
34 - 37
37 - 40
40 - 43
43 - 55
55 - 58
58 - 73
73 - 76
76 - 97
> 97
Limit
0
5
10
Kilometres
MAYOR OF LONDON
GREATERLONDONAUTHORITY
CLEANERAIR
FOR LONDON
23

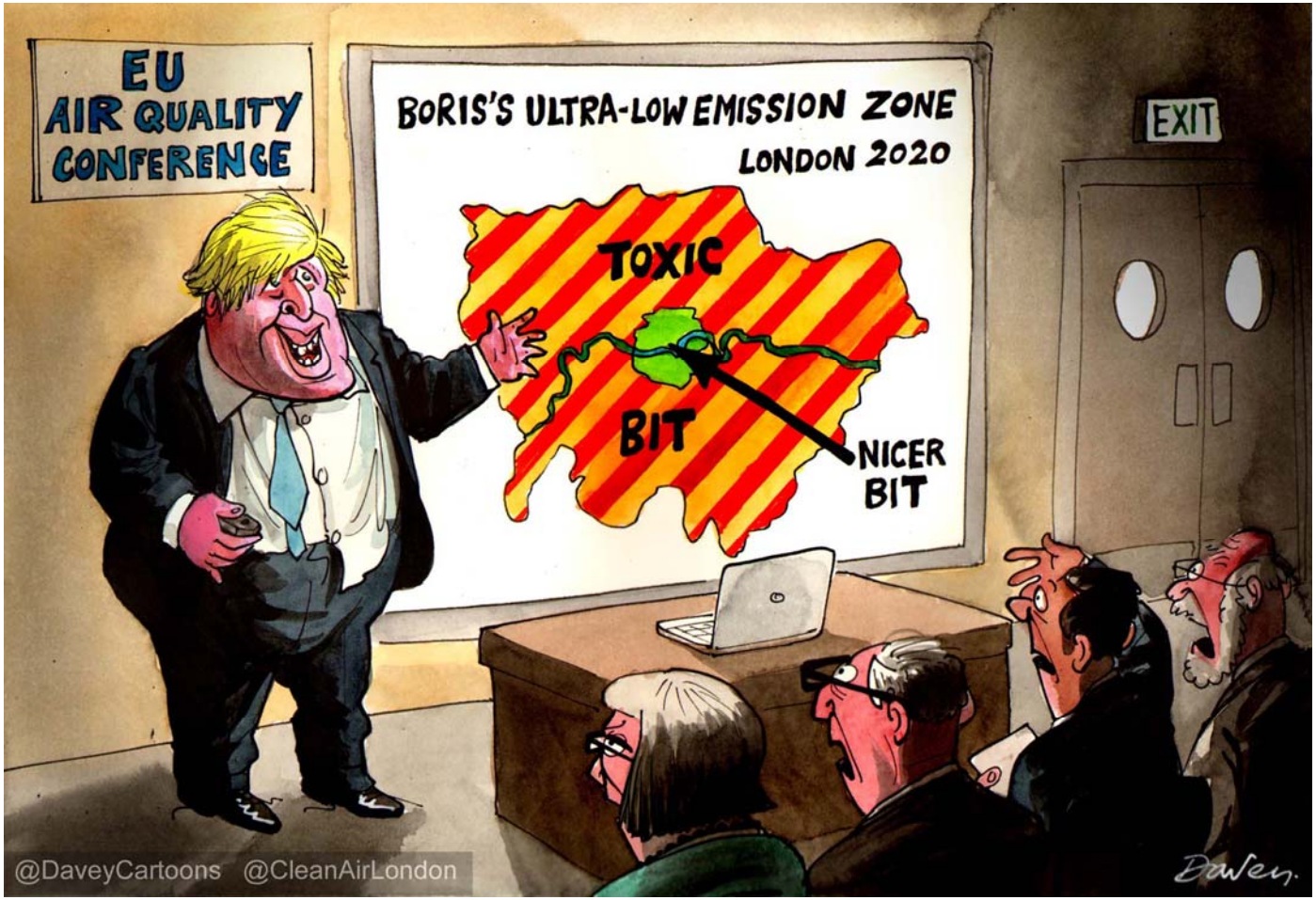
Zero tailpipe emissions by 2020

Source: Transport for London

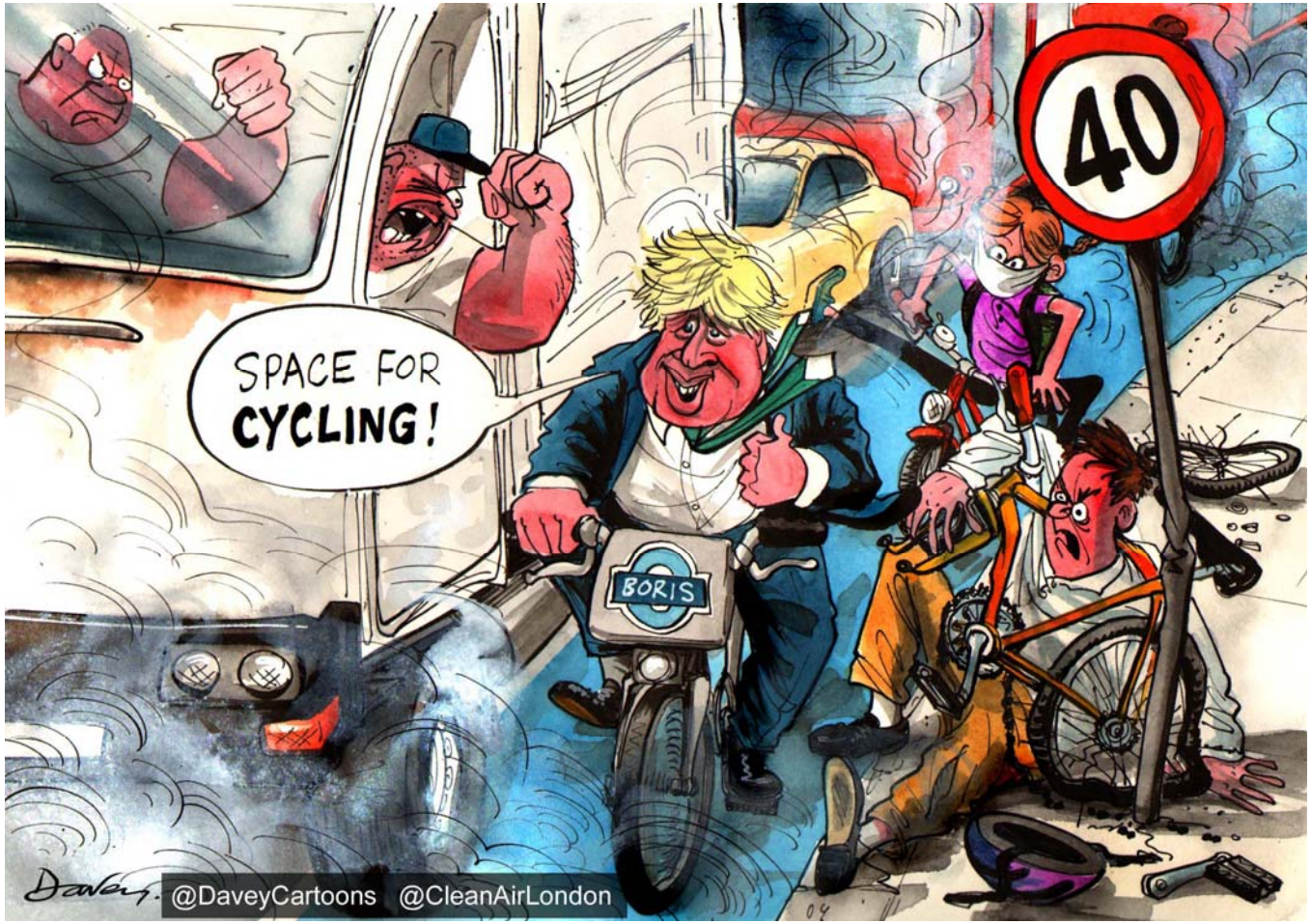
Londoners and the Mayor ‘get it’

- ClientEarth surveys
- Mayor’s surveys
- Recommendations for Mayor’s direction of travel
  - T Charge from 23 October 2017 (pre-Euro 4 diesel and petrol)
  - Bring forward central ULEZ (to 2019)
  - Expand ULEZ to north/south circular (by 2019)
  - PHVs to pay the congestion charge
  - Simplify the above by introducing Emissions Based Road Charging (EBRC)
  - Vision of ending all fossil fuel burning in London by 2030
- Court, media and (some) politicians ‘get it’ too!

Ultra-low emission zone in 2020



Encourage active travel



Next steps

- Eliminate all fossil fuels in the most polluted places by 2030
- Start with diesel. Fiscal measures. Bans in Mexico City, Paris, Madrid and Athens by 2025. Point of sale information. Constant real world testing. MOT update
- Pedestrianisation is a strong ‘low emission zone’
- VED. Emissions based road charging
- Public is confused about ‘climate change’. Is it air pollution, greenhouse gases, emissions, causes, impacts, mitigation or adaptation? Clearer language would help
- ‘Climate change’ is an ‘impact’ not a ‘driver’. Emissions and sources are upstream. It is one of our greatest risks
- Think ‘One Atmosphere’

London and mega city solutions

- Build public understanding of air pollution. Smog warnings. Public health agencies must protect people
- Act on illegal wood burning: 5-10% annual mean PM_{10}
- Think ‘One Atmosphere’ on local energy generation e.g. stop standby diesel generators feeding into the ‘grid’
- Energy: Efficiency. Zero air emissions. Renewables. Onsite
- Ban diesel, diesel, diesel as we banned coal
- Bus and taxi emissions (scrapping 25ft turning circle)
- Use ‘geo-fencing’ with care. Restrict road building
- Promote positive measures e.g. active travel and car-free centres. Restrict polluting activities e.g. ultra low emission zones and/or emissions based road charging

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Clean Air
IN LONDON

Emissions policy and air pollution

Blame every government since 1990 for 'diesel'

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