

AIR QUALITY RISK MANAGEMENT

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Risk Assessment-current challenges

- Particles
- Ozone
- Links with Climate Change
- Health Risk Assessment
- Air Quality Management



Risk Assessment issues for Particles

- Significant advances since the problem was first identified:
- The most important is probably that there is now agreement that the problem is real-this has involved **thorough** work establishing the **robustness** of the epi methodologies
- It has become clear that the **long-term exposures** to PM dominate any cost-benefit calculation
- We have learned a lot about the source apportionment of PM10 and PM2.5

Particles.....2

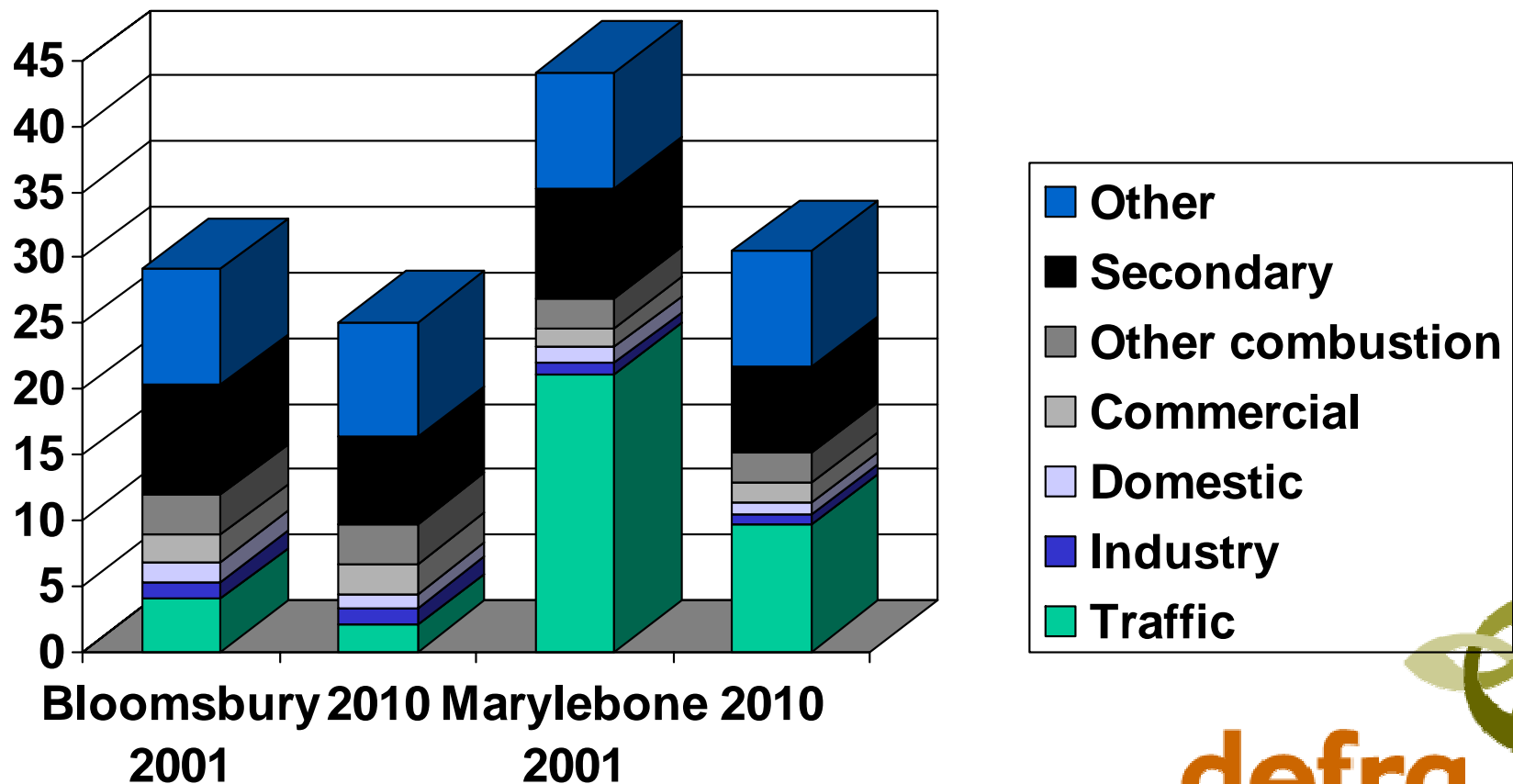
- **BUT.....** we are still asking many of the questions we asked ten years ago
- What are the **damaging components** of the ambient aerosol ?
- What are the mechanism(s) of action?
- What is the population at risk? What are the sensitive groups?

Particles.....3

- There have been advances:
- There is growing concern over the smaller ($<2.5\mu$) fraction, and over motor vehicle emissions as the active components
- On mechanisms, oxidative stress and Fenton Chemistry involving transition metals have been suggested notably by Donaldson and Kelly in the UK
- The association between **Cardiovascular effects** and particles is important and could lead to further understanding of mechanisms. A review report on CV effects is due shortly from COMEAP in the UK

- Source apportionment has improved, but deterministic modelling is still under development
- Local and Regional have difficulty in securing mass closure for PM_{10} or $PM_{2.5}$
- Secondary Organics, resuspended material, crustal material, natural events, combustion emission factors even, are all areas of uncertainty

Annual average PM₁₀ contributions ($\mu\text{g m}^{-3}$)

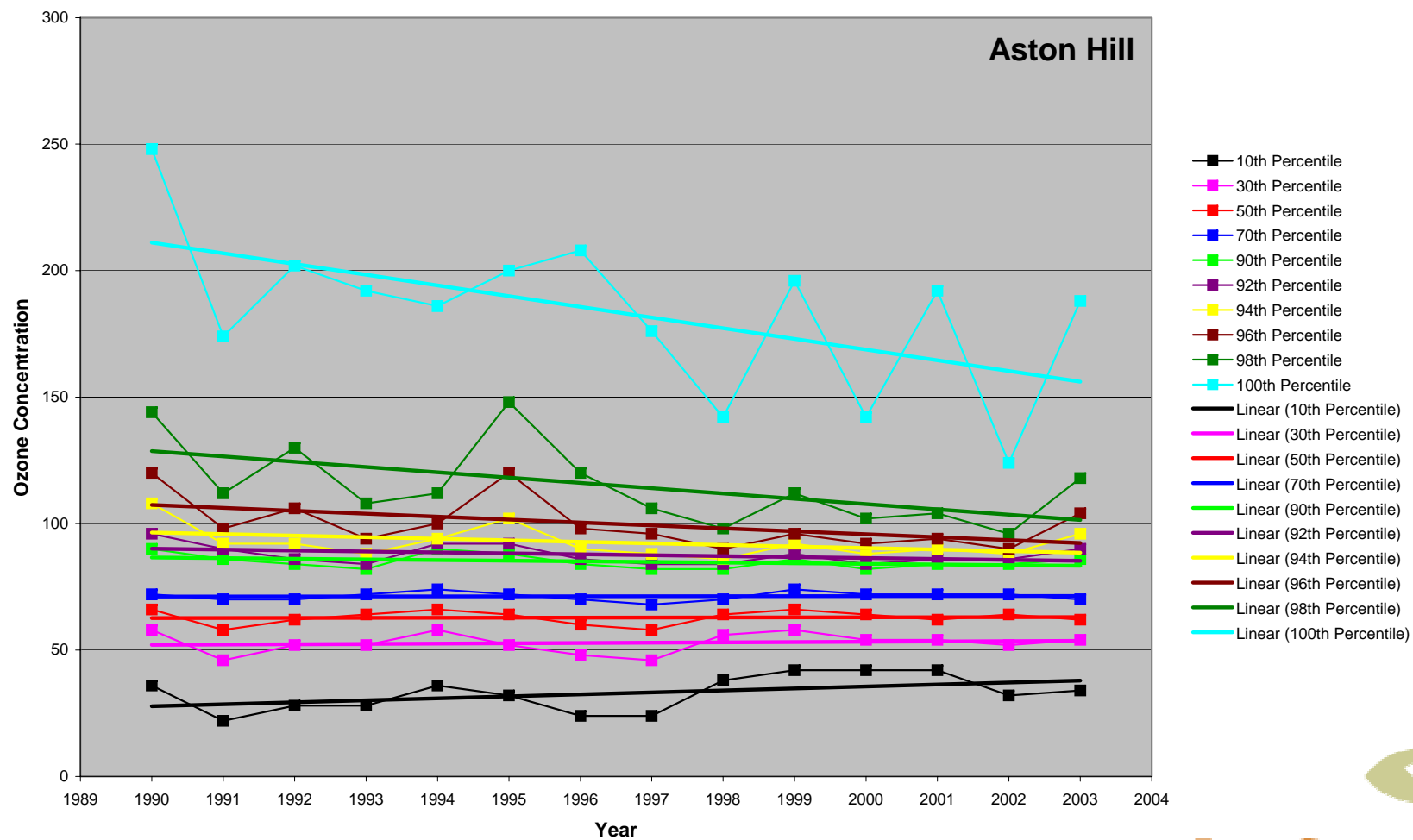


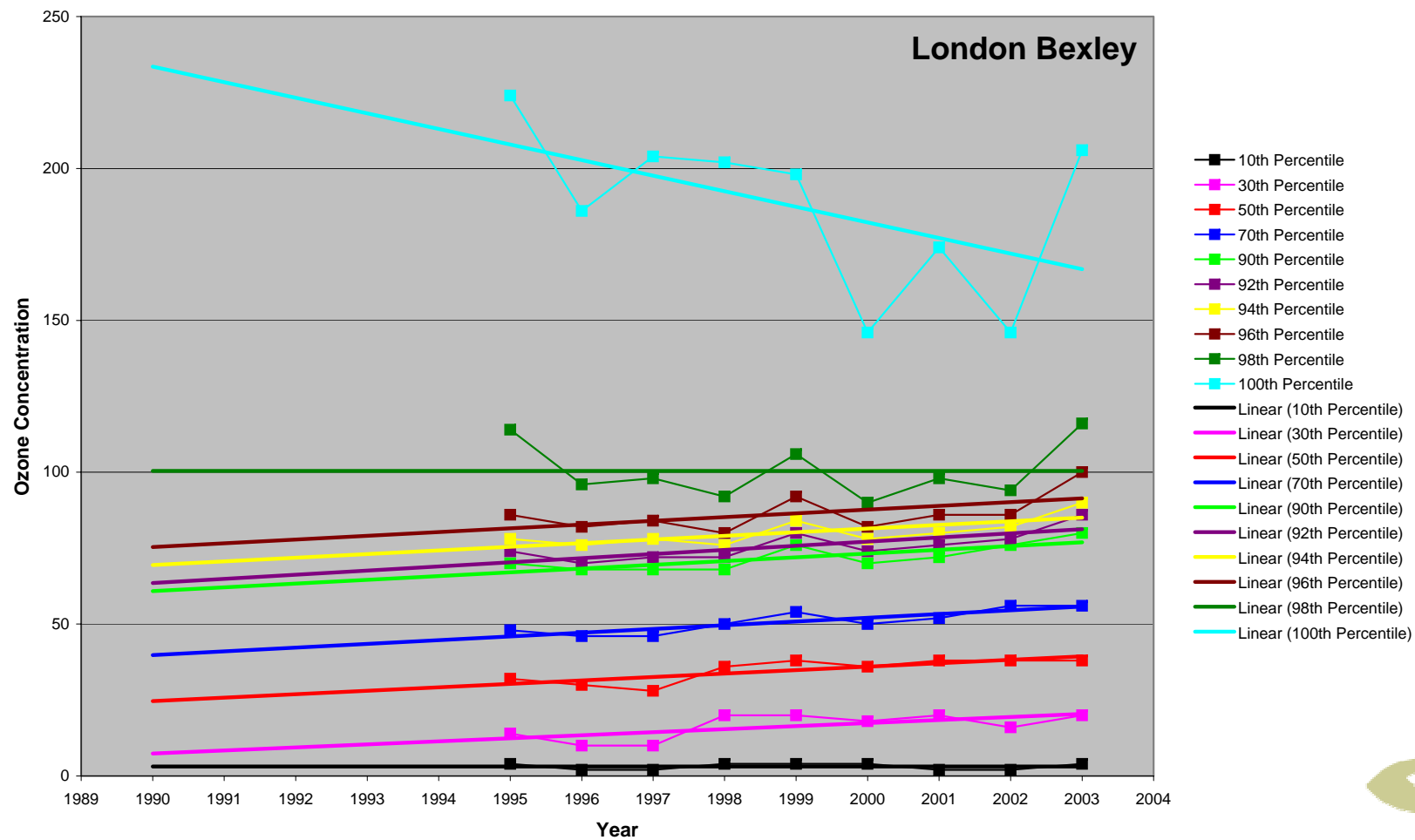
The Ozone Problem

- There are two problems!
- One is the pattern of changing concentrations of Ozone as precursors reduce
- The other is the increasing spatial scale of the ozone problem

Ozone.....2

- Reductions in VOCs and NOx have resulted in the higher concentrations of ozone reducing significantly
- But lower levels have already begun to increase

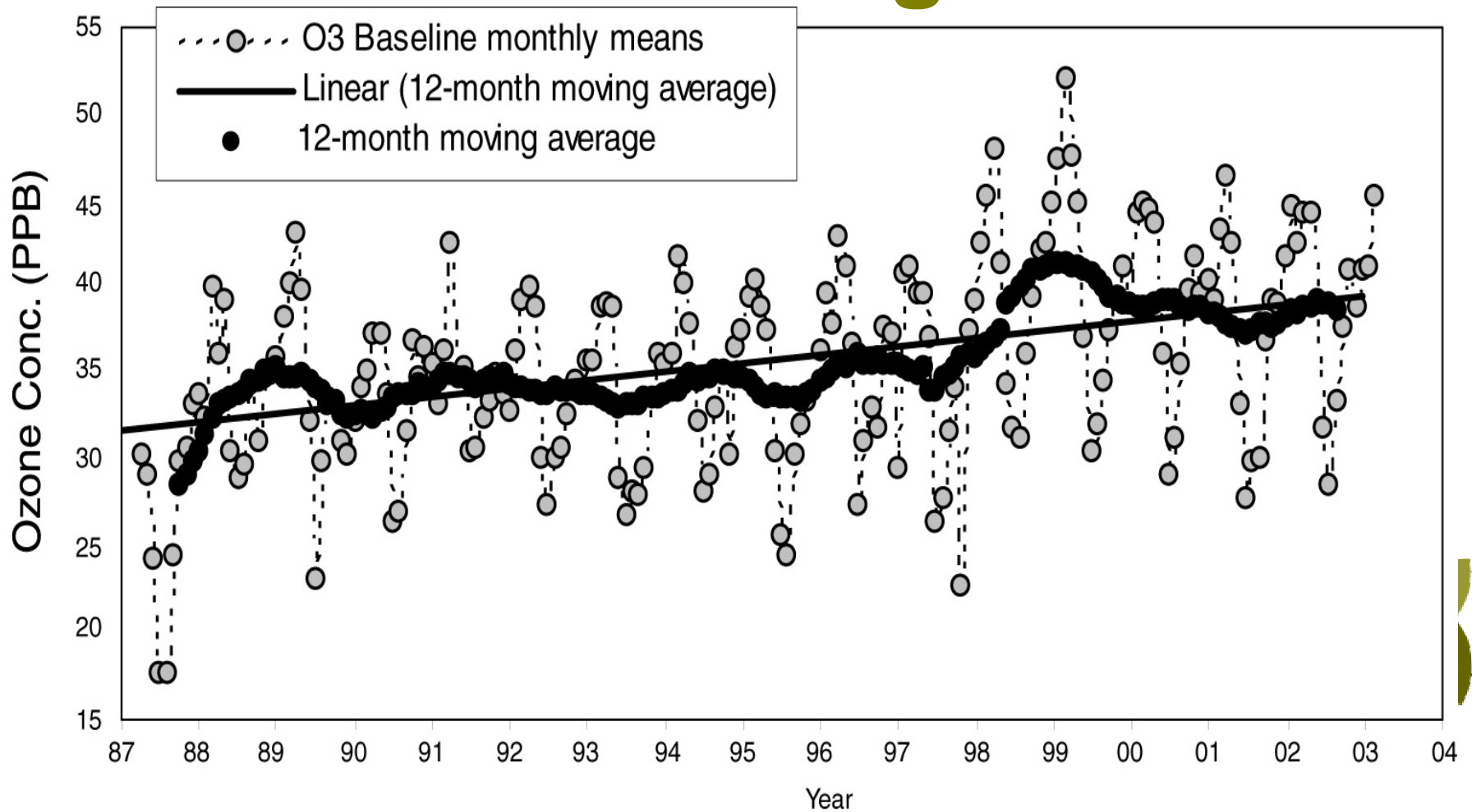




Ozone.....3

- The important question is how much does this matter for public health?
- Is there a threshold for ozone effects?
- If it does, then there is a link with the other important ozone issue – the spatial scale of the problem
- As mean NO_x levels decrease, mean ozone levels will increase towards the background level.....**BUT**.....

The Background is increasing!



Hemispheric transport of Ozone

- It is now a recognised fact that intercontinental transport of ozone occurs in the Northern Hemisphere
- The increasing baseline ozone level will have direct implications for
 - Damage to vegetation & crops
 - Effects on health

It will also make the reduction of NO₂ levels more difficult-thereby linking the **hemispheric** scale with the **street canyon** scale

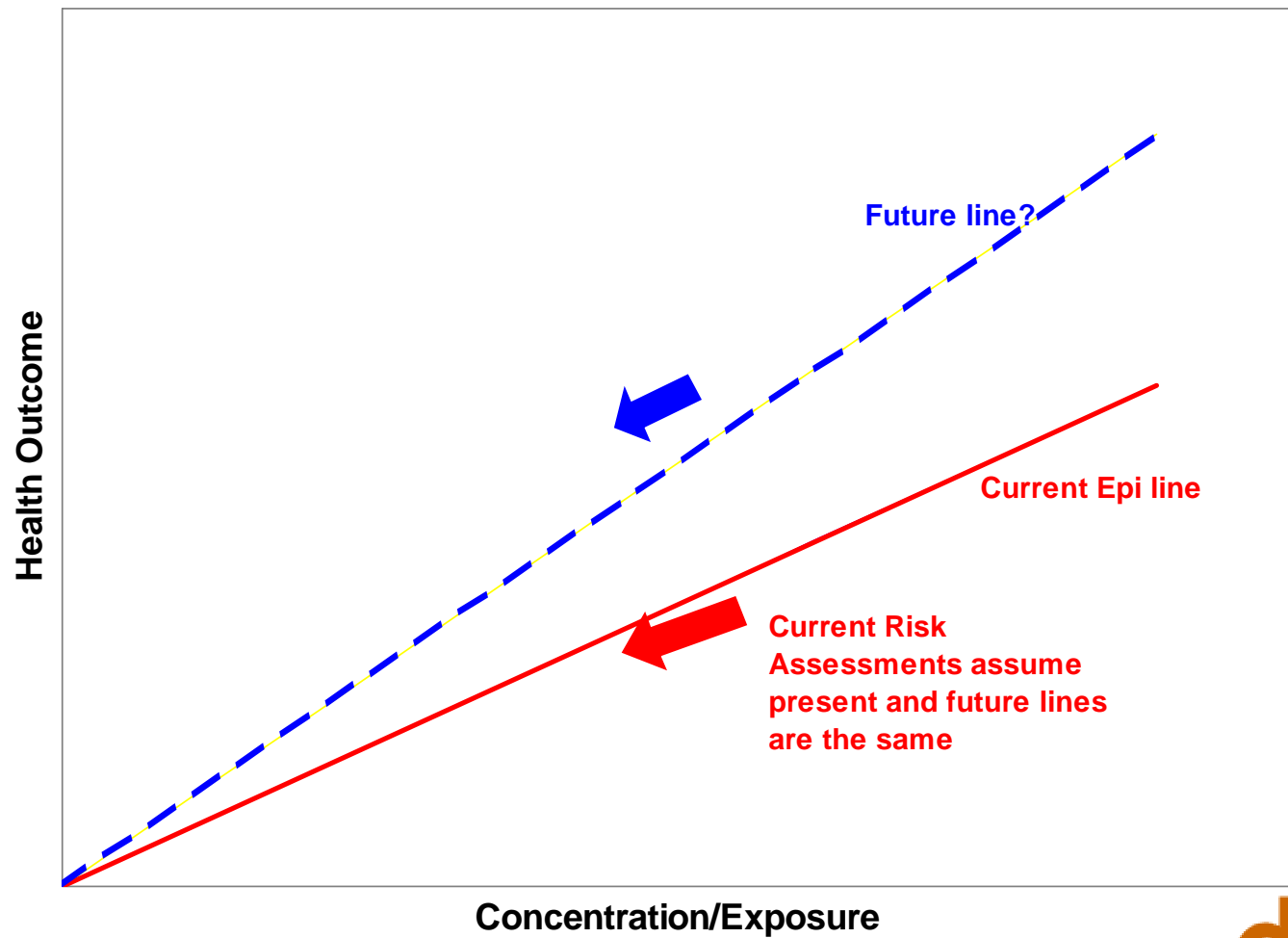
- The next generation of Air Quality Strategies in Europe (and elsewhere!) will need to be even more explicit on the hemispheric contributions
- Ozone will provide the strongest common link
- Controls on CH₄ and CO will need to be considered for air quality reasons

Links with Climate Change

- It has become clear that there are major advantages-to both sides-in considering the risk assessments and feasibility of policies together
- It is important to explore the synergies-energy efficiency, low-carbon vehicles, hydrogen economies as well as the trade-offs
- This is an inherent part of the CAFÉ process in Europe

Health Risk Assessment

- Increasing use of epi is raising questions regarding **thresholds** of effect
- These have significant implications for policy – and raise fundamental questions about air quality management methods – see later
- Do we need to do better than use the **current** exposure-response relationship to estimate **future** health risks?



- Current risk assessments use the slope of the exposure-response line at one point in time
- This is at best an approximation
- Only in the last year has there been any advance here-a recent analysis by Joel Schwarz plotted the **change** in health effects versus the **change** in pollutant concentrations

Beyond Air Quality Standards

- Recent experience in the UK suggested that an Air Quality Management System based **purely** on ambient air quality standards is inefficient as measured by improvements in public health
- Legal compliance implies 'chasing hot-spots' and this leads to increasingly unfavourable cost-benefit ratios.....

-as costs increase and the numbers of people protected decrease
- For pollutants with no threshold of effect-like PM- it will generally be more beneficial for public health as a whole to reduce concentrations everywhere, **even where they already meet legal limits**
- A legal framework which relies primarily on ambient standards therefore **exerts pressures in the wrong direction**

- We are exploring in the UK the concept of **exposure-reduction** where there is a dual system of
 1. Compliance with a Limit Value, Objective or Standard to ensure **environmental justice**
 2. Achieving a **concentration reduction** in ambient levels at **all** sites, even if they already meet the standard

Thank you !

The views in this talk are mine alone and do not represent the views of Defra or Her Majesty's Government.

