Atmospheric Science

10:15

Ally Lewis

Air Quality and atmospheric science
– key issues, future requirements

Prof. Alastair Lewis

750 years of UK air pollution science in one slide

Edward 1 (1239 – 1307),
the first air pollution regulator

Air pollution and the industrial
Revolution 1750 - 1900

London smog, Clean Air Act 1956

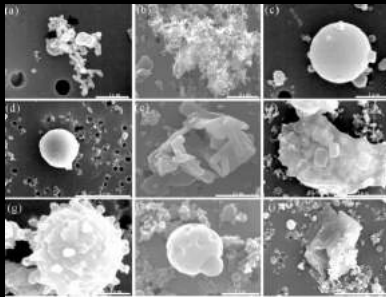Acid rain and trans-boundary
pollution (1960 - 1970s)

Diesel Euro5 emissions and Nitrogen
Dioxide (2010-2020?)

The net zero future? 2020 – 2050

What are the pollutants of concern?

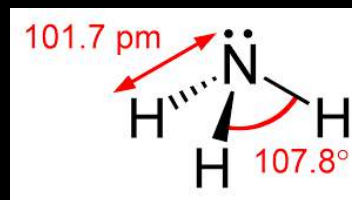**Particulate matter** – PM$_{2.5}$ – particles smaller than 2.5 microns diameter

Nitrogen Dioxide – a brown toxic gas from high temperature combustion

Ozone – a blue-ish highly unstable gas formed in the lower atmosphere from other pollutants

Sulfur Dioxide – a colourless gas, from mainly from burning coal and heavy oil, & occasional volcanos

Ammonia – an unstable 'sticky' gas, predominately from farming emissions

101.7 pm

107.8°

VOCs – a group of organic chemicals, from fuels, paints, products and many more

HIGH
VDC CONTENT 25% to 50%
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VOCs. (Volatile Organic Compounds) contribute to atmospheric pollution.

What factors create poor air quality in the UK?

- Simplistically: Air Pollution = emissions x weather x chemistry x toxicity
- Only the emissions component is under policy / regulatory control
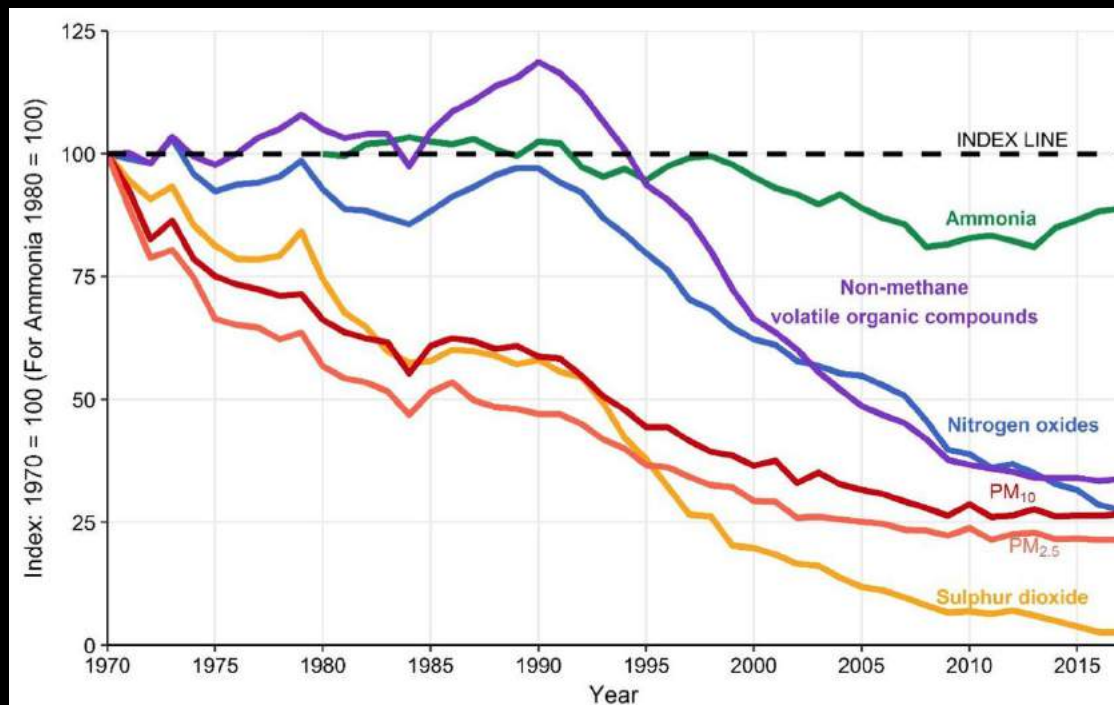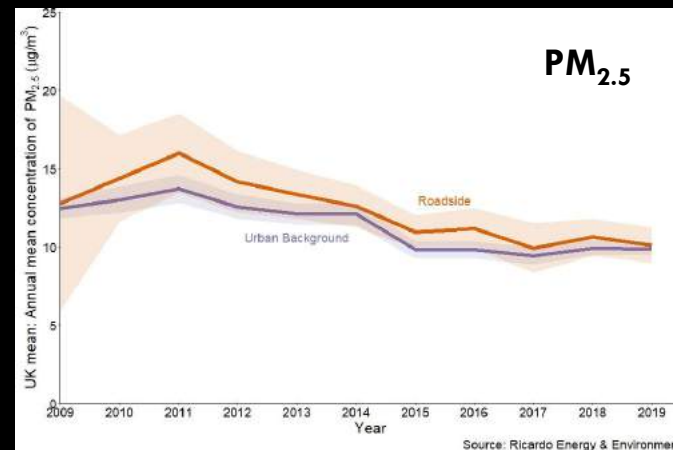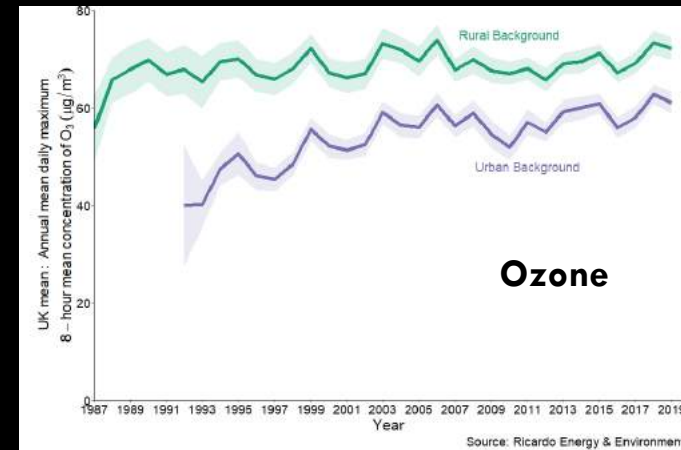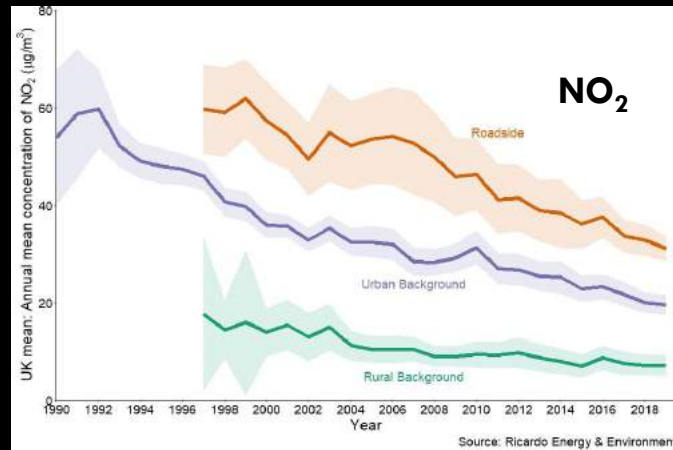

Changes in UK emission totals for various pollutants.

Source: National Atmospheric Emissions Inventory, Defra/Ricardo 2018

UK air quality trends on the ground

NO$_2$

Ozone

PM$_{2.5}$

A future challenge for the UK will be improving air quality for those pollutants that have significant secondary / non-local sources.

Non-linear atmospheric chemistry makes the job more difficult

Source: Defra/Ricardo National Air Quality Statistics (2019)

Changing perceptions of pollution

Public perceptions of AQ

Future critical sectors

Science and horizon scanning

Skepticism of atmospheric and health science evdience

Atmospheric "solutions pseudo-science"

The post-COVID world