

UK air pollution forecasting

Greg Archer

**Air and Environmental Quality Division
DEFRA**

Content



- **Uses and limitations of forecasts**
- **Overviews of UK air pollution episodes**
- **Introduction to the UK National Forecasting system**
- **Forecast accuracy**
- **Conclusions**

DEFRA

Department for
**Environment,
Food & Rural Affairs**

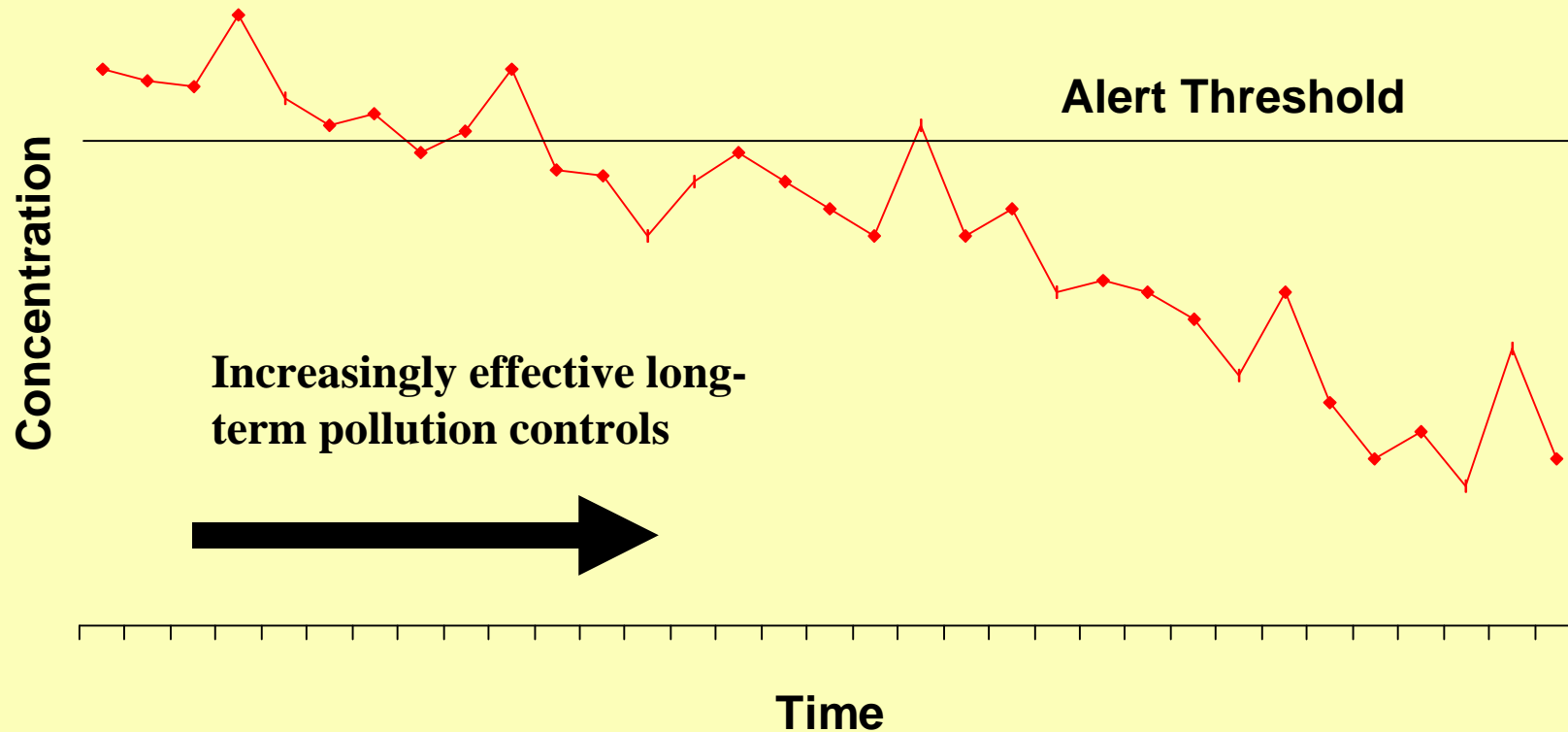
are you doing **your bit?**

Why forecast air pollution?

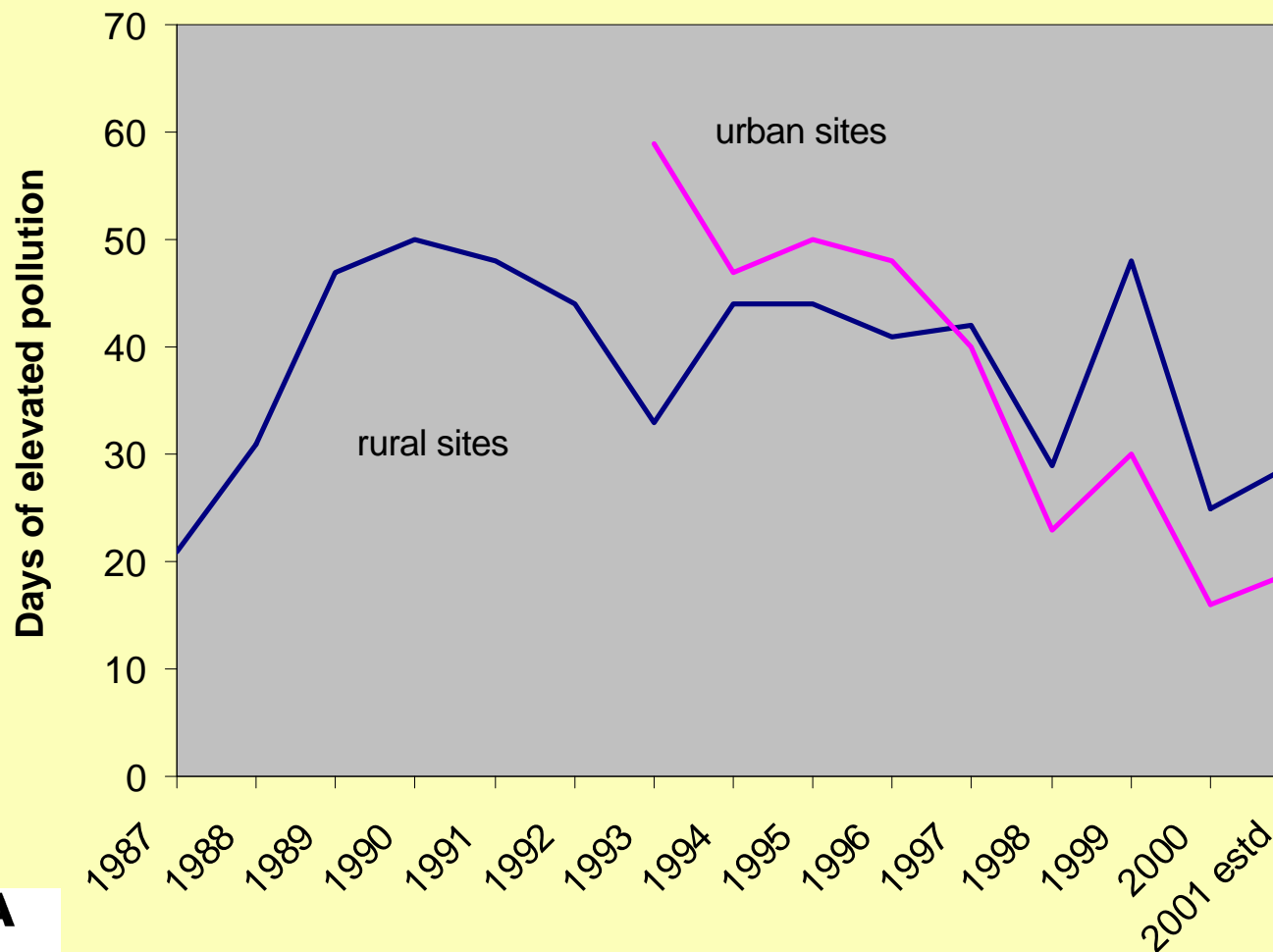
- To inform sensitive groups about periods of high pollution
- To encourage the public to take personal actions to reduce polluting emissions
- To provide advance warning to public services
- To comply with European Directives
- Because the weather is unpredictable!



Impact of Long-term Strategies



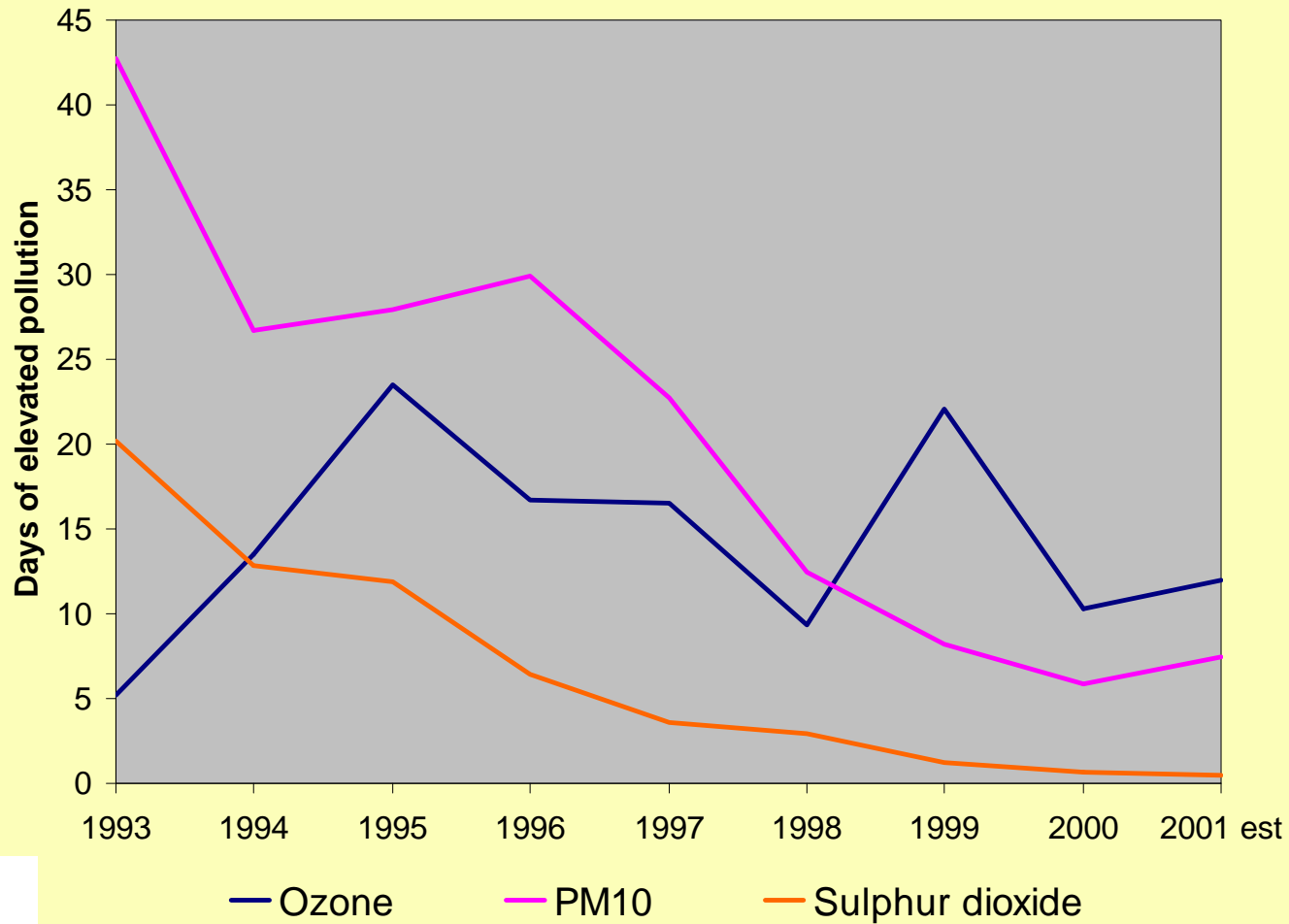
Air pollution trends



DEFRA
Department for
Environment,
Food & Rural Affairs

are you doing **your bit?**

Elevated pollutants



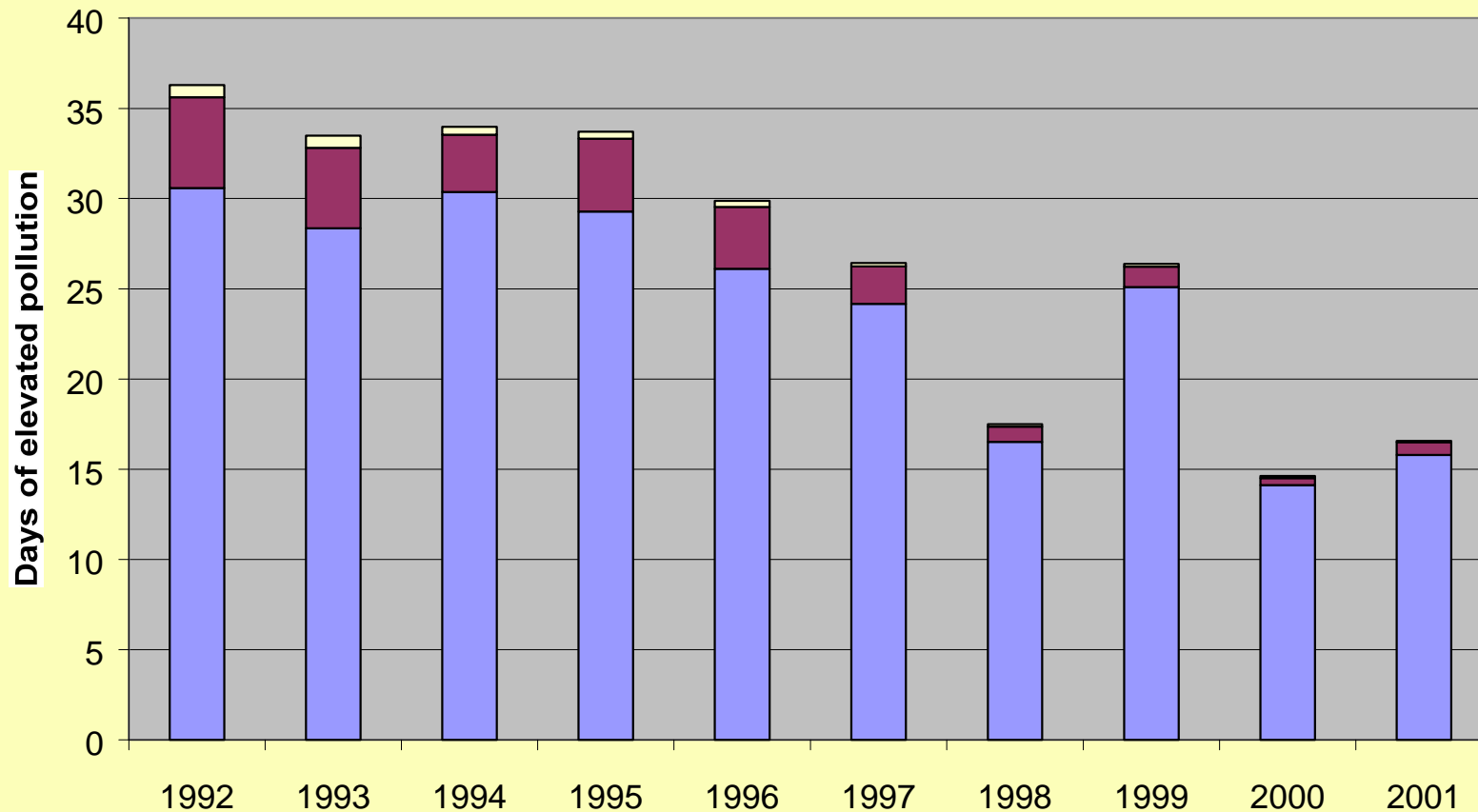
DEFRA
Department for
Environment,
Food & Rural Affairs

are you doing **your bit?**

Air pollution bands and index

	Index	SO ₂	NO ₂	O ₃	PM ₁₀	CO
mg/m ³		15 min	1 hr	8 hrs	24 hrs	8 hrs
Very High	10	> 400	> 400	>180*	>100	>20
High	7 – 9	200 – 399	300 – 399	90 – 179	75 – 99	15 – 19.9
Moderate	4 – 6	199 – 100	150 – 299	50 – 89	50 – 74	10 – 14.9
Low	1 – 3	< 100	<150	<50	<50	<10

Episode severity



DEFRA
Department for
Environment,
Food & Rural Affairs

■ Moderate ■ High □ Very High

are you doing **your bit?**

Air Pollution Forecast

Air pollution forecast until 4pm Wed Nov 21st

Region	In rural areas	In towns and cities away from busier roads	In towns and cities next to busier roads
Northern Ireland	2 (Low)	2 (Low)	2 (Low)
London		3 (Low)	3 (Low)
Midlands	2 (Low)	4 (Moderate)	4 (Moderate)
North East England	2 (Low)	3 (Low)	3 (Low)
North West England	2 (Low)	4 (Moderate)	4 (Moderate)
South East England	2 (Low)	3 (Low)	3 (Low)
South West England	2 (Low)	4 (Moderate)	4 (Moderate)
East Anglia	2 (Low)	2 (Low)	2 (Low)
Scotland	3 (Low)	3 (Low)	3 (Low)
Wales	3 (Low)	3 (Low)	3 (Low)

Air Pollution is on a scale of 1 to 10

Low (1 - 3)

Moderate (4 - 6)

High (7 - 9)

Very High (10)

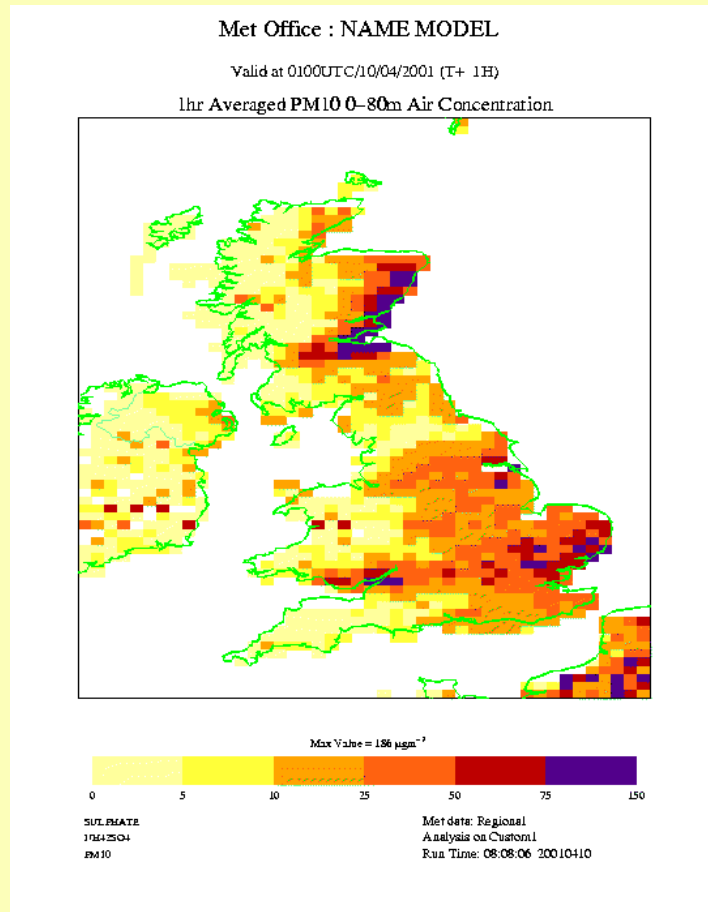
[About this scale](#)

Forecasting tools

- Air pollution modelling
- Weather forecasting and interpretation
- Review of current monitoring data
- Local knowledge and emissions information
- Expert judgement



Current models



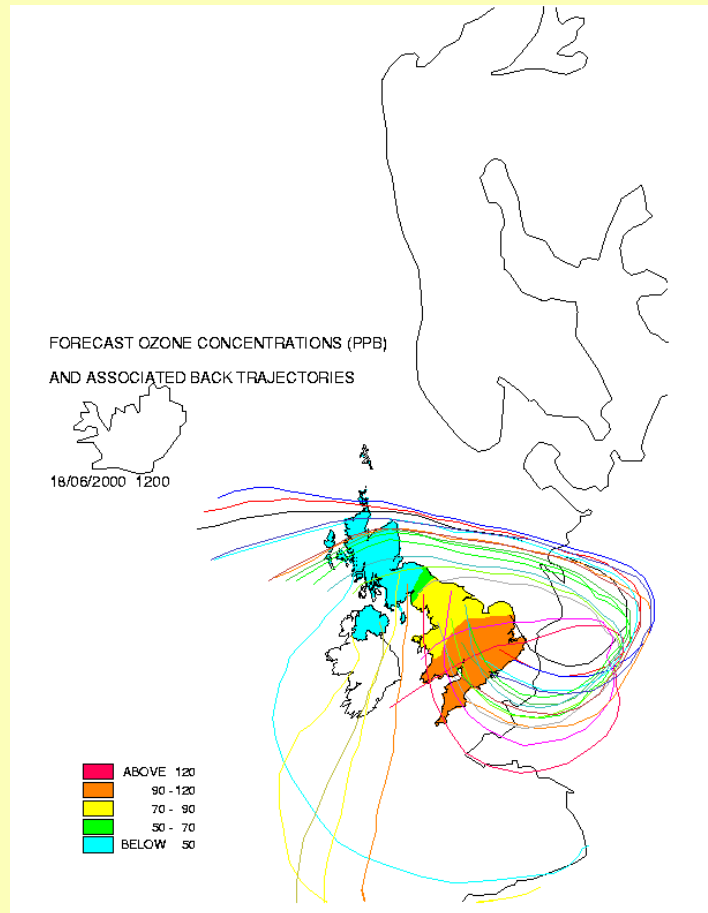
- NAME
 - Primary PM₁₀
 - Sulphur dioxide
 - Nitrogen dioxide
 - Carbon monoxide

DEFRA

Department for
**Environment,
Food & Rural Affairs**

are you doing **your bit?**

Current models



- NAME
 - Primary PM₁₀
 - Sulphur dioxide
 - Nitrogen dioxide
 - Carbon monoxide
- Trajectory Model
 - Ozone
 - Secondary PM₁₀

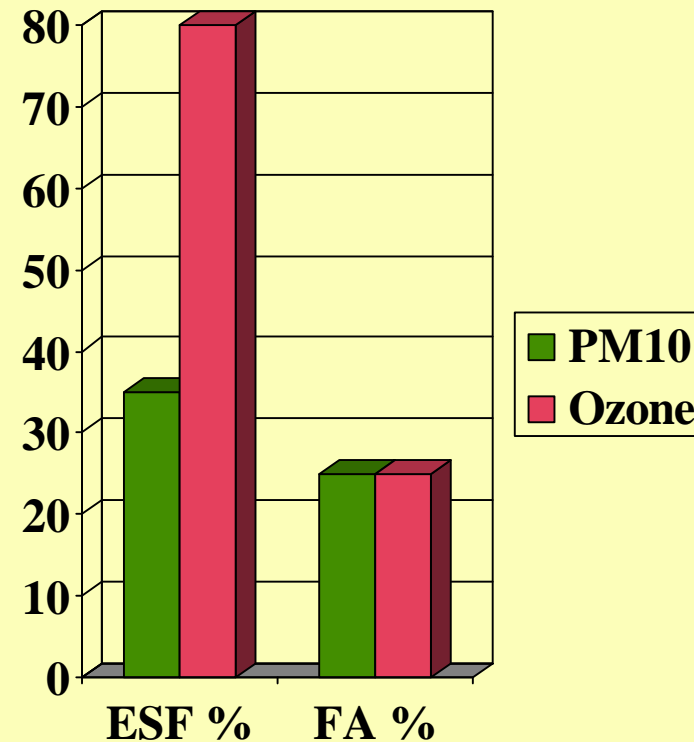
DEFRA

Department for
**Environment,
Food & Rural Affairs**

are you doing **your bit?**

Forecast accuracy

- % of Episodes Successful Forecasts
 - “Episode hit rate”
- % Forecast Accuracy
 - “Overall accuracy” including false positives

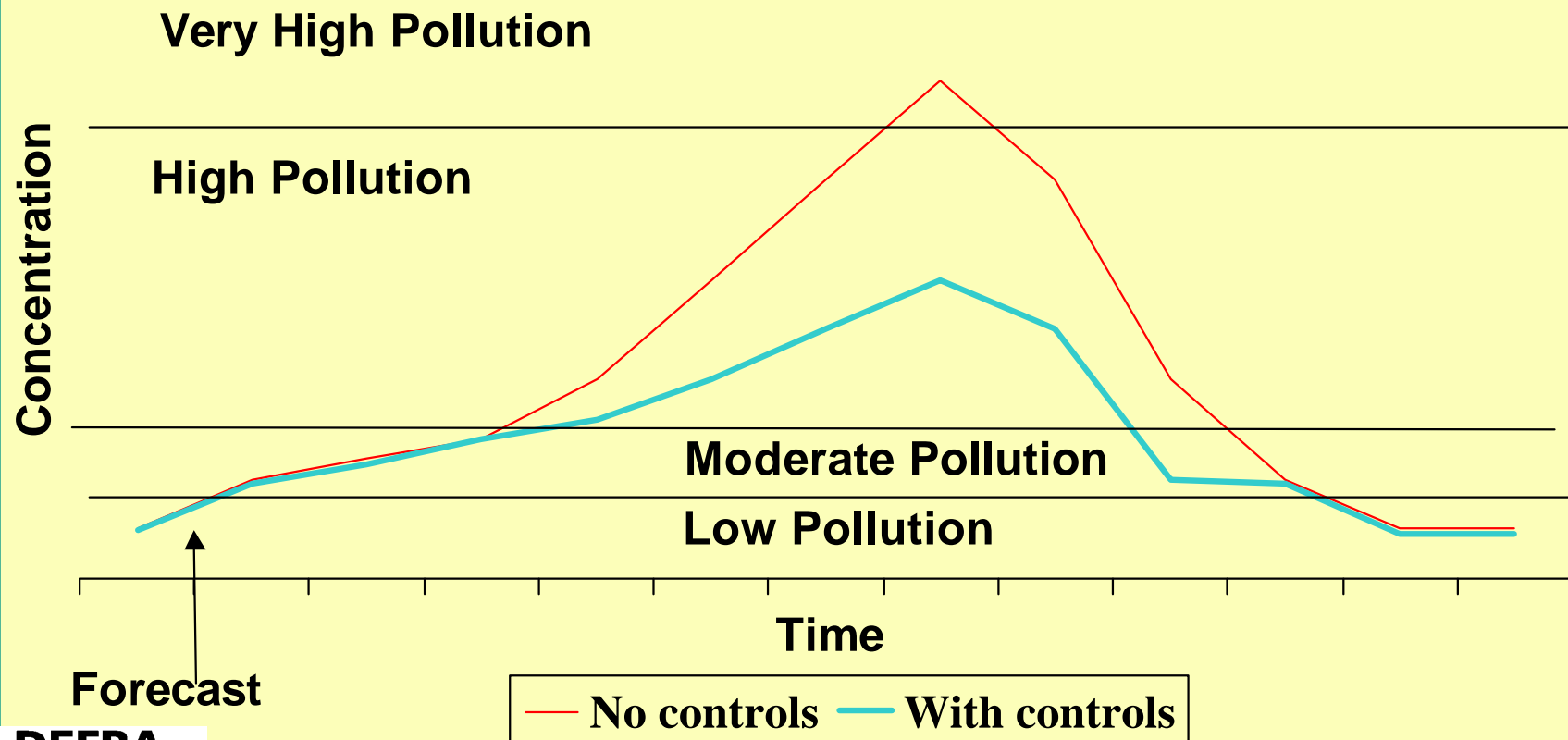


Forecast accuracy limitations

- Uncertain Weather
- PM₁₀ - Local construction works
- Transient local sources
- Ozone - cloud cover
- Precautionary forecasts



Future management tool?



DEFRA
Department for
Environment,
Food & Rural Affairs

are you doing **your bit?**

Short-term controls

- Short-term controls previously employed in
 - Paris
 - Germany
 - Rome
 - Athens
 - Mexico City
 - Santiago
- Not currently employed or widely advocated in the UK
- Effectiveness limited
- Considerable planning, advanced warning and public support needed for success
- Probably not cost effective with current forecast accuracy

DEFRA

Department for
Environment,
Food & Rural Affairs

are you doing **your bit?**

Conclusions

- **Extended periods of Very High pollution are now very rare**
- **Forecasts important for effective public information**
- **DEFRA national forecast issued at least daily**
- **Forecast accuracy constrained by uncertainties in weather and emissions**
- **Current forecasts probably not sufficiently robust as the basis for short-term emissions management**

DEFRA

Department for
**Environment,
Food & Rural Affairs**

are you doing **your bit?**

UK air pollution forecasting

Greg Archer

**Air and Environmental Quality Division
DEFRA**