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Is Local Air Quality Management a successful strategy in achieving selected EU Limit Values?

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LAQM Consultation

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bettertogether

Overview

- Premise
- Introduction to Air Quality Management in England
 - Air Quality Strategy
 - Local Air Quality Management
 - Exceedence of EU NO₂ Limit Value
- Methodology
- Next steps
- Interim conclusions

Premise

- Despite 15 years of UK Local Air Quality Management (LAQM), exceedences of UK Air Quality Objectives and EU Limit Values for traffic-related pollutants, especially NO₂, are still widespread.
- The purpose of the research is to determine whether LAQM in England has contributed towards achieving the EU NO₂ annual mean Limit Value.
- Part of the Methodology of this research is discussed here, highlighting some of the limitations of LAQM in contributing towards achieving EU Limit Values in England.

National air quality strategy

- In 1997 the UK Government published the first of three Air Quality Strategies presenting the national approach and setting out the Local Air Quality Management (LAQM) process to manage air pollution.
- Principle of subsidiarity: “Action should be taken to improve air quality at the most appropriate level, be it international, European, national or local”.
- LAQM role was to be in supplementing and “fine tuning” central policies at local hotspots where national measures would be too blunt or expensive.



Local Air Quality Management

- The UK Air Quality Regulations 1997 introduced Air Quality Objectives (AQOs) for LAQM, which were comparable with, but sometimes stricter than the EU Limit Values.
- Failure to achieve an AQO means the Local Authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP).
- Local Authorities required to *work towards* meeting the AQOs in their AQAPs as it was recognised that local air quality was not only a local issue.
- ~60% (238) UK Local Authorities declared AQMAs, primarily for NO₂ and PM₁₀ from traffic (2011).
- But as yet no traffic-related AQMAs have been revoked on the basis of Local Authority measures implemented in AQAPs¹.

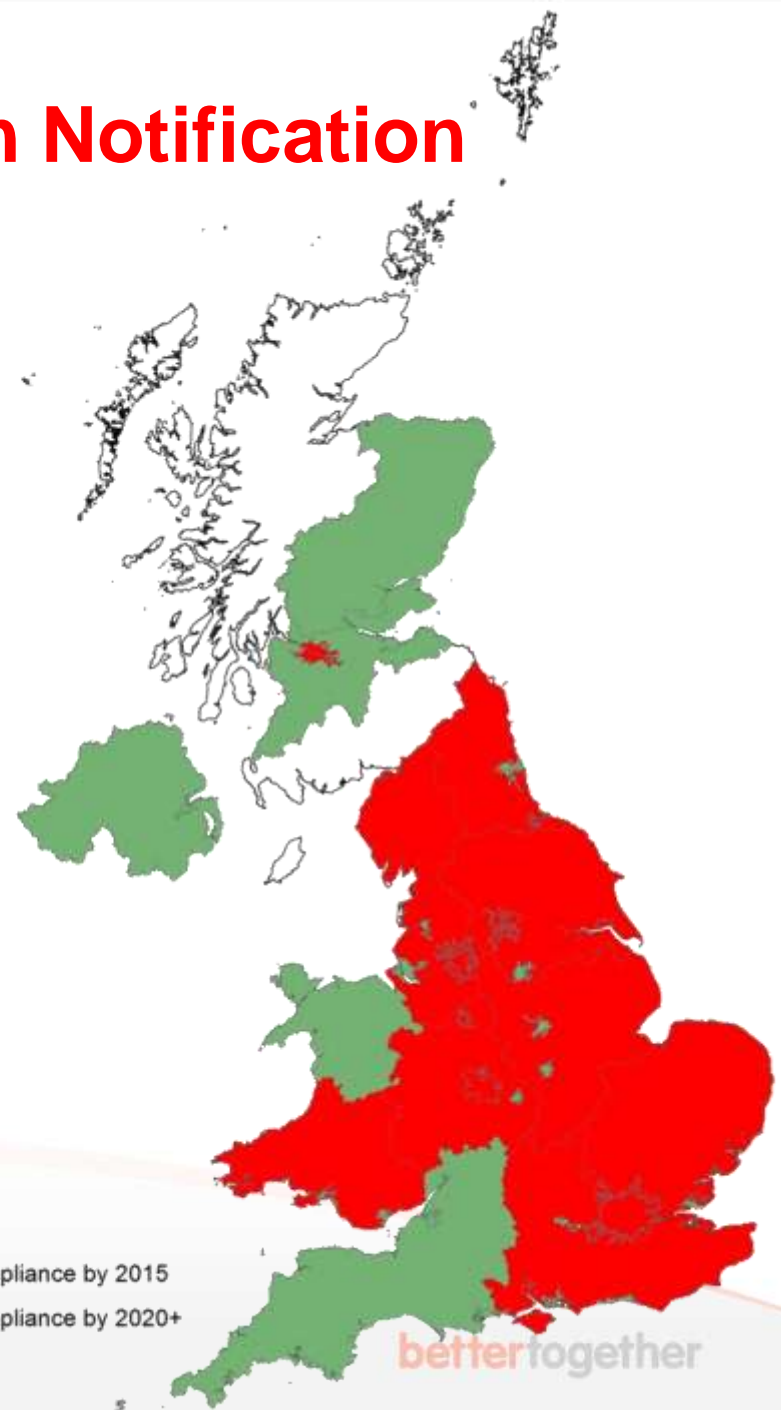
¹ Review of Effectiveness of LA AQAP and Future Policy Options for LAQM (2013).

NO₂ Time Extension Notification

- September 2011 – Defra submitted Time Extension Notification (TEN) for compliance with NO₂ annual mean Limit Value to 1st Jan 2015 in 23 zones and agglomerations.
- 17 zones and agglomerations won't meet 2015 – High Court, the Court of Appeal and the Supreme Court agreed the government is in breach of the Directive but action referred to the European Court of Justice.
- TEN action plans relied heavily on the implementation of Low Emission Zones (LEZs) subject to Local Authority discretion.

Legend

- compliance by 2015
- compliance by 2020+



Research hypothesis and objectives

- **Research question:** Is Local Air Quality Management a successful strategy in achieving selected EU Limit Values?
- **Research hypothesis:**
 - *Local Air Quality Action Plans are not successful in terms of reducing local concentrations of nitrogen dioxide and therefore Local Air Quality Management will not achieve the annual mean UK Air Quality Objective and so will not make a full contribution to meeting the relevant EU limit value.*
- **Research objectives:**
 - Objective 1: Document the change in the concentration of annual mean nitrogen dioxide (road-contribution) using continuous monitoring data, in AQMAs declared in Round 1 of Review and Assessment;
 - Objective 2: Evaluate, using multiple regression, whether the measures included in the Air Quality Action Plans produced following Round 1 are being achieved and whether implementation is contributing to an improvement in nitrogen dioxide concentrations.

Methodology

Step 1 – assess significant changes in road-contribution nitrogen dioxide within AQMAs against Round 1 baseline

a) Identify AQMAs for traffic-related NO₂ annual mean objective resulting from Round 1 in England.

b) Establish road contribution NO₂ within AQMA at the time of declaration from Stage 3 report/AURN.

c) Establish road contribution NO₂ within same AQMAs at the end of Rounds 2 & 3 from USA reports/AURN.



Step 2 – assess the implementation of Action Plan (local) measures

a) Identify original Round 1 Action Plan for those AQMAs identified in Stage 1.

b) Identify measures completed from final AQAP and latest AQAP-PRs.

c) Typologise AQAP measures according to AQAP appraisal checklist.



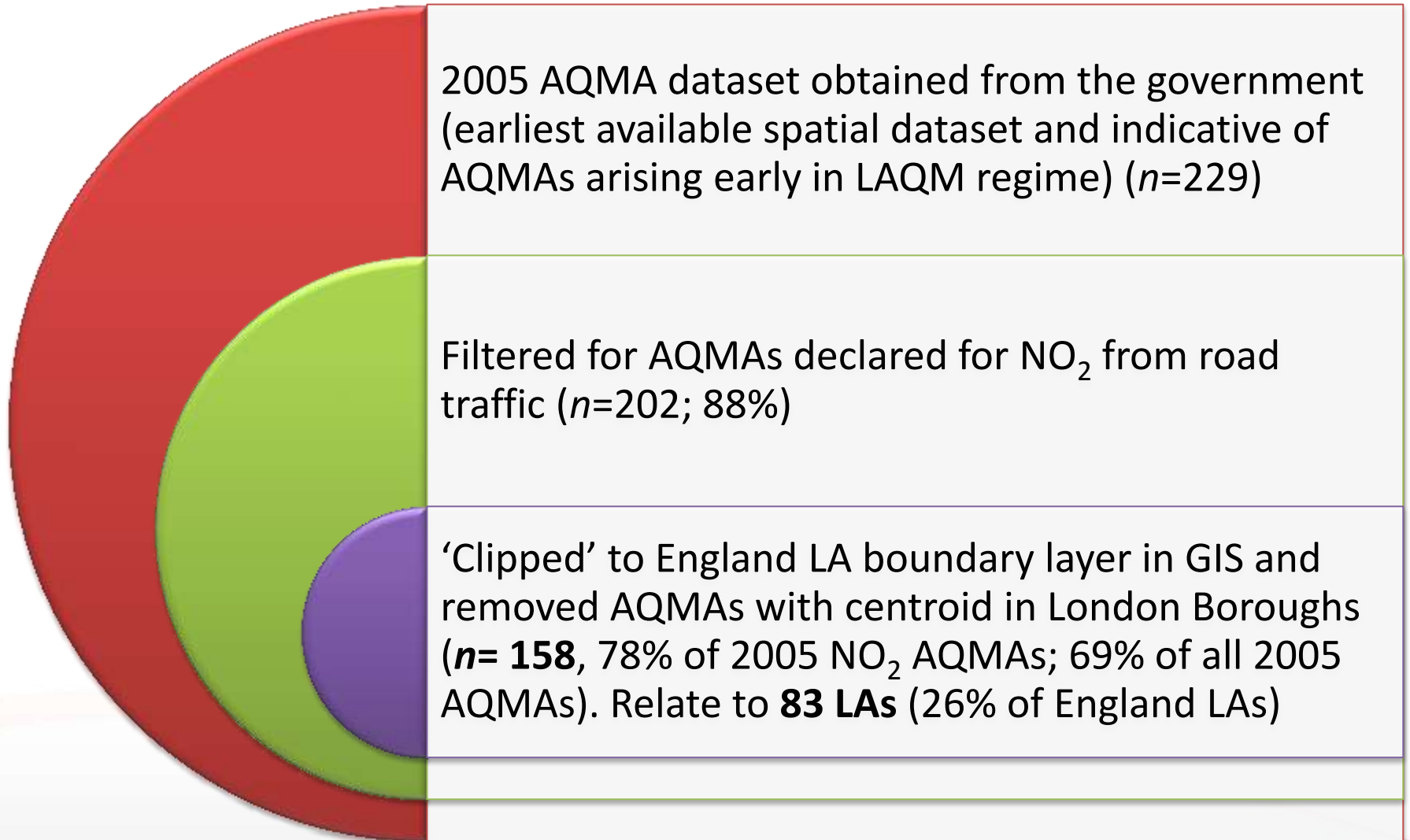
Step 3 – statistically determine whether there is any correlation between changes in nitrogen dioxide concentrations (step 1) and AQAP implementation (step 2)

a) Use multiple regression to determine whether there implementation of measure typologies are predictive of improved NO₂.

b) Significant difference in *p-value* may indicate association between Action Plans and NO₂ reductions.

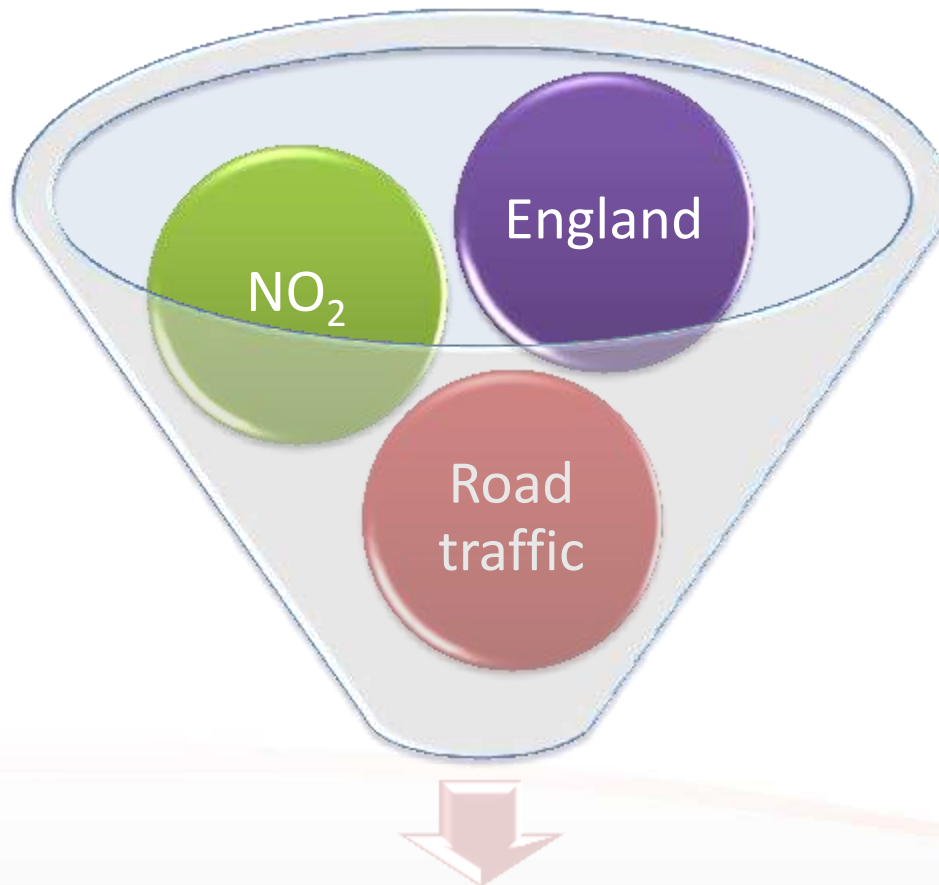
c) No significant difference in *p-value* indicates that Action Plans are not working.

Initial sample filtering process (1)



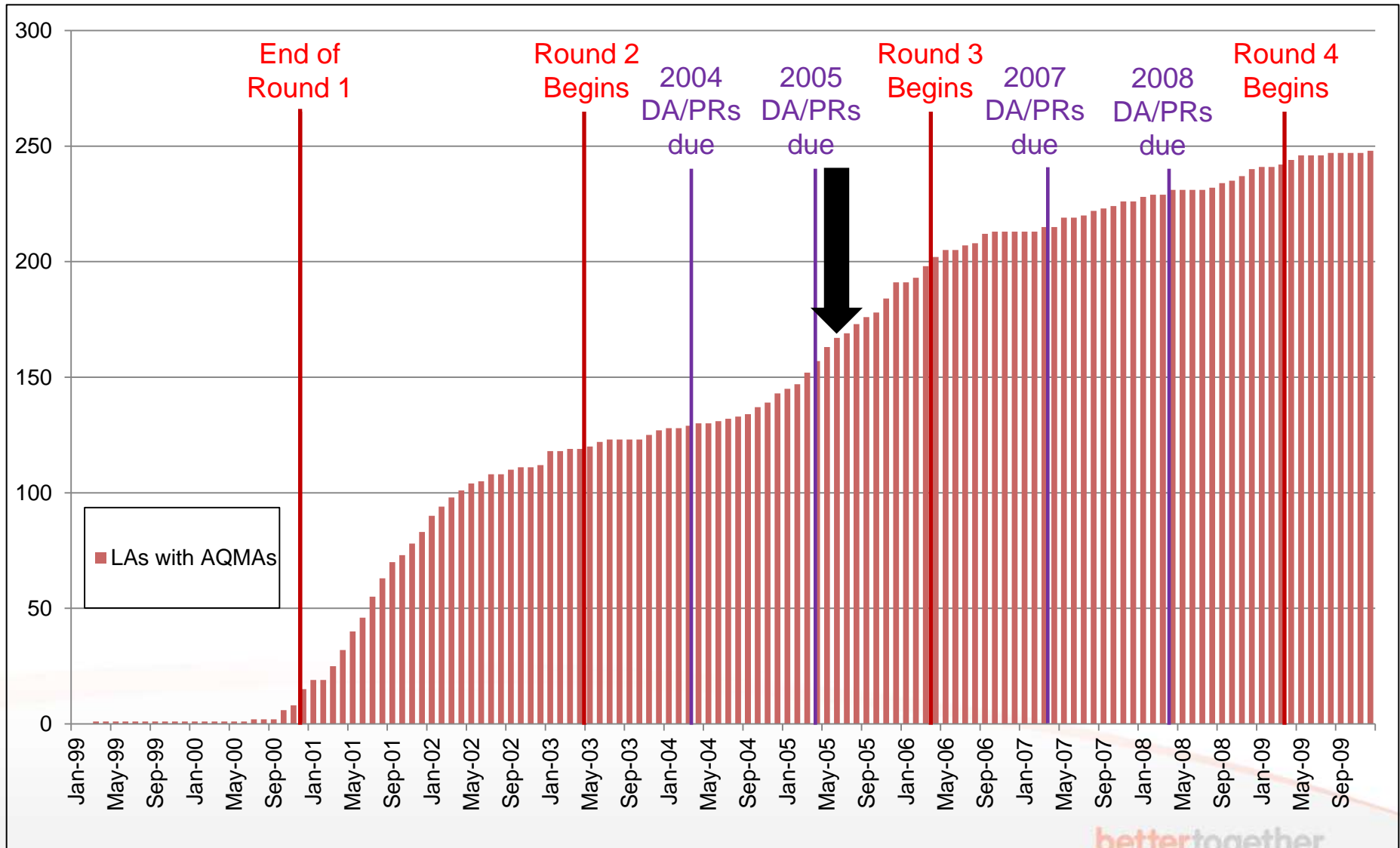
Initial sample filtering process (2)

2005 AQMA dataset ($n=229$)



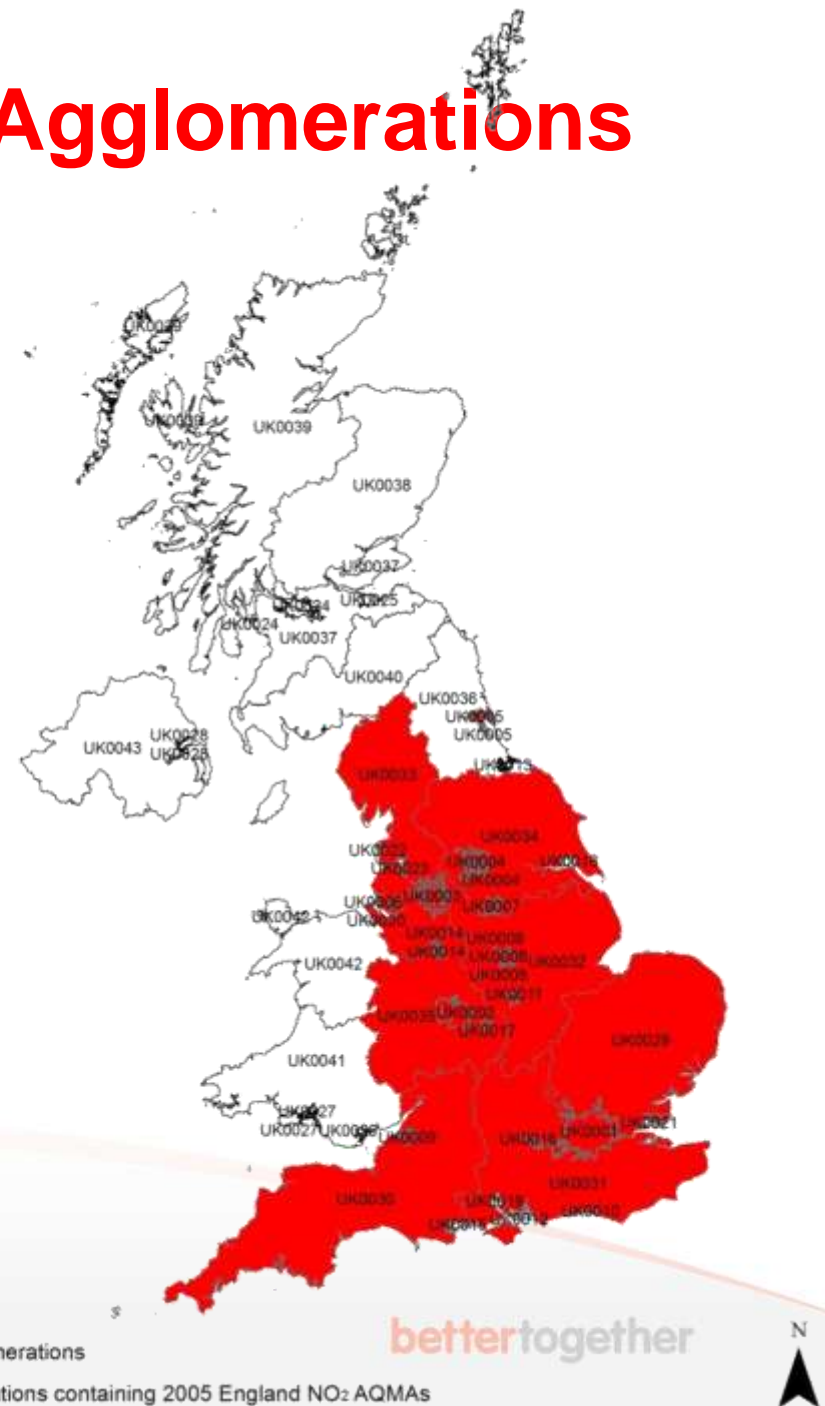
83 England LAs with 158 traffic-related AQMAs
for NO₂ declared by July 2005

Number of Local Authorities with AQMAs

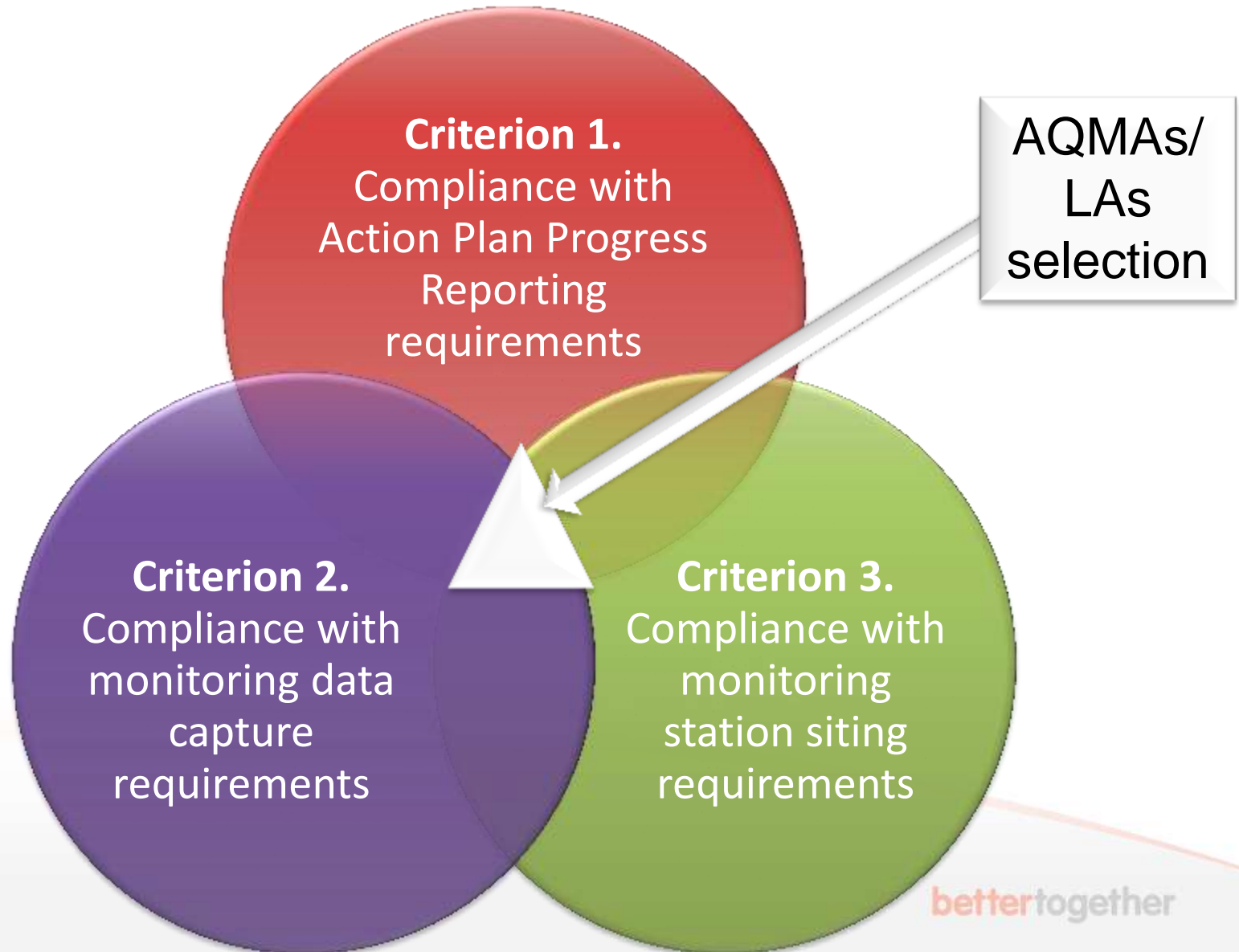


AQMAs in Zones and Agglomerations

- Zones and Agglomerations spatial dataset obtained from EEA AirBase v.6
- AQMAs intersect with
 - 21 of the 43 UK Z&As, all of which $>$ EU NO₂ annual mean Limit Value and
 - 11 AQMAs (in 8 LAs) that intersect with Greater London agglomeration $>$ EU LV NO₂ hourly mean
- N.B. Zones and Agglomerations are not necessarily coterminous with LAs or AQMA boundaries



Criteria for selecting AQMAs/LAs

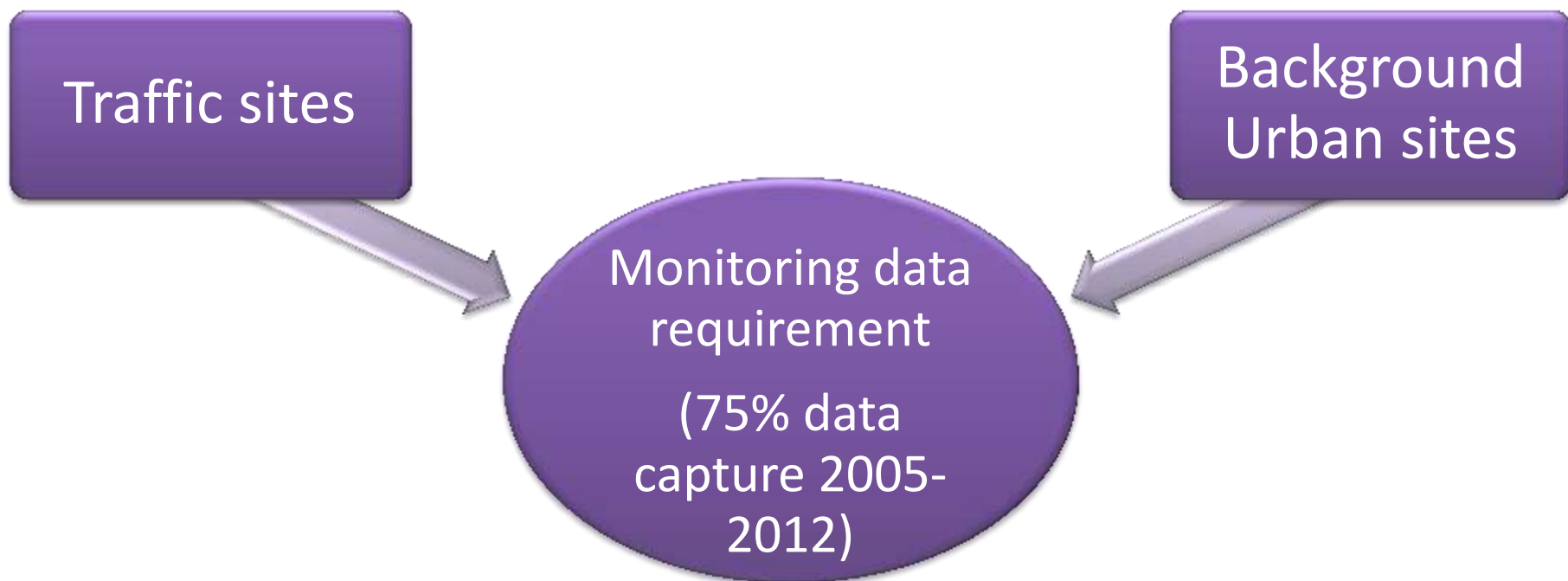


1. Action Plan Progress Report criteria



- Of the 158 2005 AQMAs, there were 101 (covering 52 local authorities) meeting the criteria for selection of Action Plan Progress Reports (i.e. Action Plans published pre-1/1/2006 and revised Action Plans, Action Plan Progress Reports or Updating and Screening Assessments containing Action Plan Progress Reports, published in 2009 or later).

2. Monitoring data criteria



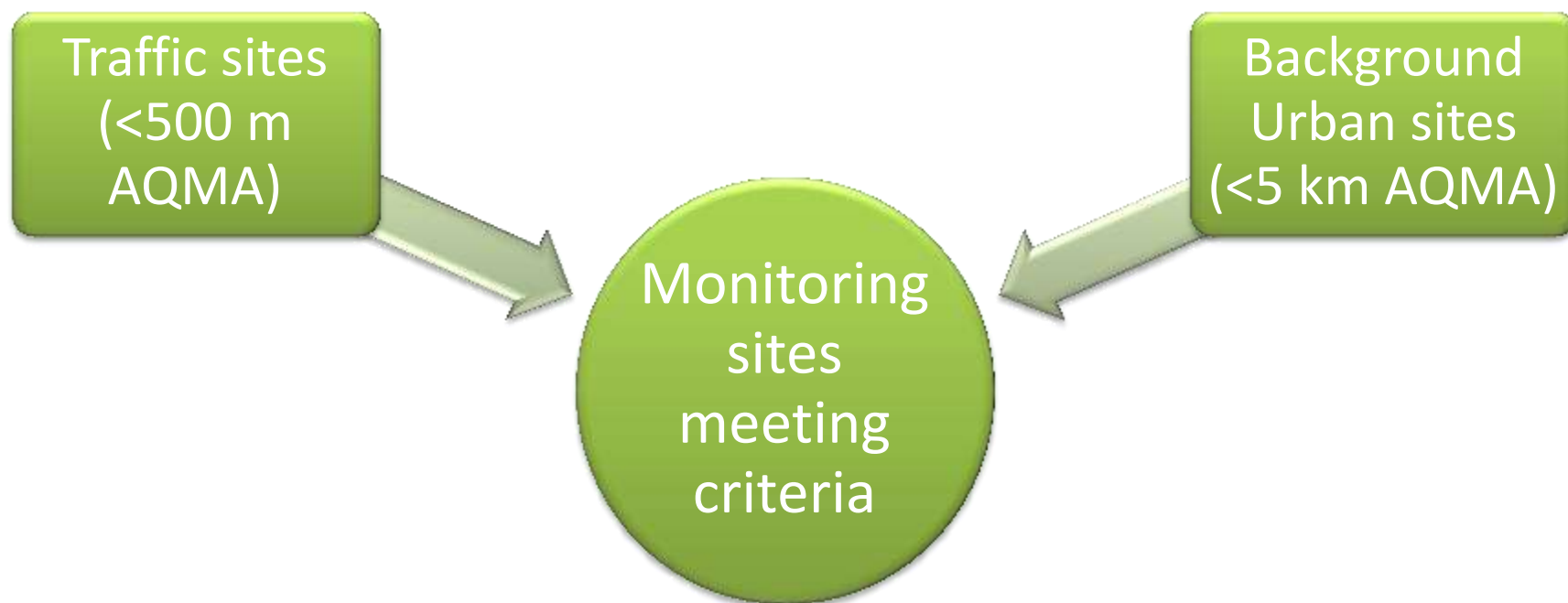
- Annual mean NO₂ monitoring data (annual data capture >75%) for all AURN sites (1961-2012) obtained from Defra ($n=178$)
- Sites filtered for NO₂ data >75% data capture for the period 2005-2012 (i.e. at least six years' data) ($n=77$; 43%)

Local contribution NO₂



Defra site types	Defra definition	EU site types	2008/50/EC Directive definition	Interpreted distance criteria
Kerbside	Representative of street segment no less than 100 m length. At least 25 m from the edge of major junctions and no more than 10 m from the kerbside	Traffic	At least 25 metres from the edge of major junctions and no more than 10 metres from the kerbside	< 0.5 km
Roadside				
Urban centre	Representative for several square kilometres	Background urban	Places representative of exposure of the general urban population	< 5 km
Urban background				

3. Monitoring siting criteria



- Spatial data for government monitoring sites obtained (130 operational and 79 closed sites)
- Closed sites filtered for NO₂ monitoring stations ($n=57$) and England ($n=31$)

Sites meeting siting and data capture criteria

- Filtered NO₂ data for the 77 AURN sites joined to closed and operational monitoring sites based on site name in ArcGIS
 - 75 operational sites meeting data requirement criteria
 - 1 closed site meeting data requirement criteria
- Closed and operational sites merged into one dataset with **76 monitoring sites with NO₂ annual mean concentrations >75% data capture from 2005 to 2012**

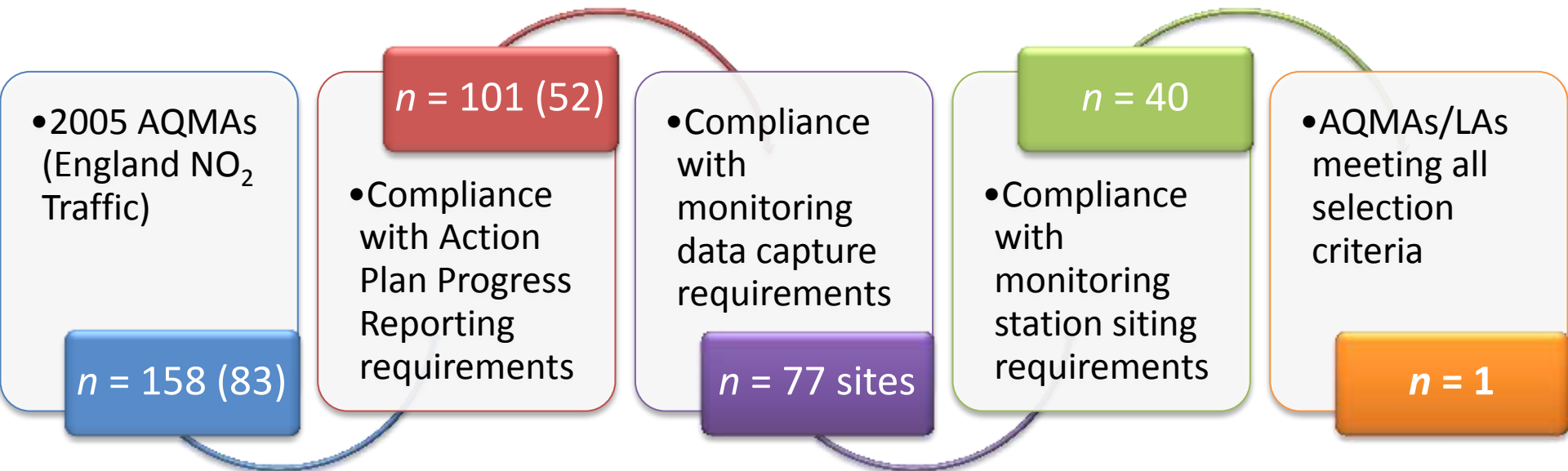
Selected AQMAs by monitoring site types

- Monitoring sites selected by EU site type and spatially joined to 2005 England NO₂ AQMA dataset in turn based on AQMAs that are intersected by monitoring sites + a variable buffer:
 - Traffic Urban (>0.5 km) ($n=4$, 4 LAs)
 - Background Urban (>5 km) ($n=38$, 23 LAs)
- 2 AQMAs (Bristol AQMA and Bury AQMA) have sufficient Traffic Urban and Background Urban monitoring sites available to calculate the local element of NO₂
- 2 AQMAs have Traffic sites only (Bath AQMA, Oxford AQMA)
- 36 AQMAs have Background Urban sites only
- **118 AQMAs (75%) which have no government monitoring sites meeting siting and data criteria for the period 2005-2012**

Selected AQMAs meeting monitoring data and station siting criteria and Action Plans criteria

- Of the 101 AQMAs meeting Action Plan Progress Reports criteria:
 - 1 (Bristol AQMA) met the monitoring data and station siting criteria for Traffic Urban and Background Urban sites
 - 1 AQMA (Oxford AQMA) met the monitoring data and station siting criteria for Traffic Urban sites only
 - 24 (across 13 local authorities) met the monitoring data and station siting criteria for Background Urban sites only
- **Using government monitoring sites alone, therefore, there is insufficient data available to calculate the local contribution to NO₂ and therefore the effectiveness of the Action Plan implementation to reduce local NO₂**

Summary flow diagram



Next steps

- Identify local authority monitoring stations meeting the selection criteria to complement the government monitoring sites for those local authorities with sufficient Action Plan Progress Reports
- Calculate the local contribution to NO_2 in each AQMA (Traffic NO_2 minus Background Urban NO_2)
- Determine whether there is any change in local NO_2 between 2005 and 2012 in each AQMA
- Look at Action Plans and Action Plan Progress Reports for these local authorities and identify any measures that have been implemented
- Case studies for each local authority meeting the selection criteria to correlate local NO_2 and Action Plan implementation

Interim conclusions

- Local Air Quality Management is insufficiently calibrated to provide adequate support to the achievement of the NO₂ EU Limit Value.
- Zones and Agglomerations are not coterminous with local authority boundaries or AQMAs.
- There are insufficient government monitoring sites available to gauge progress against EU Limit Values in AQMAs.
- Local authority monitoring sites are not required to be compliant with EU siting or operational criteria.
- Requirement for local authorities to produce Action Plans (within 18 months of declaration of AQMA) and annual Action Plan Progress Reports is not enforced.
- Nevertheless, have local authorities been able to improve local air quality?
- Results will be reported soon...



Thank you for your attention.

Any questions?