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Has implementation of Local Air Quality Management reduced local nitrogen dioxide concentrations in the UK?

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Overview

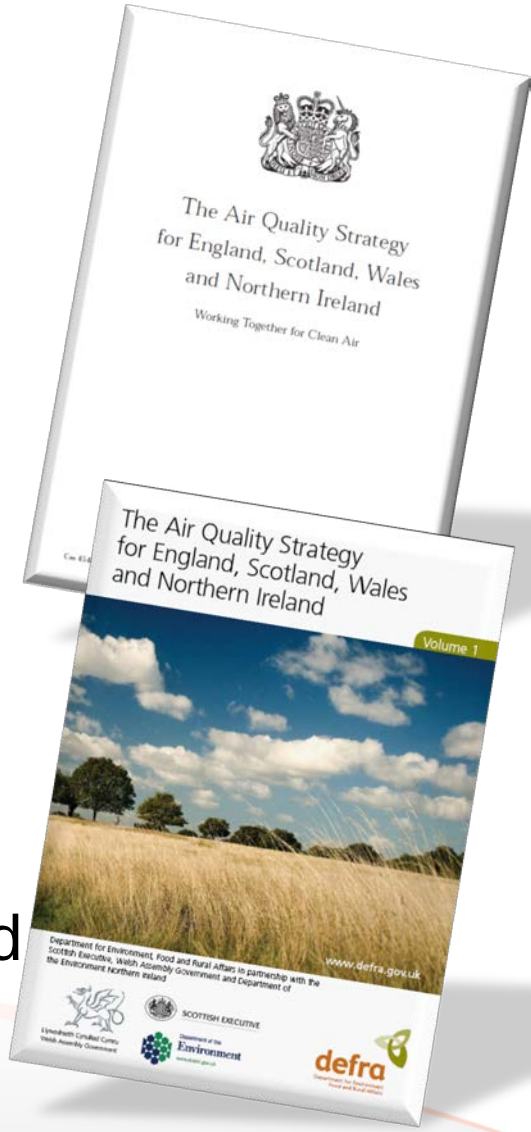
- Premise
- Introduction to Air Quality Management in England
  - Air Quality Strategy
  - Local Air Quality Management
  - Exceedence of EU NO_2 Limit Value
- Methodology
- Results
- Conclusions and Recommendations

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 NO_2, are still widespread.
- The purpose of the research is to determine whether LAQM in England has contributed towards achieving the EU NO_2 annual mean Limit Value.
- Part of the Methodology and Results of this research are discussed here, highlighting some of the limitations of LAQM in contributing towards achieving EU Limit Values in England and making recommendations for improvements.

National air quality strategy

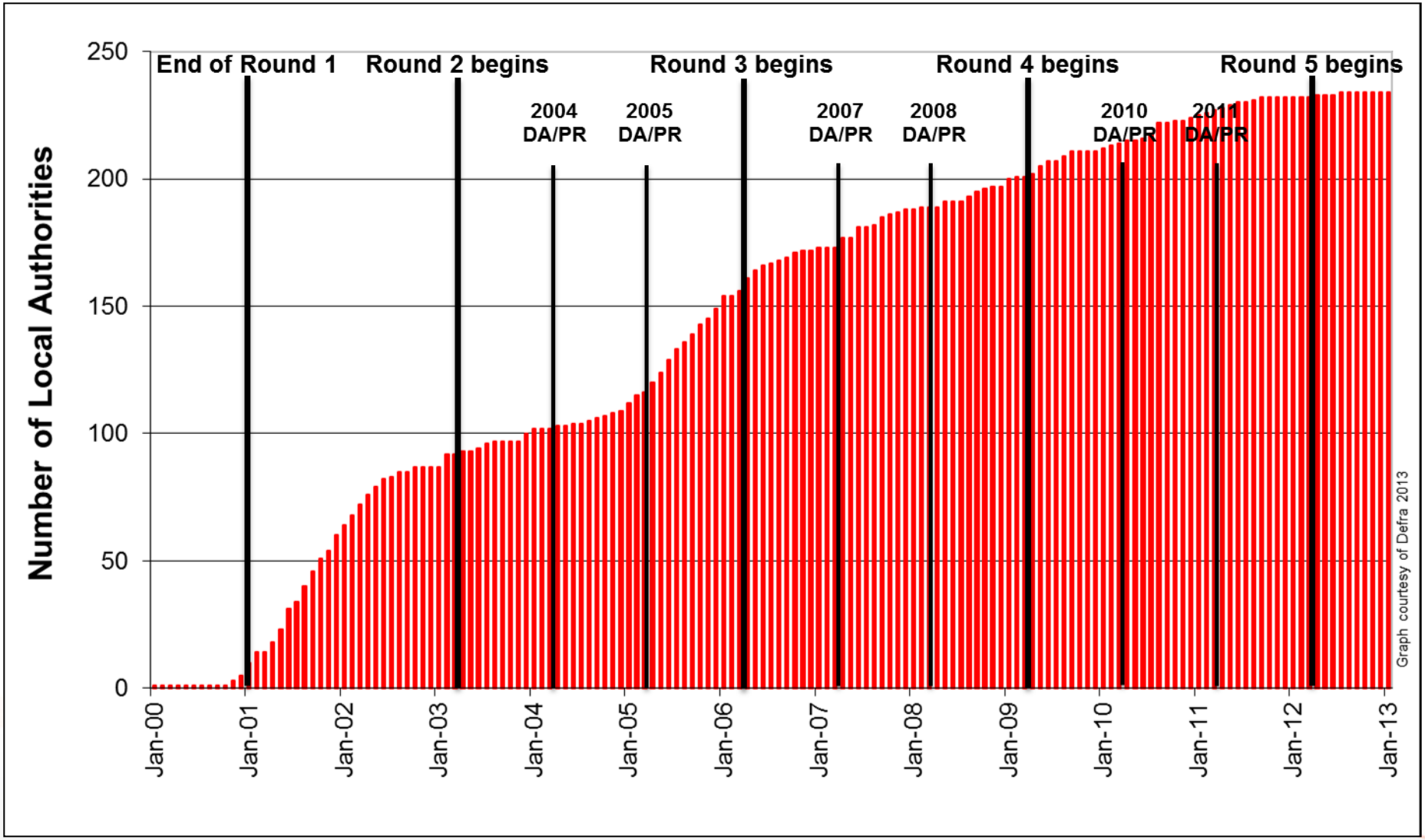
- In 1997 the UK Government published the first of three Air Quality Strategies presenting the national approach and setting out the Local Air Quality Management (LAQM) process to manage air pollution.
- Principle of subsidiarity: “Action should be taken to improve air quality at the most appropriate 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

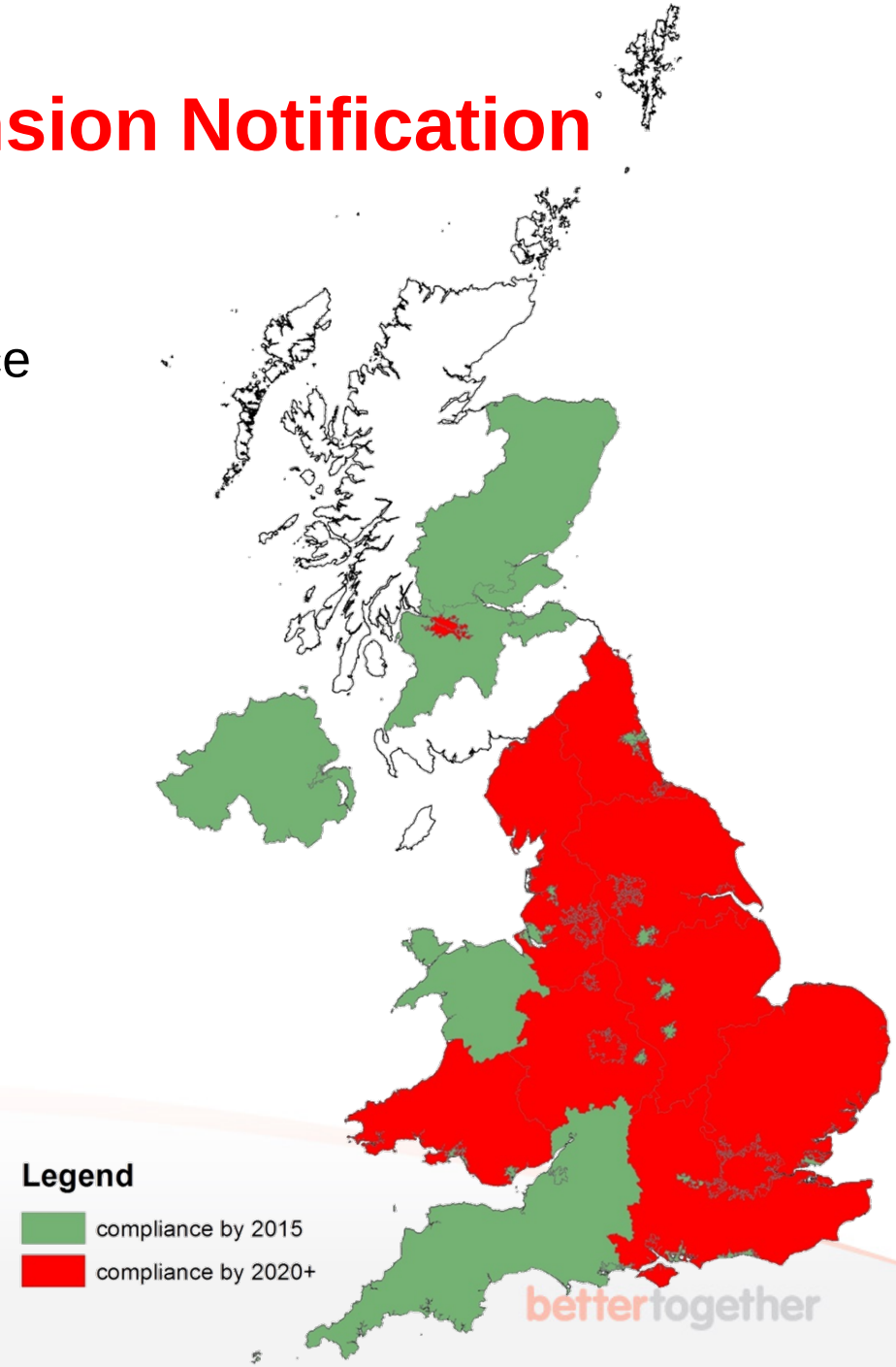
- The UK Air Quality Regulations 1997 introduced Air Quality Objectives (AQOs) for LAQM, which were comparable with, but sometimes stricter than the EU Limit Values.
- Failure to achieve an AQO means the Local Authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action 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 NO_2 and PM_{10} from traffic (2011).
- But as yet very few, if any, traffic-related AQMAs have been revoked on the basis of Local Authority measures implemented in AQAPs.

Number of Local Authorities with AQMAs



NO_2 Time Extension Notification

- September 2011 – Defra submitted Time Extension Notification (TEN) for compliance with NO_2 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.



Research statement and objectives

- Research statement:
  - *Local Air Quality Action Plans are not successful in terms of reducing local concentrations of nitrogen dioxide. Therefore, Local Air Quality Management will not achieve the annual mean UK air quality objective and will not make an effective contribution to meeting the relevant EU limit value.*
- Research objectives:
  - Objective 1: Document the change in the concentration of annual mean nitrogen dioxide from road traffic using continuous monitoring data, in AQMAs declared in Round 1 of Review and Assessment;
  - Objective 2: Evaluate 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 local nitrogen dioxide concentrations.

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Methodology

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

a) Identify AQMAs for traffic-related NO_2 annual mean objective resulting from Round 1 in England	b) Establish Round 1 baseline road-contribution NO_2 within AQMAs	c) Establish road-contribution NO_2 for subsequent years

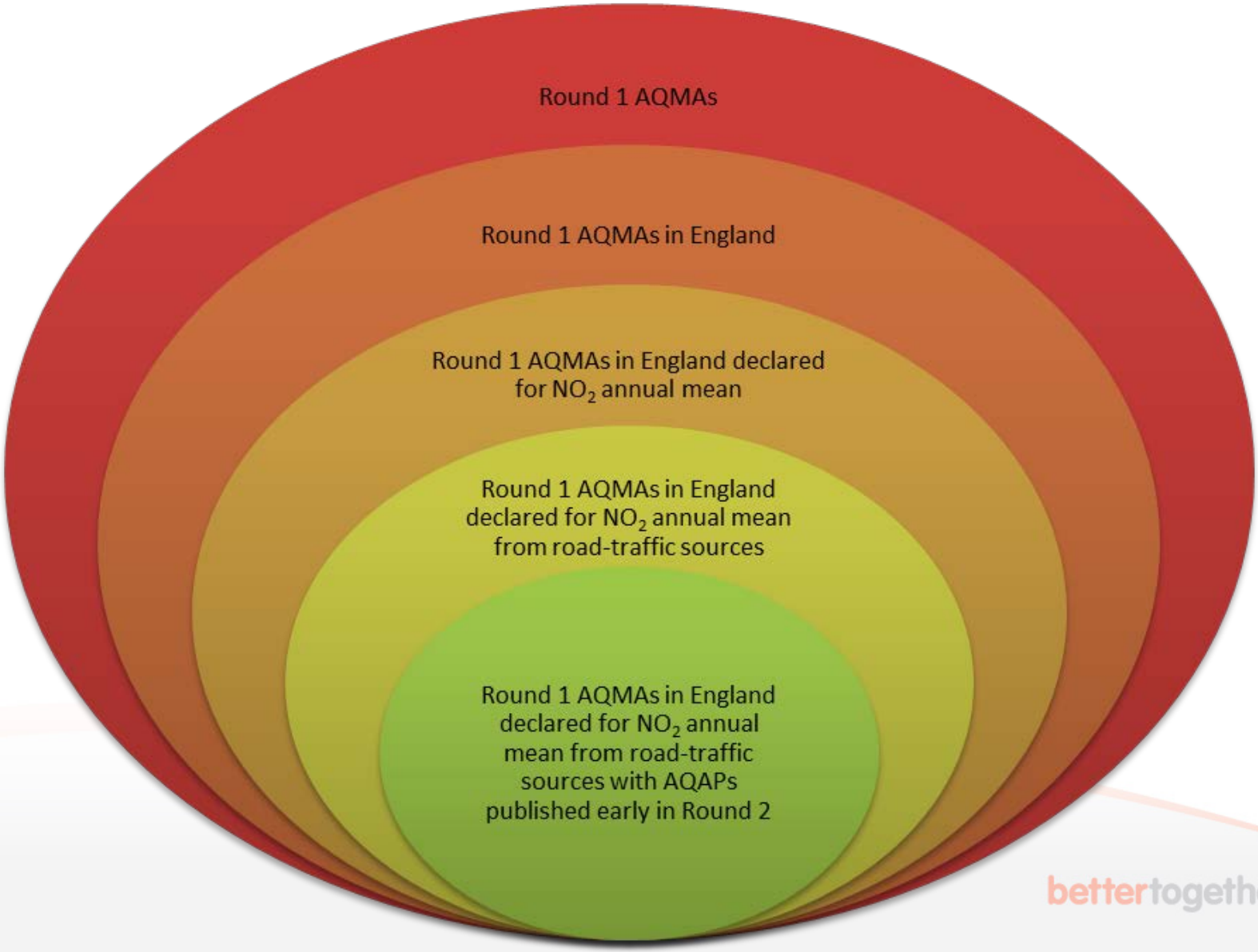
Step 2 – assess the implementation of local Action Plan measures

a) Identify original Round 1 Action Plan for AQMAs identified in Step 1	b) Identify subsequent iterations of AQAPs and annual AQAP Progress Reports	c) Determine progress in implementation of AQAP measures

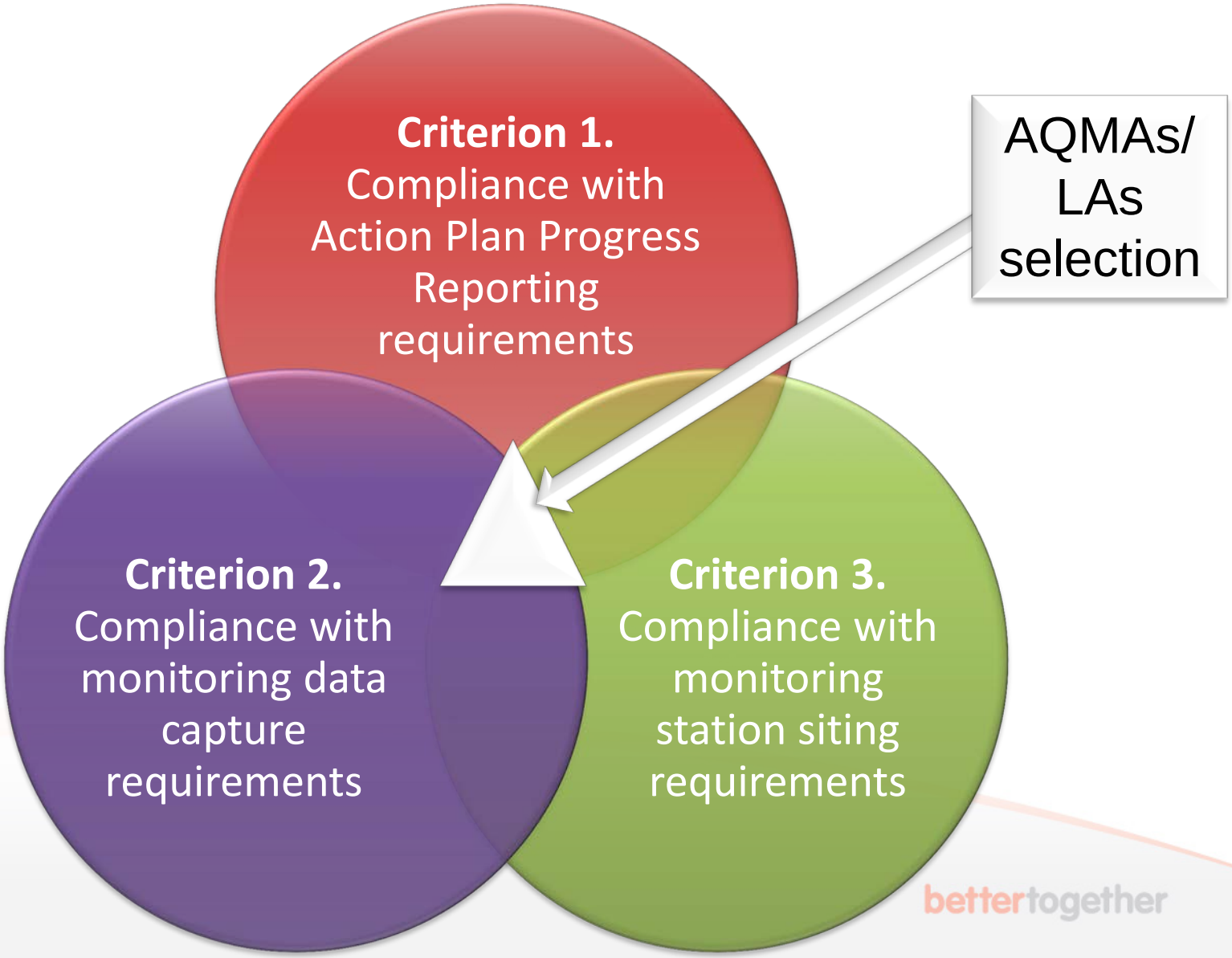
Step 3 – Determine whether there is any relationship between changes in local road-contribution NO_2 (Step 1) and implementation of AQAP measures (Step 2)

a) Determine temporal associations between implementation of AQAP measures and changes in local road-contribution NO_2	b) Determine spatial associations between implementation of AQAP measures and changes in local road-contribution NO_2	c) Identify trends across all Round 1 baseline AQMAs included in the final sample

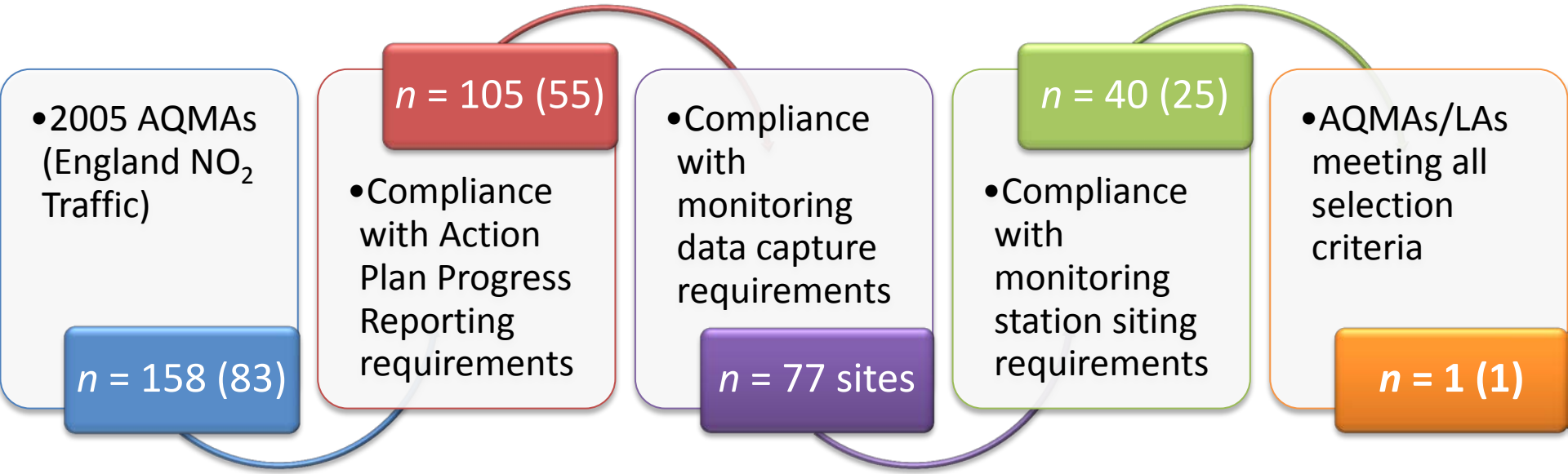
Identifying baseline AQMAs/Local Authorities



Criteria for selecting AQMAs/Local Authorities

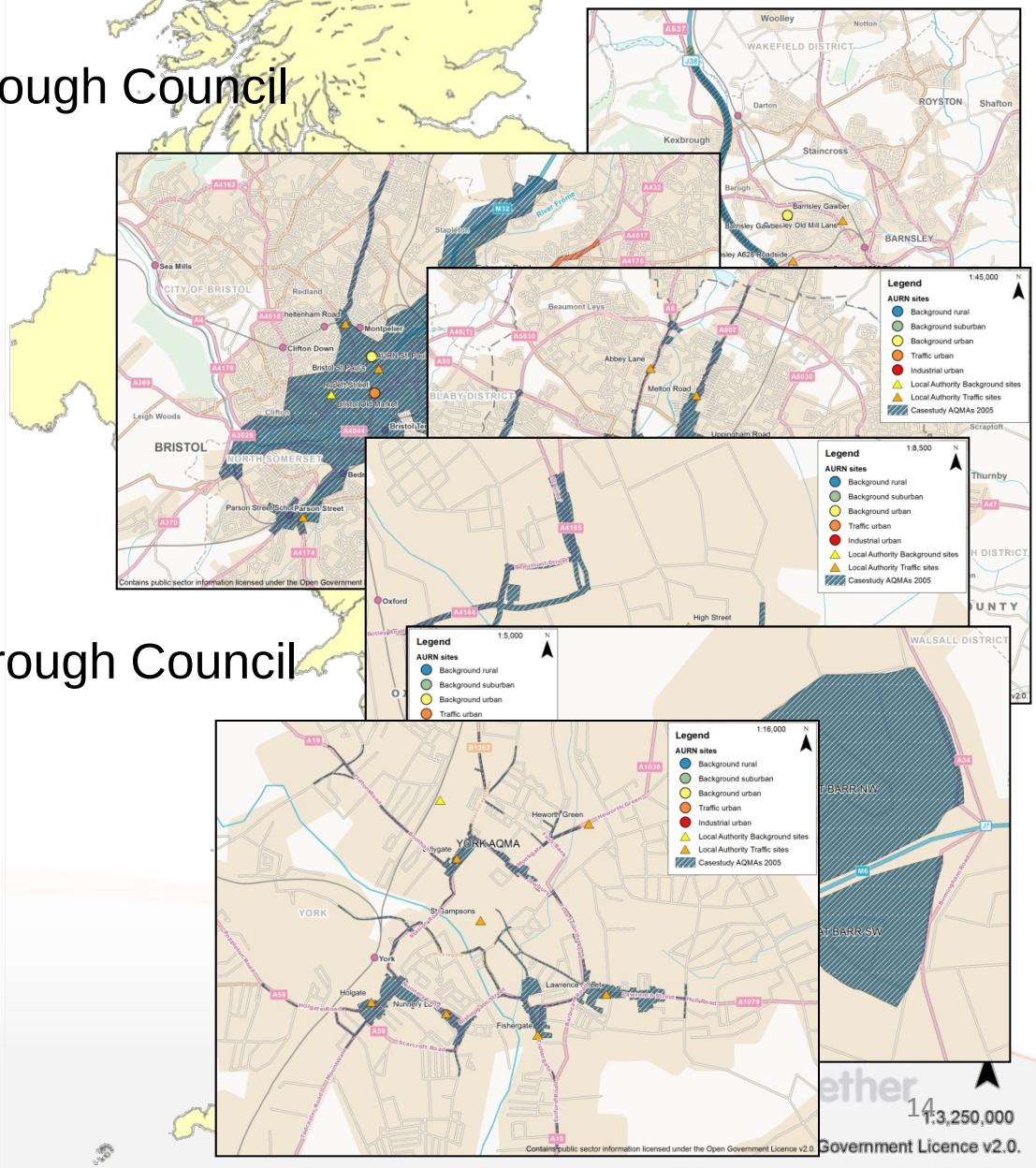


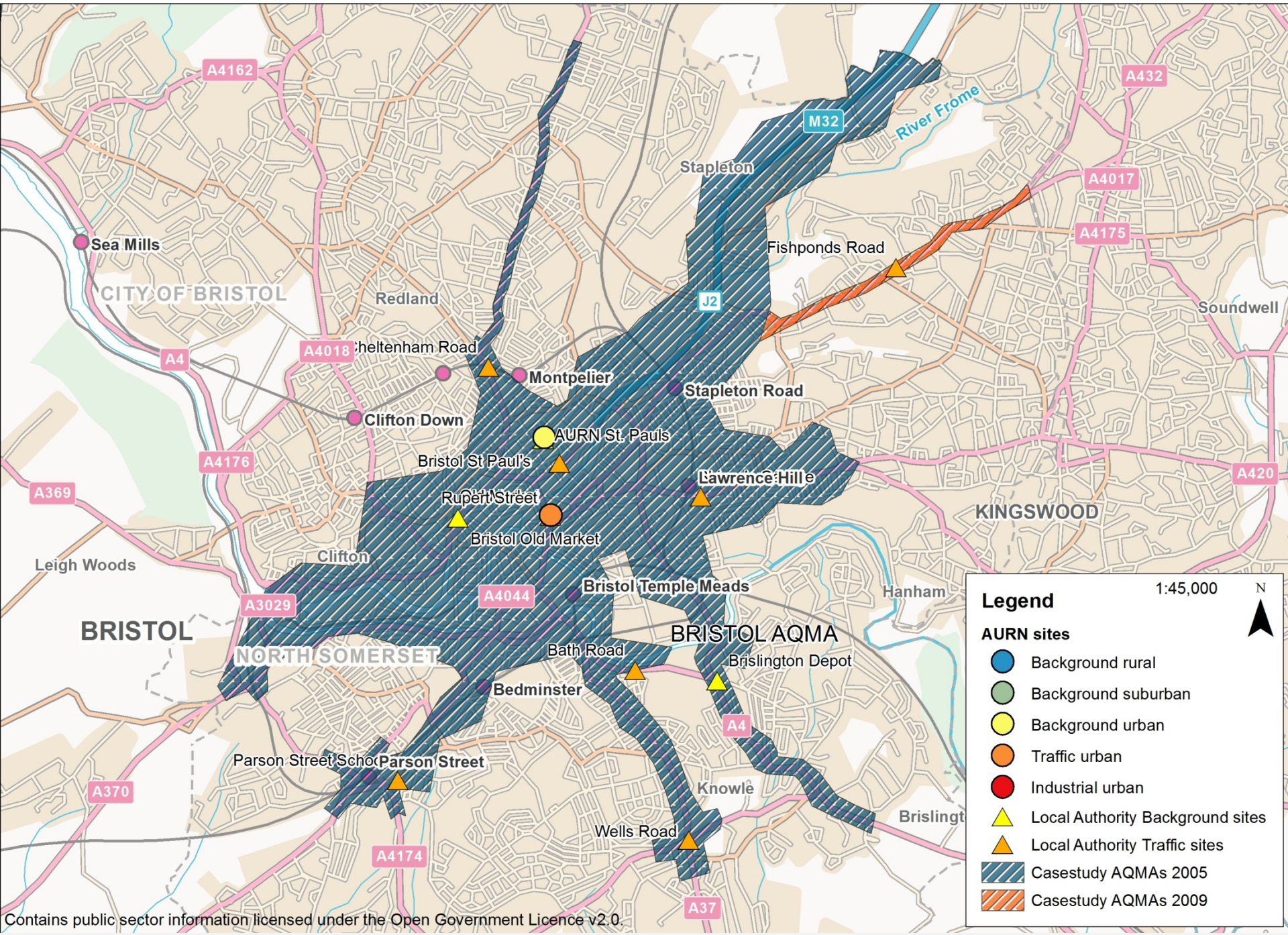
Summary flow diagram



Case study AQMAs/Local Authorities

- Barnsley Metropolitan Borough Council
  - Barnsley AQMA
- Bristol City Council
  - Bristol AQMA
- Leicester City Council
  - Leicester AQMA
- Oxford City Council
  - Oxford AQMA
- Sandwell Metropolitan Borough Council
  - Great Barr NW,
  - Great Barr South,
  - Great Barr SW
- City of York Council
  - York AQMA





Example monitoring sites

Bristol St Paul's AURN (Background Urban) site (from Defra UK Air website http://uk-air.defra.gov.uk)

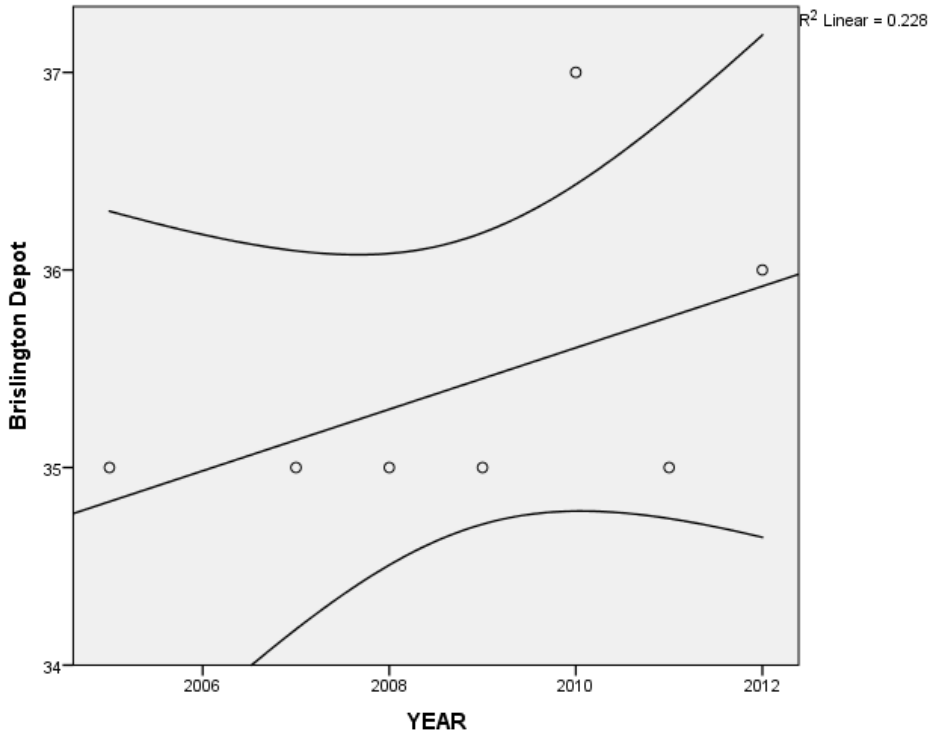
Bristol Rupert Street (Traffic Urban) site (from http://www.bristol.airqualitydata.com)

Local contribution NO_2

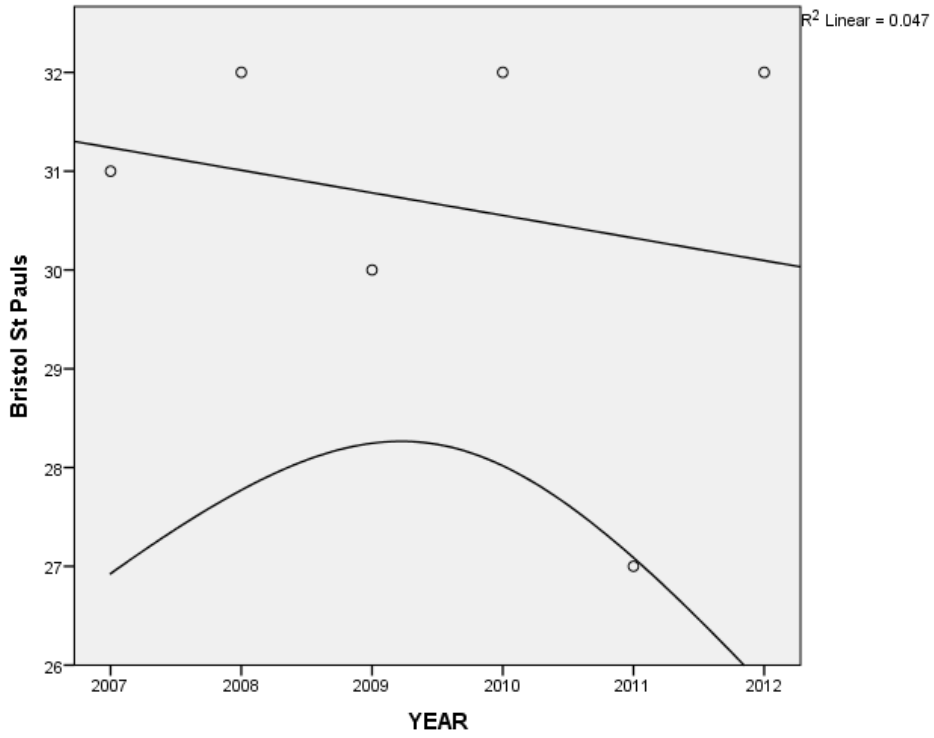
Defra site types	Defra definition	EU site types	2008/50/EC Directive definition	Interpreted distance criteria
Kerbside	Representative of street segment no less than 100 m length. At least 25 m from the edge of major junctions and no more than 10 m from the kerbside	Traffic	At least 25 metres from the 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				

Background Urban site trends

Brislington Depot



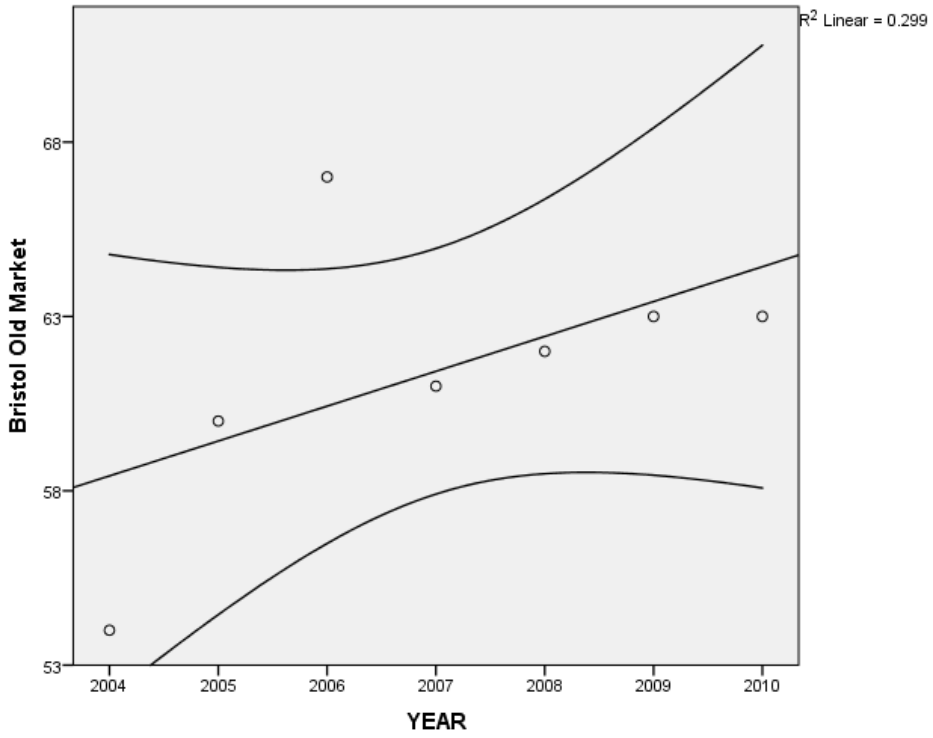
Bristol St Pauls (AURN)



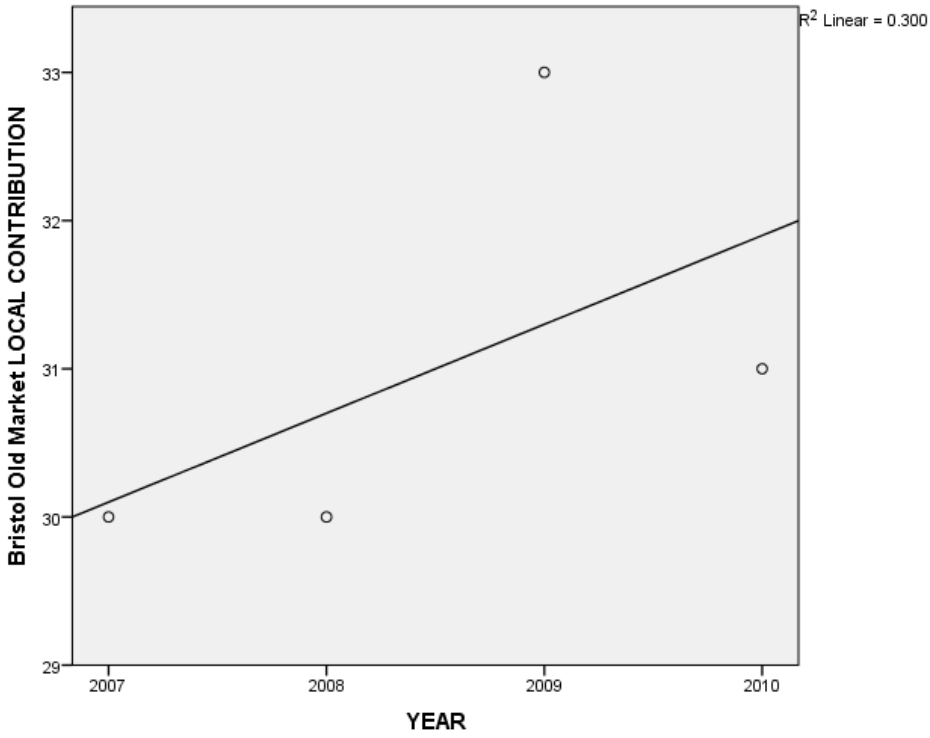
- No significant trend at either Background Urban site (95% CI).

Traffic Urban site/ Local contribution trends

Bristol Old Market – Total NO_2



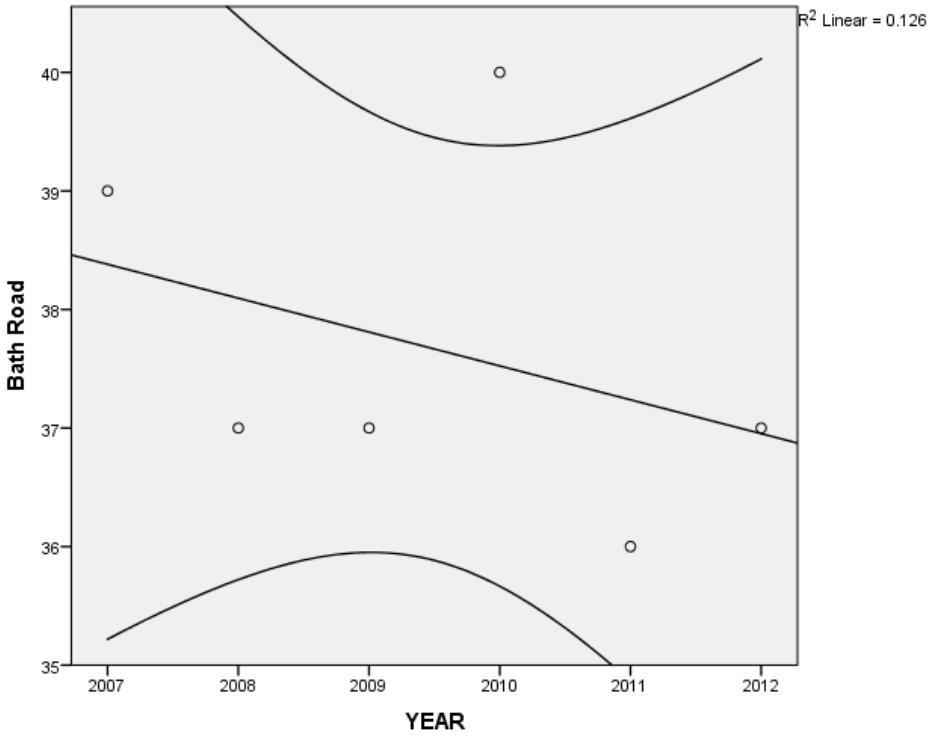
Bristol Old Market – Local NO_2



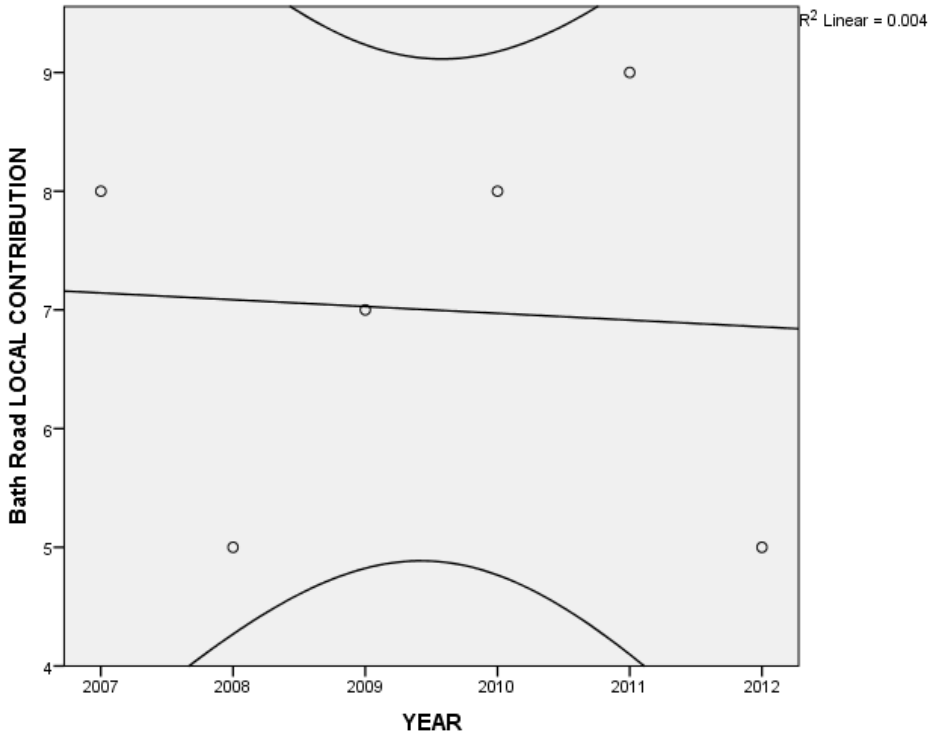
- No significant trend at Bristol Old Market (AURN) Traffic Urban site for Total NO_2 or Local contribution NO_2 (95% CI).

Traffic Urban site/ Local contribution trends

Bath Road – Total NO_2



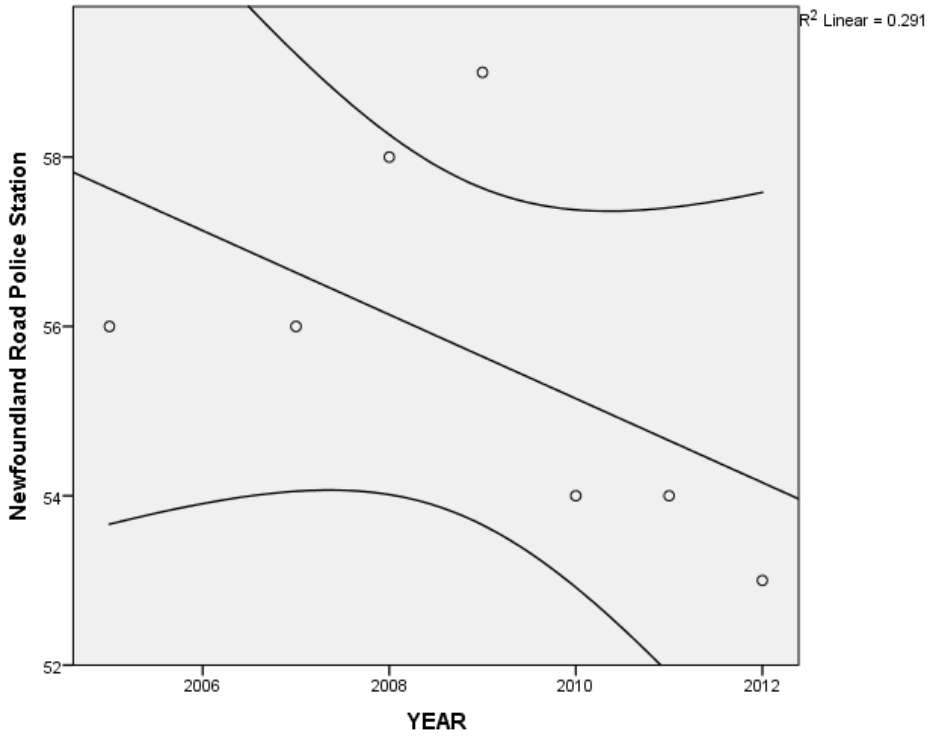
Bath Road – Local NO_2



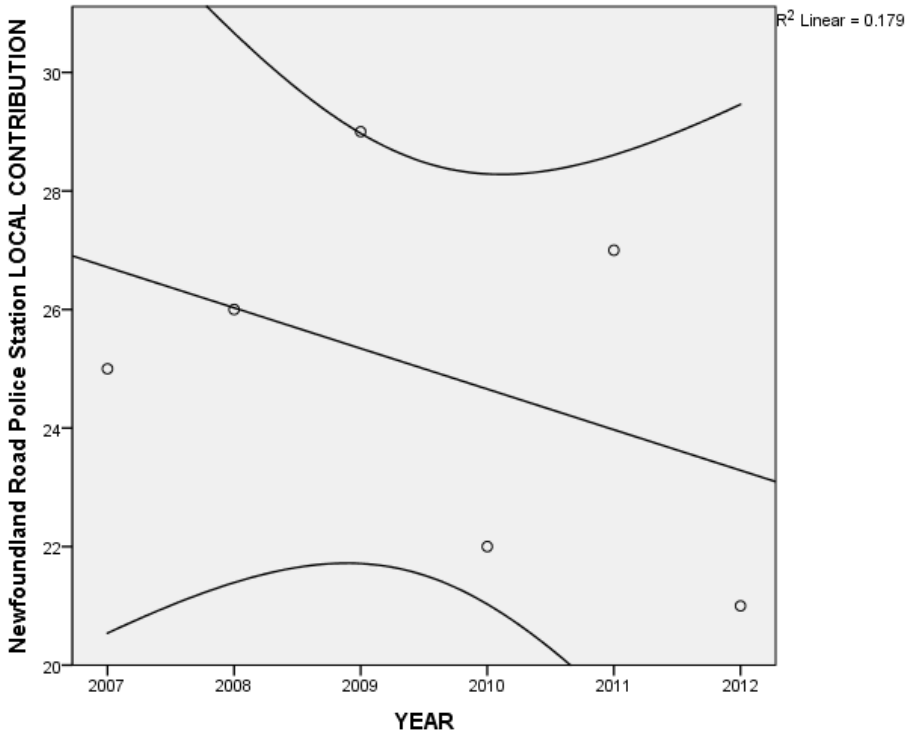
- No significant trend at Bath Road Traffic Urban site for Total NO_2 or Local contribution NO_2 (95% CI).

Traffic Urban site/ Local contribution trends

Newfoundland Road – Total NO_2



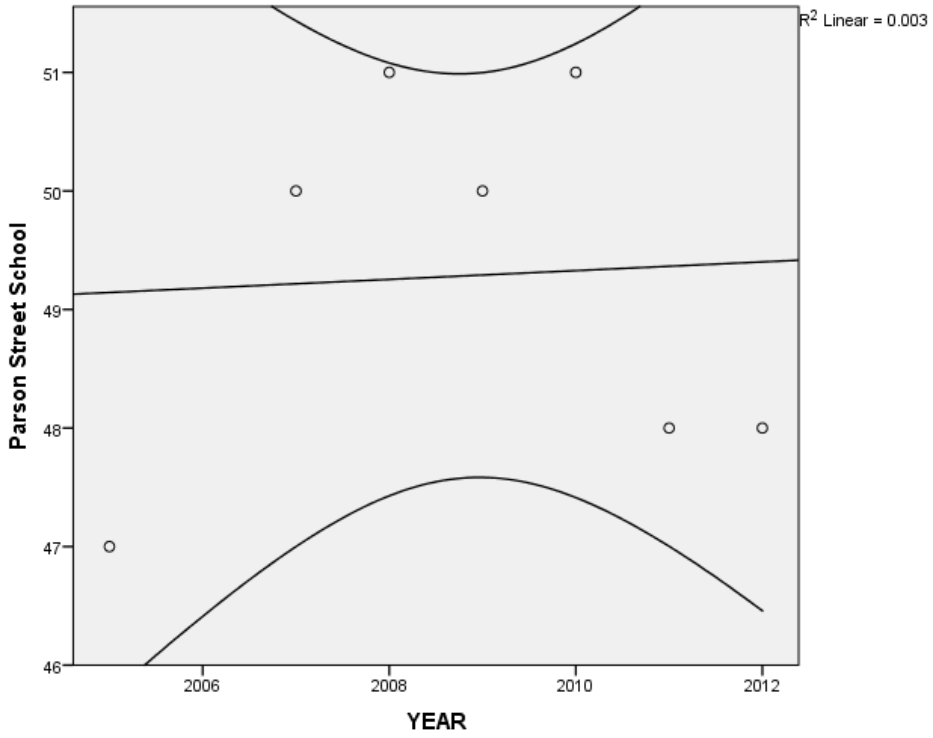
Newfoundland Road – Local NO_2



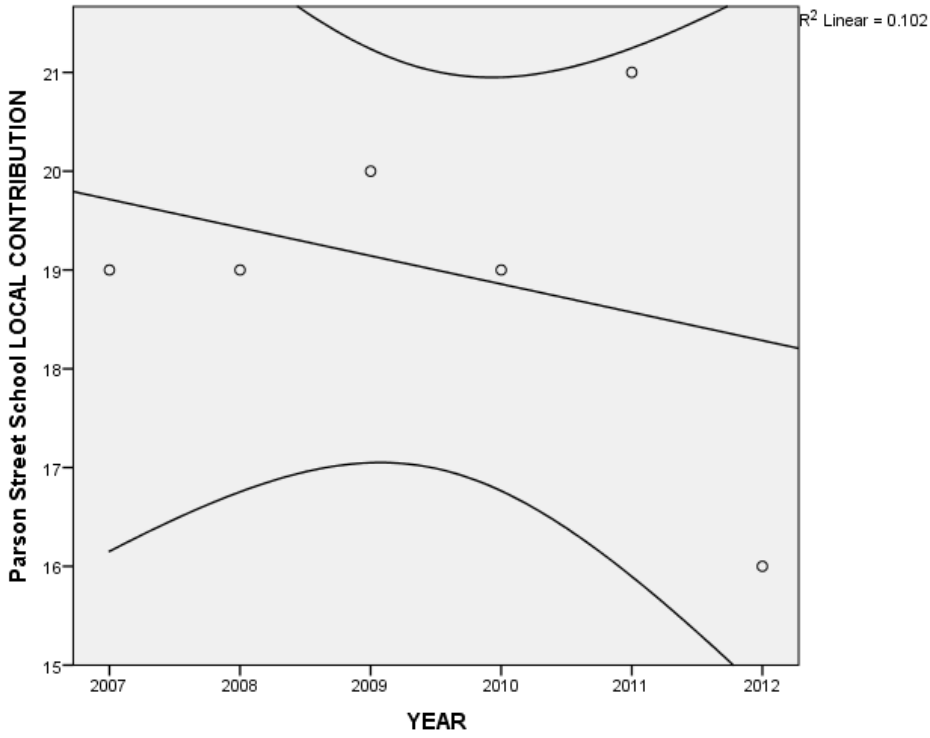
- No significant trend at Newfoundland Road Traffic Urban site for Total NO_2 or Local contribution NO_2 (95% CI).

Traffic Urban site/ Local contribution trends

Parson Street – Total NO_2



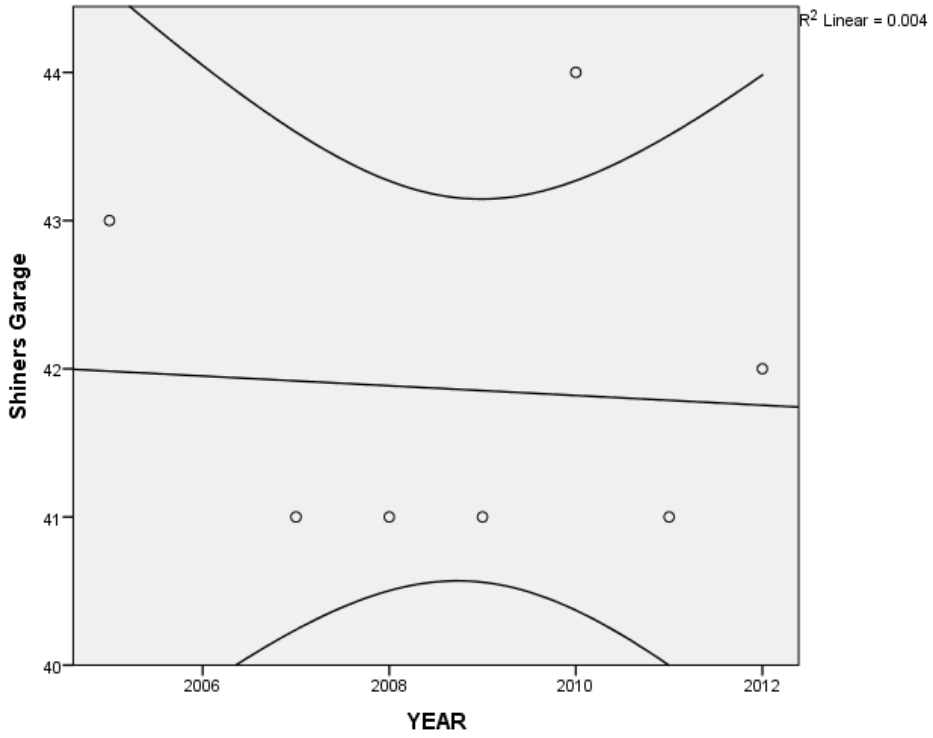
Parson Street – Local NO_2



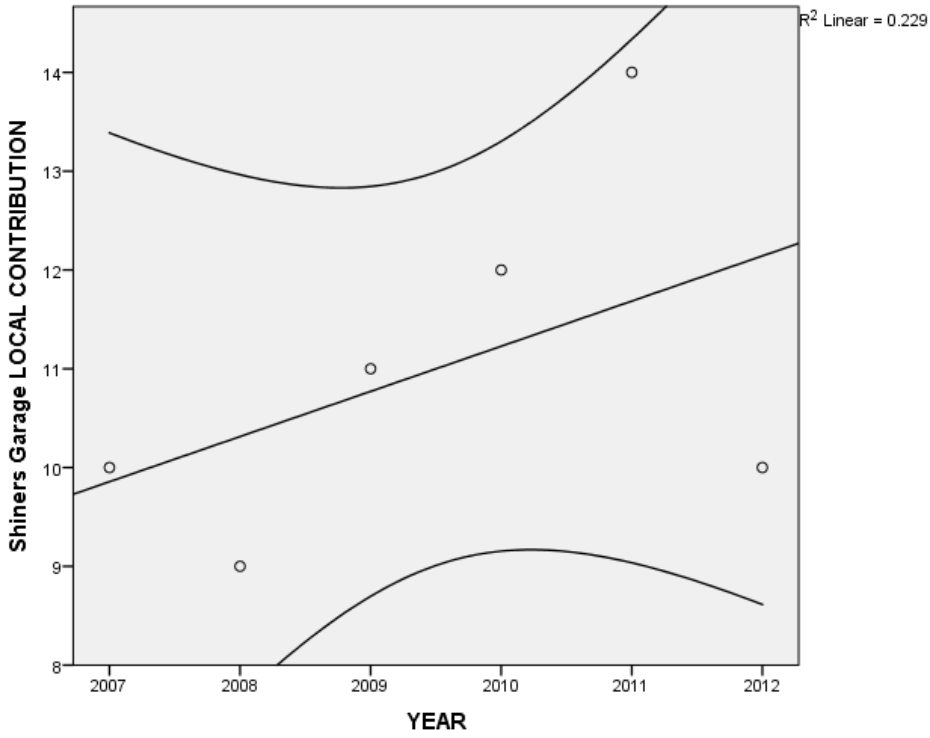
- No significant trend at Parson Street Traffic Urban site for Total NO_2 or Local contribution NO_2 (95% CI).

Traffic Urban site/ Local contribution trends

Shiners Garage – Total NO_2



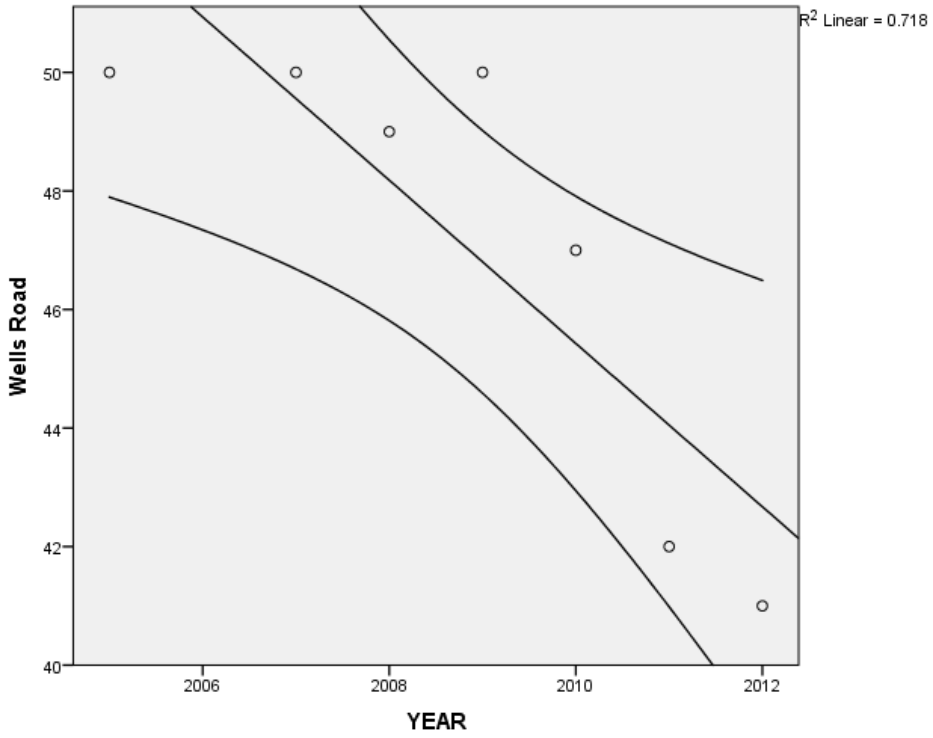
Shiners Garage – Local NO_2



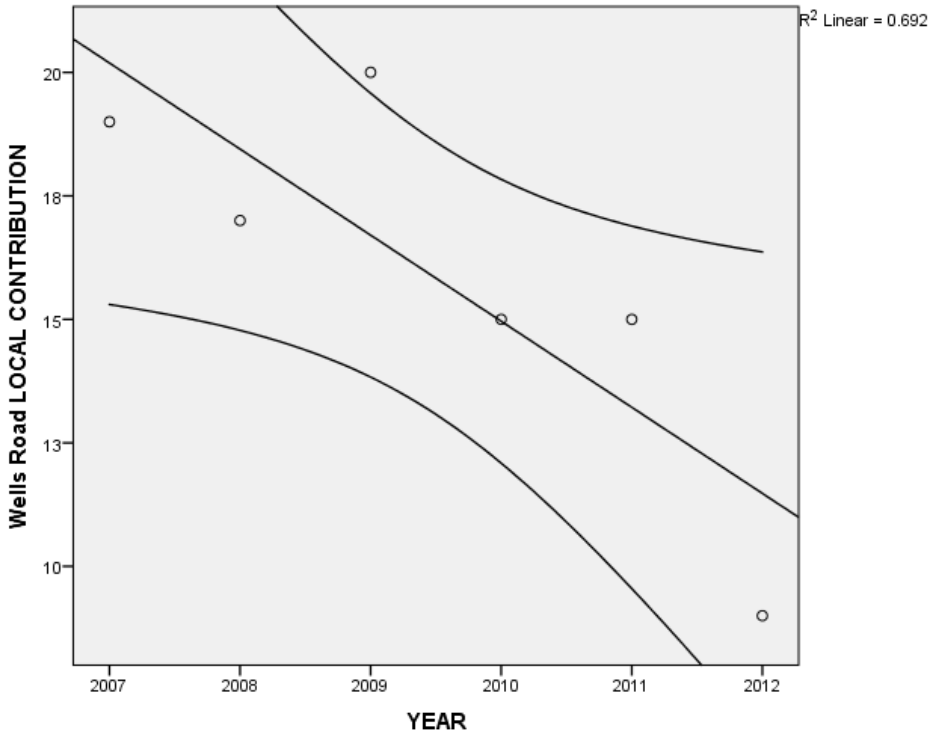
- No significant trend at Shiners Garage Traffic Urban site for Total NO_2 or Local contribution NO_2 (95% CI).

Traffic Urban site/ Local contribution trends

Wells Road – Total NO_2



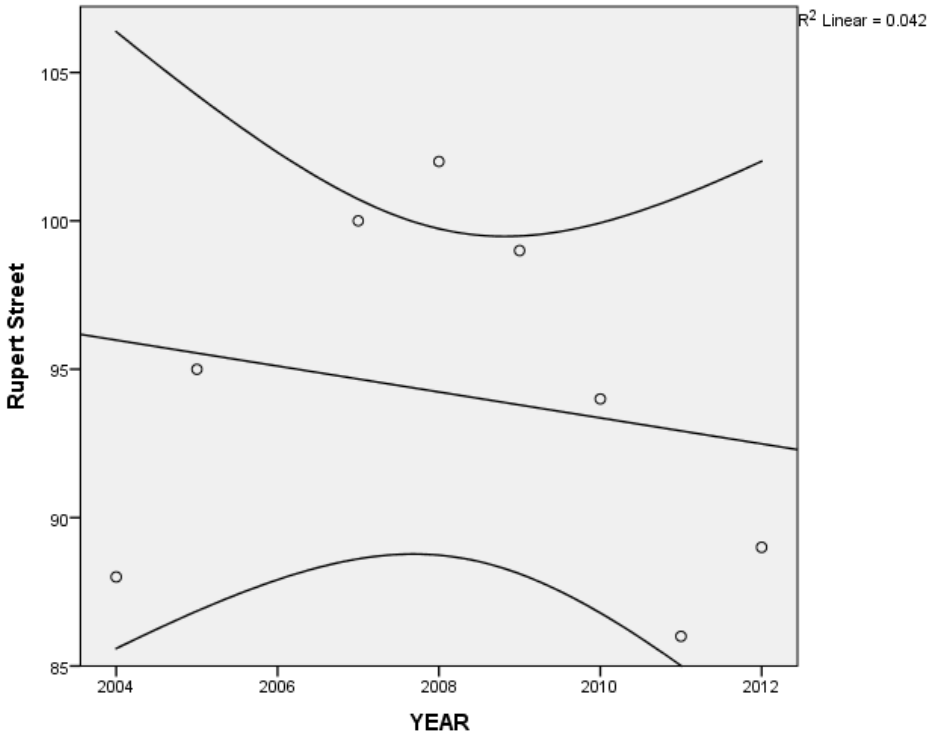
Wells Road – Local NO_2



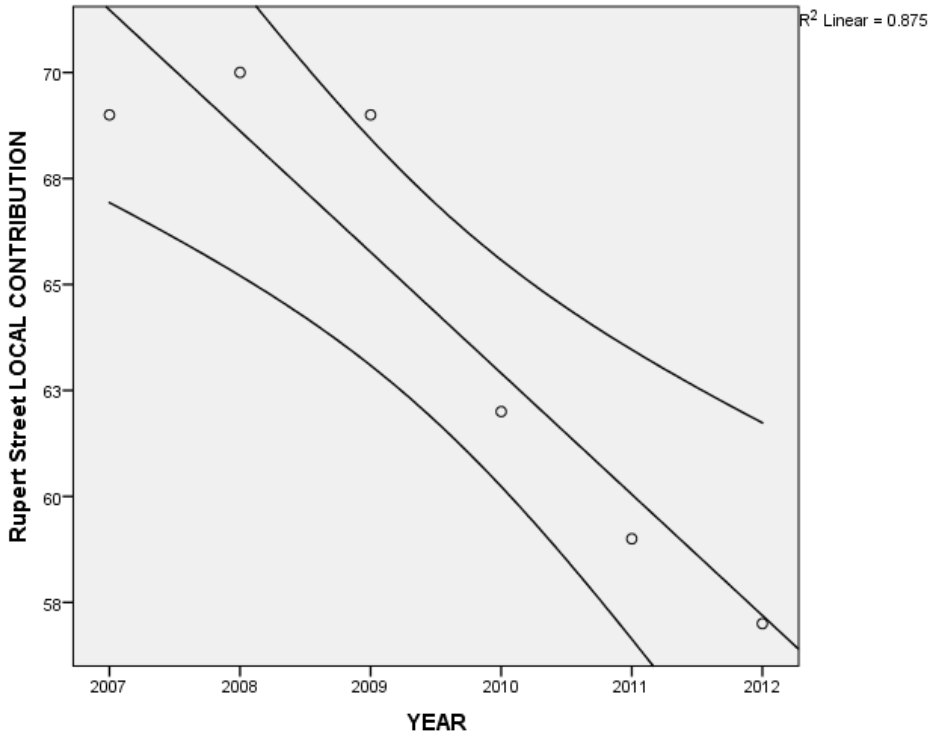
- Statistically significant negative gradient ($\widehat{\beta}$ = -1.377) for Wells Road (Traffic Urban) (t = -3.572, df = 5, p = 0.016, two-sided).
- Statistically significant negative gradient ($\widehat{\beta}$ = -1.743) for Wells Road (Local Contribution) (t = -2.997, df = 4, p = 0.040, two-sided).

Traffic Urban site/ Local contribution trends

Rupert Street – Total NO_2



Rupert Street – Local NO_2



- No significant trend at Rupert Street Traffic Urban site for Total NO_2 but statistically significant negative gradient ($\widehat{\beta}$ = -2.857) in the data for Rupert Street (Local Contribution) (t = -5.283, df = 4, p = 0.006, two-sided).

Conclusions

- Where trends are significant they are downward, but most sites had no significant trend.
- Insufficient AURN sites available to gauge progress against EU limit values in AQMAs.
  - Only one AQMA had Traffic Urban and Background Urban AURN sites available (even this Traffic Urban site was not compliant with EU siting criteria!).
- Local authority monitoring sites are not required to meet EU siting or operational criteria.
  - Monitoring sites ceased while exceedences still evident.
  - Sites mislabelled as inconsistently named.
- LAQM is not a successful strategy in achieving selected EU limit values.
  - The means to robustly assess the effectiveness of LAQM in reducing local concentrations of NO_2 does not currently exist.

Recommendations

1. Expand the AURN in association with local authorities to ensure that AQMAs have robust representative monitoring sites.
   - Establish AURN sites in each AQMA to assess changes in concentrations of the key pollutants, e.g. NO_2, against which progress in the local AQAPs and national measures may be assessed..
2. Ensure that continuous monitoring QA/QC is rigorous and that monitors are kept in situ for at least the duration of the exceedence in order to assess trends.
   - Ensure that LAQM monitoring QA/QC procedures in line with those required by the EC, to increase the network of reportable monitoring data that could be used to determine progress made on local and national actions within AQMAs
3. Standardise local authority reporting of site type classifications, location and monitoring data to ensure consistency of data reported to the European Commission.

Thank you for your attention.

Any questions?

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