Ricardo
Energy & Environment

Challenges in Delivering Clean Air Zones – lessons from the feasibility studies

Dr Guy Hitchcock
Technical Director
AQE, 21st and 22nd Nov 2018

Presentation content

- Background to Clean Air Zones
- The modelling and assessment process in the feasibility studies
- Key challenges
- Where are we now

What is a Clean Air Zone (CAZ)?

Clean Air Zones are areas where action is focussed to impr ality and the cleanest vehicles are encouraged. They aim to:

- Focus on immediate actions to improve air quali
- Support local growth and ambition
- Accelerating transition to a low emiss

CAZ locations are **areas** where ar ess restrictions for the most polluting vehicles in pa to improve air quality.

Two types of Clean A

- Non-charging C for action to improve air quality, does not in of charge based access restrictions.
- **Charging Clean Air Zones** – Zones where, in addition to the above, vehicle owners are required to pay a charge if vehicle does not meet the particular standard in that zone.

Defined geographical area

Charging or access restriction at its core

Designed to meet NO2 compliance in shortest possible time

Definition of the charging CAZ

- Uses road user charging powers from the UK Transport Act 2000
- Vehicles that do not meet a given emission standard are charged for entry to the area
- Fixed definition of standards and vehicle classes charged

Class	Vehicle type	Vehicle	Nox emission limit
A	Buses, coaches, taxis	Buses/coaches	Euro VI
B	Buses, coaches, taxis, HGVs	HGV	Euro VI
C	Buses, coaches, taxis, HGVs, LGVs	Van (1305-3500kg)	Euro 6 (diesel) 4(petrol)
D	Buses, coaches, taxis, HGVs, LGVs and cars	Car/light comm. (1305kg)	Euro 6 (diesel) 4(petrol)

Developing charging scheme options

Class	Vehicle type
A	Buses, coaches, taxis
B	Buses, coaches, taxis, HGVs
C	Buses, coaches, taxis, HGVs, LGVs
D	Buses, coaches, taxis, HGVs, LGVs and cars

	Scenario	Red	Blue	Brown WA+CC	Brown WA+CC	Brown CC	Brown CC
		Citywide	Outer RR	inc Inner RR	exc Inner RR	inc Inner RR	exc Inner RR
0	DM (not incl. CAZ response)						
1	Citywide B	B					
2	Citywide C	C					
3	Citywide D	D					
4	OuterRR B		B				
5	OuterRR C		C				
	terRR D		D				
	r WA+CC (Inc InnerRR) B			B			
8	Inner WA+CC (Inc InnerRR) C			C			
9	Inner WA+CC (Inc InnerRR) D			D			
10	Inner WA+CC (Exc InnerRR) B				B		
11	Inner WA+CC (Exc InnerRR) C				C		
12	Inner WA+CC (Exc InnerRR) D				D		
13	Citywide Doughnut BD	B				D	
14	Citywide Doughnut BC	B				C	
15	wide Doughnut CD	C				D	
	wide Doughnut BD	B					D
	Citywide Doughnut BC	B					C
18	Citywide Doughnut CD	C					D
19	OuterRR Doughnut BD		B			D	
20	OuterRR Doughnut BC		B			C	
21	OuterRR Doughnut CD		C			D	
22	OuterRR Doughnut BD		B				D
23	OuterRR Doughnut BC		B				C
24	OuterRR Doughnut CD		C				D
25	Double Doughnut BCD	B	C			D	
26	Double Doughnut BCD	B	C				D

Non-charging scheme options

Wider fiscal measures – e.g. parking charges

Investment in clean vehicles and infrastructure

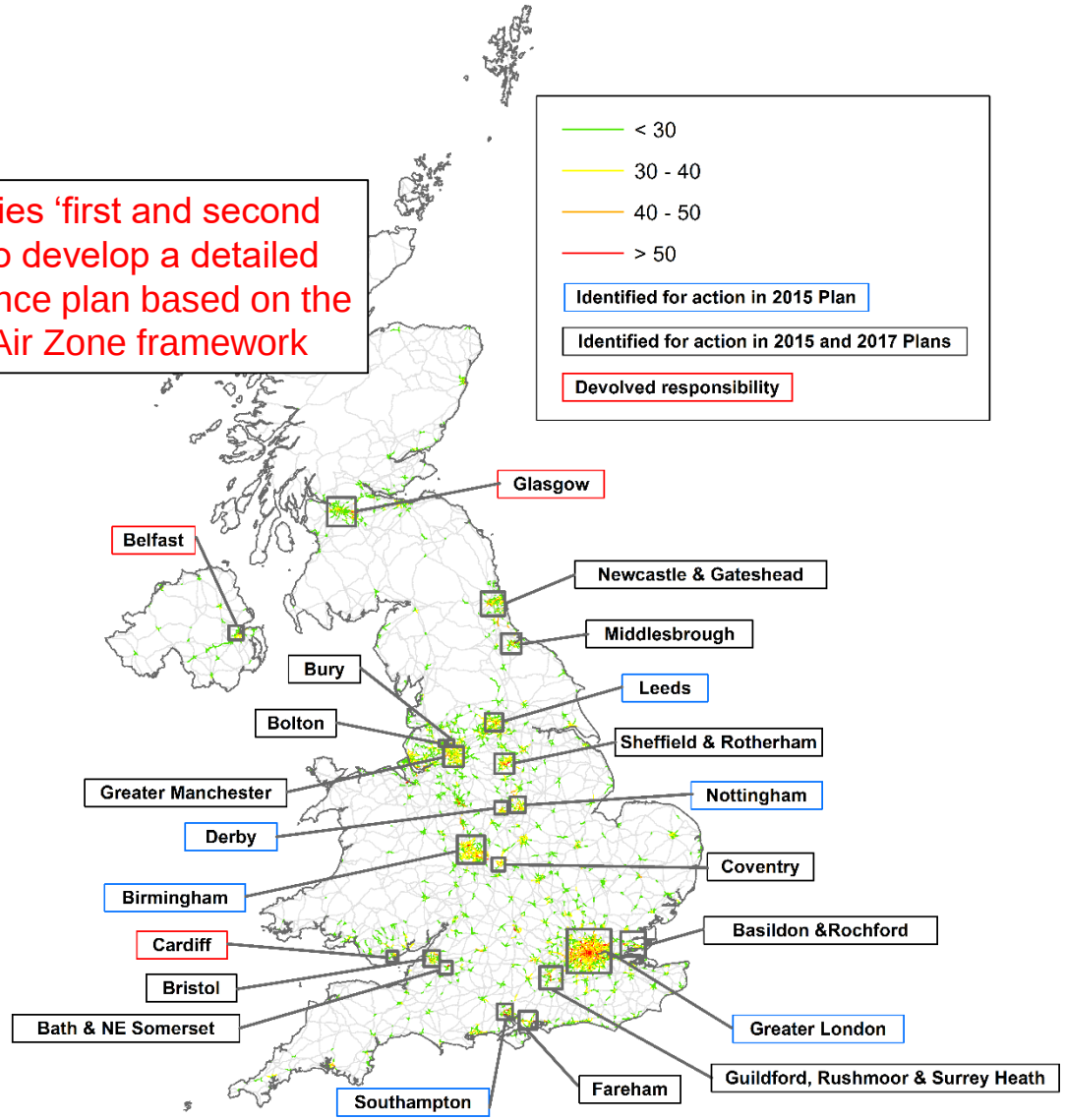
Regulating taxis and buses

Planning and procurement

Partnership working and information

Local authorities required to assess the need for a CAZ

28 towns and cities ‘first and second wave’ required to develop a detailed local NO_2 compliance plan based on the national Clean Air Zone framework



33 further LAs to do rapid assessments aiming to bring compliance forward

Local authorities affected		
Ashfield	Kirklees	Sandwell
Basingstoke & Deane	Leicester	Sefton
Blaby	Liverpool	Solihull
Bolsover	Newcastle-Under-Lyme	Southend
Bournemouth	Oldham	South Gloucestershire
Bradford	Oxford	South Tyneside
Broxbourne	Peterborough	Stoke
Burnley	Plymouth	Sunderland
Calderdale	Poole	Wakefield
Cheltenham	Portsmouth	Walsall
Dudley	Reading	Wolverhampton

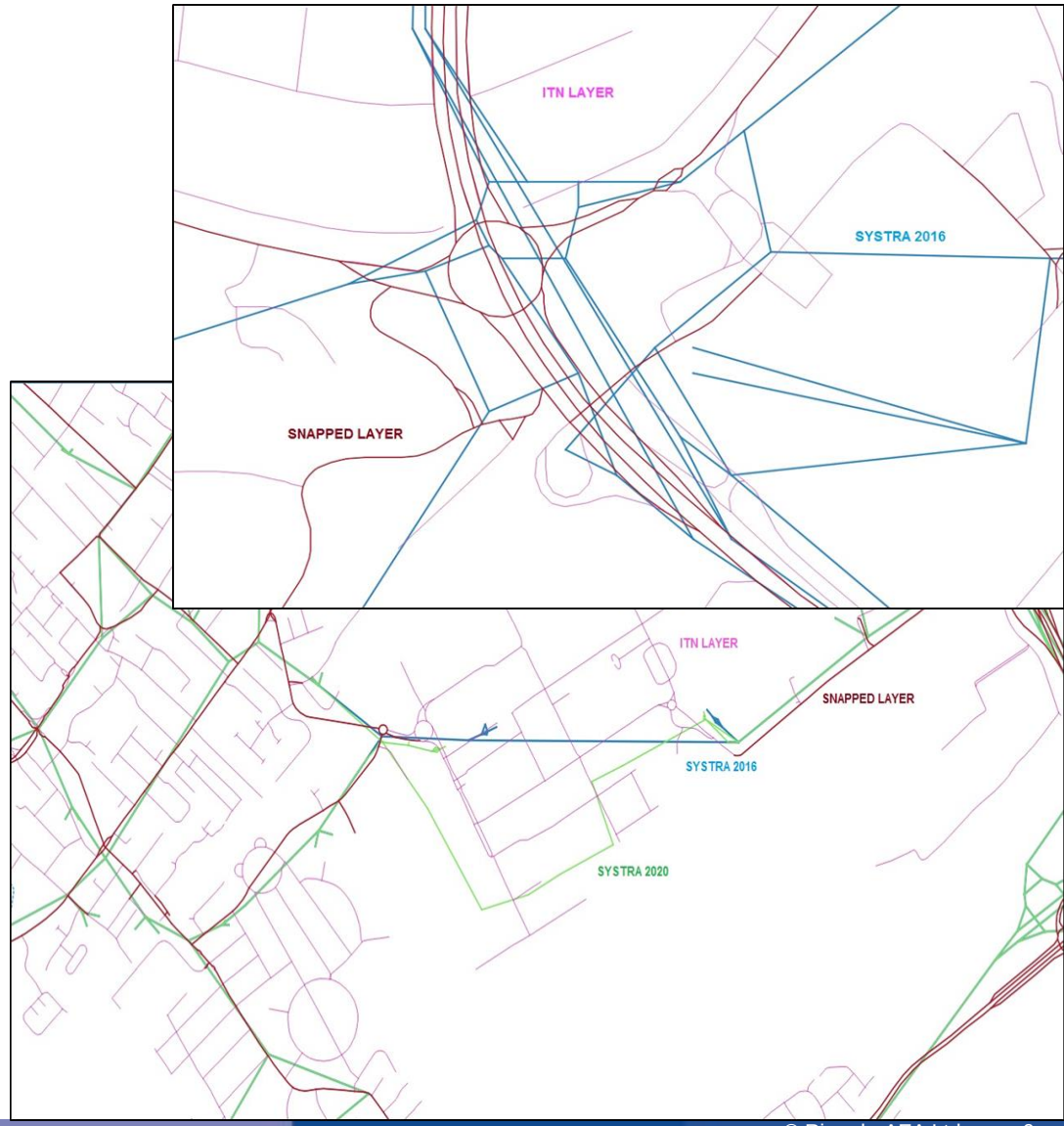
Elements of the feasibility study

- Transport modelling
  - Base year
  - Target year – baseline or do minimum
  - Target year – CAZ scenarios or do something
- Air quality modelling
  - Base year
  - Target year – baseline or do minimum
  - Target year – CAZ scenarios or do something
- Business case

Integrated modelling assessment

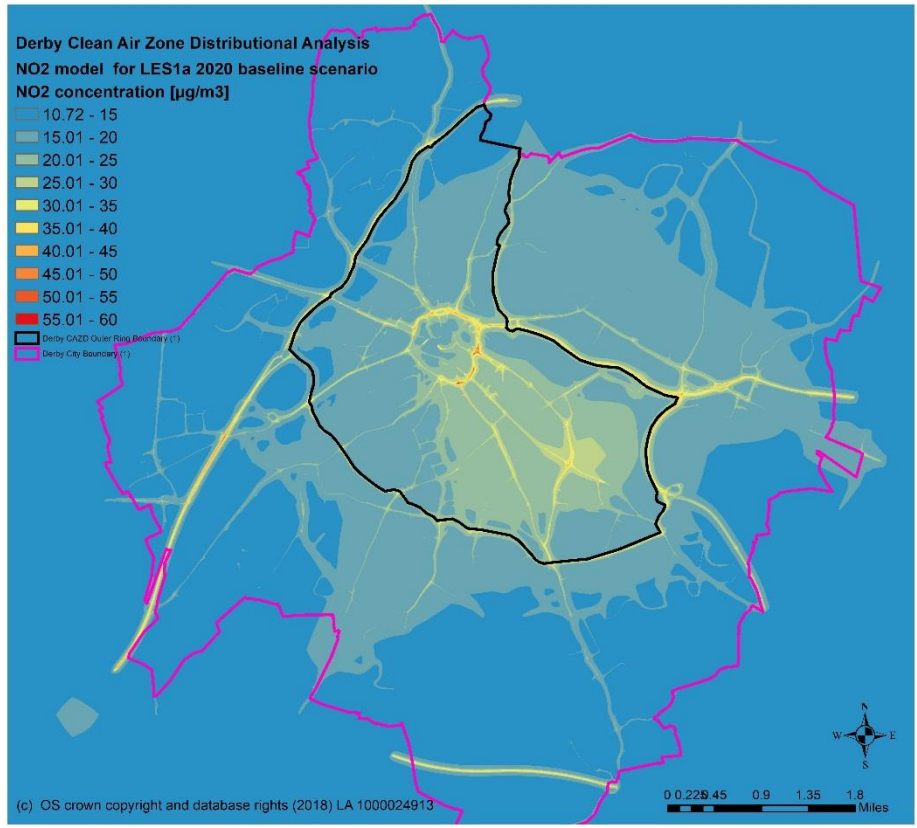
Transport modelling requirements

- Base year model needs to be validated, preferably to WebTag guidance
- Needs to be able to model:
  - Cars, HGVs, Vans and buses
  - **Split fleet between compliant and non-compliant vehicles**
- Future years need to account for:
  - Future land use/growth
  - Future transport/highways schemes
- Modelling CAZ scenarios needs to include:
  - **Assessment of behaviour change in relation to a daily area charge;**
  - Consider payment, rerouting, mode shift and trip cancelation



Air Quality modelling quality criteria

- A full dispersion model is required compliant to TG16 guidance
- Needs to account for canyons and gradients as per TG16
- Should use latest COPERT 5 emissions factors as in latest EfT V7.4
- Should use latest f-NO2 data from NAEI 2014
- Non-road sources
  - Background maps
  - Specific local sources if significant e.g. power generation, incineration, ports
- **Receptor points covering PCM roads (4m from road, 2m high), local monitoring points, AQMAs and overall 10 x 10m grid**
- Validation to local measurement data as per TG16
- **For the whole study area – city or wider**



Cost Benefit Analysis components

Benefits

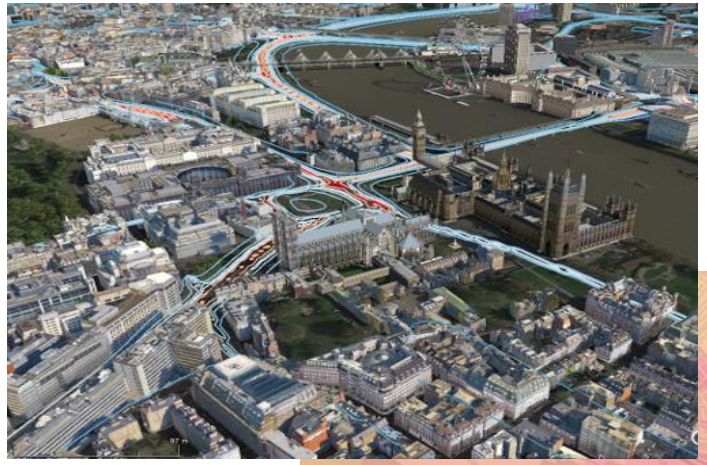
- Air quality benefits – damage costs related to NOx and PM from emissions model
- GHG – emissions from the emission model
- Congestion and traffic benefits – from traffic model

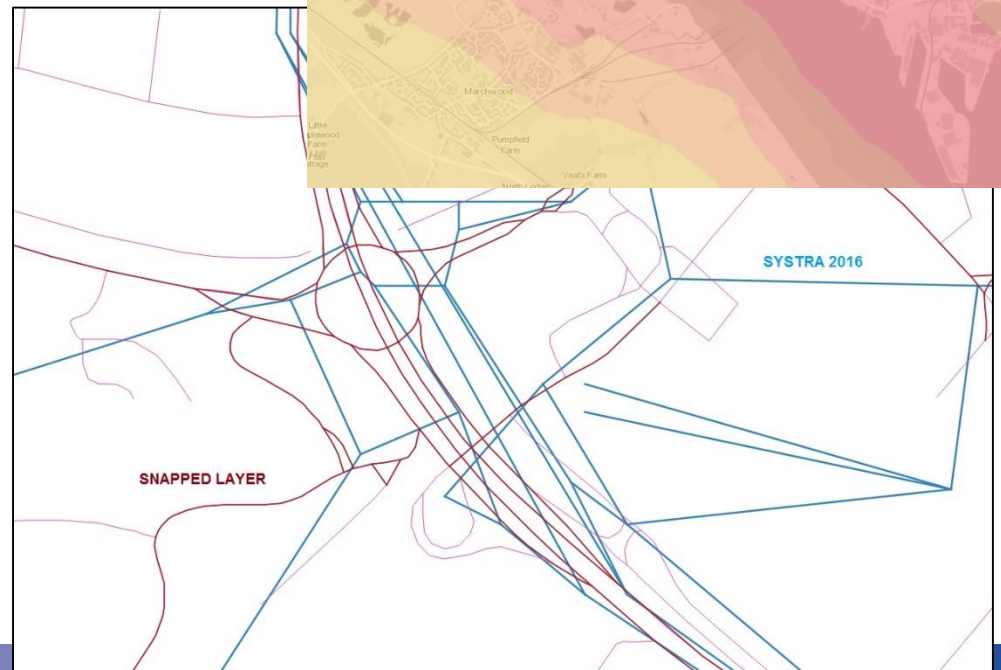
Costs

- Implementation costs – infrastructure costs, running costs etc
- Vehicle upgrade costs – upgrade response to the scheme
- Other behavioural costs – such as welfare loss from alternative routes, or changed trip patterns

Challenge 1 – modelling at city scale

- Common for transport models but not for air quality modelling
- AQ model requires geo-spatial correct traffic data, not always straight forward
- AQ model needs much more detail on the fleet – Euro standard, fuel type, etc, which is often not available
  - Link to challenge 2
- AQ model needs terrain data – gradients, building heights
- Data management and QA challenge – generally managed through GIS





Challenge 2 – Understanding the vehicle fleet

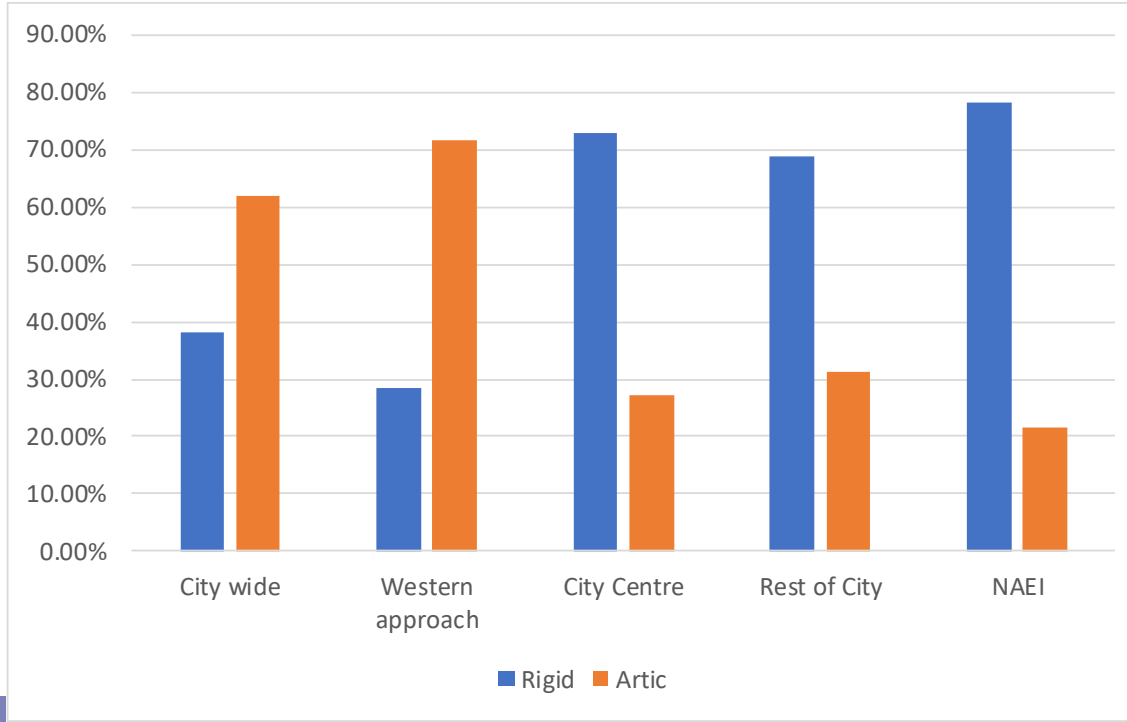
- Use of ANPR surveys to get local fleet data - 10-20 sites over a 1 week period as a minimum

- Analysing that data to get
  - Euro standards
  - Fuel type
  - Rigid/Artic split for HGVs
  - Identify taxis

- Is this consistent across the area or do we need to zone the model?
  - Adds complexity

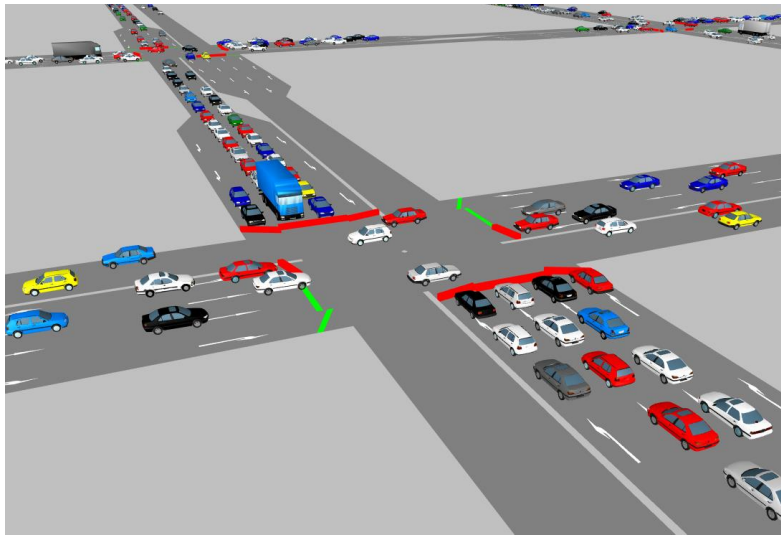
- Projecting forward to the future?
  - Key uncertainty

Rigid/Artic split



Challenge 3 – modelling of compliant and non-compliant vehicles

- What is this? Compliant vehicles meet the stand, non-compliant vehicles don't
- Why is this needed? Compliant vehicles don't see the charge, non-compliant vehicles do and will react in the model
- The split is done at zonal origin
  - Derived from ANPR data if linked to post code
  - Could use vehicle ownership data
- Compliant split can be run just in assignment or potentially also in demand modelling
- Some potential issues
  - Splitting the model can change vehicle flows even without a scheme
  - How well does the modelled compliant/non-compliant fleet reflect the ANPR data on observed links?



Challenge 4 – understanding behavioural response

- Response to a changing scheme
  - Upgrade vehicle to compliant – where do we get evidence for this response as not in traffic model and key response?
    - Data from London ULEZ as a back stop
    - Carrying out local survey work is ideal to get local response
  - Avoid, cancel or pay responses – should be generated by traffic model but needs demand modelling to handle cancel

- Non-charging measures
  - Standard transport schemes should be handled by traffic model, e.g. increase bus capacity, etc
  - What about measures such as
    - EV charging infrastructure – how does this effect EV fleet?
    - Freight consolidation or delivery and servicing plans?

- Sensitivity runs to test impact of assumptions as evidence is limited – dealing with uncertainty

Challenge 5 – Integrating the local context

- Every city is different in context, transport system and so on
  - The devil is in the detail and needs good local understanding

- Major local transport schemes not necessarily picked up in national forecasts
  - Major road development on A38 through Derby starts in 2020
  - City remodelling in Leeds designed to push traffic to inner ring road, the AQD compliance area
  - Nottingham existing Clear Zone, tram, electric buses, GoUltra low work
  - Southampton Smart motorway development on key diversionary route, Port influence

- Impact of these schemes
  - on CAZ and implementation timing
  - impact of CAZ on these other transport schemes
  - potentially conflicting objectives

Challenge 6 – Decision making in a complex world

- Interpreting the outcomes – we have a concentration limit value 40µg/m^3 but where are we assessing this?
  - EU Air Quality Directive criteria is flexible – 1-10m from road side, this makes a huge difference! Also excludes major junctions
  - UK local air quality management criteria are different – based on relevant exposure
  - This leas to significant confusion with local stakeholders as to what compliance with the limit value actually means!

- Evolving evidence
  - The solution you need depends on the problem you have
  - The modelling and assessment helps you understand the detail of the problem
  - This then feeds back into solutions to understand what may solve the problem

- Managing the politics! Or the three headed client!
  - National requirements, city authority lead, key local stakeholders (big business)
  - Putting in a charging scheme is highly political!

So what has been the outcome?

No final plans yet (nearly!) but picture is emerging

Scheme type	
CAZ A or bus scheme	Oxford - existing Bus LEZ, moving to ZEZ Leicester - bus LEZ
CAZ B and C (freight schemes)	Bristol – potentially CAZ C Leeds - CAZ B Southampton – consulted on CAZ B Sheffield – consulting on CAZ C
CAZ D (car schemes)	London ULEZ Bath - consulted on CAZ D Birmingham - consulted on CAZ D
Non charging only	Derby – traffic management scheme Nottingham – clean bus and taxi schemes

https://www.fleetnews.co.uk/fleet-faq/what-are-the-proposed-uk-clean-air-zones-caz

And finally – Evidence vs action

- A lot of resource is being used to collect the evidence and justify schemes

- Aiming for a consistent approach across all the cities
  - National co-ordination is taking time (sign-off process)
  - National guidance is being developed as studies are being done
  - Local complexities and issues can make this difficult

- Are plans, studies and evidence delaying action?
  - The evidence and assessment is complex
  - There are a huge array of charging CAZ schemes and complementary that can be considered
  - The results can be conflicting
  - It can only support the decision process not drive it

- **Vision, leadership and political will are also needed for action!**

Dr Guy Hitchcock
Technical Director
Ricardo Energy & Environment

Guy.Hitchcock@Ricardo.com

Thank you for your attention