Ricardo
Energy & Environment

Developing a Low Emission Strategy

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What is a Low Emission Strategy

- Original definition from the Low Emission Strategies Partnership:

  "a package of planning measures to reduce transport emissions, air quality and carbon, from new developments"

- ***Wider definition:***

  "a package of measures to reduce emissions, covering both air quality and carbon emissions"

- Widest definition:

  "a package of measures to reduce emissions, both air quality and carbon, from all sectors"

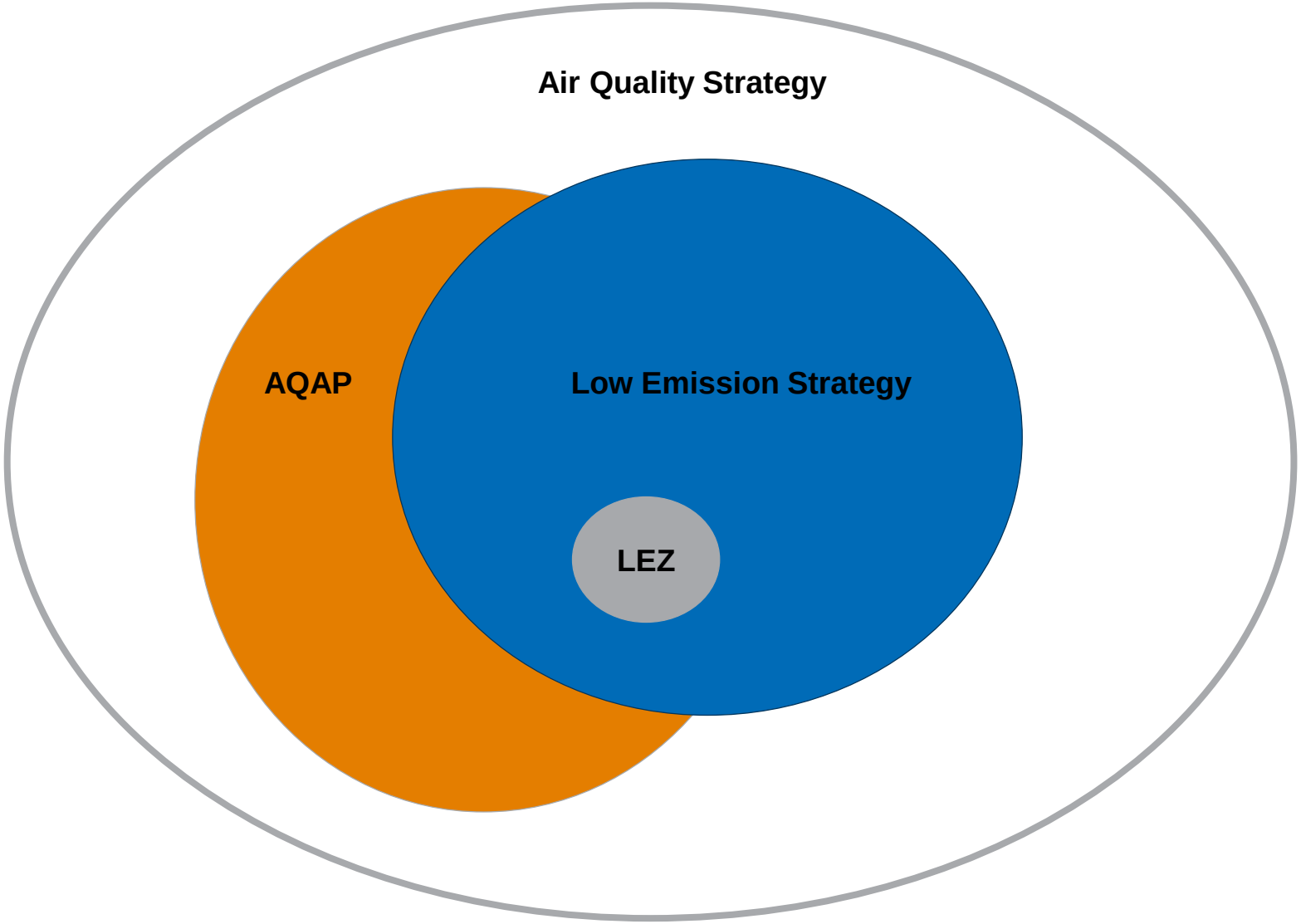
Transport emissions (not concentrations)

Air quality and carbon emissions

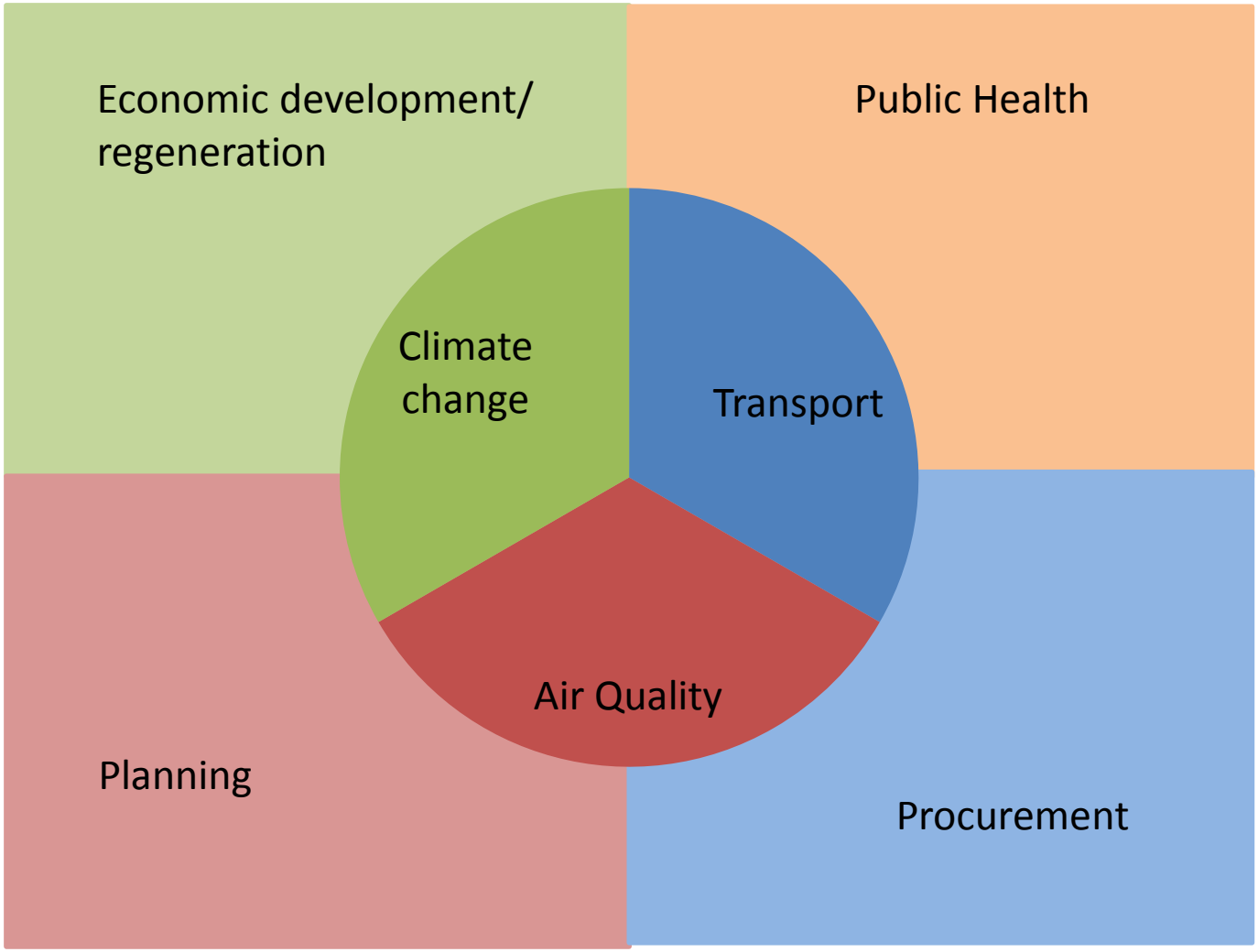
Integrated package of measures

Examples of Low Emission Strategies

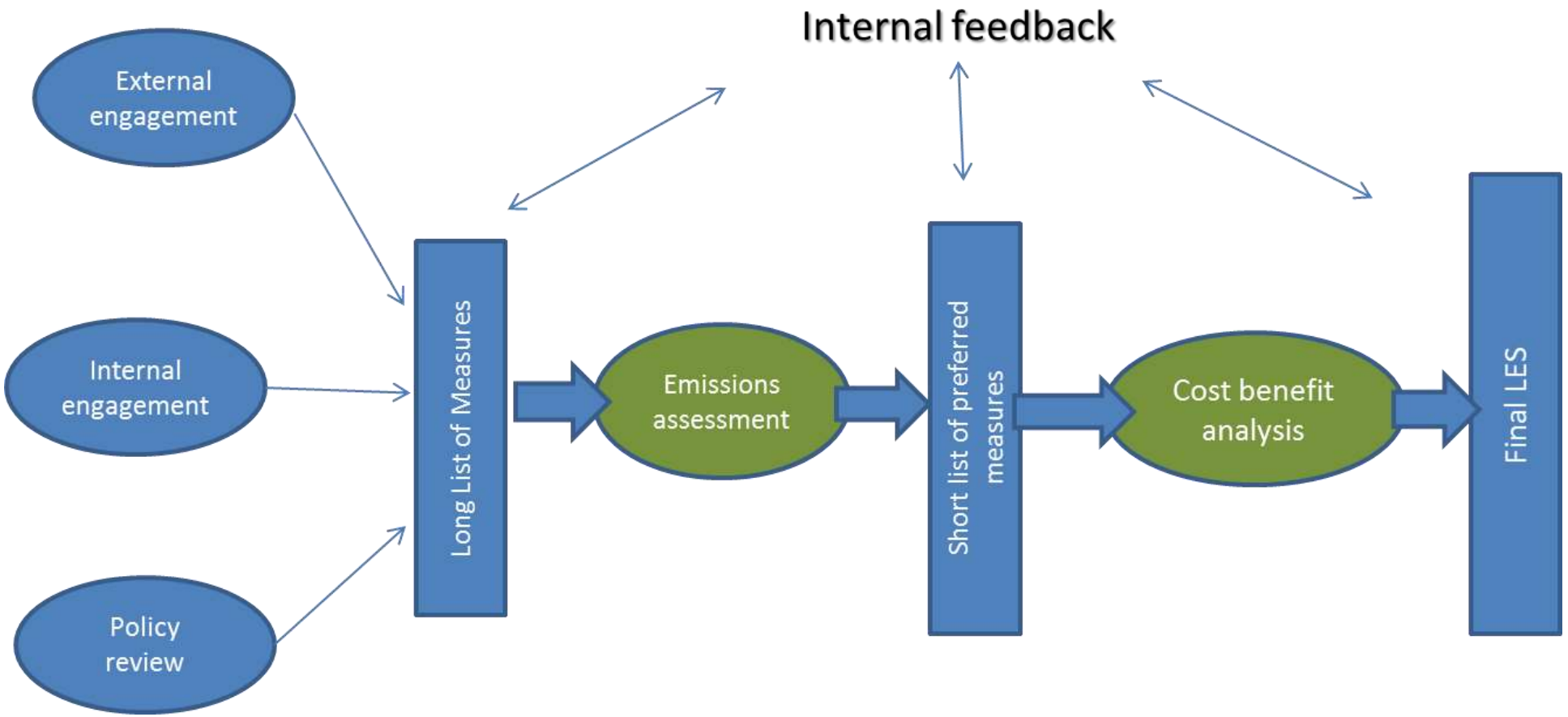
LES and LAQM



LES and policy integration



Developing a LES



Engagement – key stakeholders

Internal

- Transport
- Air Quality
- Climate change
- Planning and development control
- Procurement
- Taxi Licensing
- Public Health
- Fleet Management
- Human Resources

External

- Freight & Logistics
- Bus Operators
- Taxi Drivers/Businesses
- Retail interests
- Commercial interests – key business
- Health Sector
- Universities
- Community and NGOs

Assessing the emissions impact of measures

Any measure can impact on emissions in three ways by influencing:

1. The fleet composition

2. Traffic levels

3. Vehicle speeds

That's easy then?!

Developing measure impacts for a LES package

ID	Measure	Description	Fleet composition	Traffic levels	Vehicle speeds
Regulatory LEZ					
Corridor based LEZ		LEZ defined for key corridors (AQMA) into Leicester. Applies to bus and HGV and is regulated by ANPR. Traffic management measures applied to stop rat running off key routes.			
LEZ1	Base LEZ	Euro 3 standard for all Bus and HGV in 2016	bus and HGV Euro 3	-	-
LEZ2	Mid LEZ	Euro 4 standard for all Bus and HGV in 2016	d HGV 4	-	-
ULEZ	Ultra low Emission Zone	Euro 6 standard for all bus and HGV by 2016. Sensiti scenario to see what highest Euro standard could	V	-	-
EcoPass system		Normal LEZ is applied to all bus lanes on key c Emissions charging scheme is applied to HC emission limit is free, two charges for low			
EP1	Base EcoPass	Bus at Euro 4 HGV Euro4 – free HGV Euro2-3 –Low charge, shi HGV <Eruo2 – High charge	o Min 4, adjust HGV Euro standards up	HGV Traffic <20%	-
EP2	Ultra Low Ecopass	Bus at Euro 6 HGV Euro6 – free HGV Euro3-6 – Low cha HGV <Eruo3 – High charge	Set bus to Min Euro 4, adjust HGV Euro standards up	HGV Traffic <20%	-
		es			
Bus 1	Voluntary emission standard	Agree a voluntary emission stand operating in the city. Set standard to Euro 4 or re F scheme). Assume 80% compliance.	Euro 4 plus SCRT retrofit 20% non-compliant	-	-
Bus 2	Gas bus scheme	Gas buses operating from main Arriva depot. Apply to Melton road and Devonshire road – check for cross city routes from here and so impact on other corridors. Aso apply to Uppingham road to compare with TRL work.	Gas buses on 3 agreed corridors.	-	-
Bus 3	Quality corridor measures	Use data from Aylstone corridor to estimate roll out to all corridors.	-	Reduce car traffic by 3%	Check speed currently and increase – journet time reduced by 7-8 mins.

Literature review of measures
Local knowledge/models
Expert views

Detailed example: Euro IV Bus and HGV LEZ in 2016

- Fleet composition
  - All less than Euro IV become Euro IV?
  - All less than Euro IV are renewed so F
  - All less than Euro IV spread in sam xisting 2016 fleet greater that Euro IV?
  - Would bus response and HGV e the same?
  - Engagement with fleet opera

- Traffic levels
  - These are not affe
  - Some vehicles EZ so traffic levels go down?
  - Traffic mod ?

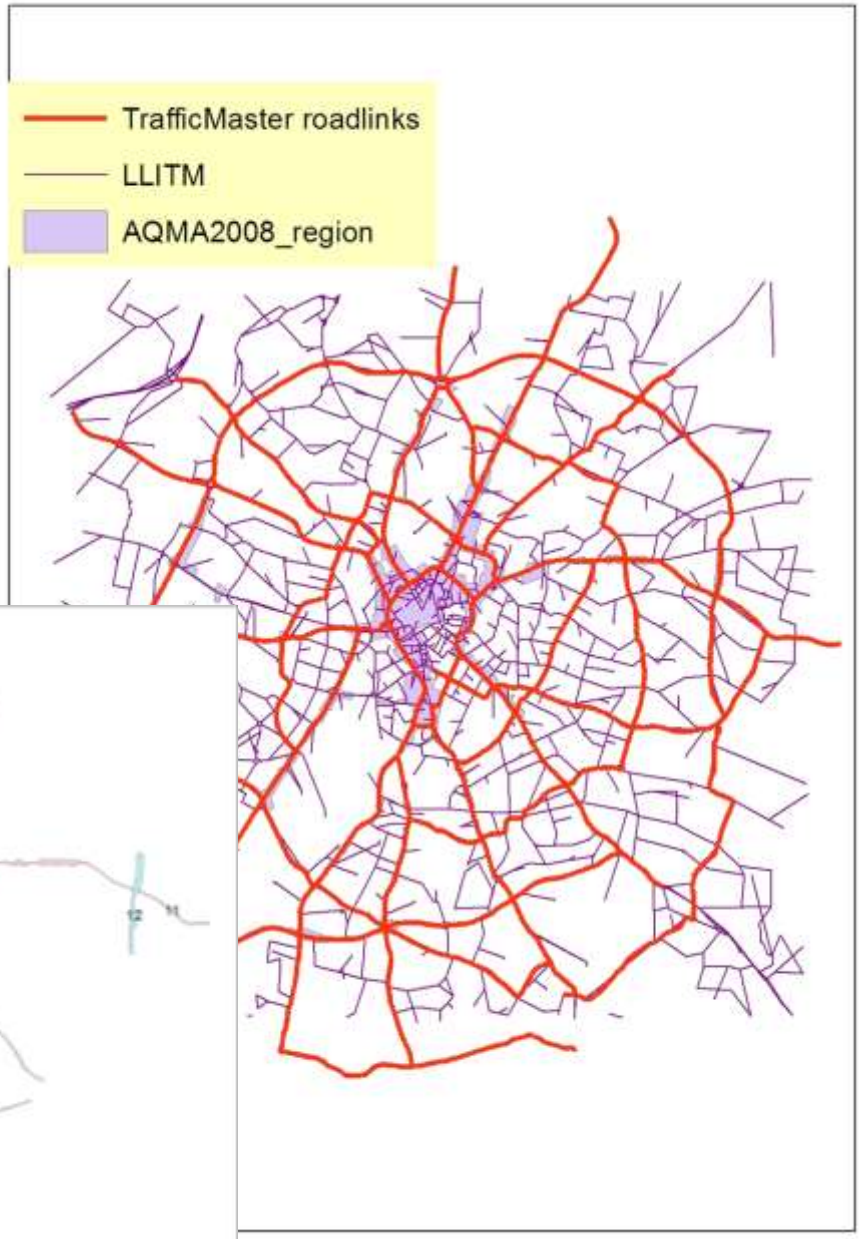
- Vehicle speeds
  - No change?
  - Less vehicles, so speeds may increase?

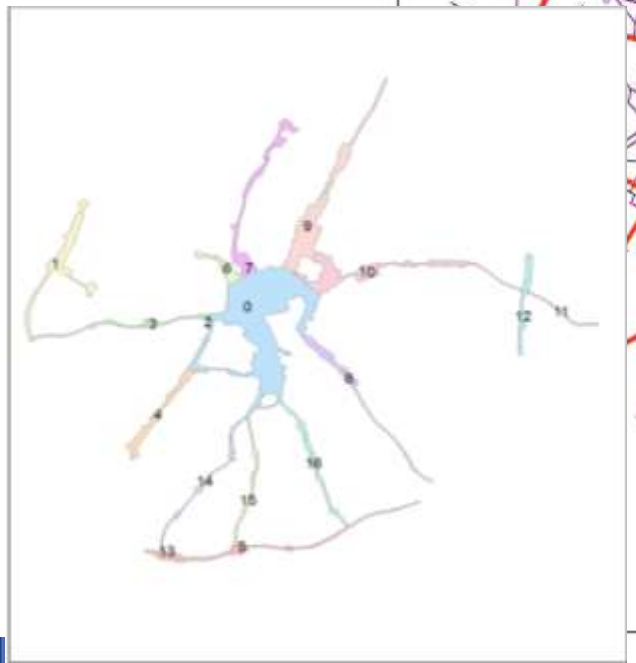
Your assumptions can have a big impact on the results

Sensitivity testing of assumptions

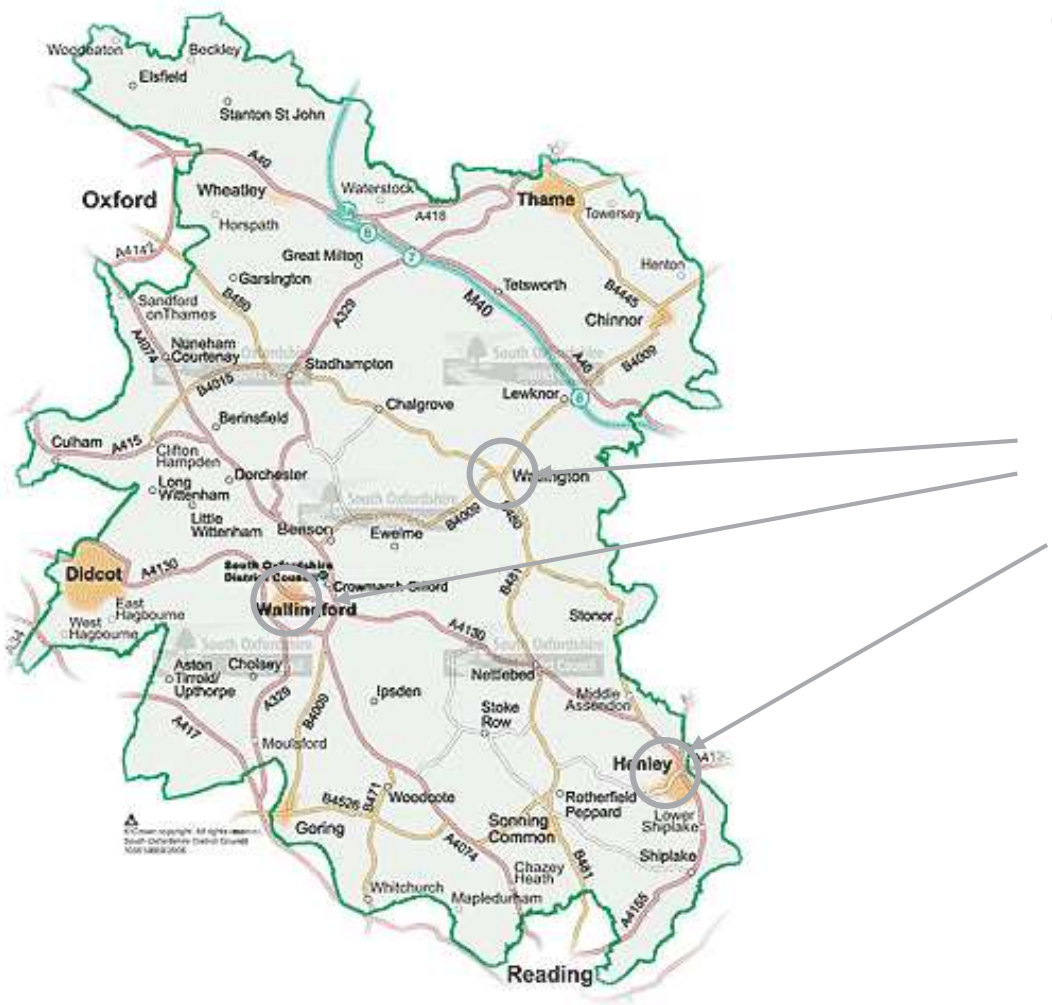
Example emissions model 1 - Leicester

- Based in EfT
- Leicester traffic model as basis
- DfT count data for fleet composition
- Traffic master data for speeds
- Zonal aggregation
- NOx, PM and CO2





Example emissions model 2 – South Oxfordshire



- District wide emissions model
  - EfT basis
  - DfT traffic data
- Three AQMA sub models
  - EfT/ADMS
  - Local count data
  - Local bus fleet data
  - Traffic master speeds
  - DfT complementary data
  - Emissions/concentrations

Cost Benefit Analysis

- Damage/Abatement costs savings

- Measure costs
  - Capital expenditure (CapEx)
  - Operating expenditure (OpEx)
  - Public sector costs
  - User/operator costs
  - Treasury costs (change in tax take)?

- Cost benefit assessment
  - Assessment period?
  - Net present value of costs and benefits over period > 0
  - Benefit Cost Ratio (BCR) > 1

Damage and Abatement costs

- Damage cost
  - Simplified estimate of cost of damage of emission to health, crops, etc
  - Emissions X damage cost

- Abatement cost
  - Used for when in areas of non-compliance
  - Represents costs in terms of national average cost to abate emissions
  - Applies only to portion of emission that effect compliance
  - Choice of abatement costs to reflect local conditions
  - Default value - £29,150
  - Much higher than damage costs

Sub sector	Baseline Technology	Abatement Measure	Marginal Abatement Cost (£/Tonne of NOx) 2015
HGV	Euro II	SCR	5099
HGV	Euro III	SCR	5380
Buses	Euro II	SCR	6251
Buses	Euro I	Hybrid	6500
Buses	Euro I	SCR	6625
Buses	Euro III	SCR	7257
Buses	Euro II	Hybrid	7462
HGV	Euro IV	SCR	8053
Buses	Euro III	Hybrid	9423
Buses	Euro IV	SCR	11889
Buses	Euro I	Electric	14669
Buses	Euro II	Electric	14872
Buses	Euro III	Electric	17352
Articulated HGV	New Euro V	Euro VI	17743
Buses	Euro IV	Hybrid	18391
Buses	New Euro V	Euro VI	24852
Rigid HGV	New Euro V	Euro VI	28374
Buses*	**Euro IV**	**Electric**	**29150**
Buses	Euro V	Hydrogen	72932
Diesel LGV - class 1	New Euro 5 class I	Euro 6	79323
Diesel LGV	Euro 1	Electric	100665

Example of measure costs – Euro IV LEZ

Public sector costs

- How will scheme be implemente[illegible]PR, manual, ?
- Capital costs of scheme – e[illegible]
- Operational costs of sch[illegible]sts, back office, etc
- Revenue from fines?

Literature review of measures

Local knowledge/models

Expert views

Operators costs

- Vehicle replacement [illegible]
  - How many vehicles will be affected? We [illegible]issions with VKM
  - What will they do?
    - Buy new?
    - Move fleet around
    - Residual values?
- What about operating costs?
  - New or different vehicles may cost more to run?

Your assumptions can have a big impact on the results

Sensitivity testing of assumptions

Benefits over time

- What time frame do we use?
  - Relate to life time of measures – usually 10 or 20 years
- We have assessed the emissions benefit for 1 target year
- However our assessment is over a 10 or 20 years?
  - Is the emission saving the same every year?
  - Should we model every year?
  - Should we estimate trend?
  - In theory benefit will reduce over time as fleet improves
- A simple trend may be best

Example CBA results 1 - Leicester

Scenario	Total PV benefits 2016-2025 (£millions)	Total PV cost 2016-2025 (£millions)	NPV (£millions)	Rank (NPV)	Benefit Cost Ratio	Rank (BCR)
Bus_LEZ	£3.49	£1.62	£1.87	3	2.15	6
Bus_Retrofit	£3.32	£1.19	£2.13	2	2.79	4
Bus_Gas	£8.04	£1.83	£6.21	1	4.40	1
HGV_DSP	£0.86	£0.29	£0.57	5	2.93	3
HGV_Eco	£0.85	£0.31	£0.54	6	2.74	5
HGV_Gas	£0.64	£1.40	-£0.76	8	0.46	8
EV	£1.85	£0.49	£1.36	4	3.76	2
Smart	£1.70	£1.69	£0.02	7	1.01	7
Total*	£15.68	£7.63	£8.05		2.05	

Example CBA results 2 - South Oxfordshire

Scenario	Total PV benefits 2016-2025 (£millions)	Total PV cost 2016-2025 (£millions)	NPV (£millions)	Rank (NPV)	Benefit Cost Ratio	Rank (BCR)
Area measures						
EV 2% (a)	1.41	0.38	1.02	2	3.68	3
EV 2% (b)*	6.11	21.62	-15.50	13	0.28	9
Bus 1	0.29	0.50	-0.20	5	0.59	7
Bus 2*	0.84	0.04	0.81	3	22.24	2
HGV*	13.86	0.50	13.36	1	27.76	1
Smart	2.37	5.72	-3.35	9	0.41	8
AQMA measures						
Wallingford BusX	0.09	0.79	-0.70	6	0.12	10
Henley LEZ (a)	0.10	1.31	-1.21	8	0.07	12
Henley LEZ (b)	0.10	7.98	-7.88	11	0.01	13
Watlington HGV1	0.20	0.14	0.06	4	1.44	4
Watlington HGV2	0.07	0.87	-0.80	7	0.08	11
Combined						
Area LES	23.48	28.37	-4.89	10	0.83	5
Area LES Plus AQMA	23.94	38.15	-14.21	12	0.63	6
Package - public costs	19.23	10.24	8.99		1.88	
* Opex savings added to benefits						

Some conclusions

- A Low Emission Strategy (LES) is an area strategy designed to reduce emissions of both air pollutants and GHG pollutants

- Developing a LES requires
  - An evidence base – quantification
  - Engagement with stakeholders
    - Internal – a council wide approach
    - External – to get a partnership approach

- Focus today has been on the evidence base
  - Often quite a few data/evidence gaps
  - Key gap is impact of measures on actual activity – e.g. uptake of technologies

- Significant effort is also required to engagement
  - In developing appropriate measures
  - Long term implementation

Thank-you for your attention

Any questions?