Costs and benefits of local policies

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UNECE TFIAM

CBA of European air pollution policies

- CBA has been successfully applied in EU air quality policy making since the mid-1990s
  - National emission ceilings directive
  - Industrial emissions directive
  - Air quality directives
  - Climate co-benefits assessments
  - Etc.
- Also by a number of countries
  - e.g. UK, France
- But less evidence of CBA at a local level

TSAP 2013, IIASA rep #11

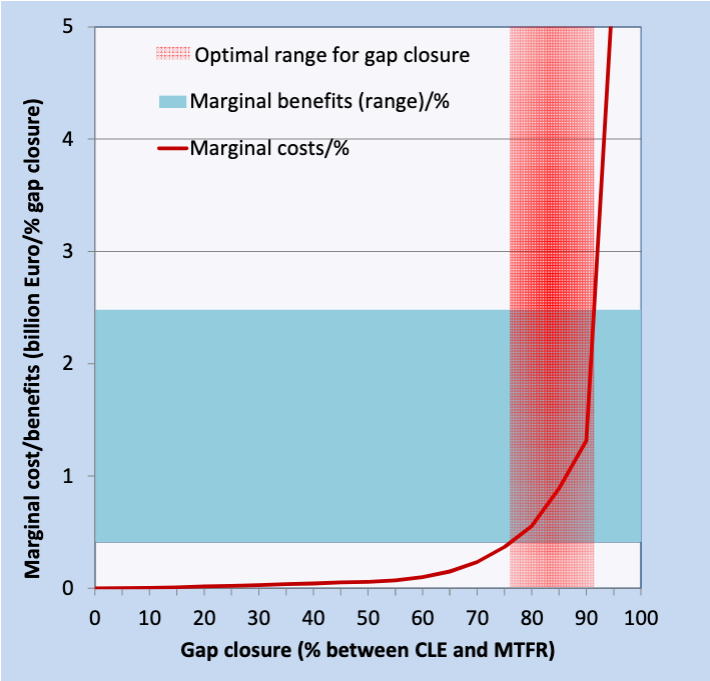

Figure 4.2: Marginal emission control costs and marginal health benefits in 2025

A problem!

- There is a lack of data on the costs and effectiveness of many local measures
  - EUROSAI report
  - Review supplied to EC AAQD Fitness check
- Some data collections with details of specific applications of measures are available, but they lack data on costs and effectiveness
- This leads to limited guidance being available for local authorities for prioritising measures and designing them to take account of local characteristics
- Why?
- Can we develop a reporting framework to remedy this?

Availability of data

- Costs
  - Technical measures
    - End-of-pipe abatement technologies, cleaner fuels, improved appliances, technical efficiency measures, etc.
    - Measures that can be widely applied with broadly similar outcomes in terms of emission control (but not necessarily benefits)
    - GAINS database, TFTEI, national databases, etc.

  - Non-technical and other local measures
    - Modal shift in transport (to walking, cycling, public transport), reduced meat intake, road layout changes, charging zones, etc.
    - Outcomes can be very variable
      - Size of city
      - Scale of scheme
      - Charging structure
      - Enforcement
      - Etc.
    - Much more limited evidence base
    - Role of TFTEI (?)

Why is cost data for local AQ measures difficult to find?

- Main reason for measure may not be related to air pollution
  - Climate, congestion, mobility, etc.
  - Those taking measures locally are often not otherwise involved in air pollution work
    - Transport planners, development planners, climate officers
- Measures of success may not include emissions or change in air quality
  - Although effectiveness data should extend beyond air pollution to include other effect (co-benefits and trade-offs – see additional slides)
- No perceived need by those taking action to collect data on measures once implementation is underway or finalised?

- No centralised resource providing data on measures to encourage data collection
- Some cost data imply full costs of measures should be attributed to improvement of air quality when this is not the case
- Understanding of variability in outcomes requires research and analysis, with the result that the small amount of data that are available are not widely used.

Questions around a proposal for data collection

- What is the purpose of further data collection?
  - To provide a consistent framework for data on local measures for air pollution improvement
  - To provide local planners with guidance to maximise efficiency of measures

- Which measures should it focus on? Suggestions:
  - Transport
    - Clean Air Zones, including charging schemes
    - Scrappage schemes
    - Modal shift, including active travel
  - Heating
    - Fuel switching
    - Cleaner appliances
    - Improved maintenance

Questions around a proposal for data collection

- What data do we need?

Local Air-quality Measures Database (LAMDA)	
City	
Country	
Sector	Select from drop down list
Measure type	
If "Measure type" = other, please describe	
Contact details	
Name	
Organisation	
Email	
Phone	
Details of organisation implementing the measure	
Who was responsible for implementation?	
Organisation	
Department name	
Type of organisation	
Sector addressed by organisation	

Questions around a proposal for data collection

- What data do we need?

Details of the measure	
Describe the measure	Free text
Primary purpose of measure	Select from drop down list
If "Primary purpose" = other, please describe	Free text
Date implementation started	Year
Date when measure was operational	Year
Date when implementation was complete	Year
Cost of measure	Free text
Indicators used for evaluation	
Size of affected area	
Change in emissins	
Change in pollution concnetration	
Information on other indicators	

Organisational questions around a proposal for data collection

- Who would coordinate the work?
- Who would collect data?
  - With a reporting framework in place, there is potential for much self-reporting of measures
  - However, to start it off, some systematic review process would be needed, building up case studies from available data
- How would it be disseminated?
  - Web, open access
- How would it be funded?

Benefits Analysis

- Benefits
  - Can be expressed in various ways
    - Emissions
    - Concentrations
    - Health impact
    - Economic cost
- Health impact analysis and economic assessment are not difficult provided that data on cost-effectiveness extend to emissions or concentrations

Benefits Analysis

- Economic analysis
  - Primary analysis using the impact pathway approach (IPA)
    - Numerous analyses for UK government, European Commission, USEPA, etc.
  - Unit damage costs (economic damage per tonne emission)
    - Growing number of countries have produced unit damage costs, as well as European Commission and European Environment Agency
    - Some countries provide a detailed breakdown of damage costs by source for some pollutants (next slide)
    - Variability in assumptions on which health effects to consider values to use, etc.
    - Regrettable tendency to ignore trans-boundary effects
  - IPA considered more reliable, but needs to be applied correctly
    - There is a growing number of examples of bad practice!

Example of detailed damage costs Defra 2019

Pollutant Emitted	Central Damage Cost (£/t)	Low – High damage cost sensitivity range (£/t)		$PM_{2.5}/PM_{10}$ Conversion Factor
		Low sensitivity	High sensitivity	
$PM_{2.5}$ Road Transport Central London	1,111,831	230,582	3,430,456	0.673
$PM_{2.5}$ Road Transport Inner London	1,132,776	234,913	3,495,112	0.673
$PM_{2.5}$ Road Transport Outer London	602,201	125,195	1,857,233	0.673
$PM_{2.5}$ Road Transport Inner Conurbation	420,523	87,626	1,296,397	0.673
$PM_{2.5}$ Road Transport Outer Conurbation	250,221	52,409	770,676	0.673
$PM_{2.5}$ Road Transport Urban Big	305,377	63,815	940,942	0.673
$PM_{2.5}$ Road Transport Urban Large	247,045	51,753	760,871	0.673
$PM_{2.5}$ Road Transport Urban Medium	203,359	42,719	626,014	0.673
$PM_{2.5}$ Road Transport Urban Small	152,694	32,242	469,611	0.673
$PM_{2.5}$ Road Transport Rural	69,745	15,089	213,548	0.673

- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770576/air-quality-damage-cost-guidance.pdf. See additional slides for further data. Same available for NOx.

Additional slides

- Co-benefits and trade-offs
- Additional Defra damage costs for $PM_{2.5}$

Examples of co-benefits and trade-offs

- Reducing the number of cars on the road:
  - **Reduce congestion: +ve.**
  - **Reduce traffic noise: +ve.**
  - **Change accident damage: +ve or -ve, with fewer vehicles to be involved in accidents but higher speeds that may worsen accident outcomes.**
  - **Reduce greenhouse gas emissions: +ve.**
  - Reduce emissions of other air pollutants including VOCs, CO: +ve.
  - Change mobility: +ve or -ve depending on additional actions taken, such as enhancing public transport or active transport provision.
  - **Improve physical fitness through increasing levels of walking and cycling: +ve.**
  - Change in cost of transport provision: +ve or -ve depending on adopted alternatives.
- Banning wood burning:
  - Reduce emissions of other air pollutants including VOCs, CO: Likely +ve, but dependent on what demand for wood burning is replaced by, if anything.
  - **Change in greenhouse gas emissions: +ve or -ve depending on the sustainability of the source of wood.**
  - Costs to users of replacing wood stoves or grates: -ve, but may be accounted for in the cost assessment.
- Reducing emissions from NRMM:
  - **Reduce greenhouse gas emissions: +ve.**
  - Reduce emissions of other air pollutants including VOCs, CO: +ve.
  - Change cost of NRMM: Likely +ve through increased efficiency of better, less polluting devices, but potential for an increase in cost (-ve).

Defra damage costs 2019

- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770576/air-quality-damage-cost-guidance.pdf

Table 3 - Updated full set of damage costs

Pollutant Emitted	Central Damage Cost (£/t)	Low – High damage cost sensitivity range (£/t)		$PM_{2.5}/PM_{10}$ Conversion Factor
		Low sensitivity	High sensitivity	
National				
NO_x	6,199	634	23,153	
SO_2	6,273	1,491	17,861	
NH_3	6,046	1,133	18,867	
VOC	102	55	205	
$PM_{2.5}$	105,836	22,588	327,928	0.642
PM Part A Sector				
$PM_{2.5}$ Part A Category 1	8,666	2,473	25,060	0.659
$PM_{2.5}$ Part A Category 2	37,087	8,350	113,161	0.659
$PM_{2.5}$ Part A Category 3	81,059	17,444	249,465	0.659
$PM_{2.5}$ Part A Category 4	2,989	1,299	7,462	0.659
$PM_{2.5}$ Part A Category 5	6,392	2,002	18,013	0.659
$PM_{2.5}$ Part A Category 6	9,708	2,688	28,293	0.659
$PM_{2.5}$ Part A Category 7	2,557	1,209	6,125	0.659
$PM_{2.5}$ Part A Category 8	3,355	1,374	8,598	0.659
$PM_{2.5}$ Part A Category 9	4,223	1,554	11,289	0.659

Defra damage costs 2019

Pollutant Emitted	Central Damage Cost (£/t)	Low – High damage cost sensitivity range (£/t)		$PM_{2.5}/PM_{10}$ Conversion Factor
		Low sensitivity	High sensitivity	
PM Source Sector				
$PM_{2.5}$ Industry (area)	95,847	20,679	308,503	0.534
$PM_{2.5}$ Commercial	63,797	13,636	183,869	0.977
$PM_{2.5}$ Domestic	85,753	18,171	247,526	0.977
$PM_{2.5}$ Solvents	194,078	41,485	692,660	0.366
$PM_{2.5}$ Road Transport	203,331	42,713	625,927	0.673
$PM_{2.5}$ Aircraft	194,269	40,571	560,317	1
$PM_{2.5}$ Offroad	153,487	32,181	446,162	0.943
$PM_{2.5}$ Rail	163,413	34,240	476,129	0.929
$PM_{2.5}$ Ships	33,739	7,443	97,124	0.947
$PM_{2.5}$ Waste	162,082	34,067	484,553	0.789
$PM_{2.5}$ Agriculture	46,442	11,732	192,401	0.218
$PM_{2.5}$ Other	251,877	52,538	738,774	0.894