Economic perspectives on accounting metrics for black carbon and methane

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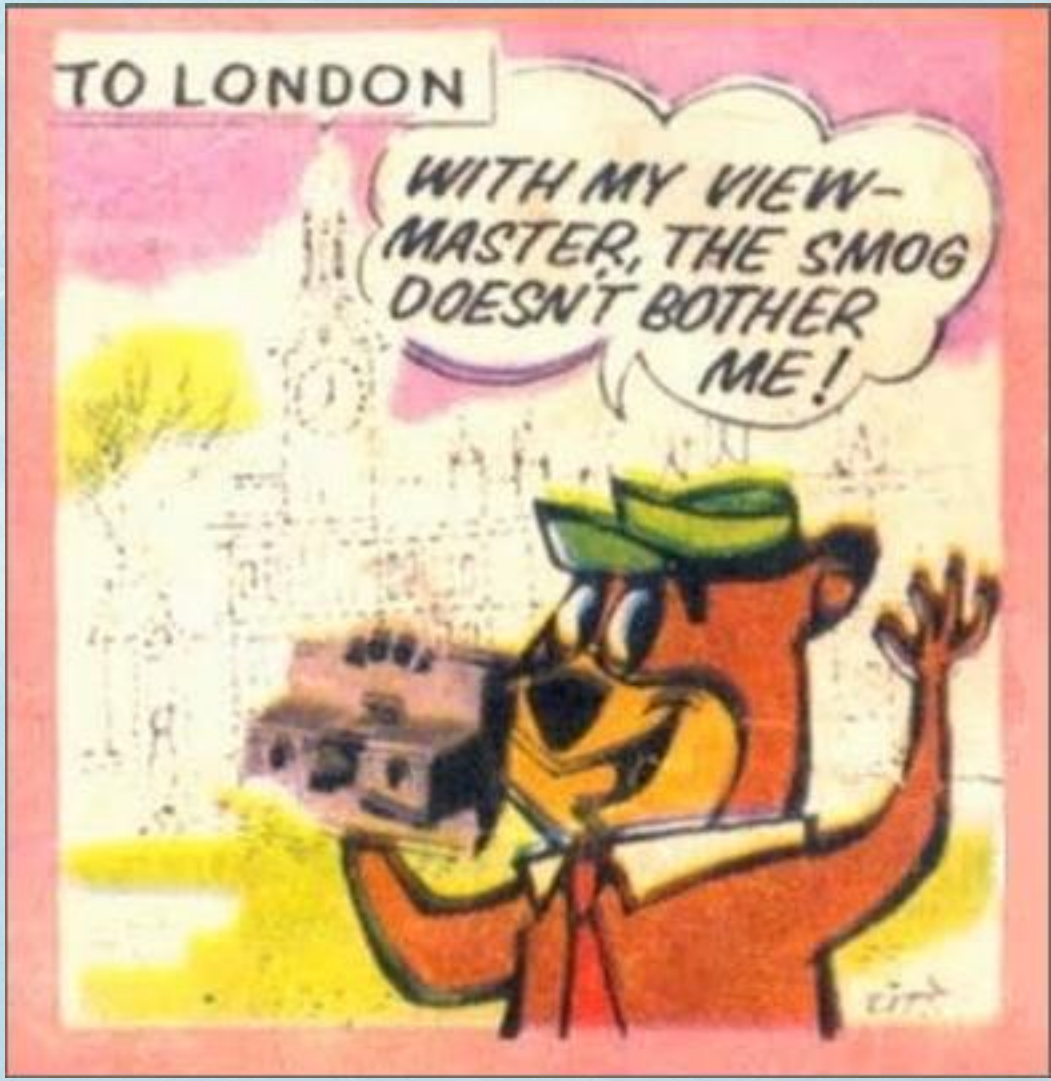
CCAC workshop on ‘Metrics for Evaluating and Reporting on Black Carbon and Methane Interventions’



‘Economic perspectives’

- The value of things (now and in the future) …

  for which monetisation is routine (‘market values’ for crops, healthcare, cleaning buildings, pollution controls, etc.)

  +

  the value of things that we normally value in other ways (‘non market values’ for being well, ecological status, etc.)

- Expressing information in a way that will be considered seriously by funders
  - What do they want to know?
  - What metrics work?
  - How should we talk about uncertainty and opportunity?

Values in more detail

- Health
  - Health care costs
  - Productivity
  - Utility of good health
- Crops
  - ‘Routine’ crop losses
  - Food security
- Other receptors (forests, natural ecosystems, materials…)
  - ….

What should we value?

- Anything that may be positively or adversely affected by an intervention
  - Black carbon and methane benefits for health and environment
  - Effects of other co-emitted pollutants
  - Effects of other burdens e.g.
    - Linked to transport choices (noise, accidents, congestion, active transport benefits, urban cohesion, energy security)
    - Linked to domestic choices (stoves, lighting, etc.: energy efficiency, educational opportunity, etc.)
    - …
- Need to juggle:
  - Policy optimisation against multiple objectives
  - Potential for adverse outcomes from a restricted assessment

Paralysis by analysis?

- Should we seek to quantify everything when we want to do anything?
- No
  - It is important to show that the ‘big picture’ has been studied, but
  - We can’t quantify everything because we don’t have the data
  - Quantifying everything you can think of every time you do anything is wasteful
- We can use frameworks that are developed at a higher level to
  - Identify different types of impact
  - Identify whether positive or negative
  - Consider whether likely to be important
  - Quantify where possible
  - Review what has been quantified and what is described qualitatively

Accounting framework developed for CCC (Forster et al) for electricity

Figure 8: Electricity production: Presence or absence of a cost associated with other lifecycle stages of measures

	Click on abatement options to move to worksheets containing full details	Nuclear	Coal	Natural gas CCGT	Natural gas OCGT	Coal with CCS	CCGT with CCS	Biomass	Onshore wind	Offshore wind
	Discount rate / Base case power plant efficiency	3% discount rate	37.50%	51.60%	51.60%	37.50%	51.60%	30.50%		
Generation stage: Human health	Diet									
	Lifestyle									
	Psycho-Social environment (e.g. stress, crime)								-	
	Housing Conditions (e.g. cold, damp, indoor air quality)									
	Major accident risk	0.009	-	-	-	-	-	-		-
	Occupational health	0.0044	0.0013	0.0009	0.0009	0.0013	0.0009	0.00072	0.02	0.02
	Water pollution - health	note 1	-	-	-	-	-	-		-
	Air quality	0.00011	- -	- -	- -	- -	- -	- -		
	Air quality: effects outside UK	note 1	- -	- -	- -	- -	- -	- -		
	Hazardous waste generation	1.10E-06	-	-	-	-	-	-		
	Geophysical factors (e.g. uv light, radiation)									
	Noise	-	0.016	-	-	0.016	-	0.019	0.01	
	Infection	-	-	-	-	-	-	-		
Generation stage: Environment	Hazardous waste generation	-	-	-	-	-	-	-		
	Solid waste generation (non-hazardous)	-	-	-	-	-	-	-	-	-
	Air quality	-	- -	- -	- -	- -	- -	- -		
	Heavy metals and other trace pollutants	-	0.0049	-	-	0.0049	-	0.0049		
	Materials damage from air pollution		-	-	-	-	-	-		
	Landscape									
	Land take									
	Water abstraction		0.05	0.026	0.026	0.05	0.026	0.05		
	Water pollution	-	-	-	-	-	-	-		-
	Bioversity and ecosystems	-							-	-
	Subsidence									
	Soil erosion/fertility									
	Resource use (metals/minerals)	see datasheet	see datasheet	see datasheet	see datasheet	see datasheet	see datasheet	see datasheet		

- https://www.theccc.org.uk/publication/fourth-carbon-budget-review/

Similarly for road transport… (same source)

Figure 14: Road transport: Valuation of external costs for the use stage (Units: Pence per vehicle km. Cur

	Click on abatement options to move to worksheets containing full details	Conventional vehicles	Electric cars and vans	Plug in hybrid cars and vans	Hydrogen buses	Biofuels_foodcrops	Biofuels_waste	Biofuels_energy crops	Improved vehicle efficiency	Smarter choices: Walking/cycling	Smarter choices: Demand reduction	Smarter choices: Pu tra
Driving: Health	Diet											
	Lifestyle									28.68	+	
	Psycho-Social environment (e.g. stress, crime)							+/-		++	+	
	Housing Conditions (e.g. cold, damp, indoor air quality)											
	Major accident risk											
	Occupational health											
	Road accidents	-1.70	-1.70	-1.70	-	-1.70	-1.70	-1.70	-1.70	-1.92	-1.68	
	Water pollution - health											
	Air quality	- -		-		- -	- -	- -	+	+	+	
	Air quality outside UK			-		- -		- -				
	Hazardous waste											
	Noise	-0.25	-	-	-	- -	- -	- -	+?	0.25	0.25	
	Infection											
	Geophysical factors (UV, radon)											
Driving: Environment	Hazardous waste generation											
	Solid waste generation (non-hazardous)											
	Greenhouse gases	Being assessed elsewhere: outside project scope										
	Regional air pollutants (NH_3, NO_x, PM, SO_2, VOCs)	-0.03		-	-	- -	- -	- -	+	0.03	0.03	
	Heavy metals and other trace pollutants	-0.04		-					+	0.04	0.04	
	Materials damage from air pollution	-		-		-	-	-	+	+	+	
	Landscape											
	Land take											
	Water abstraction											
	Water pollution	-		-		-	-	-	+	+	+	

How big are the health damages of PM and ozone? EU analysis

DAMAGE: EU28		CLE 2025	A05 2025	MTFR 2025
Acute Mortality median VOLY	O3	1,023	930	876
Respiratory Hospital Admissions	O3	53	48	45
Minor Restricted Activity Days	O3	2,028	1,845	1,739
Respiratory medication use	O3	19	17	16
Chronic Mortality median VOLY	PM	157,346	126,120	116,115
Infant Mortality median VSL	PM	729	583	535
Chronic Bronchitis	PM	29,509	23,678	21,821
Hospital Admissions	PM	184	147	136
Restricted Activity Days	PM	23,428	18,791	17,308
Respiratory medication use	PM	27	21	20
Lower Respiratory Symptoms	PM	16,000	13,000	12,000
Total, with median VOLY		**230,036**	**184,780**	**170,217**

- Based on analysis informing development of EU's Clean Air Policy Package of December 2013 (note that these are not the final policy scenarios)

Wider range of identified health effects?

	NO2 Long-term	$PM_{2.5}$ Long-term	Ozone Long-term
Mortality			
All-cause	X	X	X
Respiratory	X	X	
Cardiovascular	X	X	
Respiratory outcomes			
Asthma (children)	X	X	
Asthma (children) in asthmatics			
Asthma (adults)	X		
COPD/ Chronic Bronchitis		X	
Lung function (children)	X	X	
Cardiovascular outcomes			
CHD		X	
Stroke		X	
Hypertension			
Diabetes	X	X	
Cancer and other outcomes			
Lung cancer	X	X	
Low birth weight	X	X	
Pre-term birth		X	X
Dementia	X		X
Hospitalisation			
Respiratory	X		
Cardiovascular			
Dementia		X	

Range of identified health impacts

- Broader range but many effects based on a limited literature
  - Confidence?
  - More focus on long term conditions than previously
    - Potentially very much greater impacts on healthcare systems and on productivity
    - Increased resonance with some stakeholders?

Future values

- Richer planet? Expect growth in valuations
- Present value of future ‘wealth’
  - Many good reasons for discounting
  - Problem of long term
    - Linear vs non-linear discounting
- Sustainability
  - Tipping points, unacceptable impacts

Metrics for attracting finance

- Project design
  - Finance vs resource?
  - Understanding barriers to implementation
  - Metrics that demonstrate resource will be well used
- Metrics that permit comparison across policy objectives:
  - Clean air or clean water or education?
  - Action in one place vs another (e.g. difference in capacity for change)
- Metrics that resonate with funders and other stakeholders

Communicating with stakeholders

- Motivating stakeholders
  - Giving them something that they understand
    - Deaths?
    - Critical loads / levels exceedances?
  - GBD tells us that air pollution kills millions of people every year
    - Good news or bad news?

Communication in different ways

- Air pollution kills millions of people every year
  - Bad news
    - If you don't act on the information
  - Good news
    - We have identified a major burden on public health
    - We know what actions to take to reduce the burden
    - We know what will worsen the problem

Communicating robustness

- We don’t do it well
  - IPCC framework
    - Useful, but could be more used and better used
    - Is use of probability too technical?
  - ’Sound science’
    - Important but can be pushed so far as to increase uncertainty
  - Uncertainties
    - Of more interest than ‘certainties’?
    - To difficult to quantify?
  - Certainties
    - Generally not highlighted as such, but critical