

# CBA: progress, major issues and challenges

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# Air pollution and the UK election

*“We will also scrap the Large Combustion Plant Directive and stop the EU’s Medium Combustion Plant Directive...”*

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# Refining methods for health assessment (ongoing activities)

- COMEAP
- Novel endpoints, new valuations
- Comparison of EU and US HIA work
- Toxic metals

# Questions arising on air pollution impact assessment and valuation

- How do we present and value mortality?
  - ‘Deaths’ or lost life expectancy?
- How do we interpret morbidity effects?
  - Chronic bronchitis: Severity, duration?
- How complete are estimates?
  - NO<sub>2</sub> impacts
  - Cardiovascular morbidity
  - Low birth weight
  - Hospital admissions

# Current COMEAP activities

- COMEAP – UK Committee on the Medical Effects of Air Pollutants
- NO<sub>2</sub>
  - Threshold?
  - Linking exposure to response functions
- Work loss days
  - Extended literature review
  - Many studies on school absence identified
  - Alternative approaches to quantification
- Chronic bronchitis
  - Incidence vs prevalence
  - Consistency of epidemiology studies
- (other work in this area in Europe?)

# Novel endpoints

- Analysis of impacts in London, including ‘emerging effects’:

<b>PM</b>	<b>£ million</b>
Low birth weight	£5
Acute coronary events	£818
Cerebrovascular events	£692
Lung cancer	£410
<b>NO2</b>	
Low birth weight	£8
Chronic mortality	£560
Total cost for emerging effects	£2,493
Total cost all effects	<b>£5,000</b>

# New valuations

- Health care costs
  - WHO CHOICES database indicates that our previous estimates of health care costs for hospital admissions were too low by a factor 2

# Health care costs of air pollution, CGDD, France 2013

	Annual cases attributable to the environment		Annual cost to health care systems (€million/yr)	
	Lower bound	Upper bound	Lower bound	Upper bound
Chronic obstructive pulmonary disease	26,800	40,200	30	46
Chronic bronchitis	134,000		80	
Acute bronchitis	950,000		170	
Asthma	400,000	1,400,000	335	1,100
Lower respiratory cancers	1,608	4,020	53	138
Upper respiratory cancers	76	380		
Respiratory hospital admissions	13,800		155	
Cardiovascular hospital admissions	19,760			
<b>Total costs</b>			<b>825</b>	<b>1,700</b>

# Health care costs of air pollution, DGA, USA 2011 (4 rules)

Effect	Unit cost, \$, price year in brackets	Healthcare savings, 2011 prices, \$million, %	
Premature mortality (incl. infants)	Adults: 35,516 (1999) Infants: 20,000 (2011)	37,729	47%
Chronic bronchitis	17,936 (2000)	4,739	6%
Non-fatal heart attacks, >18years	84,955 (2006)	35,533	44%
Cardiovascular hospital admissions	13,602 (2006)	1,781	2%
Respiratory hospital admissions	8,434 (2006)	543	1%
Emergency room visits, asthma, <18 years	369 (2006)	70	0%
<b>Total</b>		<b>80,395</b>	<b>100%</b>

# European vs US positions (unit values)

	<b>European Commission (Holland, 2014)</b>	<b>US EPA (2010)</b>
Acute Mortality	57,500 - 140,000 (VOLY)	6.6 million (VSL)
Chronic Mortality	57,500 - 140,000 (VOLY) 1 - 2.3 million (VSL)	-
Infant Mortality (0-1yr)	1.6 - 3.4 million	6.6 million (VSL)
Respiratory hospital admissions	2,235	19,178
Cardiovascular hospital admissions	2,235	22,096
Non-fatal myocardial infarction	-	68,079
Emergency room visits, respiratory	-	298
Chronic Bronchitis	54,000	359,926
Bronchitis in children	591	375
Asthma exacerbation	-	42
Asthma symptom days	43	-
Restricted Activity Days	93	-
Minor Restricted Activity Days	43	50
Respiratory medication use	-	-
Lower respiratory symptoms	-	15
Upper respiratory symptoms	-	24
Lost working days	131	121
School loss days	-	72
Outdoor worker productivity	-	121

# Consequences for the CBA

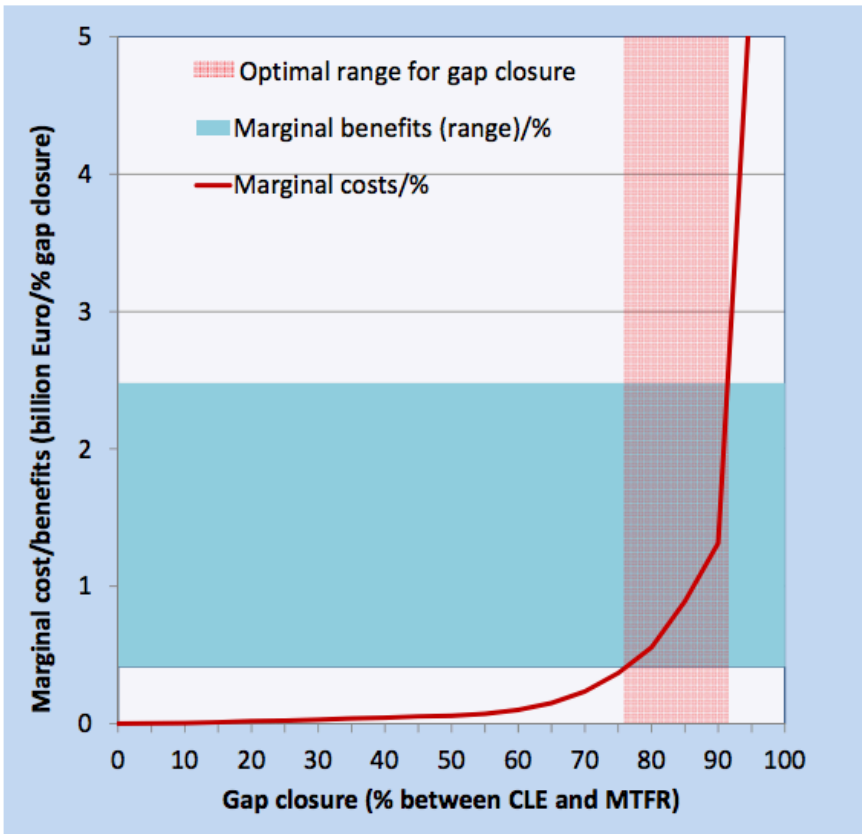


Figure 4.2: Marginal emission control costs and marginal health benefits in 2025

- Reinforces the view that benefits > costs

# Quantified effects in new metals externalities research

hs



Research not yet published

Yellow boxes highlight effects quantified previously. For As, non-cancer mortality now included and larger than cancer mortality. For Cd, use of non-occupational studies has led to significant increase in mortality risk.

# Preliminary view...

- Damage per kg estimates much higher than before through introduction of additional functions
- New figures are large enough to suggest toxic metals would make a significant contribution to damage from some sources
- Papers are currently undergoing peer review

# Updated damage per tonne estimates for PM, SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub>, VOCs

- For European Environment Agency  
<http://www.eea.europa.eu/publications/costs-of-air-pollution-2008-2012>
- Estimates based on
  - Updated EMEP transfer matrices (thanks to Chris and Tim)
  - HRAPIE functions
  - Valuations used for Clean Air Policy Package
  - Includes estimates for sea regions as well as 36 countries

EEA Technical report | No 20/2014

Costs of air pollution from European  
industrial facilities 2008–2012  
– an updated assessment

ISSN 1725-2237



# Headline results for new damage per tonne estimates

€/tonne	NH3	NOx	PM2.5	SO2	VOC
EU average	9,422	4,565	27,925	11,291	1,432
Overall average (countries)	9,463	4,637	27,942	11,004	1,355
Overall average (seas)	5,474	1,349	7,311	3,909	924

Notes; Separate results for 38 countries, 10 sea areas.

Factor >10 difference between countries

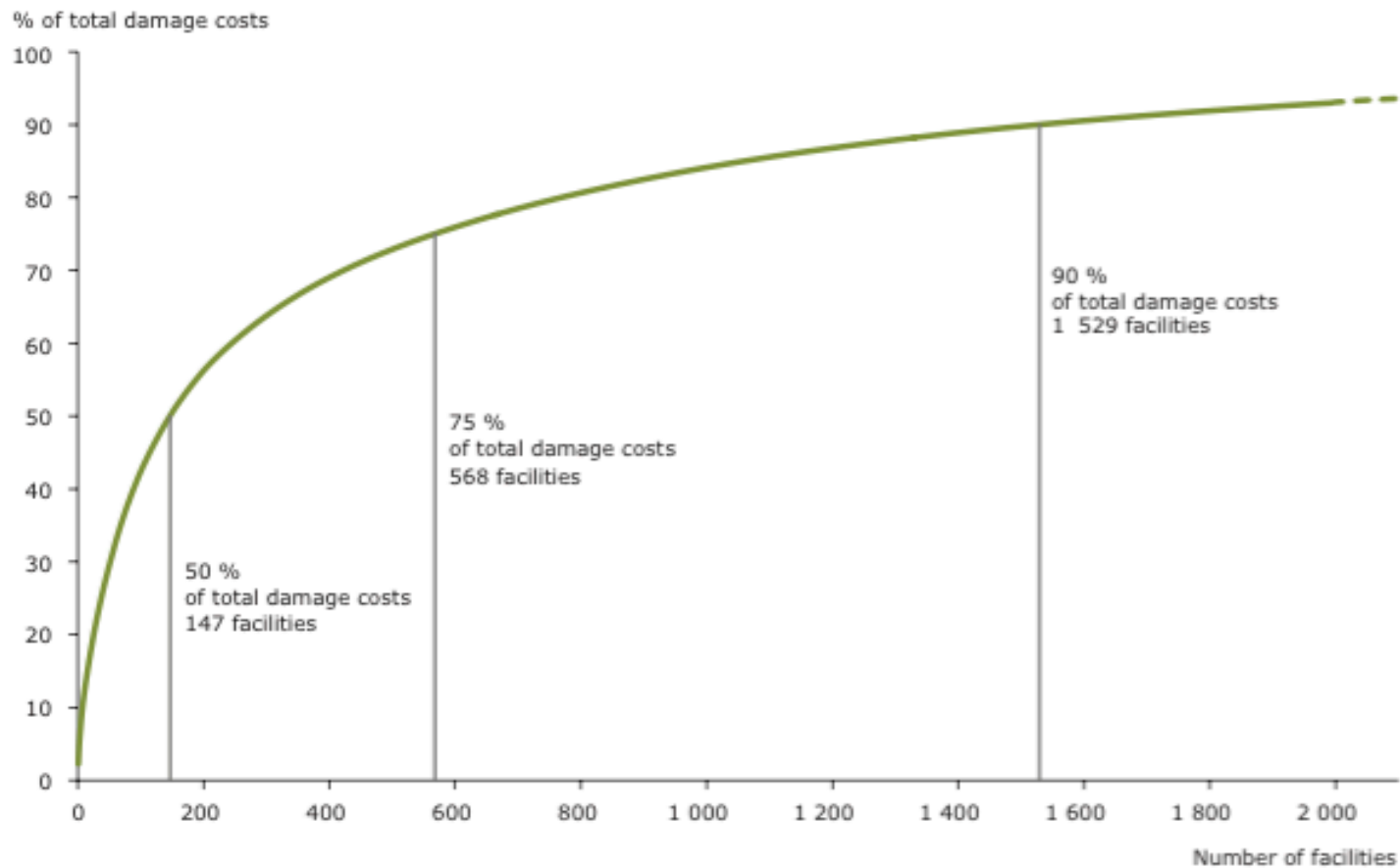
NH<sub>3</sub>, NO<sub>x</sub> both around 20% less than earlier estimates

PM<sub>2.5</sub>, VOCs similar

SO<sub>2</sub> around 50% higher

# Illustrative EEA results

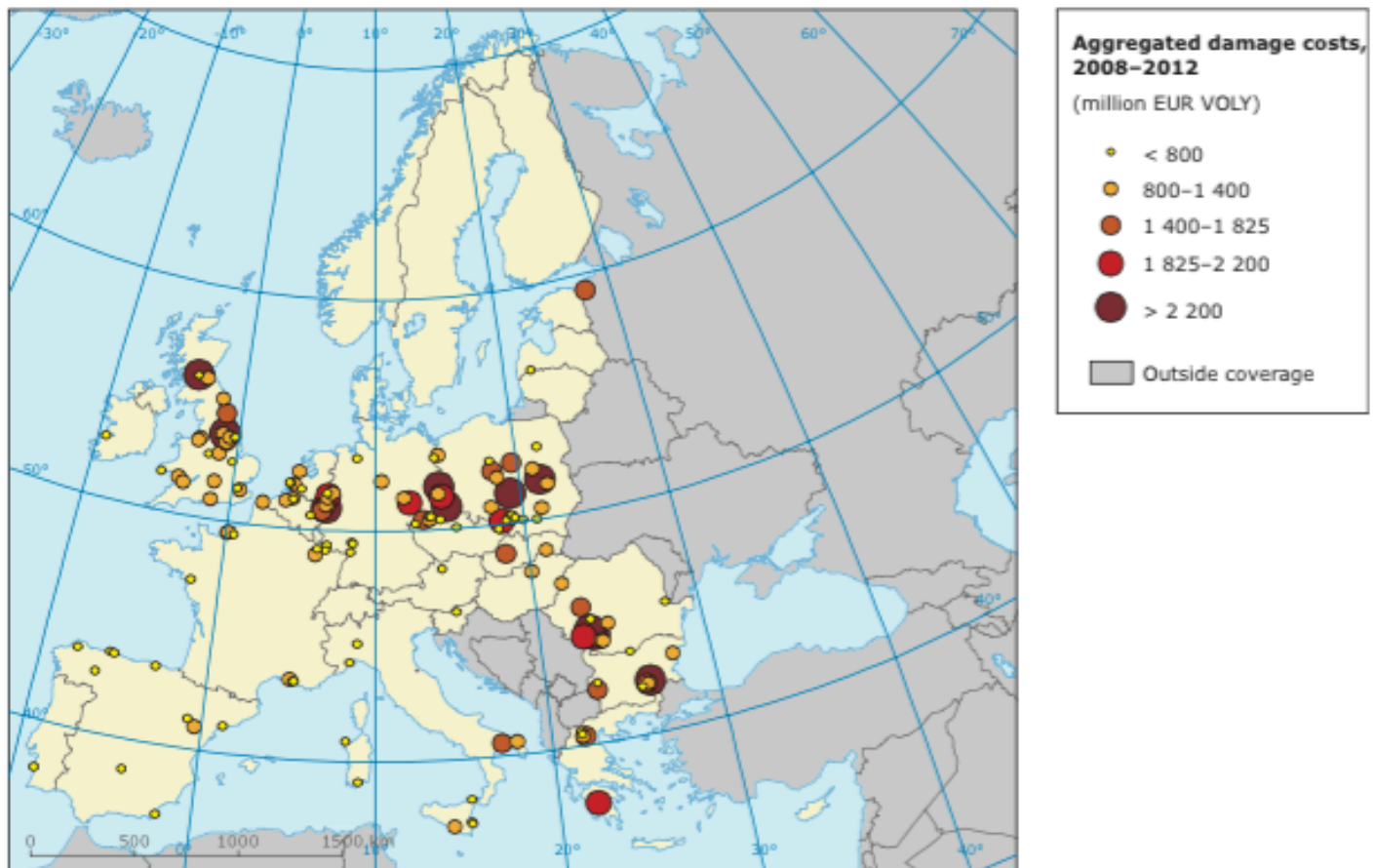
**Figure ES.1 Cumulative distribution of the estimated damage costs associated with emissions of selected pollutants from E-PRTR facilities, 2008–2012**



**Note:** The distribution is based on the lower VOLY approach for the main air pollutants and a CO<sub>2</sub> price of EUR<sub>2005</sub> 9.5 per tonne.

# Illustrative EEA results

**Map ES.1** Location of the 147 E-PRTR facilities that contributed 50 % of the total damage costs estimated for 2008–2012



**Note:** The lower VOLY approach for the main air pollutants and a CO<sub>2</sub> price of EUR<sub>2005</sub> 9.5 per tonne are applied.

# Extension of non-health impacts

- Ecosystem services (ECLAIRE)
  - Biodiversity
  - Forests
  - Crops
  - GHG balance
- Ozone, nitrogen

# Results from different methods for biodiversity assessment

<b>2025</b>	<b>CLE</b>	<b>MTFR</b>	<b>Benefit of change</b>
WTP	3,175 – 9,525	2,294 – 6,822	881 – 2,643
WTP with income adjustment	2,678 – 8,034	1,856 – 5,568	822 – 2,466
Repair cost	9,096	6,361	2,735
Regulatory revealed preference	54,754	63,985	9,231
<b>2030</b>	<b>CLE</b>	<b>MTFR</b>	<b>Benefit of change</b>
WTP	3,116 – 9,347	2,211 – 6,633	905 – 2,714
WTP with income adjustment	2,621 – 7,863	1,781 – 5,343	840 – 2,520
Repair cost	8,745	5,999	2,746
Regulatory revealed preference	61,985	72,597	10,612

For comparison, health benefits €58 billion per year and upwards, crop benefits around €1 billion/year

# Is it surprising that health costs are much bigger?

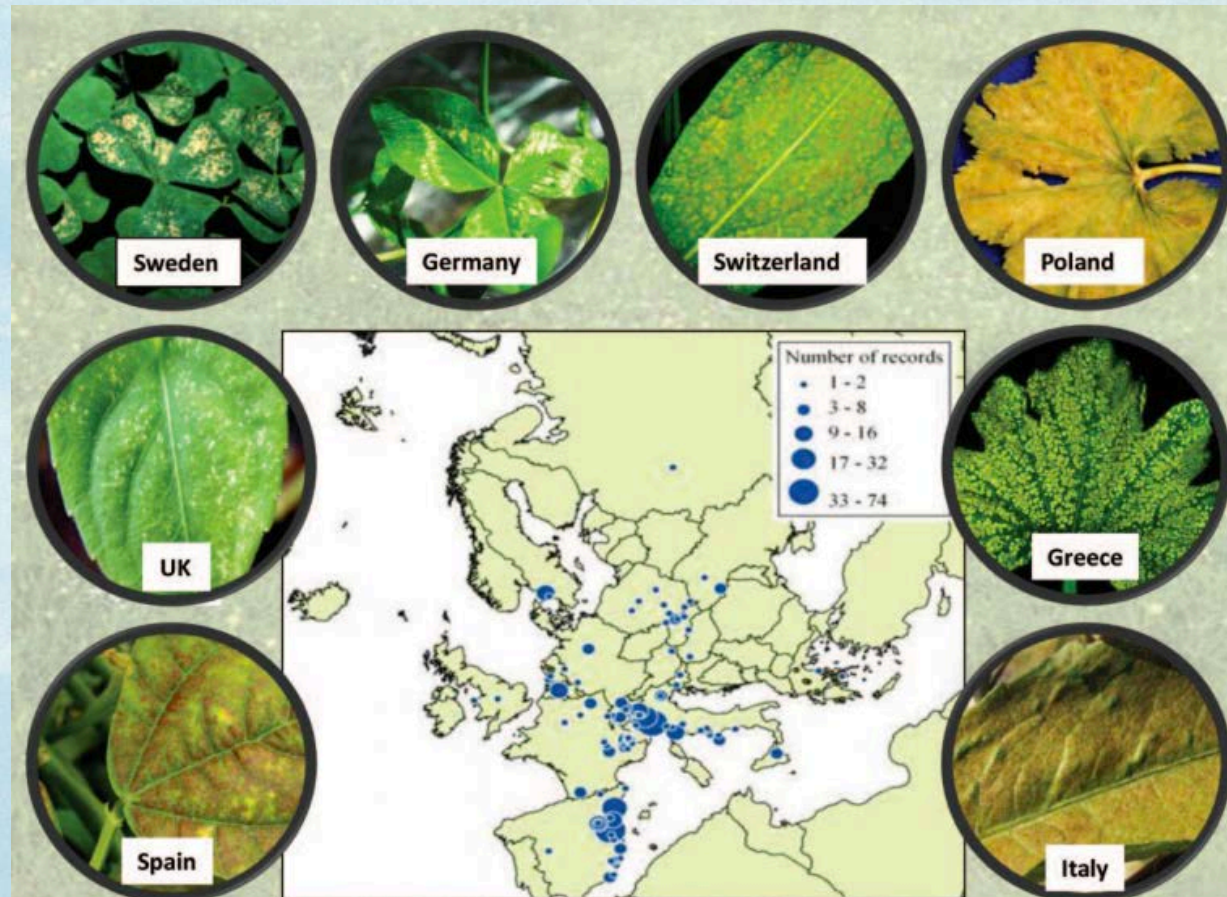
- No – health impacts are large, affecting many people, including deaths
- Health valuations are large because
  - Health is first concern for many people
  - People consider that they have (some) control over their health
- Ecosystem valuations are lower because
  - Ecosystems are a secondary concern to health
  - Lack of awareness of ecosystem damage post acid rain
  - Lack of direct personal control

# Smaller does not mean irrelevant

- EU biodiversity legislation
  - Value of ecosystems from a broader perspective
- Appropriate to consider full set of benefits to optimise policies

# More communication

- Photographs and maps of damage



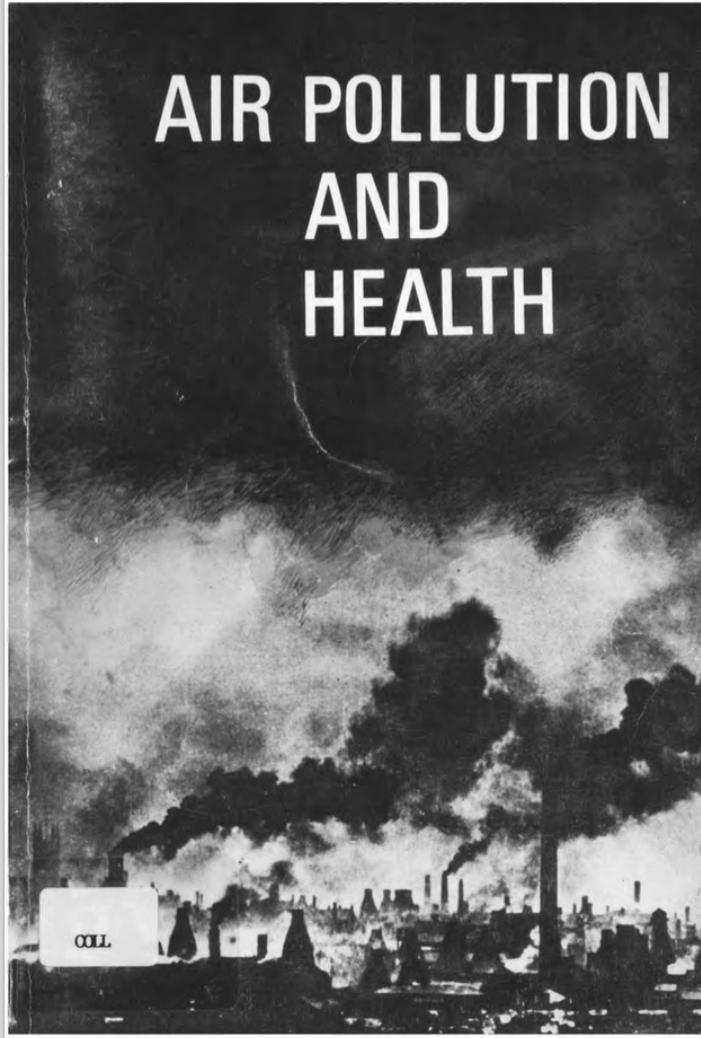
**Map.** Locations of records of visible injury attributed to ozone on crops, shrubs and (semi-)natural vegetation (Hayes et al., 2007\*).

# Wider adoption of economic damage analysis

- Wider adoption of economic damage analysis
  - WHO
  - OECD
  - Individual member states (France, Sweden, UK)
  - Health sector
  - NGOs, particularly in eastern countries

# Medical profession and air pollution

## AIR POLLUTION AND HEALTH



- Royal College of Physicians
  - WHO Air Quality Guidelines
  - European Lung Foundation
  - Many epidemiological researchers
- 
- But limited general awareness?
  - Awareness now developing

# Key messages

- Much activity to refine health impact assessment and health valuation methods
- Extension of non-health analysis
- Both raise questions of what is being valued, and what valuation means
- Data on economic damage now more widely available
- Wider adoption of impact assessment and economic damage analysis
  - International agencies, Member states, NGOs, medical profession...