

Cost-benefit analysis of the Gothenburg Protocol: Lessons learned

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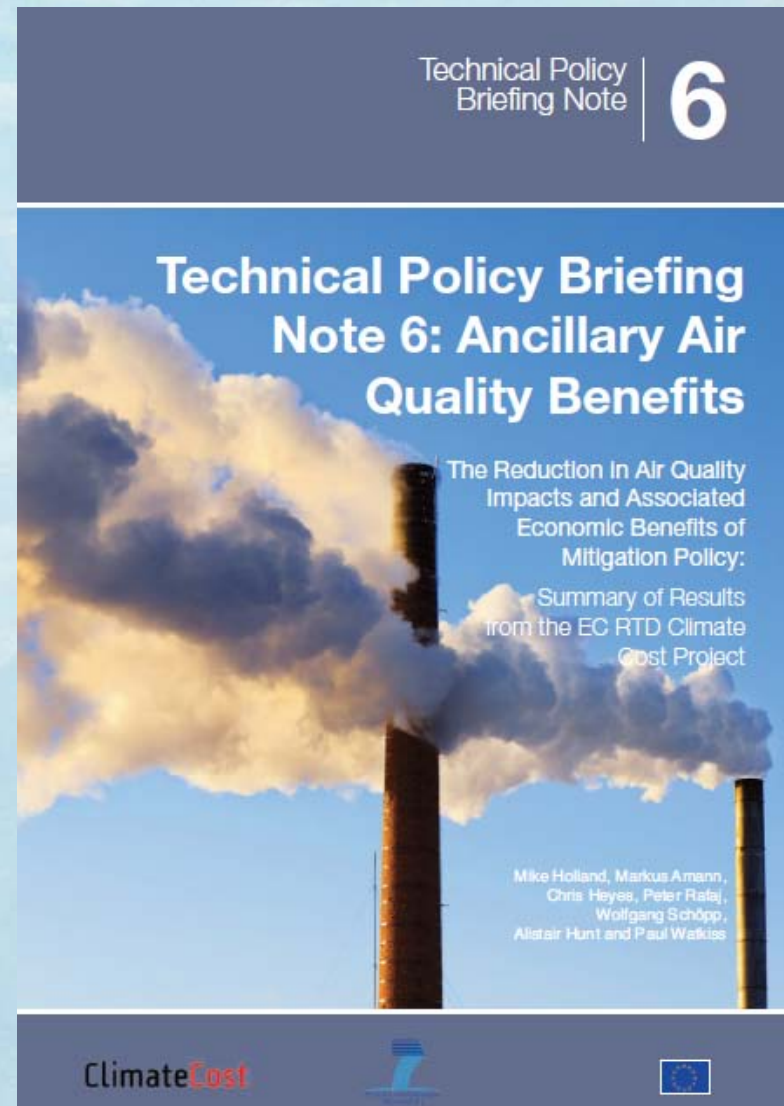
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Analysis performed

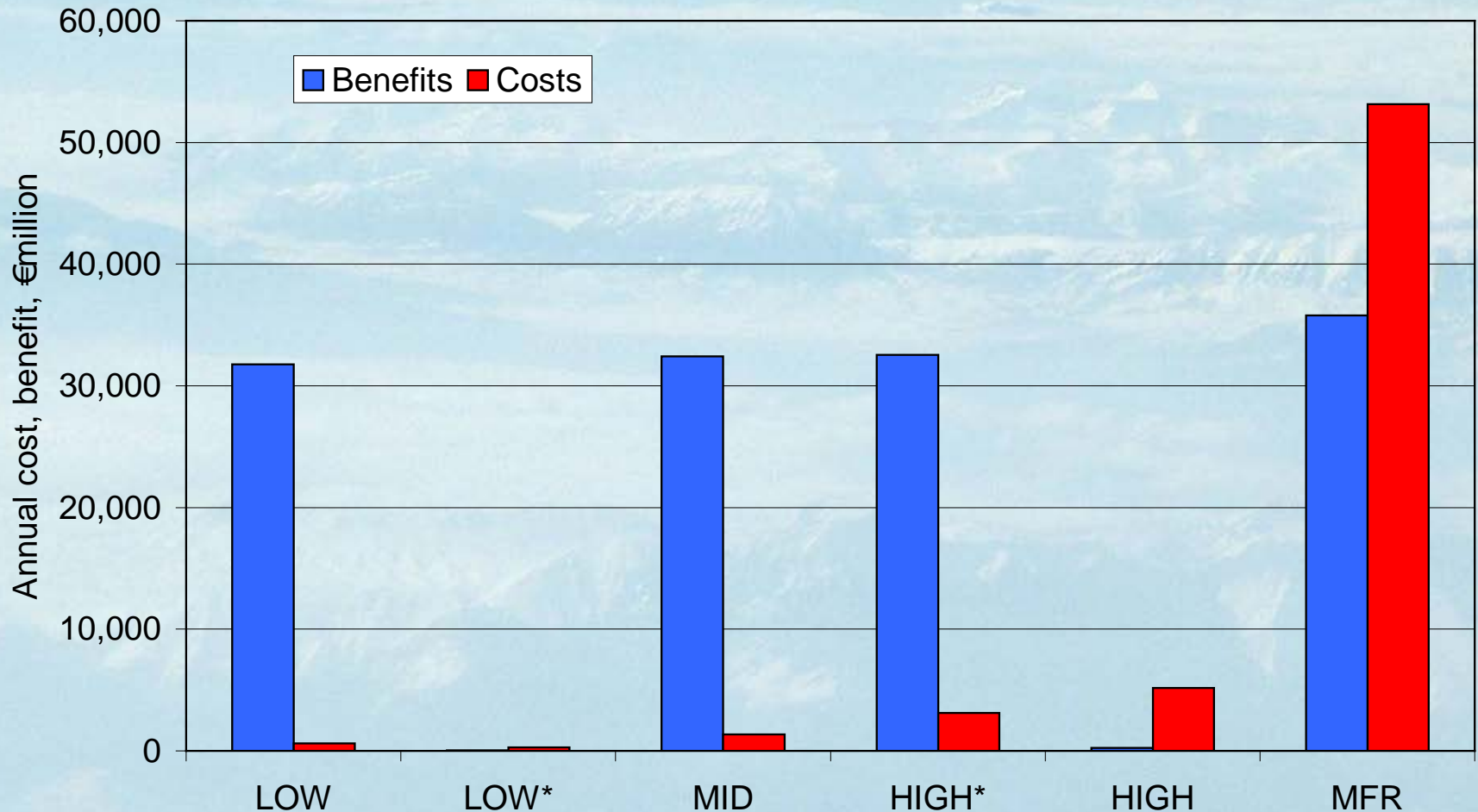
- Initial scenarios
 - Low, Low*, Mid, High*, High, GAINS MFR
 - Presented last year
- Final Gothenburg scenarios
 - To be assessed

Recent applications

- Gothenburg protocol
 - <http://ec.europa.eu/environment/air/pollutants/cba.htm>
- ClimateCost project
 - <http://www.climatecost.cc/>
- North Sea 'NECA' study
 - NECA = nitrogen emission control area



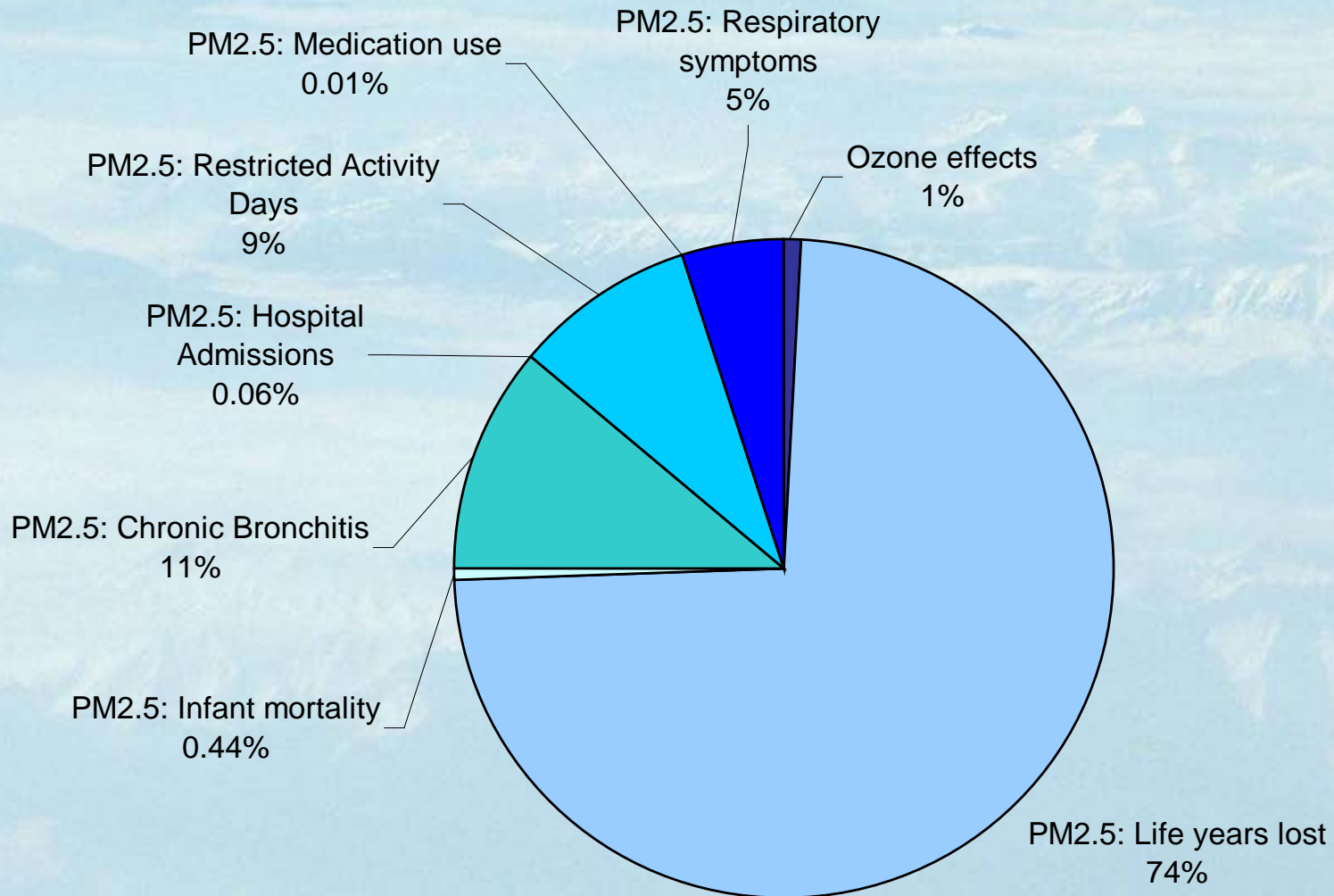
Marginal health benefits vs costs



Lesson 1

- Significant opportunities for cost-efficient emission reductions appear to remain

Share of health impacts to total health benefits, low VOLY



Lesson 2:

- Effect on loss of work days can be significant relative to costs of control

Damage to crops and materials

- Small, relative to health effects (around 1%)
 - But not all effects on agriculture or materials considered
- However, greater contribution to balancing against costs

	LOW	LOW*	MID	HIGH*	HIGH	MFR
Relative to baseline	28%	16%	12%	8%	5%	1%
Marginal comparison	28%		10%	5%	2%	0.4%

Lesson 3:

- Need to factor in broader range of effects
 - Ecosystems
 - Ecosystem services approach
 - Clear definition of impacts
 - Cultural heritage
 - Is it still threatened?
 - Are threats the same?
 - Local air quality control costs

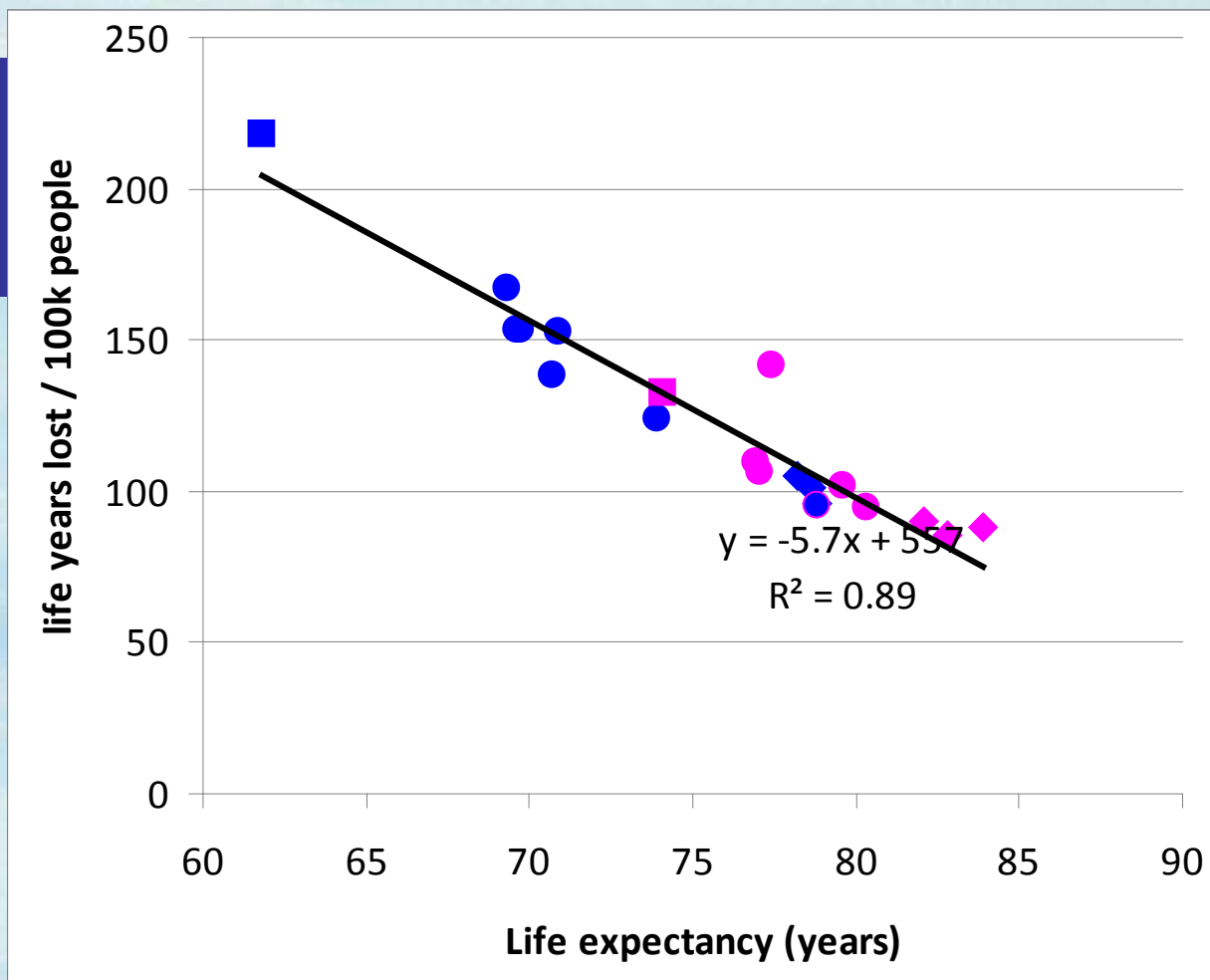
New developments in methods

- PM mortality assessment
 - Refinement of model to make it country specific
- Quantification of damage caused by countries, as well as damage experienced

Mortality assessment

Relationship between life expectancy and life years lost per 100,000 people from a one-year change in exposure to $PM_{2.5}$, per ug/m^3 .

Equal change in mortality risk per unit exposure ($6\%/10ug/m^3$) in all countries



Blue – male;

Pink – female;

Squares – Russian Federation;

Circles – Bulgaria, Czech Republic, Hungary, Poland, Slovakia, Romania;

Diamonds – England/Wales, Italy, Sweden.

Effect of country specific assessment for mortality quantification

- Increases mortality estimates by about 25% for the region considered
- Most increase is in the countries to the east of Europe, where life expectancy tends to be lower

Lesson 4:

- Need to keep new information for health analysis under review
 - Resolve complexity of mortality valuation
 - Need to review morbidity estimates based on national data?
 - Clarity on role of ammonia
 - Need clarity on meaning of health effects

Health impacts, 2020, selected scenarios, UNECE domain

Health effect	CLE	MID	MFR
Quantification against ozone			
Acute Mortality (deaths)	23,000	22,000	20,000
Respiratory Hospital Admissions	21,000	20,000	18,000
Minor Restricted Activity Days	51 million	48 million	44 million
Days with respiratory medication use	9.4 million	9.0 million	8.2 million
Quantification against PM			
Chronic Mortality (life years lost) *	5.0 million	4.0 million	2.9 million
Chronic Mortality (deaths) *	437,000	358,000	266,000
Infant Mortality (0-1yr, deaths)	1,100	870	660
Chronic Bronchitis	210,000	170,000	126,000
Hospital Admissions	108,000	88,000	66,000
Restricted Activity Days	371 million	302 million	225 million
Days with respiratory medication use	37 million	30 million	22 million
Days with lower respiratory symptoms	470 million	389 million	290 million

ClimateCost conclusions

- Substantial co-benefits from Mitigation scenario in Europe, China, India
- For EU27 averages €24/tonne CO₂ for health alone
- Large enough to change ranking of measures in standard GHG cost curves

Lesson 5:

- Importance of factoring regional pollutant control benefits into GHG cost curves

Conclusions

- For Gothenburg, large excess of benefits for the original scenarios assessed
- Lessons learned...
 - Significant opportunities for cost-efficient emission savings remain
 - Importance of work loss days
 - Improve assessment for ecosystems, materials, etc.
 - Keep health impact assessment under review
 - Importance of regional pollutant co-benefits for efficient climate policies