External costs of Energy and their internalisation in Europe
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Impact Assessment of the Thematic Strategy on Air Pollution

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http://europa.eu.int/comm/environment/air/cafe/index.htm

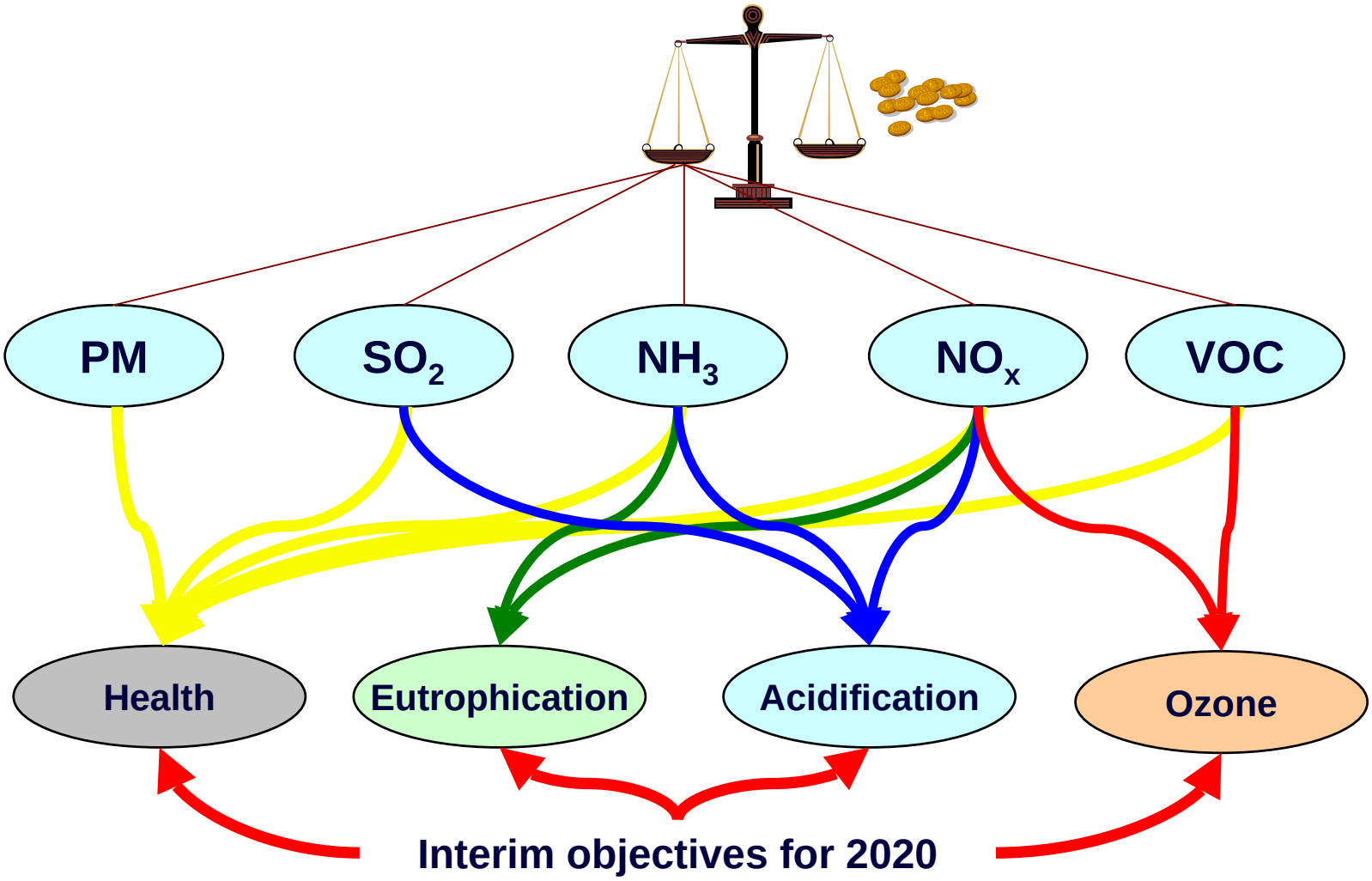
Thematic Strategy was a response to 6th Environment Action Programme

- ***'Achieving levels of air quality that do not give rise to <u>significant</u> negative impacts on and risks to human health and the environment';*** **(Art 7.1. of 6th EAP - Decision of Council & EP of July 2002)**
- **Integrated approach; consistency with other environmental policies; exploit synergies;**

Health & Environment Impacts addressed by the Strategy

- **Health: Fine Particles ($PM_{2.5}$) & Ozone**
- **Acid rain (SO_2, NOx, NH_3)**
  - **Affects freshwaters and terrestrial ecosystems**
  - **leads to loss of flora & fauna; reduced growth of forests, leaching of toxic metals into soil solution**
- **Eutrophication (NOx, NH_3)**
  - **Excess nutrient nitrogen causes species composition change & loss of biodiversity**
  - **Also causes nutrient imbalances in plants/trees -increases susceptibility to other stresses such as drought**
- **Ozone damage to forests, crops, vegetation, building materials**
- **Community long term objective is no exceedence of critical loads or levels… (as per 6th EAP and Directive 2001/81/EC)**

Defining cost-effective solutions is complicated



How were these interim objectives defined?

- Peer-reviewed health and scientific advice
  - WHO Systematic Review of air pollution
- Assessment of the effect of current policies
- Peer-reviewed integrated assessment to develop cost-effective solutions for both health and environment
- Peer-reviewed Cost-Benefit Analysis Methodology
- Macro-economic analysis
  - Lisbon Strategy & Competitiveness
- Stakeholder involvement and consultation
  - Over 100 stakeholder meetings and over 10.000 responses to internet based consultation
- Culminated in a comprehensive impact assessment (170+ pages)

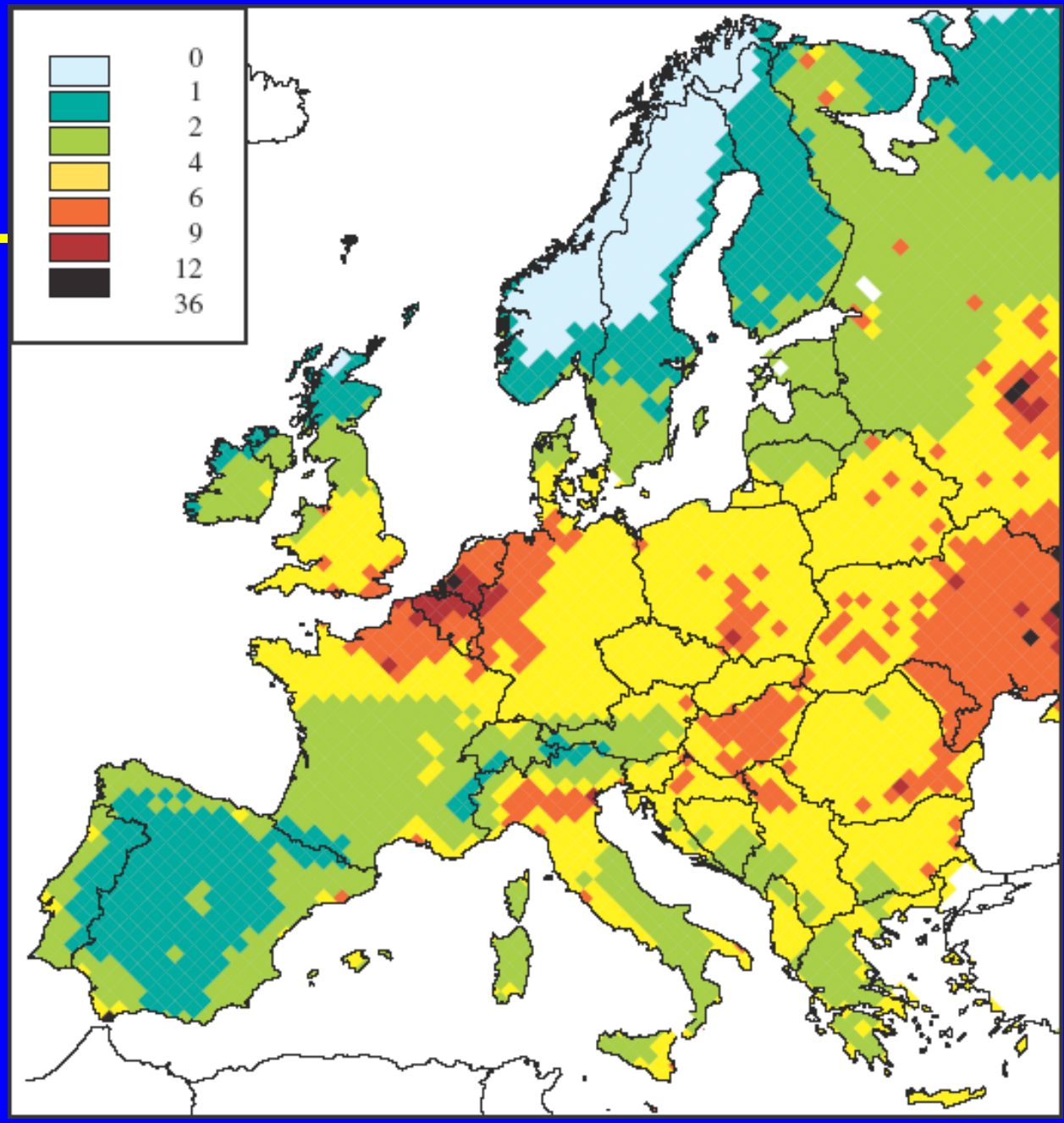
Link with NewExt: Value of statistical life and loss of life year

- Health evidence based on WHO Scientific Review
- CAFE CBA methodology developed used NewExt values
  - "New Elements for the Assessment of External Costs from Energy Technologies, September 2004"
- CAFE CBA methodology essentially same as ExternE
  - or any other standard cost-benefit analysis methodology
- CAFE CBA methodology peer reviewed published in February 2005 (uncertainties in May)
  - "Peer review of the Methodology of Cost-Benefit Analysis of the Clean Air for Europe Programme" October 2004 (Krupnick, Ostro and Bull)
- Positive externality: *"Updated estimates of marginal external costs of air pollution in Europe"* (March 2005)
- Transparent process with stakeholder meetings
  - Eg. CAFE CBA Team Response to UNICE Concerns with key aspects of CAFE CBA methodology (April 29, 2005)

Example:
Fine particles

Even if situation improves by 2020:
2.5 million life years
or
272,000 premature deaths
if nothing is done.

Loss in average statistical life expectancy due to identified anthropogenic PM2.5
Calculations for 1997 meteorology



Source: Clean Air for Europe Programme, RAINS (2005)

Summary of "Business as Usual"

- **Emissions continue to decline**
- **But in 2020**
  - **Premature deaths related to fine particulates still 270,000**
  - **Loss of statistical average life still 5 months in the EU**
  - **Ozone premature mortality equal to 20,800 cases**
  - **119,000 km^2 of forest at risk from acid rain**
  - **590,000 km^2 of ecosystems at risk from nutrient Nitrogen**
  - **760,000 km^2 of forest at risk from ozone**
- **Cost-effective improvements are possible**

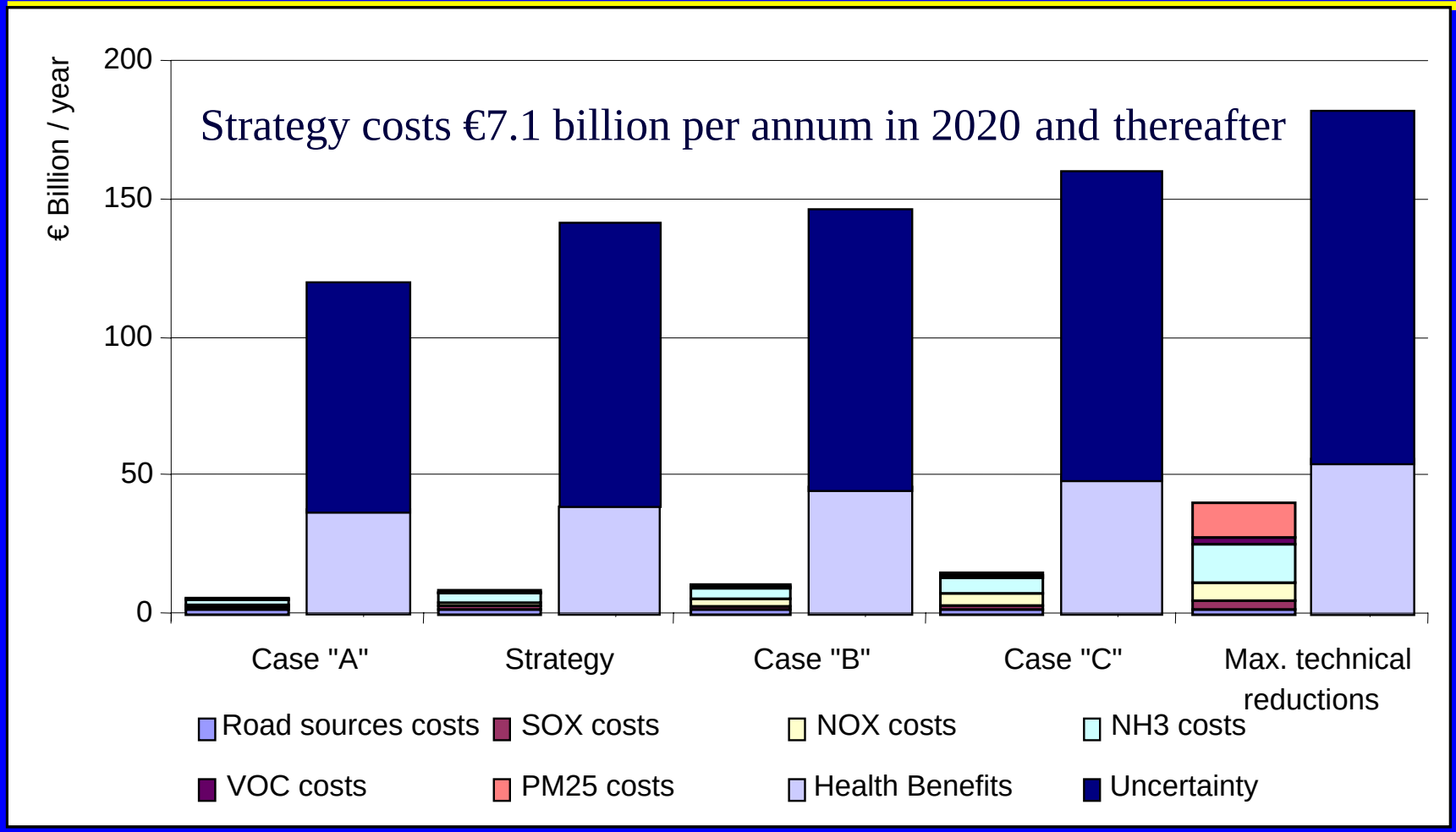
kT	*2000*	*2020*	*%*
SO_2	8736	2806	**-68%**
NOx	11583	5889	**-49%**
VOCs	10661	5918	**-44%**
$PM_{2.5}$	1749	971	**-44%**
NH_3	3824	3686	**-4%**

Ships will represent 125% and 101% of land based SO_2 and NOx emissions in 2020.

Source: RAINS (2005)

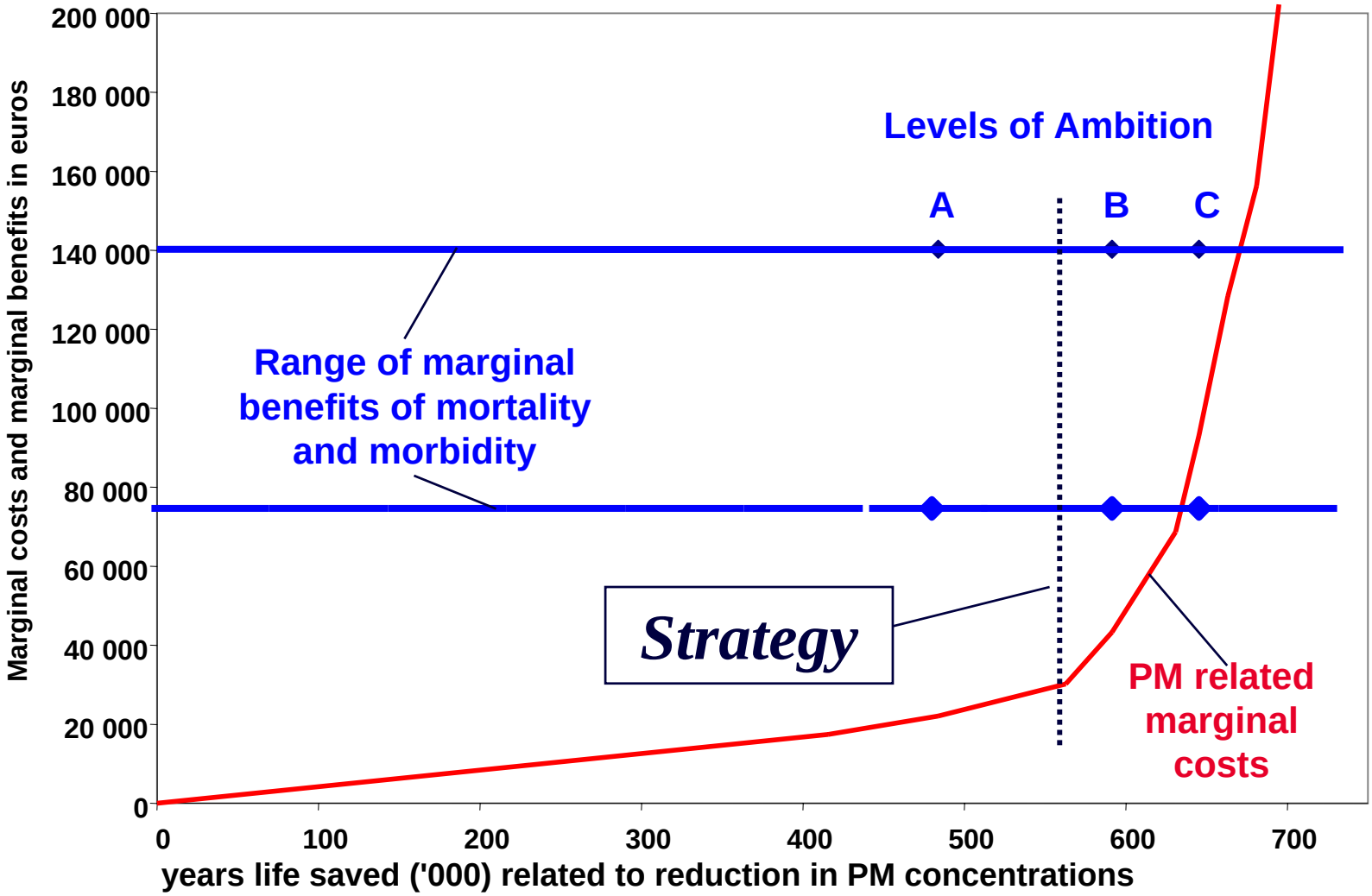
The impact assessment of the Strategy

Costs and benefits of the CAFE policy scenarios

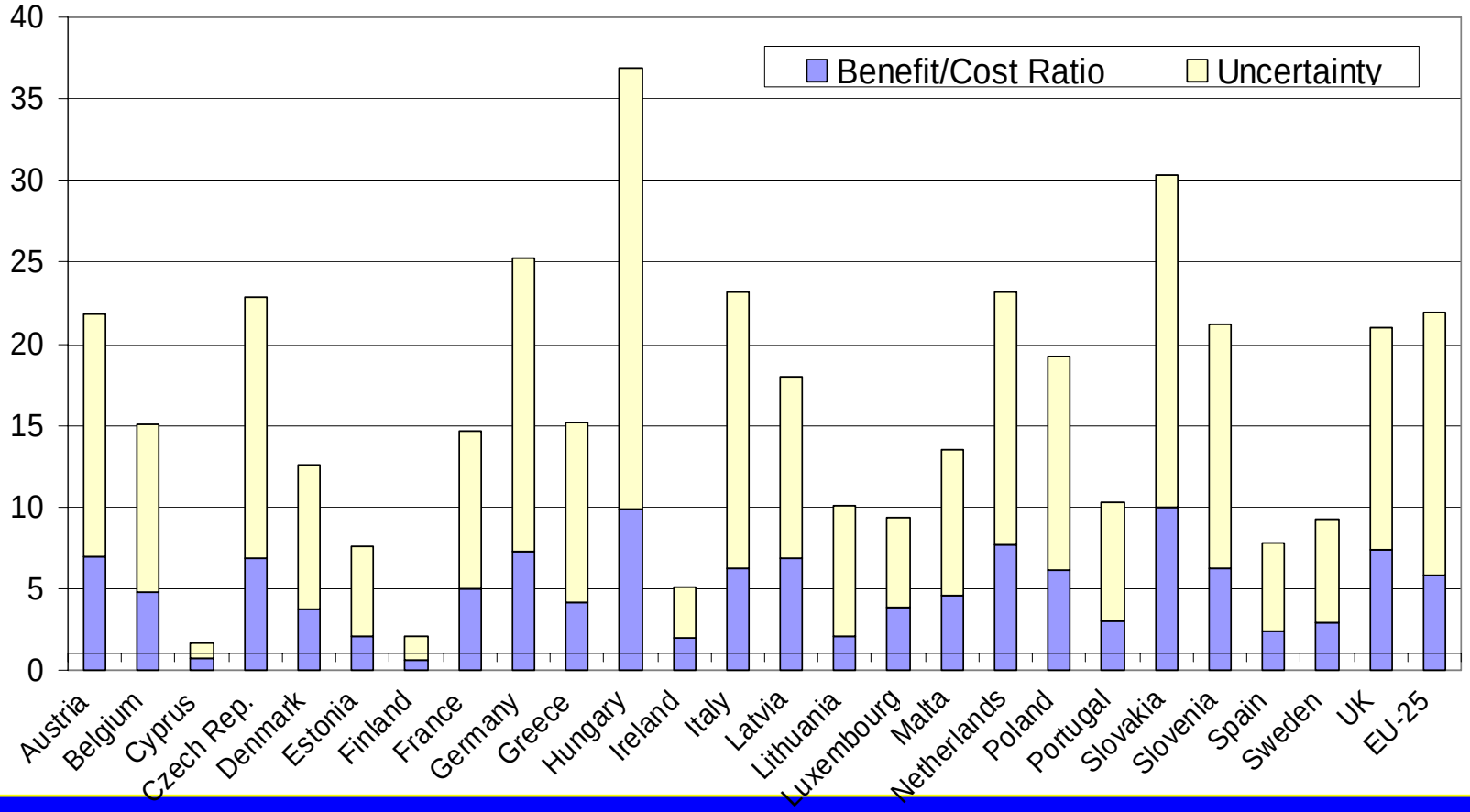


Sources: RAINS and CAFE CBA (2005)

Where is the economically optimal point? MC=MB



Health benefits vs all cost of the Strategy

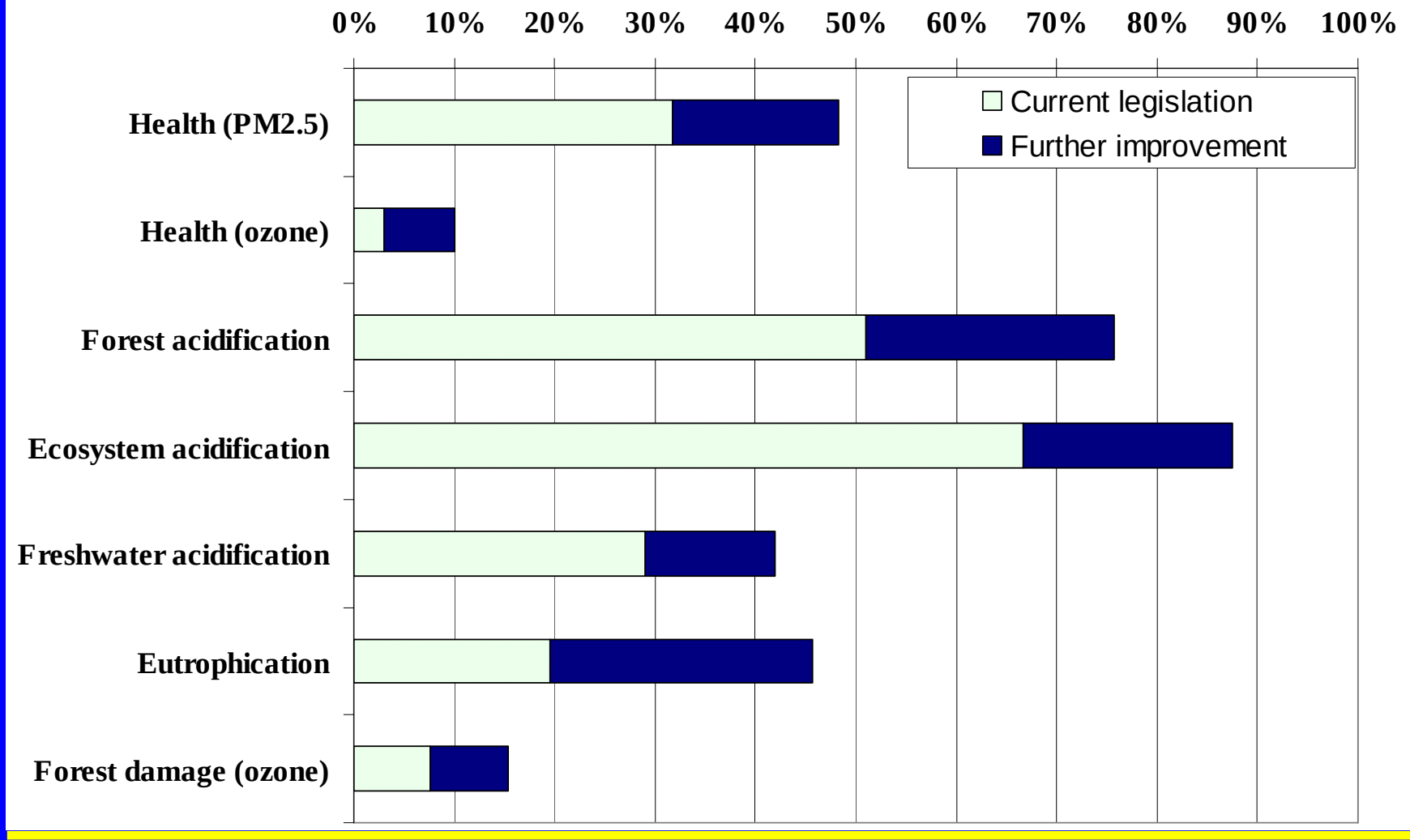


Sources: RAINS and CAFE CBA (2005)

Some uncertainties

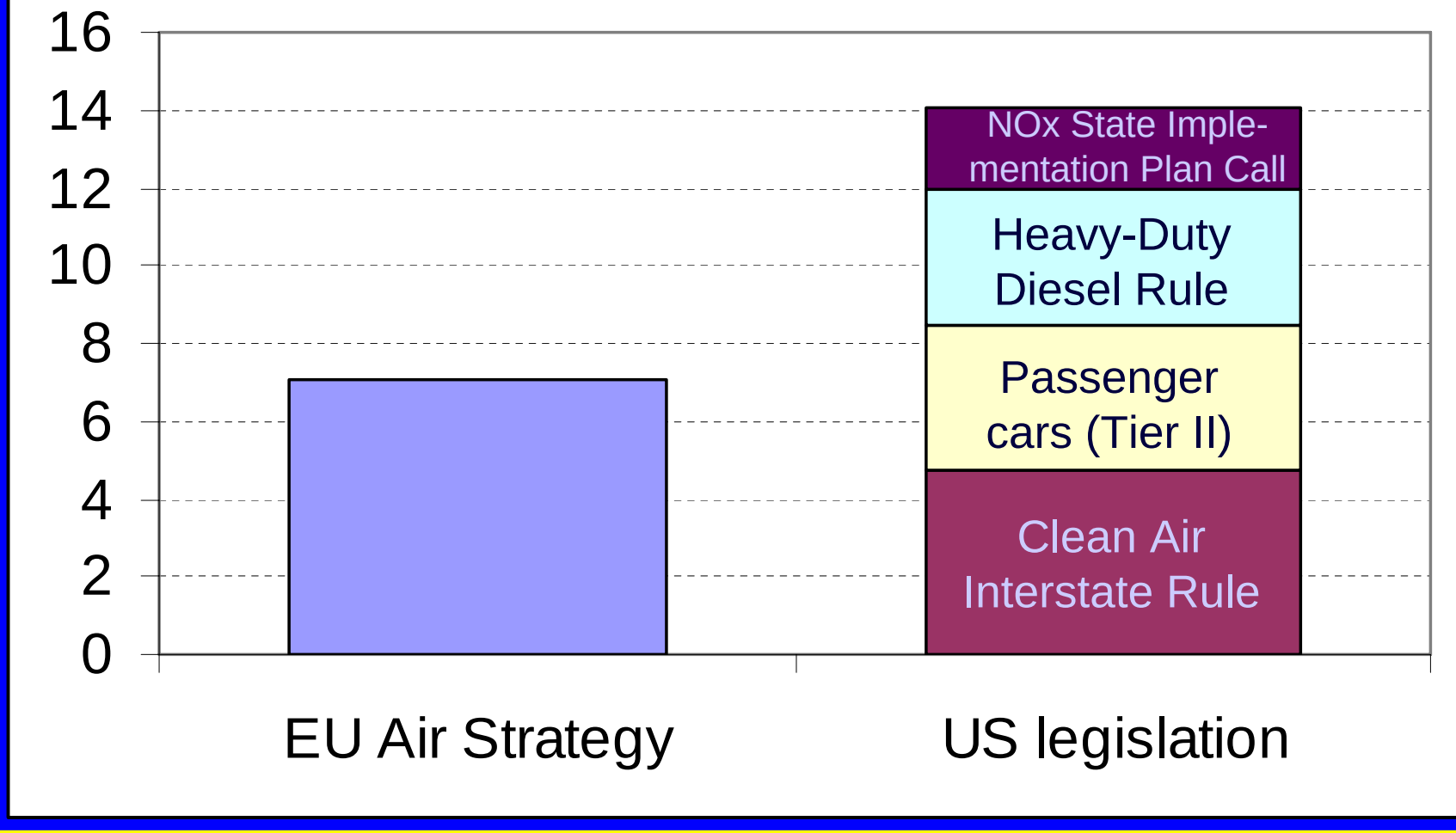
- **Benefit estimations:**
  - **Different methodologies give rise to a range. Lower end of the range utilised for Strategy (*N.B. Peer-reviewed methodology*).**
  - **Ecosystem improvements *not* monetised but likely to be significant (*CBA report*)**
- **Costs - Central estimate used in RAINS**
  - **Independent peer-review of the RAINS model concluded that costs historically overestimated *(see EB.Air/W.G.5/2005/4)***
  - **Independent review of UK National Air Quality Strategy**
    - Total ex ante costs 1990-2001 estimated at £16-23 Bn; actual costs of the order £3 Bn.
    - www.defra.gov.uk/environment/airquality/strategy/evaluation/index.htm

Improvement of health & environment indicators following the Strategy (improvement relative to 2000)

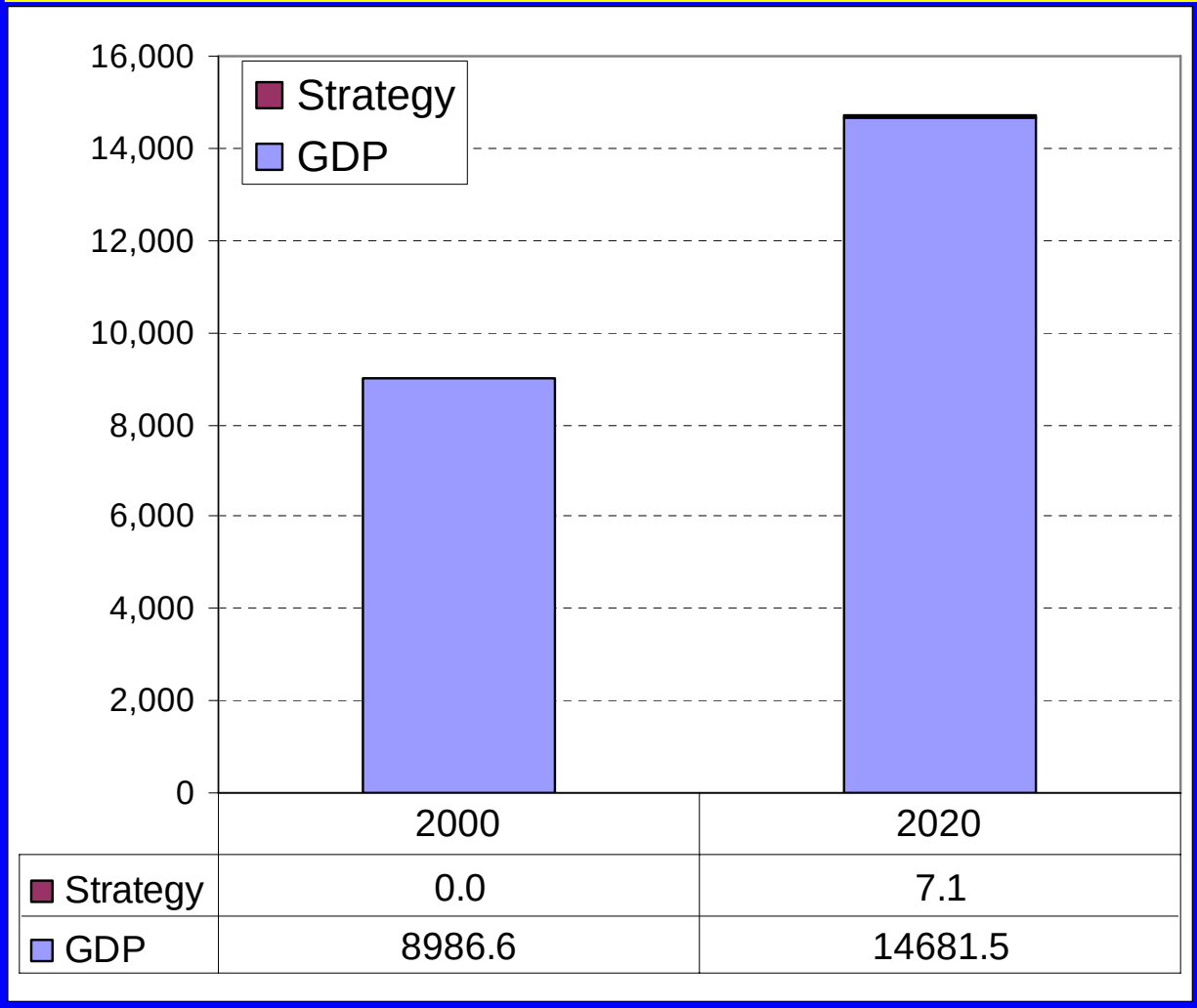


Source: Thematic Strategy on Air Pollution (2005)

Cost of new US air pollution legislation higher than in the EU (billions of euros or dollars in 2020)



Lisbon Strategy/Competitiveness with GEM-E3 model



	2000	2020
Strategy	0.0	7.1
GDP	8986.6	14681.5

billions of euros

- **No change in jobs**
- **GDP reduced in 2020 by 0.05%**
  - **Growth rate by 0.01%**

Summary of Strategy – Costs & Benefits

Ambition level	Benefits								Costs per annum (€bn)
	Human health			Natural environment					
	Life Years Lost (million) $PM_{2.5}$	*Pre-mature deaths* (000s) $PM_{2.5}$ and ozone	Range in monetised health benefits per annum (€bn)	Ecosystem area exceeded acidification (000 km^2)			Ecosystem area exceeded eutro-phication (000 km^2)	Forest area exceeded ozone (000 km^2)	
				Forests	Semi-natural	Fresh-water			
2000	3.62	370	-	243	24	31	733	827	-
Baseline 2020	2.47	293	-	119	8	22	590	764	-
Strategy	1.91	230	42 – 135	63	3	19	416	699	7.1
MTFR	1.72	208	56 – 181	36	1	11	193	381	39.7

Source: Thematic Strategy on Air Pollution (2005)

Summary of the impact assessment

- **Extensive scientific and research input and stakeholder consultation**
  - **All results transparently reported on the web**
- **Air pollution is and will continue to be a real problem for health and *environment :***
  - **Need to act at EU level -- air pollution is transboundary**
- **Ambitious but affordable and justified Thematic Strategy**
  - **Health benefits alone between six and 20 times higher than costs**
  - **Uncertainties assessed systematically**
- **Links with other policy areas (e.g. Climate change, agriculture) important**
  - **For instance, different climate scenarios were elaborated**

Final thoughts

- ExternE and NewExt results used extensively
- Good quality of the EU research work is essential to underpin policy development
- Peer review very helpful
- We want more: Need further economic research into
  - Valuing morbidity end points
    - Change in health care costs due to reduced air pollution would be very helpful!
  - Value of Statistical Life and Life Year Lost
  - Valuing different ecosystems
  - Transparency of process and faster dissemination of results
- Scientific research on health and ecosystem effects of air pollution