Integrated assessment of air pollution and greenhouse gases mitigation in Europe

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Integrated Assessment of Air Pollution and Greenhouse Gases Mitigation in Europe

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Content

- European air pollution policy process – past and present
- Methodology of integrated assessment modeling
- Simulations for the revision of the NEC Directive
- Further steps – link to climate policies

Air pollution policy in Europe - past

- UN/ECE Convention on Long-range Transboundary Air Pollution (1979)
  - SO_2 protocols 1985, 1994
  - NO_x protocol 1988
  - VOC protocol 1991
  - Protocols on heavy metals and POPs 1998
  - Gothenburg Protocol (acid., eutroph. and ozone) 1999
- EU Legislation
  - Air Quality Directives (1980 - 1998)
  - Technology-related Directives (LCP, IPPC, solvents, Auto-Oil, etc.)
  - National Emission Ceilings Directive (2001)

Policy process - recent

2003: Clean Air For Europe (CAFE) Programme established

2005: EU Thematic Strategy on Air Pollution (TSAP) proposed

2007: Review of the NEC Directive based on targets from TSAP

2007: GHG reduction (burden sharing agreement)

2008: Review of the Gothenburg Protocol to CLRTAP

The RAINS multi-pollutant/multi-effect framework

	PM	SO_2	NO_x	VOC	NH_3
Health impacts: PM	√	√	√	√	√
O_3			√	√	
Vegetation damage: O_3			√	√	
Acidification		√	√		√
Eutrophication			√		√

Air pollution and greenhouse gases

Critical linkages

- Emission originate from the same sources
- Aerosols/small particles cause health impacts <u>and</u> influence radiative forcing
- Tropospheric ozone damages health and vegetation <u>and</u> causes radiative forcing

The RAINS multi-pollutant/multi-effect framework extended to GHGs (GAINS)

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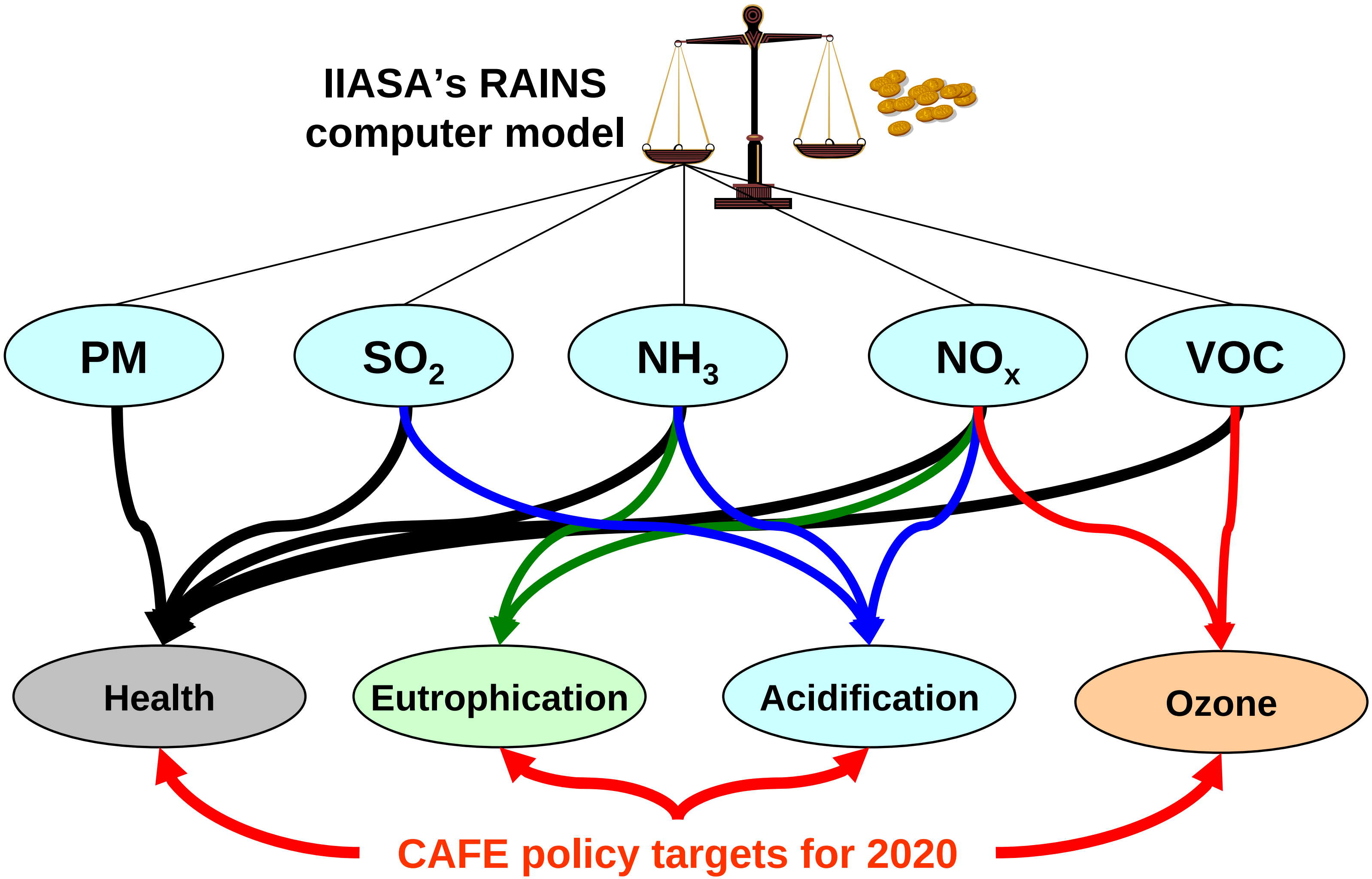
Economic synergies between emission controls

Multiple benefits

	PM	SO_2	NO_x	VOC	NH_3	CO_2	CH_4	N_2O	CFCs HFCs SF_6
Health impacts: PM	√	√	√	√	√				
O_3			√	√			√		
Vegetation damage: O_3			√	√			√		
Acidification		√	√		√				
Eutrophication			√		√				
Radiative forcing: - direct						√	√	√	√
- via aerosols	√	√	√	√	√				
- via OH			√	√			√		

Multi-pollutant/multi-effect analysis

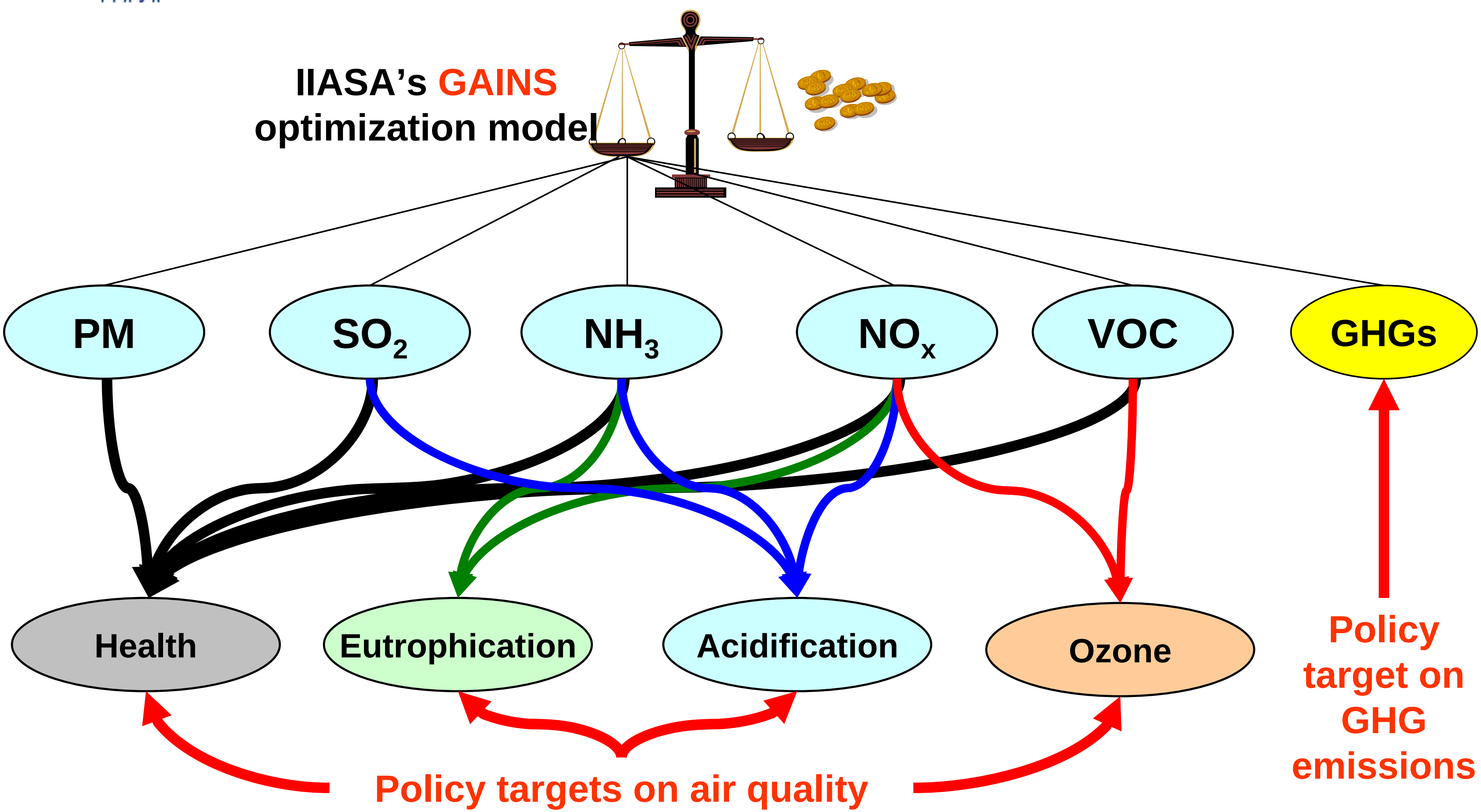
for identifying cost-effective policy scenarios



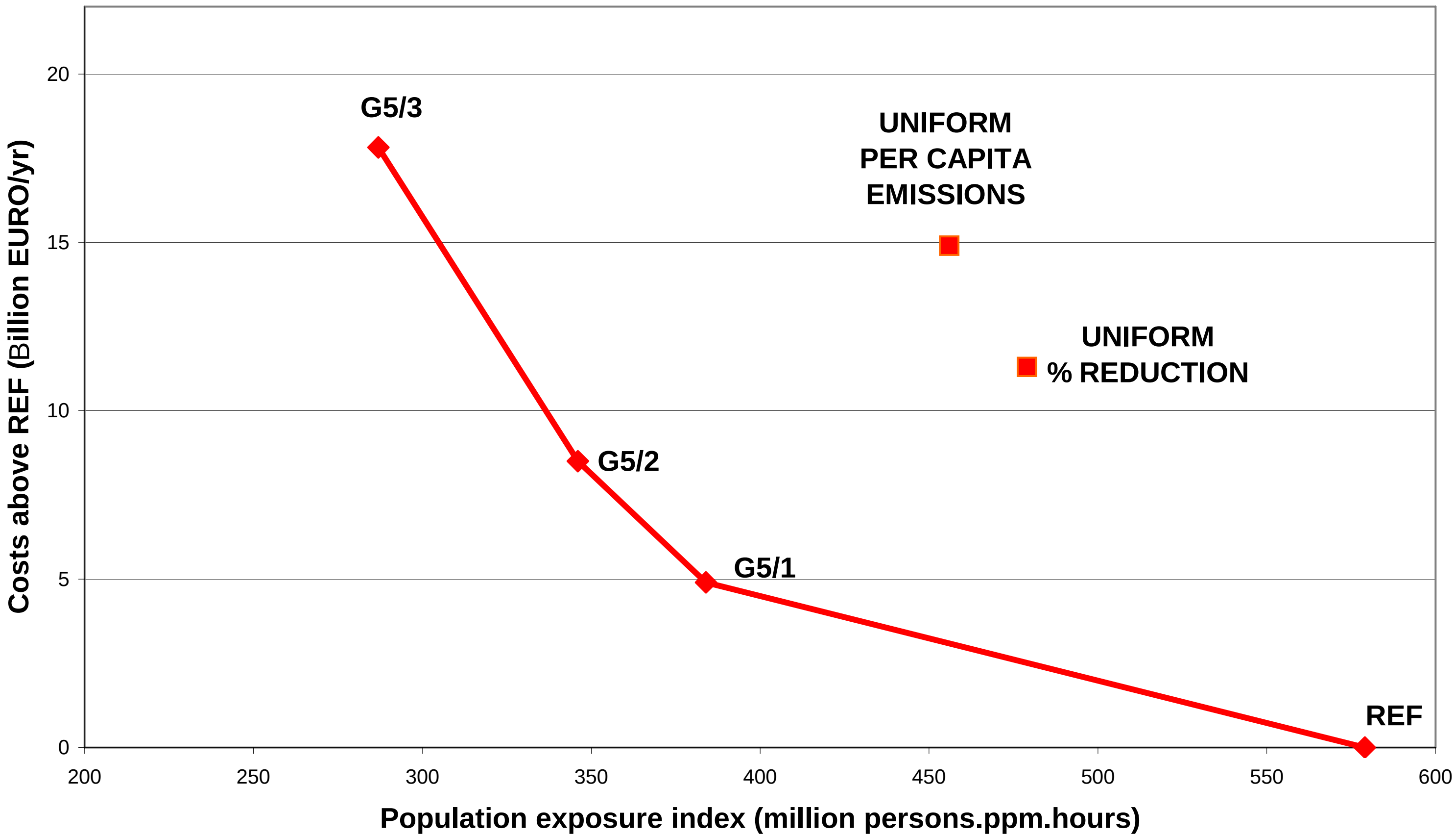
The GAINS approach

for identifying cost-effective emission control strategies

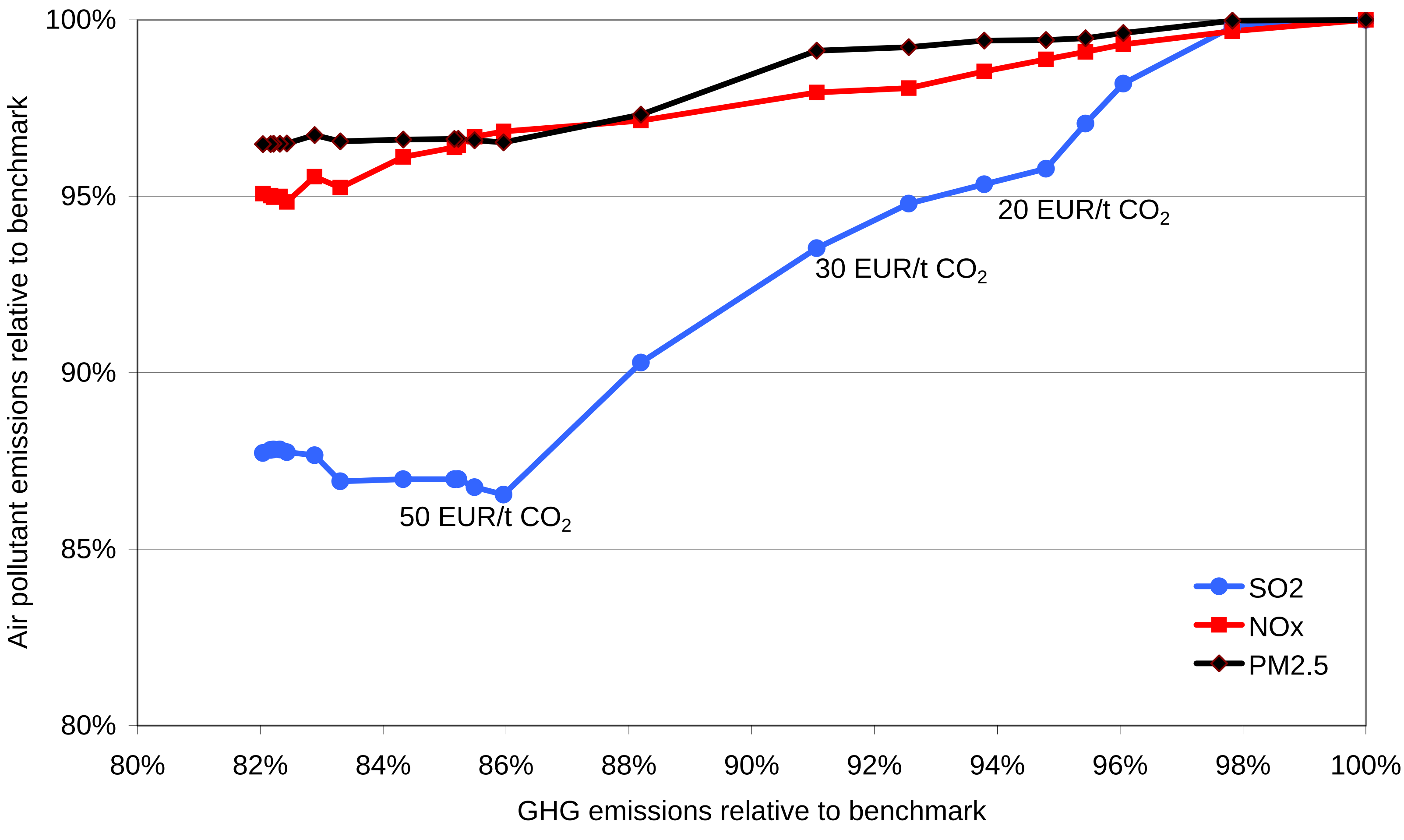
(GHG-Air pollution INteractions and Synergies)



Uniform or effect-based scenarios?



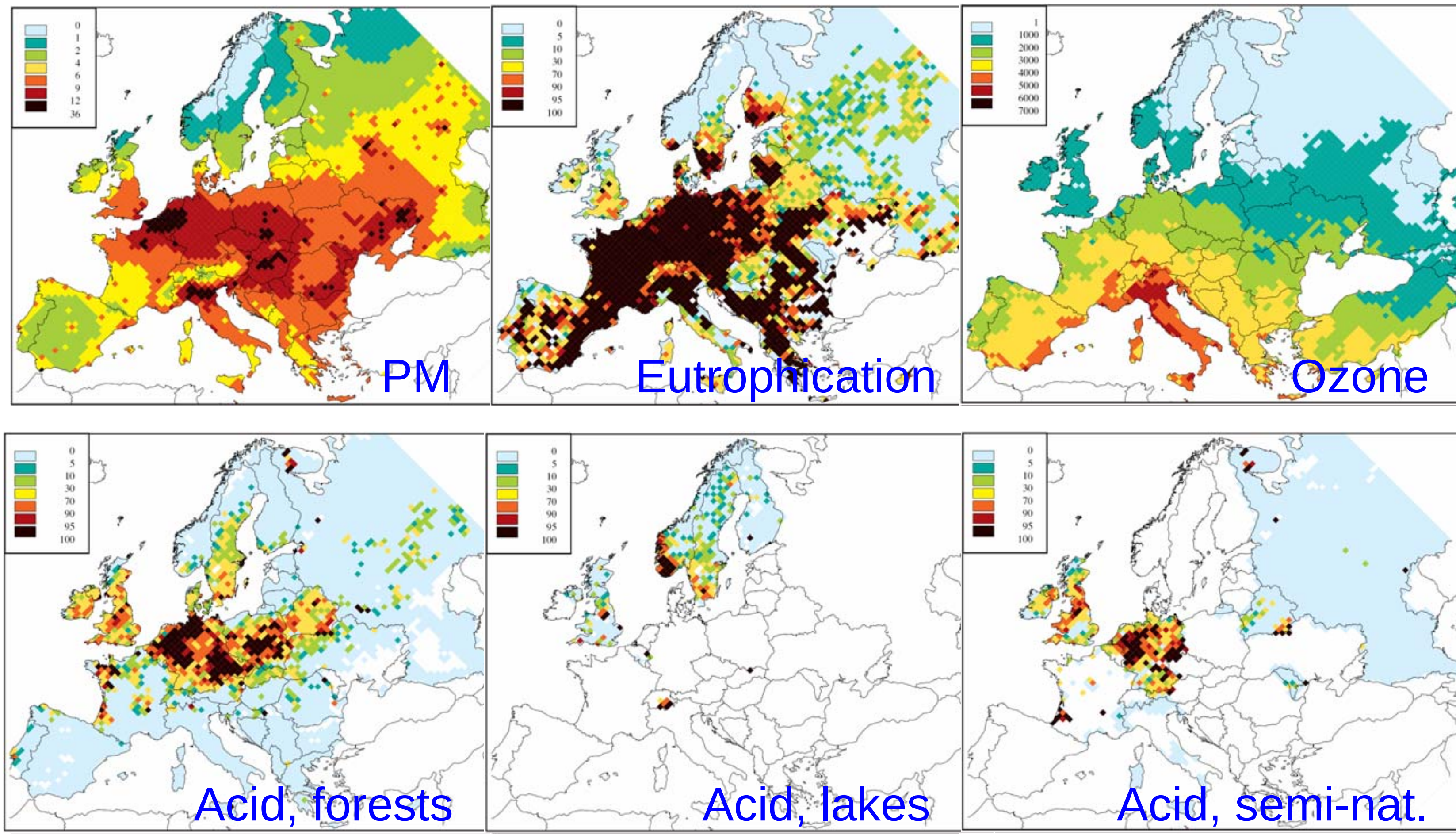
Air pollutant emissions as a function of GHG mitigation (EU-15)



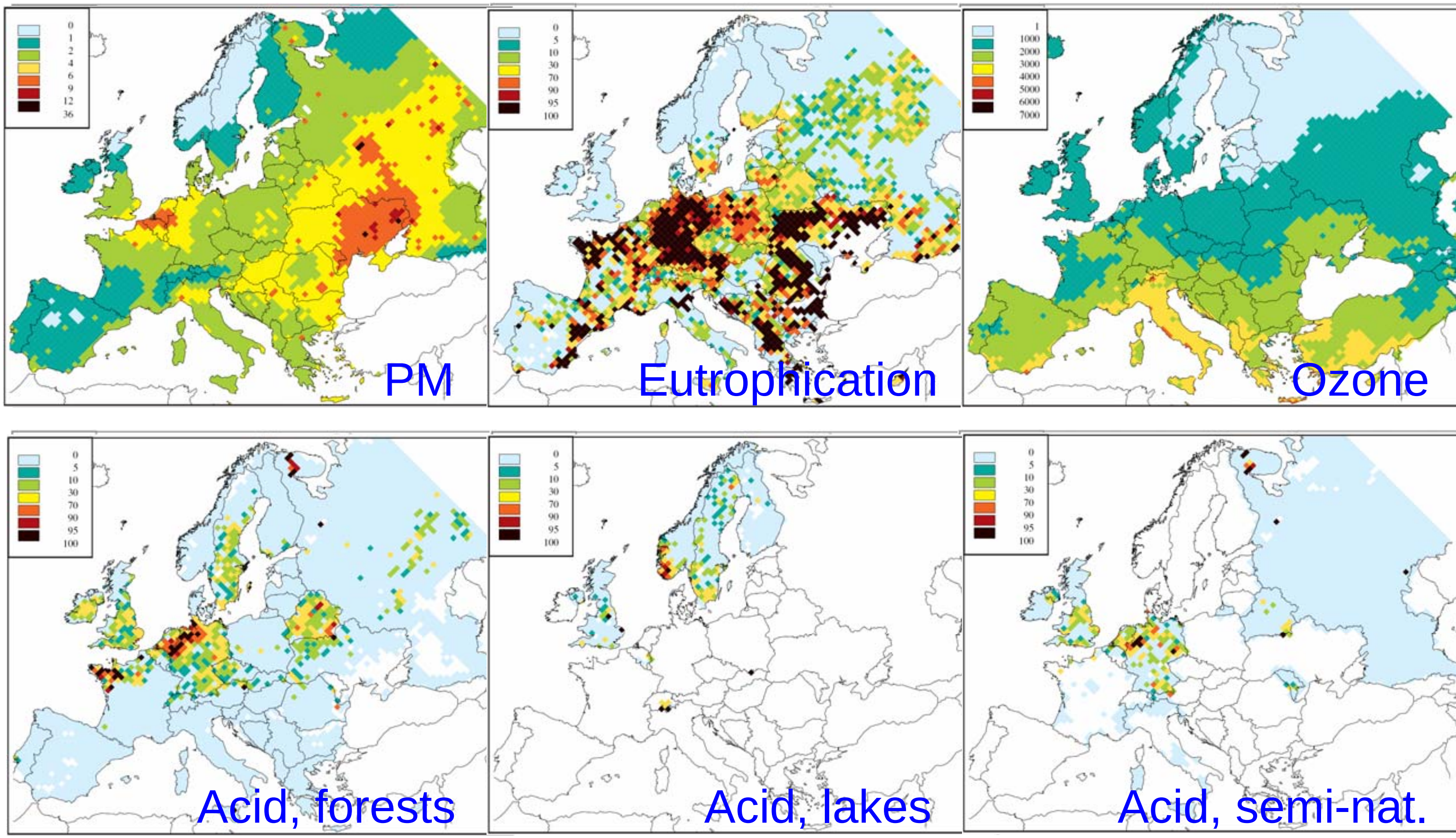
Targets from the EU Thematic Strategy on AP

	Unit of the indicator	*Percentage improvement compared to the situation in 2000*
Life years lost from particulate matter (YOLLs)	**Years of life lost**	**47 %**
Area of forest ecosystems where acid deposition exceeds the critical loads for acidification	**km^2**	**74 %**
Area of freshwater ecosystems where acid deposition exceeds the critical loads for acidification	**km^2**	**39 %**
Ecosystems area where nitrogen deposition exceeds the critical loads for eutrophication	**km^2**	**43 %**
Premature mortality from ozone	**Number of cases**	**10 %**
Area of forest ecosystems where ozone concentrations exceed the critical levels for ozone[1)]	**km^2**	**15 %**

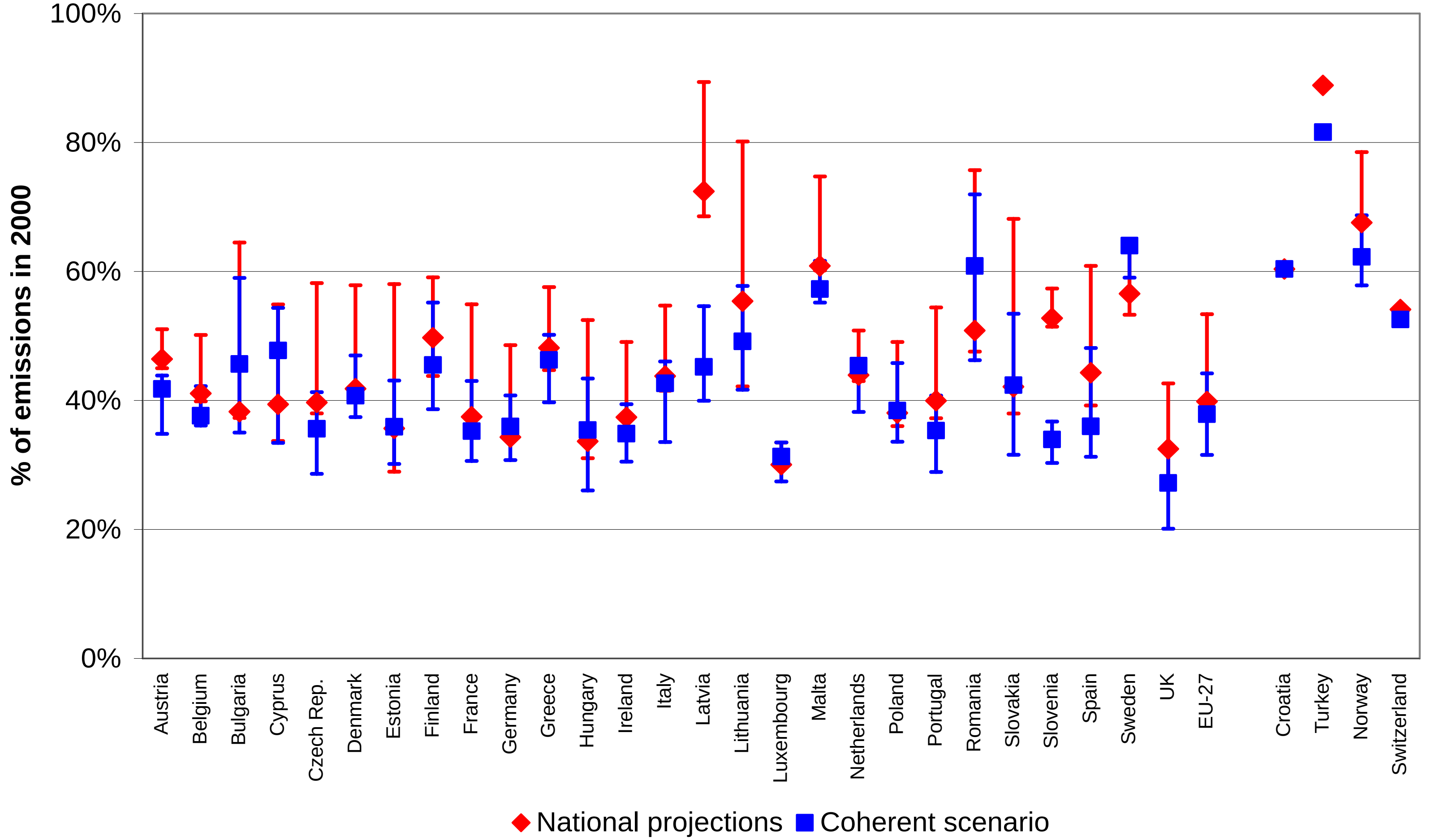
Air pollution effects in 2000



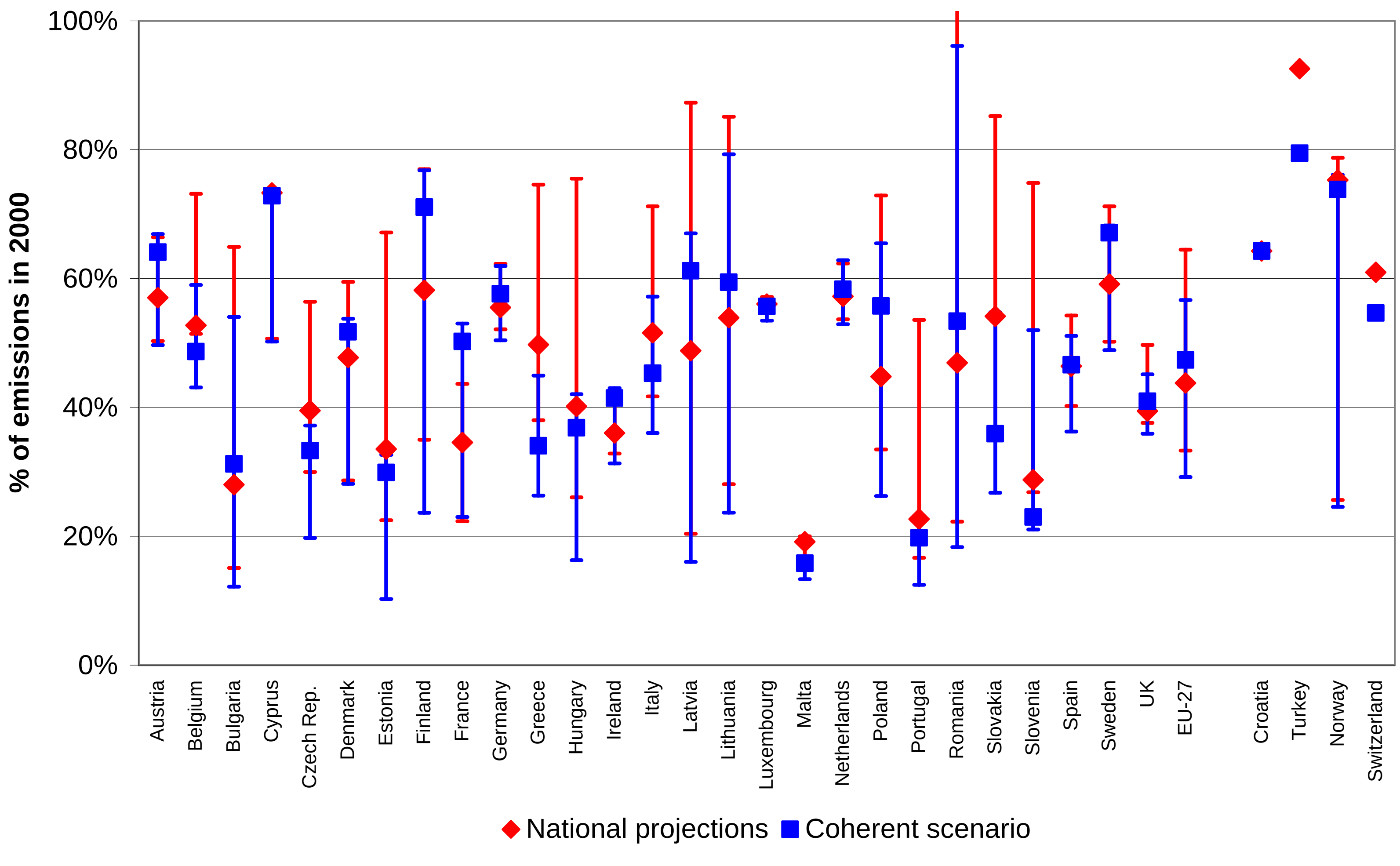
Air pollution effects for TSAP targets 2020



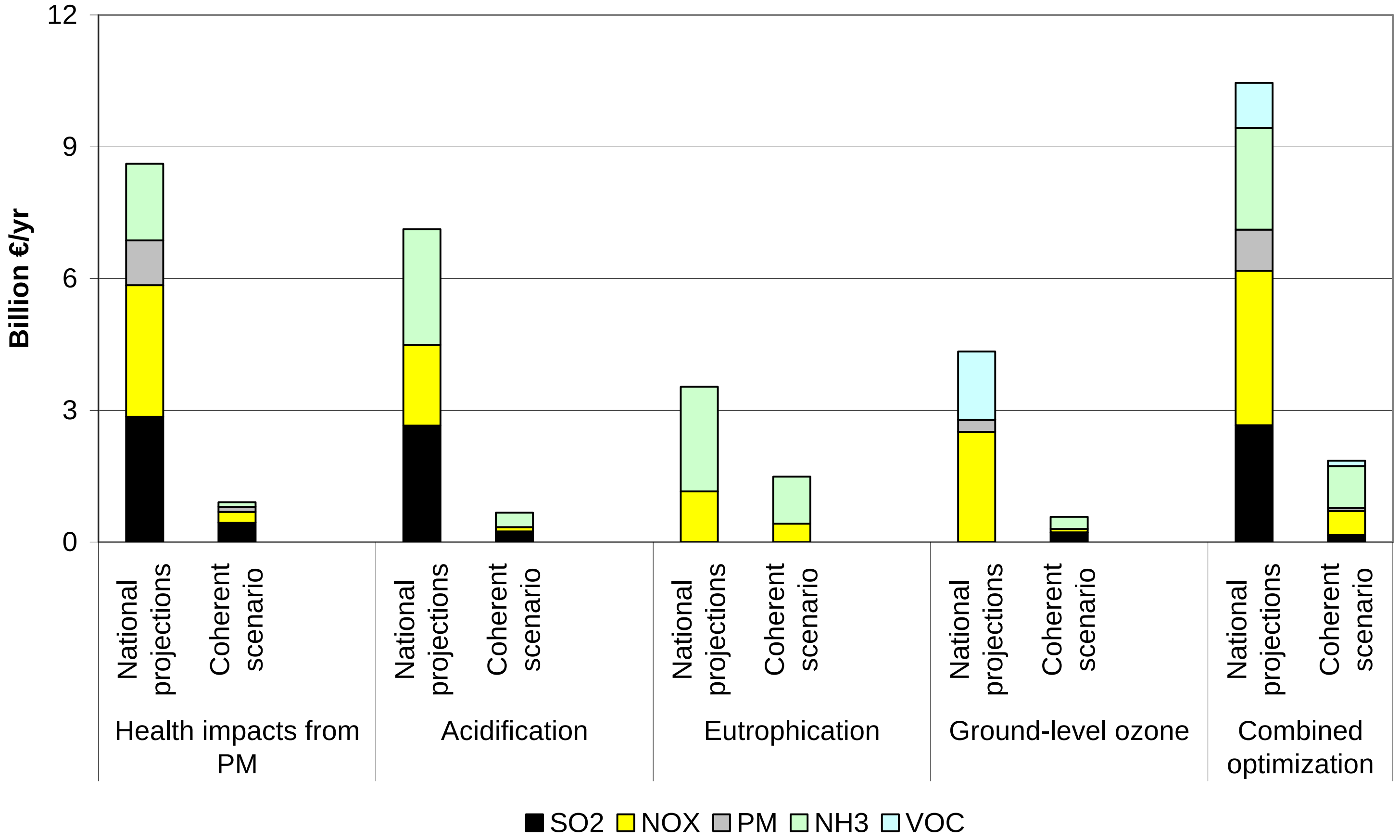
Optimized NO_x emissions - reduction from 2000



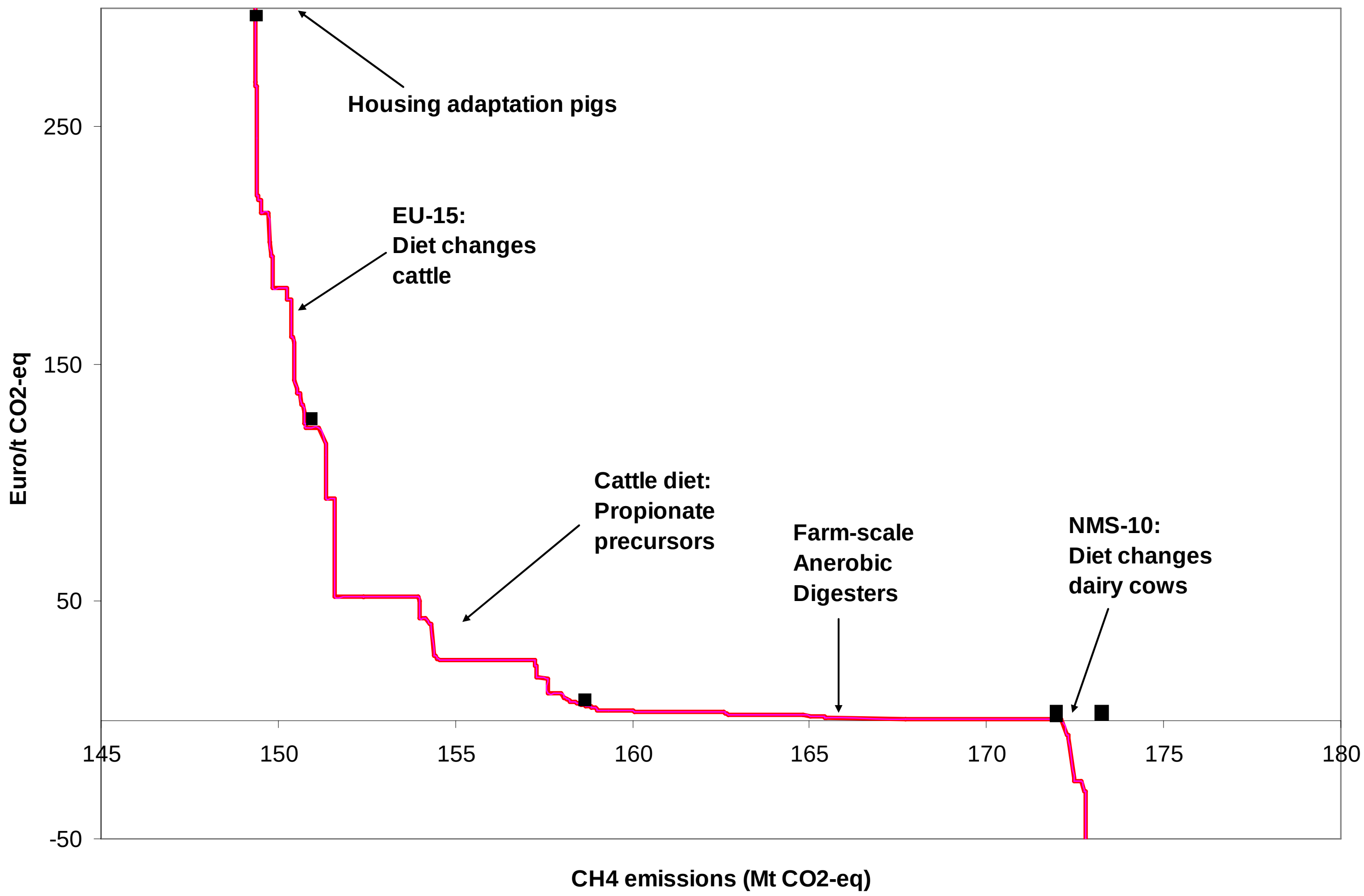
Optimized PM2.5 emissions – reduction from 2000



Costs of achieving environmental objectives



Scope for further CH_4 reductions from agriculture
GAINS cost curve – an example



Conclusions

Integrated assessment models:

- Enable designing air pollution control policies and explore linkages with mitigation of greenhouse gases
- Help to explore a wide range scenarios and targets
- Assess co-benefits and synergies of combined policies and look for cost-optimal solutions
- Are widely used in all-European context
- Are also useful for national analysis (RAINS Netherlands, RAINS Italy)
- Work on integrated assessment framework for Poland needed

More information:

www.iiasa.ac.at/rains