GREENHOUSE GAS – AIR POLLUTION INTERACTIONS AND SYNERGIES

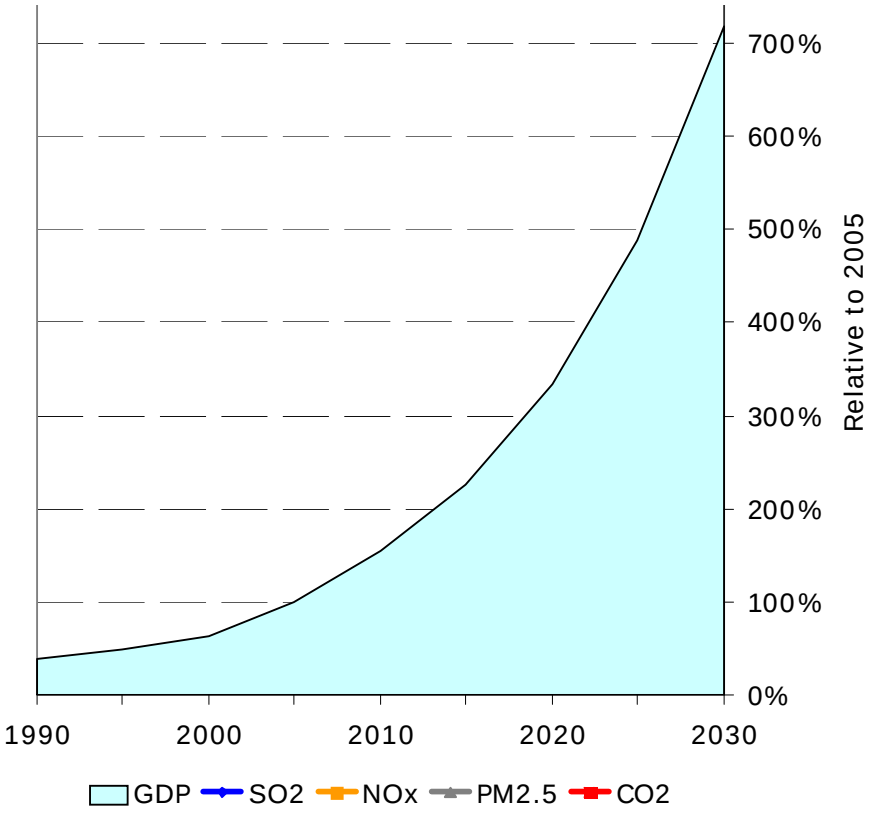
GAINS ASIA

A TOOL TO COMBAT
AIR POLLUTION AND
CLIMATE CHANGE
SIMULTANEOUSLY

IIASA ERI TSINGHUA UNIVERSITY 1911 teri ies Institute for Environment and Sustainability SIXTH FRAMEWORK PROGRAMME

Current economic growth will increase emissions
unless additional air pollution controls are implemented

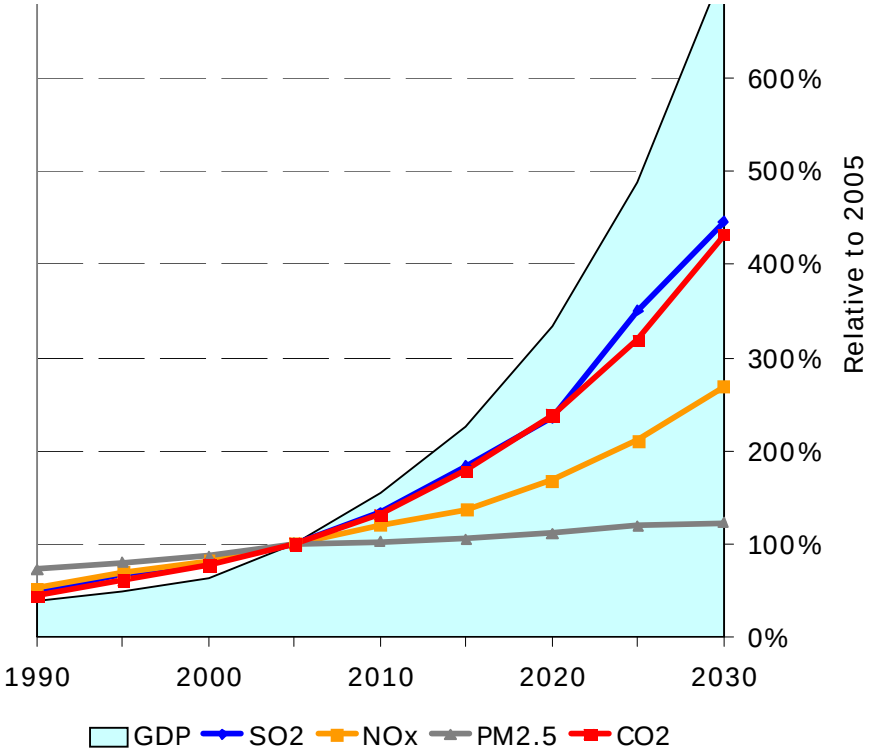
Governmental economic projection for India



- Population growth and development will further boost the level of economic activities in Asia.

Current economic growth will increase emissions
unless additional air pollution controls are implemented

Governmental economic projection for India and implied emissions (with current legislation)



- Population growth and development will further boost the level of economic activities in Asia.
- Current air pollution control strategies will not be sufficient to balance out the negative effects on air pollution and GHG emissions.
- **There is a need for further emission control strategies that do not harm economic development.**

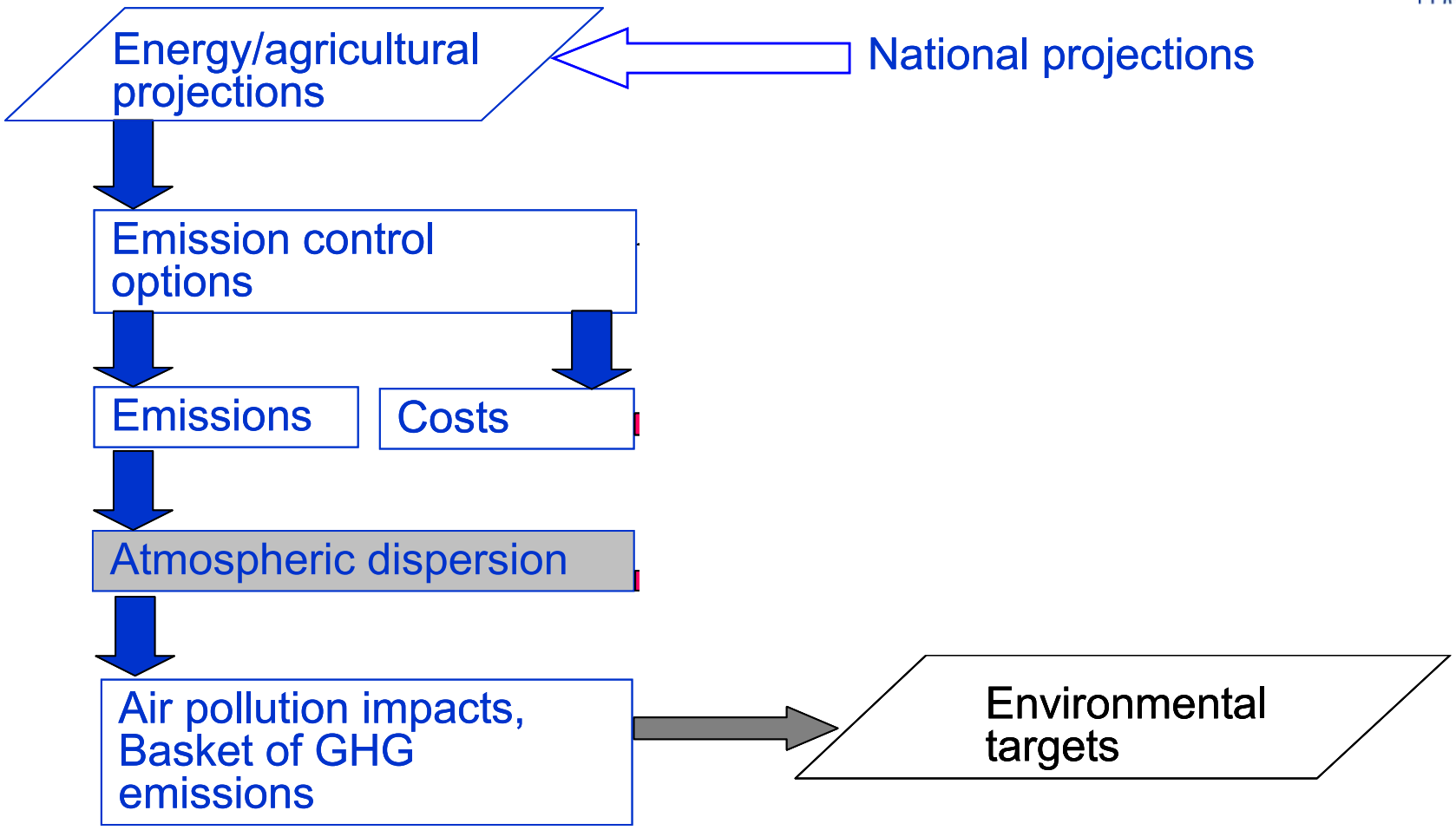
GAINS: A tool for a systematic assessment of the cost-effectiveness of emission control strategies

- GAINS quantifies sectoral emission control potentials and costs,
  - for exogenous (governmental) activity projections (by State and province),
  - considering physical and economic interactions between pollutants,
  - assessing urban/rural impacts from air quality effects and climate indicators.
- Search for least-cost mix of mitigation measures to meet air quality and/or GHG targets
- GAINS is implemented for China (with ERI), India (with TERI), Pakistan, Europe

Example questions for GAINS analyses

- How much would it cost to reduce air pollution levels to a given standard in a country?
- For the worst-affect areas only?
- What is the cheapest way to reduce health impacts on the population?
- Which measures should be taken?
- In which economic sectors?
- Which pollutants should be addressed?
- In which regions?
- Which air pollution controls maximize the reduction of greenhouse gases?

The GAINS model follows pollution from the sources to their impacts

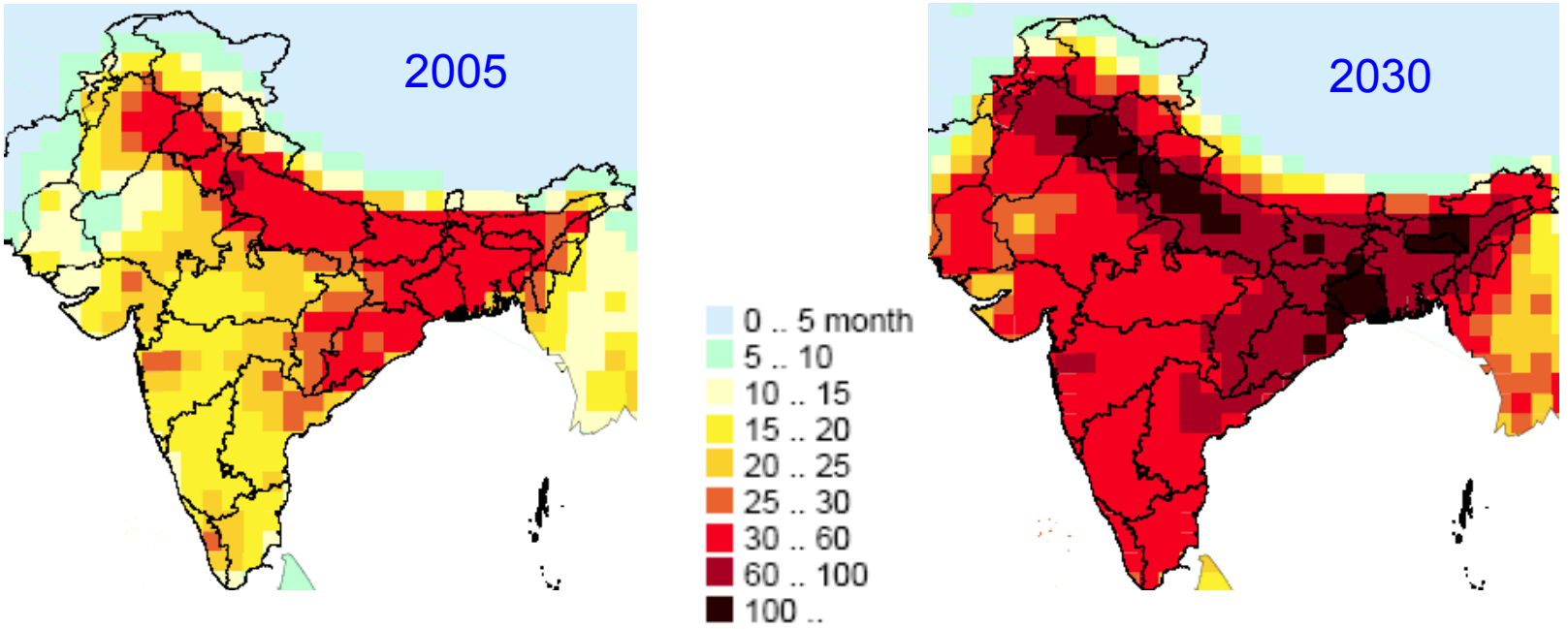


GAINS: A model to harvest synergies by integrating multiple pollutants and their multiple effects

Impacts	Emissions and control measures for air pollutants					and greenhouse gases			
	PM BC OC	SO_2	NO_x	VOC	NH_3	CO_2	CH_4	N_2O	HFCs PFCs SF_6
Health impacts: from fine particulate matter	√	√	√	(√)	√				
from ground-level ozone			√	√			(√)		
Vegetation damage: Ozone (agricultural crops)			√	√			(√)		
Acidification (forests, water)		√	√		√				
Eutrophication (biodiversity)			√		√				
Radiative forcing: - from direct greenhouse gases						√	√	√	√
- via aerosols and ozone	(√)	(√)	(√)	(√)	(√)		(√)		

Air quality problems are expected to intensify
unless additional air pollution controls are implemented

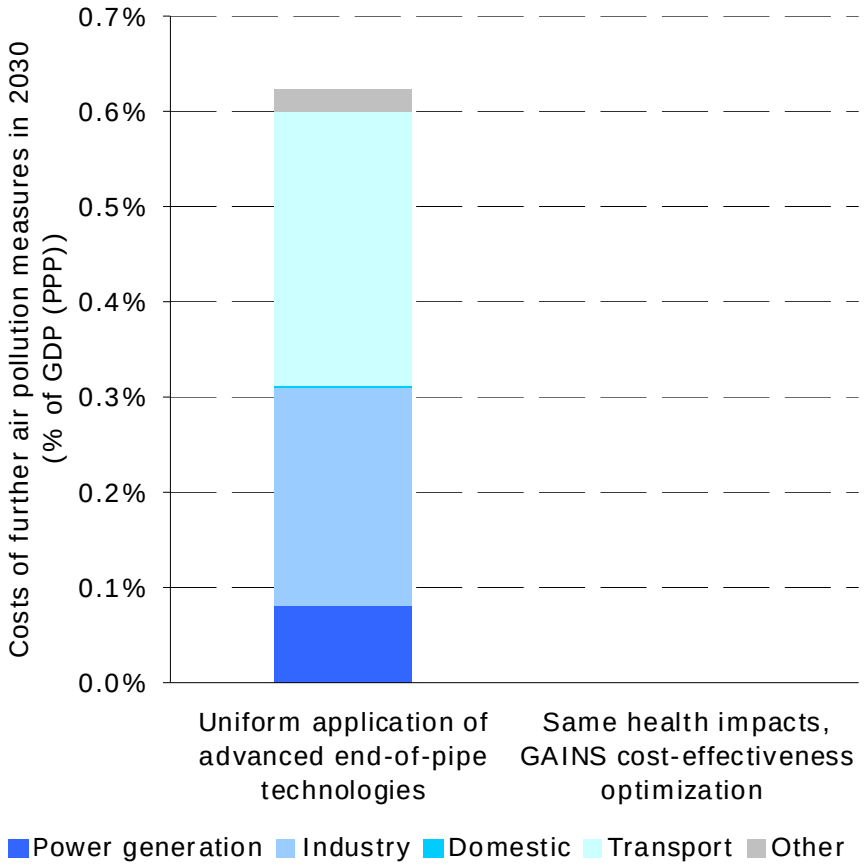
Loss in statistical life expectancy
attributable to outdoor exposure of PM2.5 (GAINS estimates)



The GAINS cost-effectiveness approach can reduce costs for improving air quality by up to 80%

- Full application of advanced emission control technologies can reduce health impacts in China by 43% in 2030

Emission control costs for reducing PM health impacts in China by 43%



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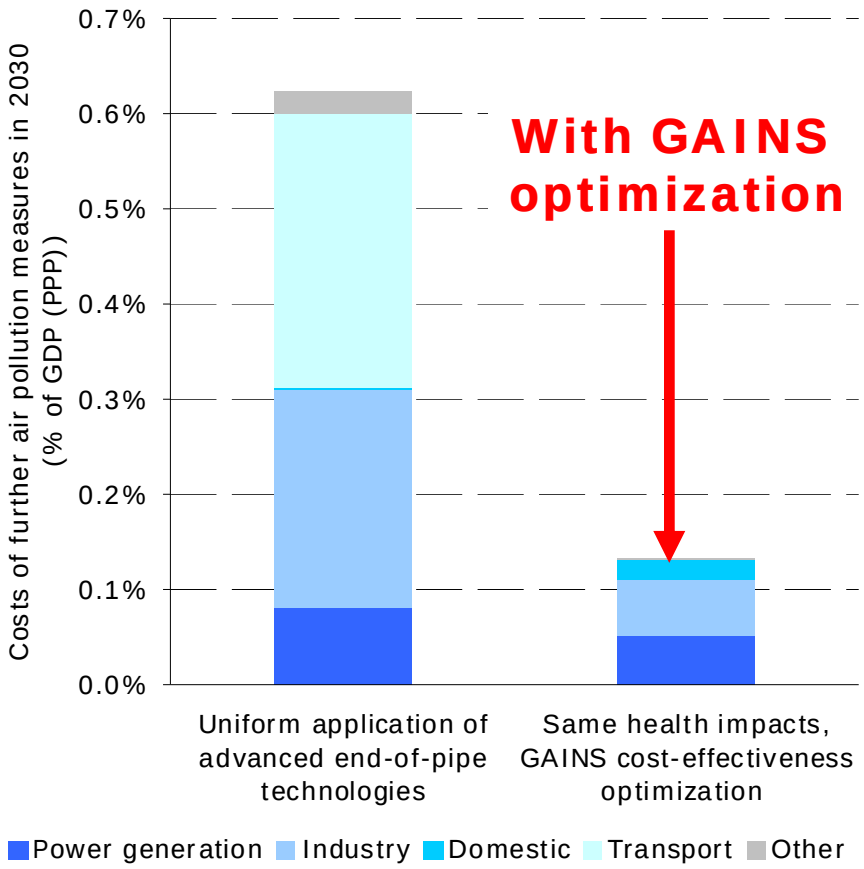
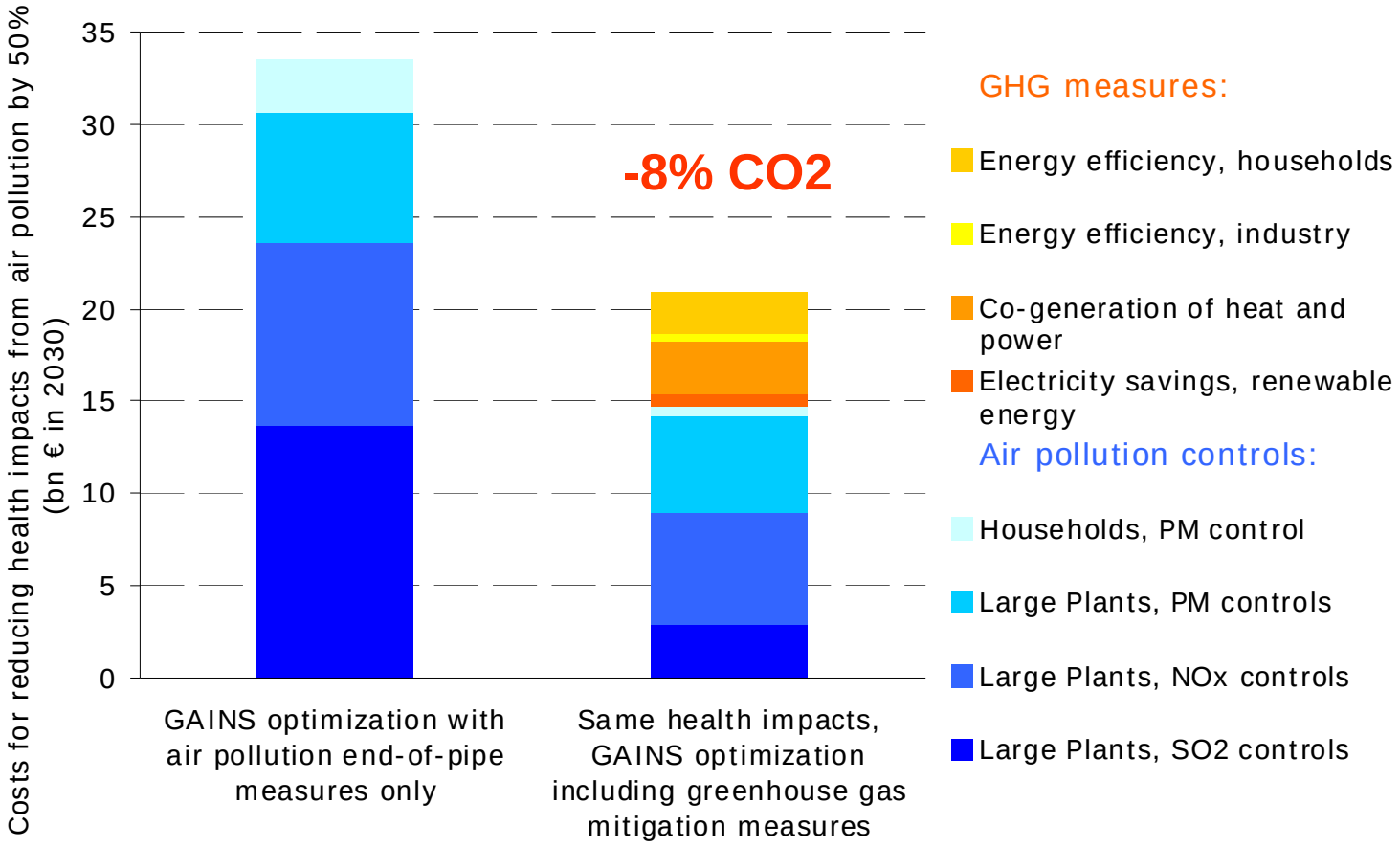
- The GAINS optimization can identify the most cost-effective portfolio of measures – these achieve the same health improvements at 20% of the costs

Emission control costs for reducing PM health impacts in China by 43%



Well-designed air pollution control strategies can also reduce GHG emissions

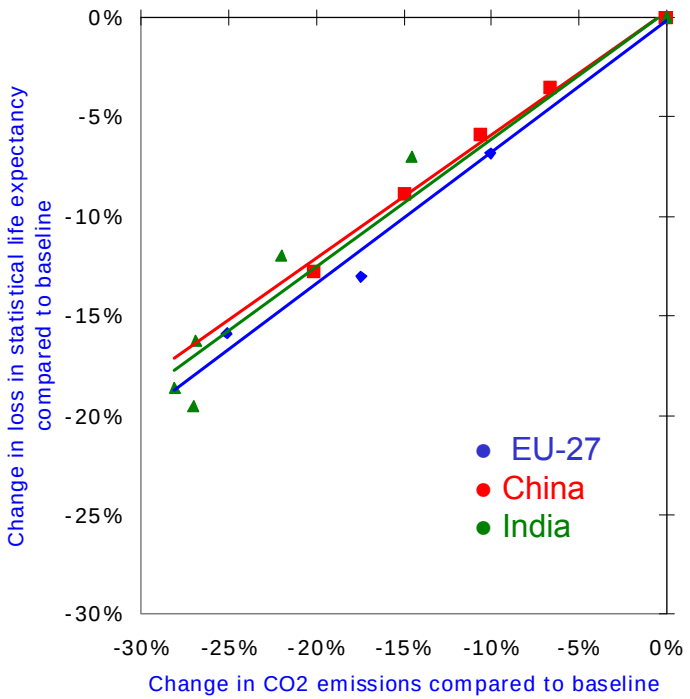
Emission control costs for reducing PM health impacts in China by 50%



Low carbon strategies have significant co-benefits - in Europe and in Asia

- Low CO_2 strategies result in
  - less SO_2, NO_x and PM emissions,
  - lower damage to health and vegetation from reduced air pollution,
  - cost savings for air pollution control equipment, compensating for up to 40% of GHG mitigation costs.

CO_2 emissions vs. health impacts (YOLLs)



The GAINS model is freely accessible on the Internet: http://gains.iiasa.ac.at

- Access to on-line versions
  - China
  - India
  - Europe
- Policy reports,
  user tutorials,
  model documentation,
  etc.
- Implementations for other countries are possible with limited efforts