# INTEGRATED ASSESSMENT MODELLING: CLRTAP EXPERIENCE


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CHAIR OF THE EMEP STEERING BODY


emep

Co-operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe

wge

Working Group on Effects of the Convention on Long-range Transboundary Air Pollution

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# CONTEXT

- IAM is one of the activities borne by the EMEP programme which provides scientific background to the CLRTAP and its protocoles

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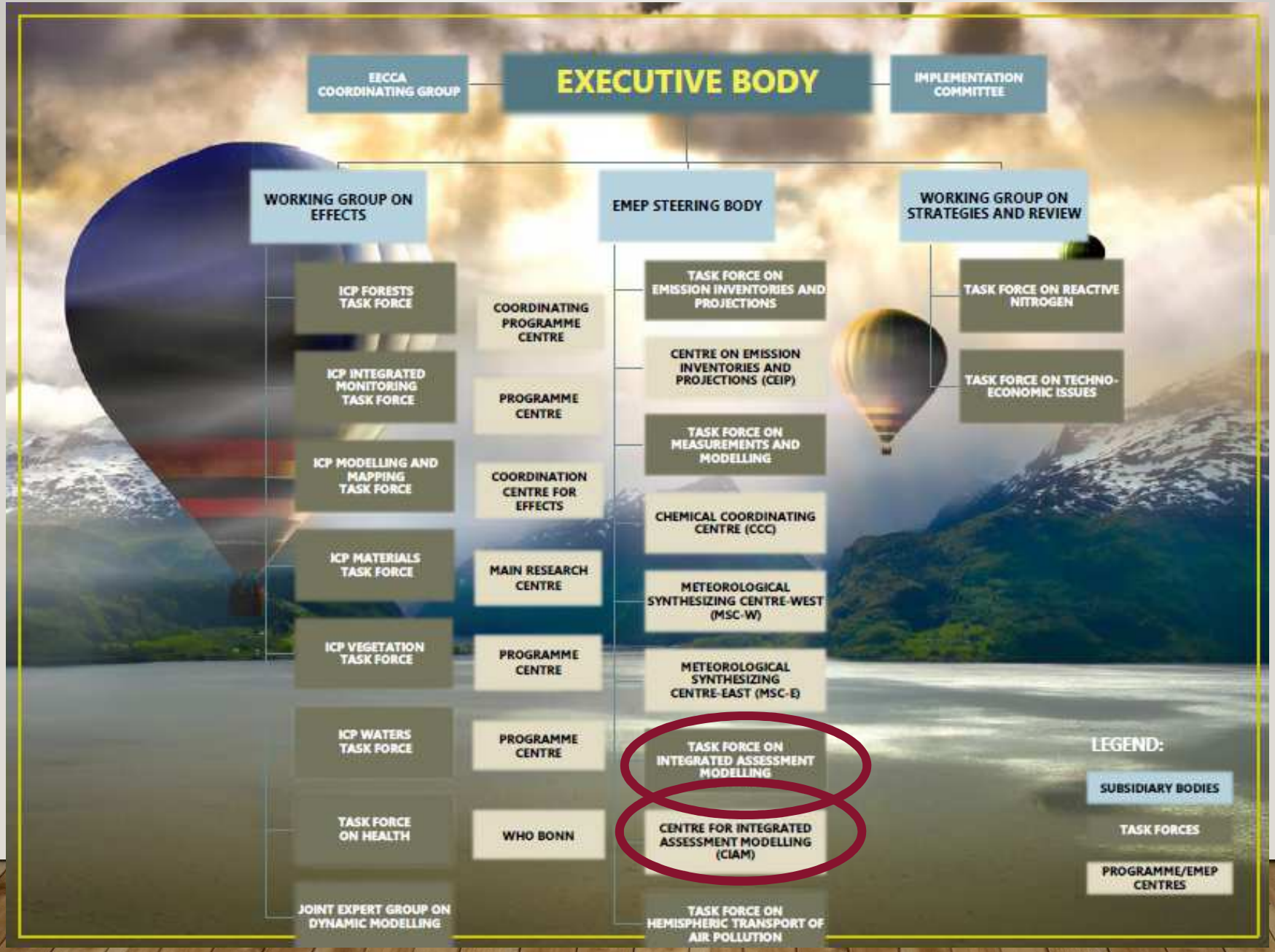
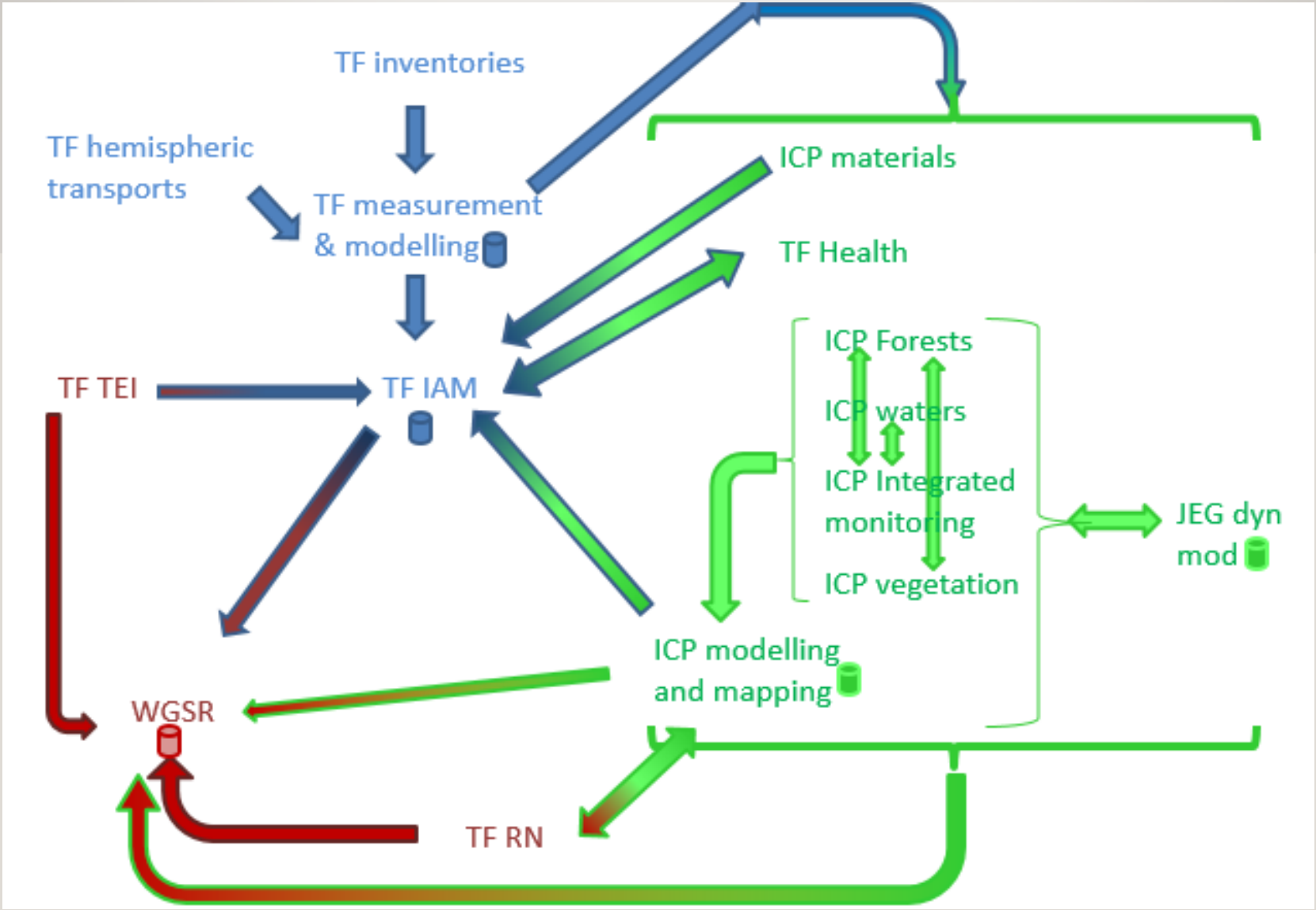
- CLRTAP: Adopted in 1979, CLRTAP is a UNECE convention (Europe, USA, Canada) ratified by 51 Parties
- 8 protocols among which the 1999 Gothenburg Protocol to abate Acidification, Eutrophication and ground level ozone that entered into force in 2005 and has been amended in 2012 with new objectives (2020) and to include PM issues
- IAM drove the objective set by the "multi-pollutants / multi-effects" Gothenburg protocol


EECCA COORDINATING GROUP
EXECUTIVE BODY
IMPLEMENTATION COMMITTEE
WORKING GROUP ON EFFECTS
EMEP STEERING BODY
WORKING GROUP ON STRATEGIES AND REVIEW
ICP FORESTS TASK FORCE
ICP INTEGRATED MONITORING TASK FORCE
ICP MODELLING AND MAPPING TASK FORCE
ICP MATERIALS TASK FORCE
ICP VEGETATION TASK FORCE
ICP WATERS TASK FORCE
TASK FORCE ON HEALTH
JOINT EXPERT GROUP ON DYNAMIC MODELLING
COORDINATING PROGRAMME CENTRE
PROGRAMME CENTRE
COORDINATION CENTRE FOR EFFECTS
MAIN RESEARCH CENTRE
PROGRAMME CENTRE
PROGRAMME CENTRE
WHO BONN
TASK FORCE ON EMISSION INVENTORIES AND PROJECTIONS
CENTRE ON EMISSION INVENTORIES AND PROJECTIONS (CEIP)
TASK FORCE ON MEASUREMENTS AND MODELLING
CHEMICAL COORDINATING CENTRE (CCC)
METEOROLOGICAL SYNTHESIZING CENTRE-WEST (MSC-W)
METEOROLOGICAL SYNTHESIZING CENTRE-EAST (MSC-E)
TASK FORCE ON INTEGRATED ASSESSMENT MODELLING
CENTRE FOR INTEGRATED ASSESSMENT MODELLING (CIAM)
TASK FORCE ON HEMISPHERIC TRANSPORT OF AIR POLLUTION
TASK FORCE ON REACTIVE NITROGEN
TASK FORCE ON TECHNO-ECONOMIC ISSUES
LEGEND:
SUBSIDIARY BODIES
TASK FORCES
PROGRAMME/EMEP CENTRES

# DATA FLOWS WITHIN THE CLRTAP



# IAM ADDED -VALUE :

- Defining emission control strategies by accounting for their costs, feasibility, and their impacts and benefits
- Maximizing benefits, optimizing costs and burden sharing

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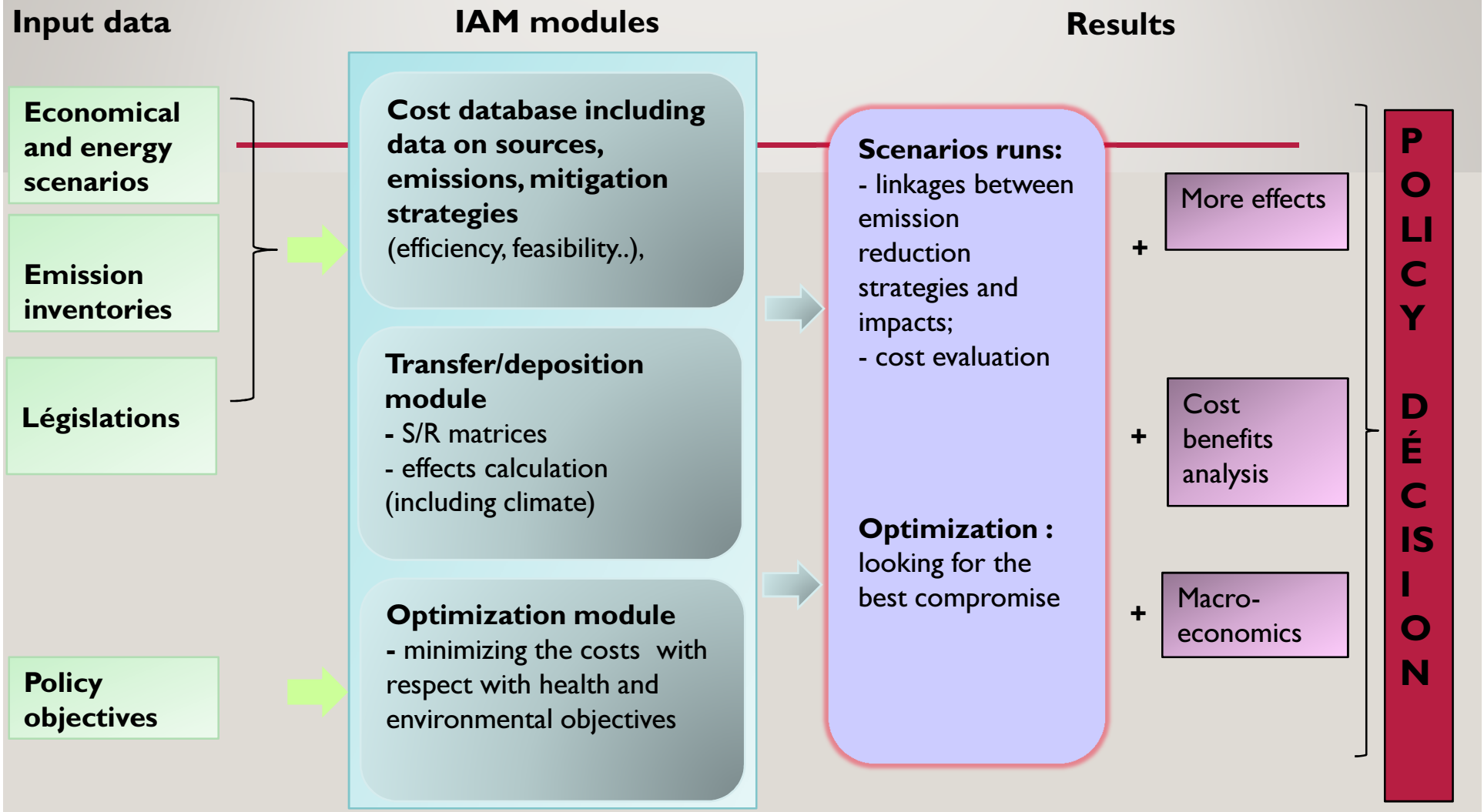
- The GAINS model (former RAINS) developed by IIASA provides "a framework for assessing strategies that reduce emissions of **multiple air pollutants and greenhouse gases at least costs**, and minimize their negative effects on human health, ecosystems and climate change".
- It allows to test various emission reduction scenarios regarding as objective a number of metrics (end points) that are representative of health and environment impacts
- The Convention approach (and EU legislation) is based on national emission ceilings

# GAINS APPROACH : INTEGRATED APPROACH FOR THE POLLUTANTS AND THE EFFECTS

| | PM (BC, OC) | $SO_2$ | $NO_x$ | VOC | $NH_3$ | CO | $CO_2$ | $CH_4$ | $N_2O$ | HFCs PFCs $SF_6$ |
|---|---|---|---|---|---|---|---|---|---|---|
| **Health impacts:** PM (Loss in life expectancy) | √ | √ | √ | √ | √ | | | | | |
| $O_3$ (Premature mortality) | | | √ | √ | | √ | | √ | | |
| **Vegetation damage:** $O_3$ (AOT40/fluxes) | | | √ | √ | | √ | | √ | | |
| Acidification (Excess of critical loads) | | √ | √ | | √ | | | | | |
| Eutrophication (Excess of critical loads) | | | √ | | √ | | | | | |
| **Climate impacts:** Long-term (GWP100) | (√) | (√) | (√) | (√) | (√) | (√) | √ | √ | √ | √ |
| Near-term forcing (in Europe and global mean forcing) | √ | √ | √ | √ | √ | √ | (√) | √ | (√) | (√) |
| Black carbon deposition to the arctic | √ | | | | | | | | | |

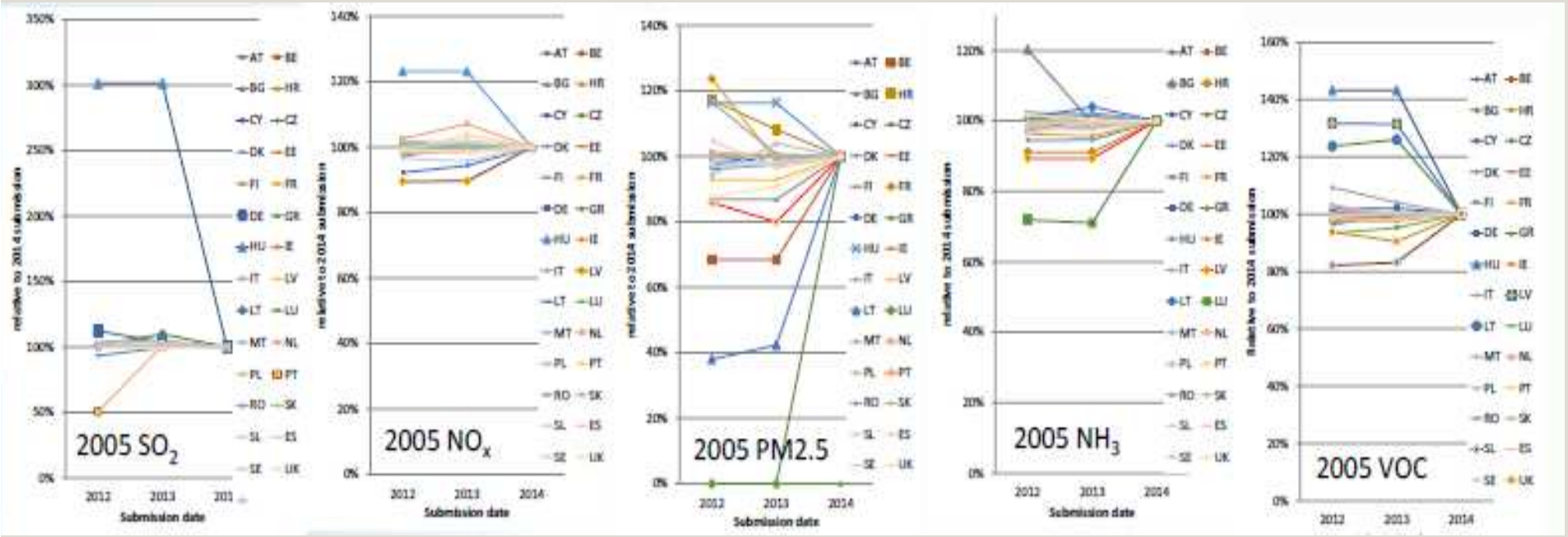
Source : IIASA – GAINS website

# IAM CONCEPT


Input data
IAM modules
Results
Economical and energy scenarios
Emission inventories
Législations
Policy objectives
Cost database including data on sources, emissions, mitigation strategies (efficiency, feasibility..),
Transfer/deposition module
- S/R matrices
- effects calculation (including climate)
Optimization module
- minimizing the costs with respect with health and environmental objectives
Scenarios runs:
- linkages between emission reduction strategies and impacts;
- cost evaluation
Optimization : looking for the best compromise
+ More effects
+ Cost benefits analysis
+ Macro-economics
POLICY DÉCISION

# EMISSIONS, PROJECTIONS, SCENARIOS

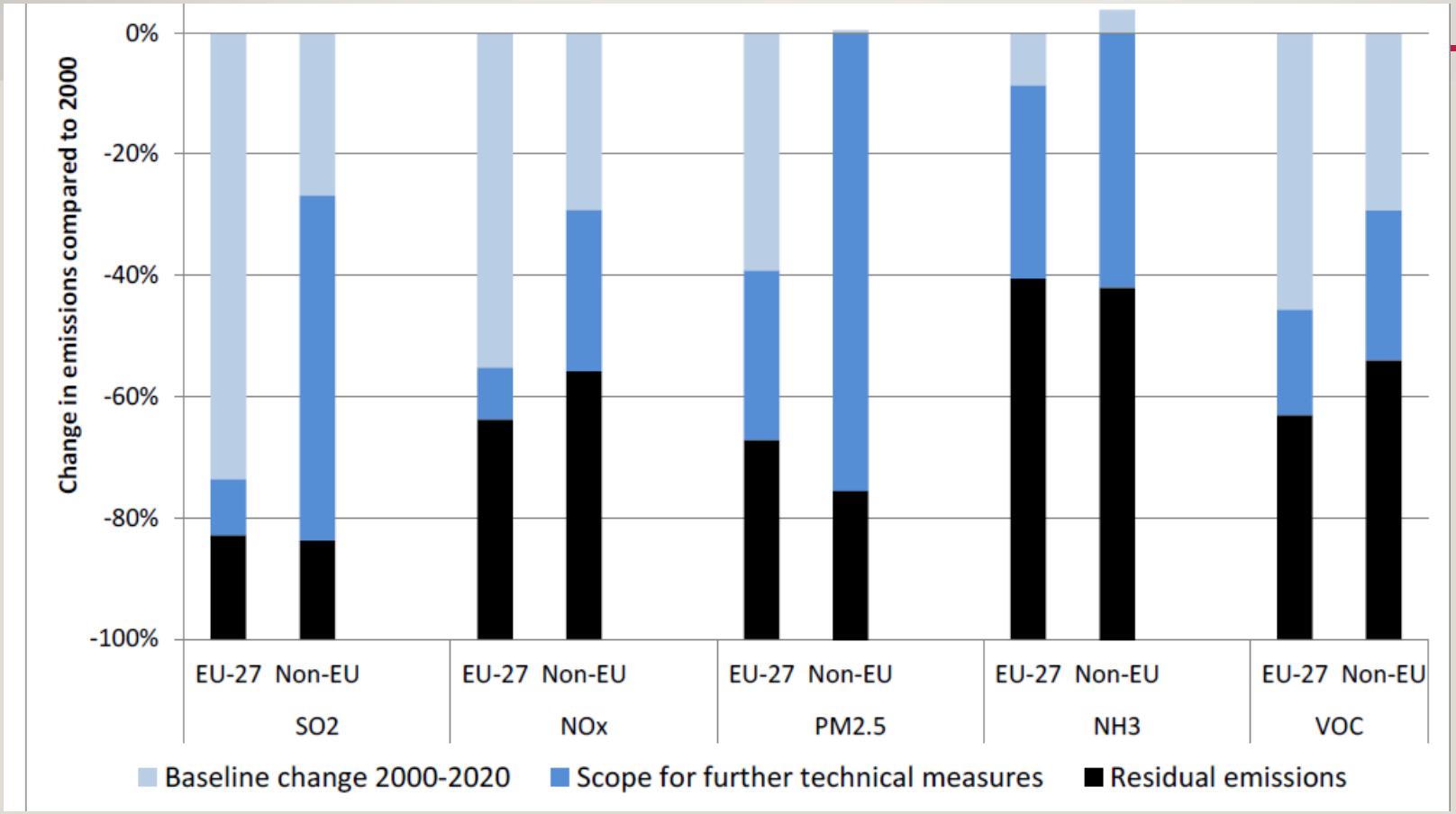
- Regulatory framework (Protocols, EU Directives) allows to gather emission and projection databases
- Task Force on Techno-economic Issues (TF TEI) helps for projections
- But potential drastic changes in data reported year by year




Source : CIAM

# LOOKING FOR POTENTIAL OPTIONS TO REDUCE EMISSIONS

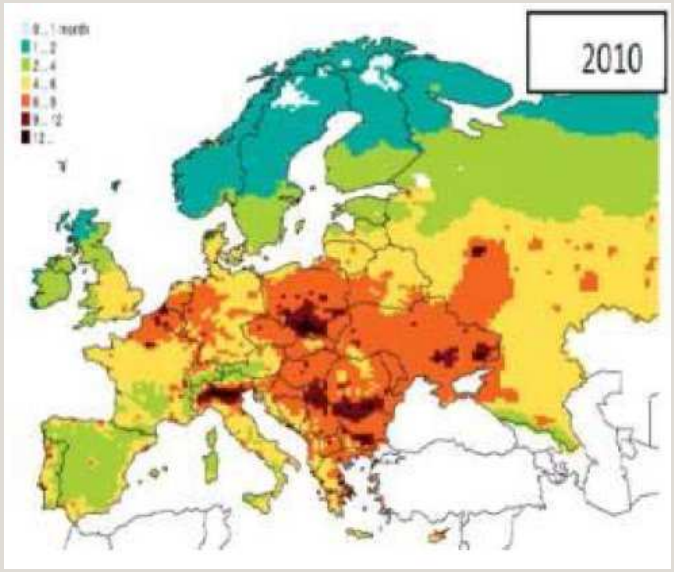
- There is still some potential to reduce emissions from power plants and industries in EECCA countries



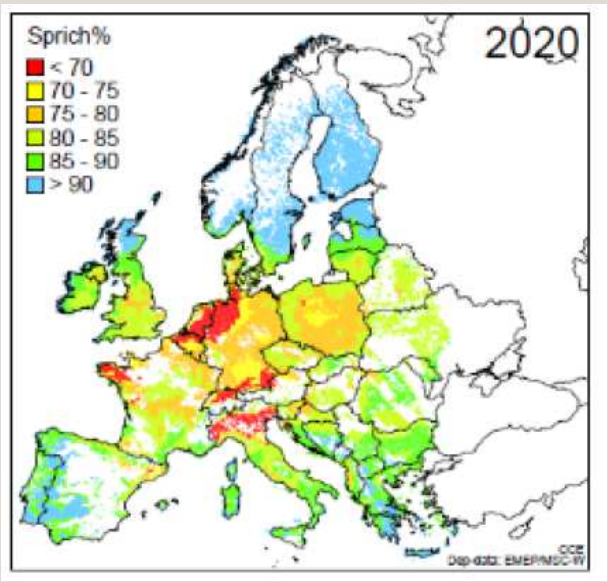

Source : IIASA

# EMEP MODELLING AND MONITORING TOOLS TO SIMULATE THE IMPACTS

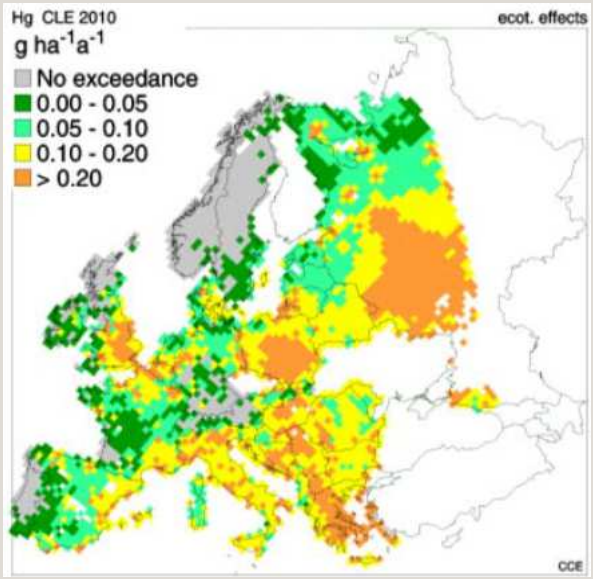
- Airborne concentrations and deposition
- Impact indicators in the present situation and in the future



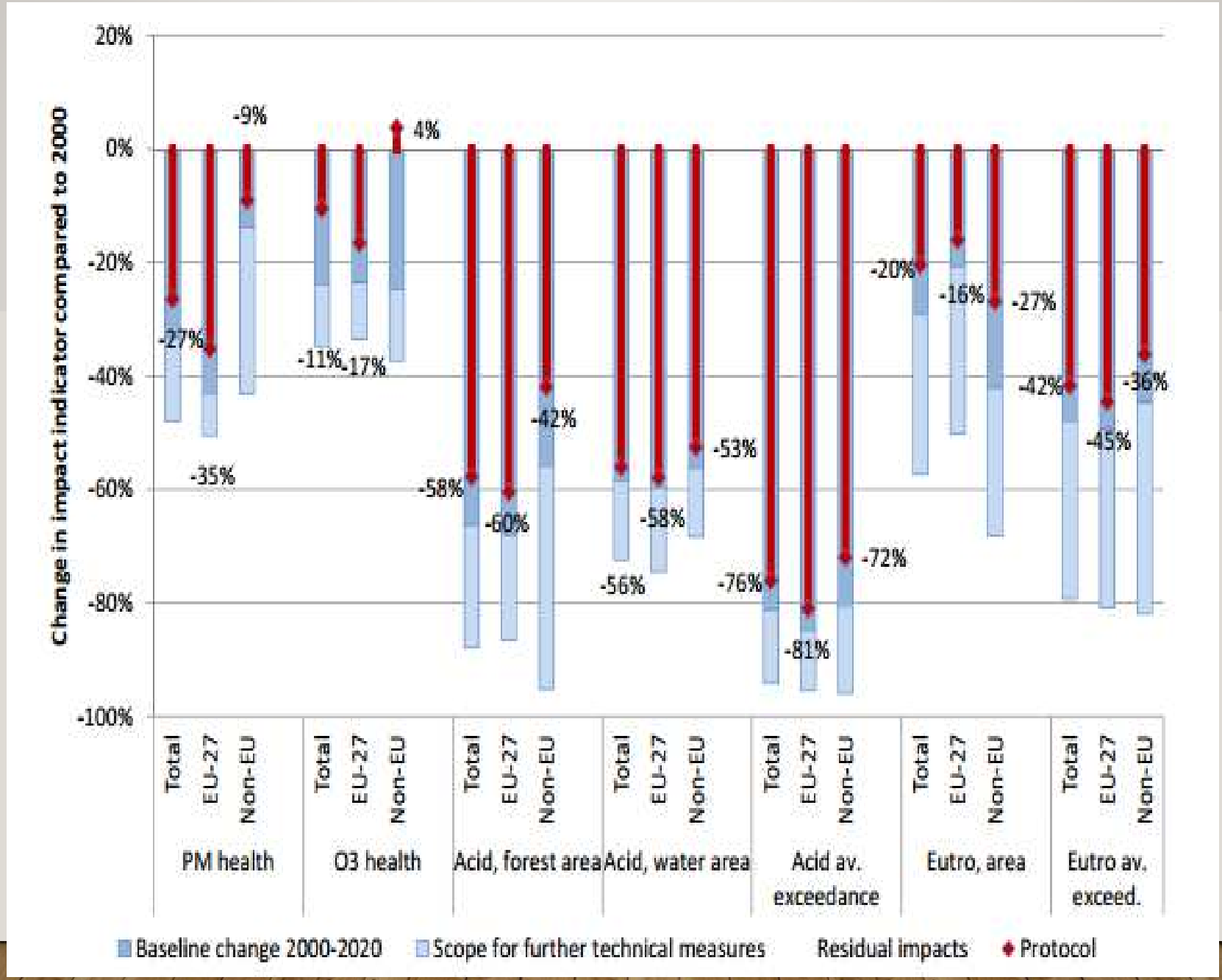

Loss of life expectance (months)




Plant species loss (% protected)



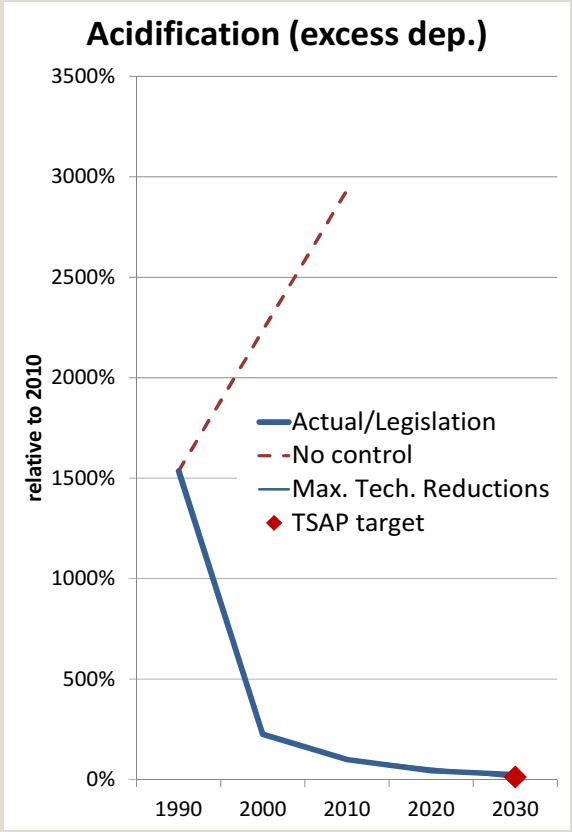

Mercury accumulation in soil (CL-exceedance)

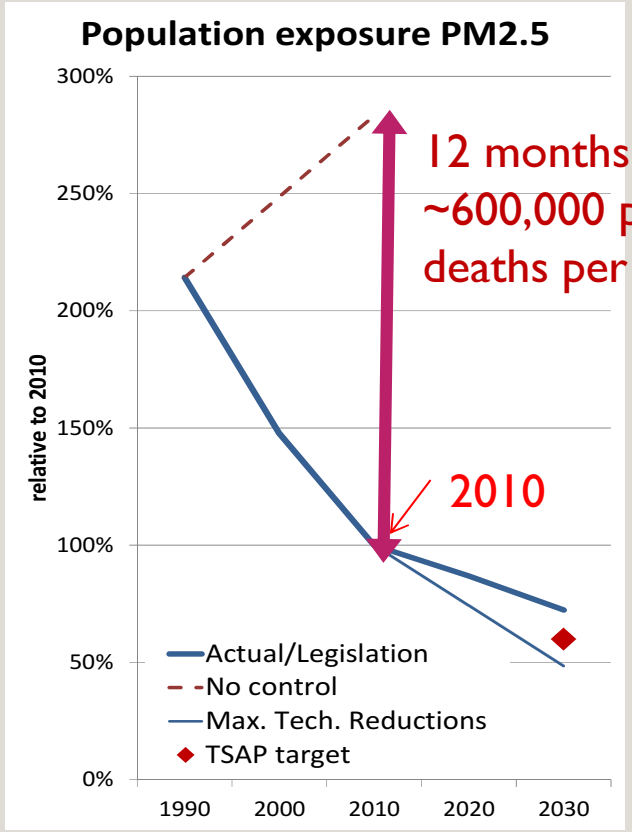



Source : CIAM, 2012, *Environmental Improvements of the 2012 Revision of the Gothenburg Protocol*

# QUALIFYING THE BENEFITS

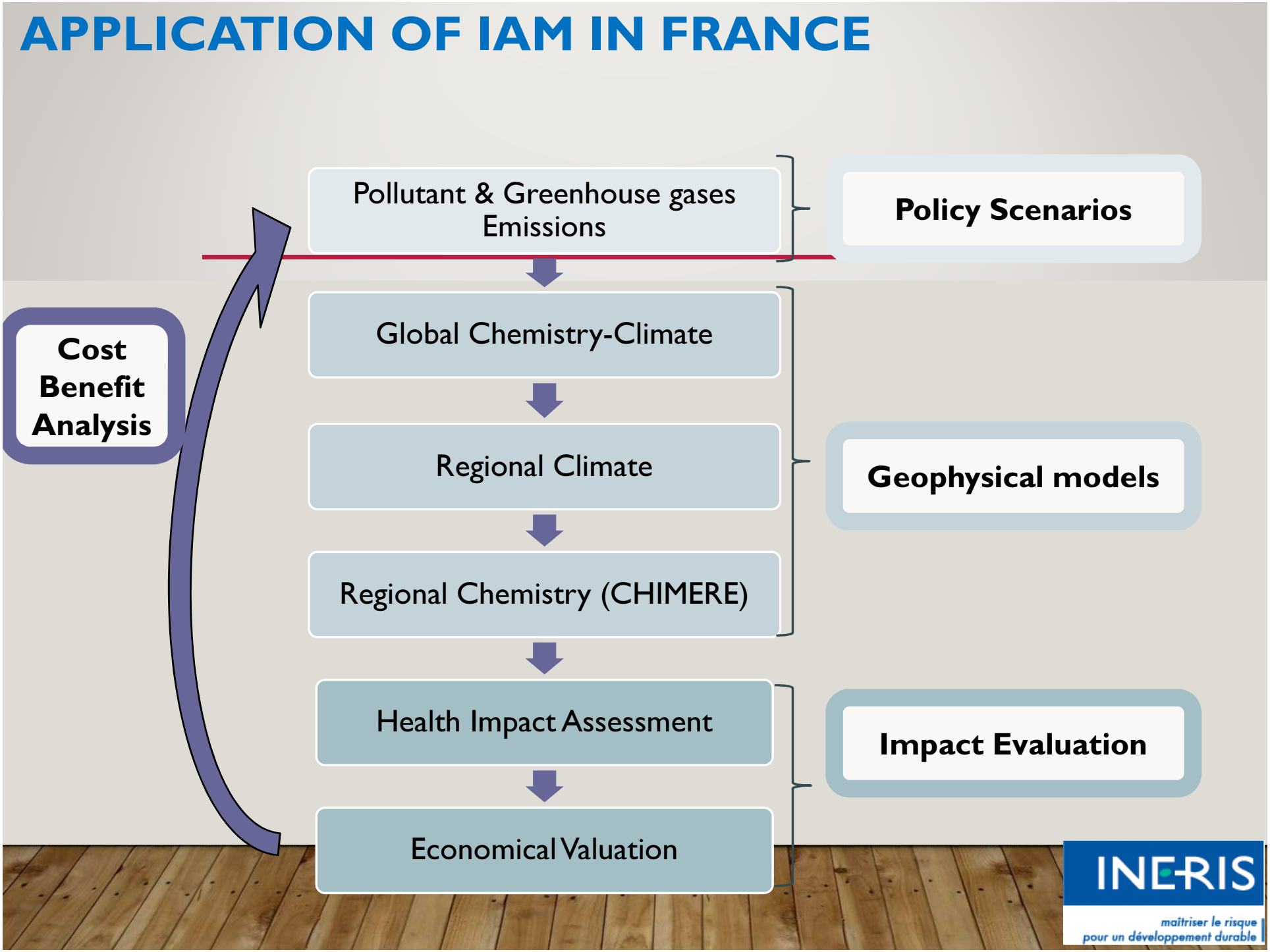
- Comparing with scenarios corresponding to « no management strategy »




**Source: IIASA**

# APPLICATION OF IAM IN FRANCE

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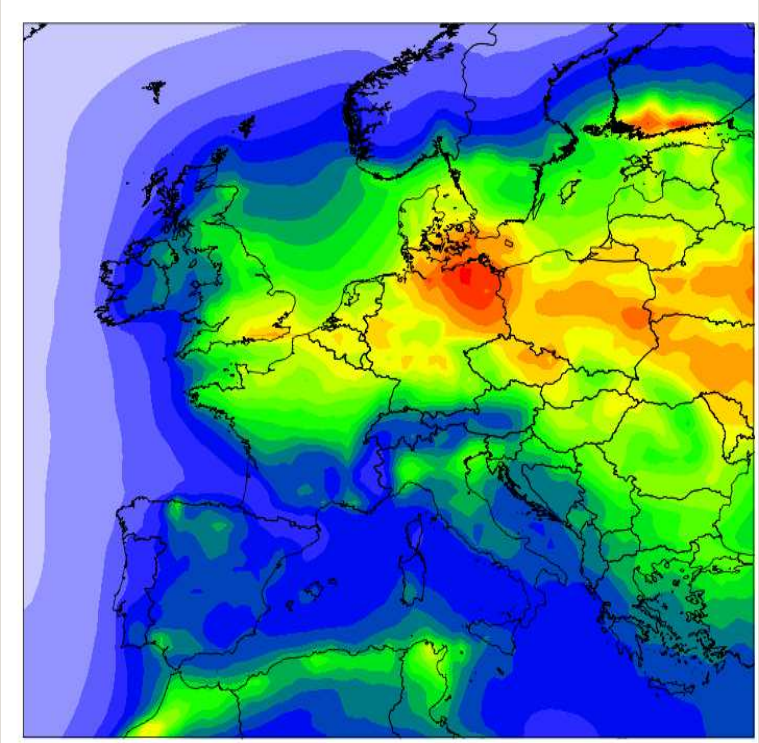
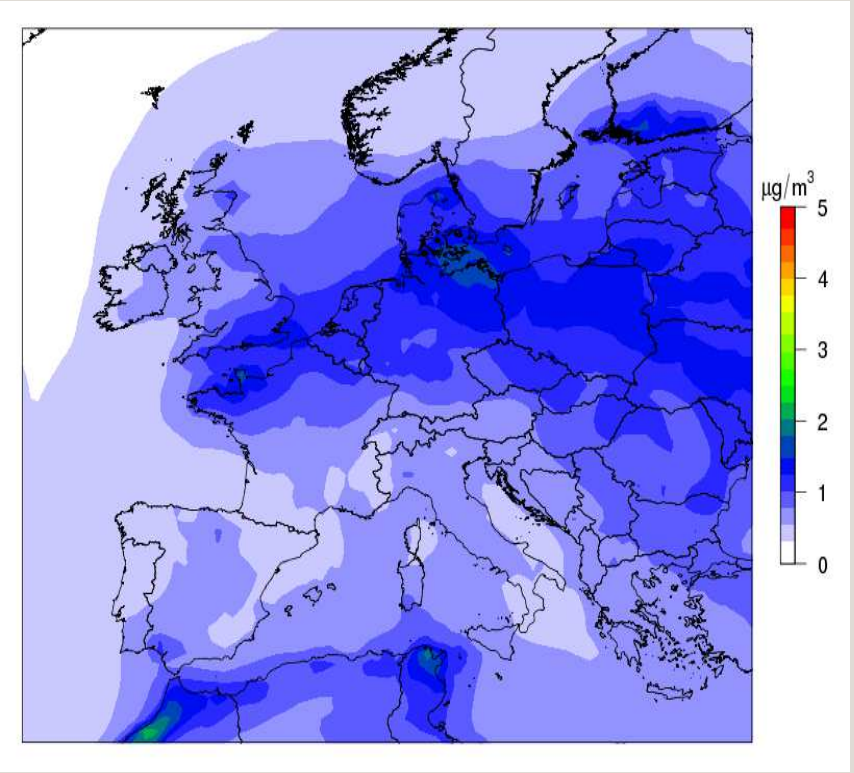
# PM2.5 IN 2050 SIMULATED BY INERIS CLIMATE/CTM CHAIN

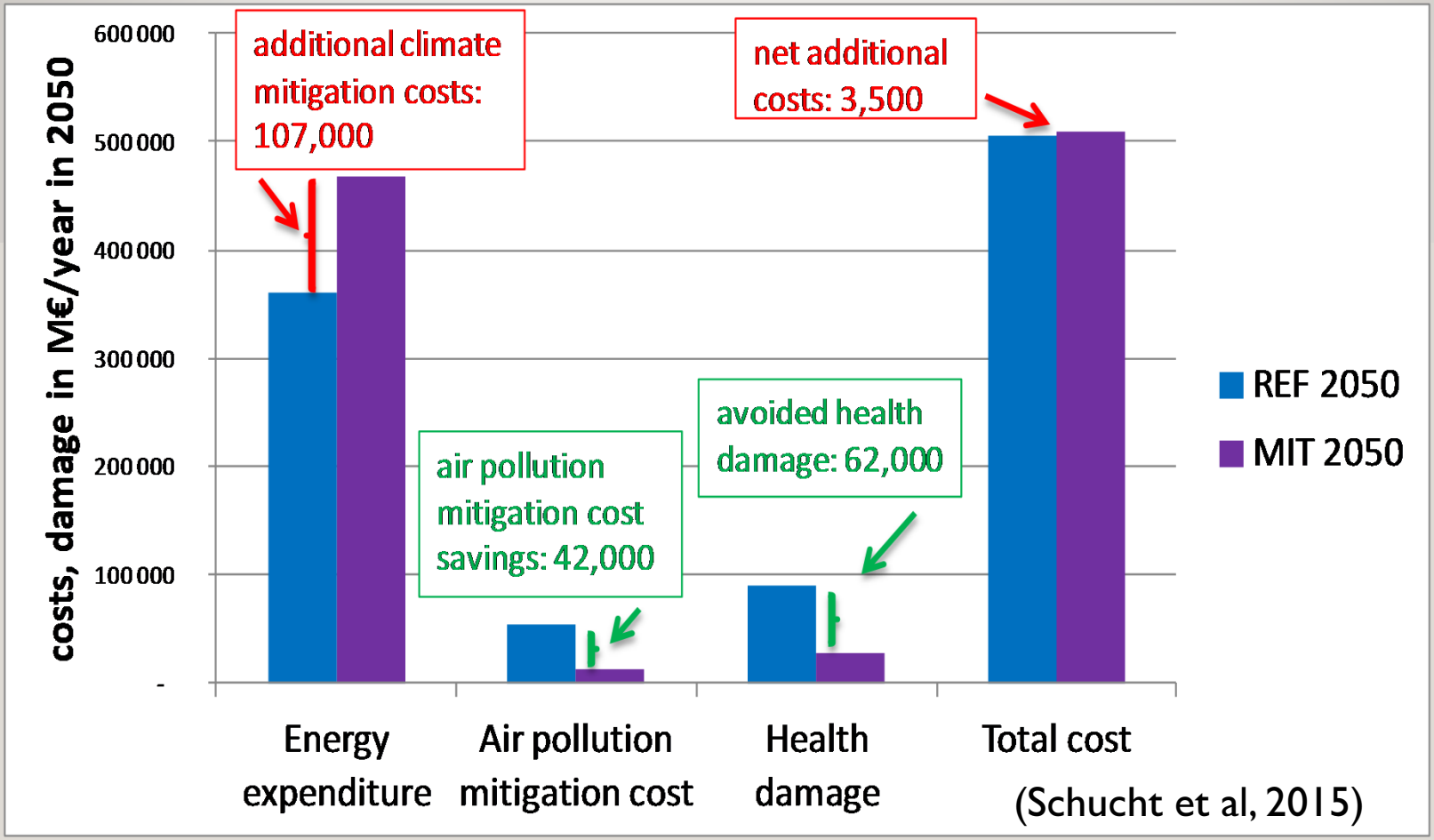
**Business as usual**



**Mitigation**



# … AND COST BENEFITS ANALYSIS




The cost of climate mitigation is largely compensated by
(i) Savings in quality mitigation, (ii) Reduced health damage

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# INTERNATIONAL COOPERATION

- GAINS-ASIA is running, and there are some examples of national applications (GAINS-Korea)
- Other IAM initiatives develop in Asia

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- Common policy-oriented framework could help to feed the IAM tools and to set shared objectives driving the scenarios
- Permanent dialogue with the countries should be maintained (CIAM's duty) to develop a robust and transparent approach and control uncertainties. Reference centers are very useful in that perspective
- CLRTAP gets experience in implementing good practices (emissions and projections, cost-benefits analyses) and develop its own tools.
- Cooperation could develop through :
  - exchange of views and tools,
  - review initiatives,
  - common objectives on hemispheric issues (ozone, SLCP)

# THANK YOU FOR YOUR ATTENTION

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