atopica®

atopic diseases in changing climate, land use & air quality

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Air quality projections for the 21st century

Climate change and air pollution interlinkages

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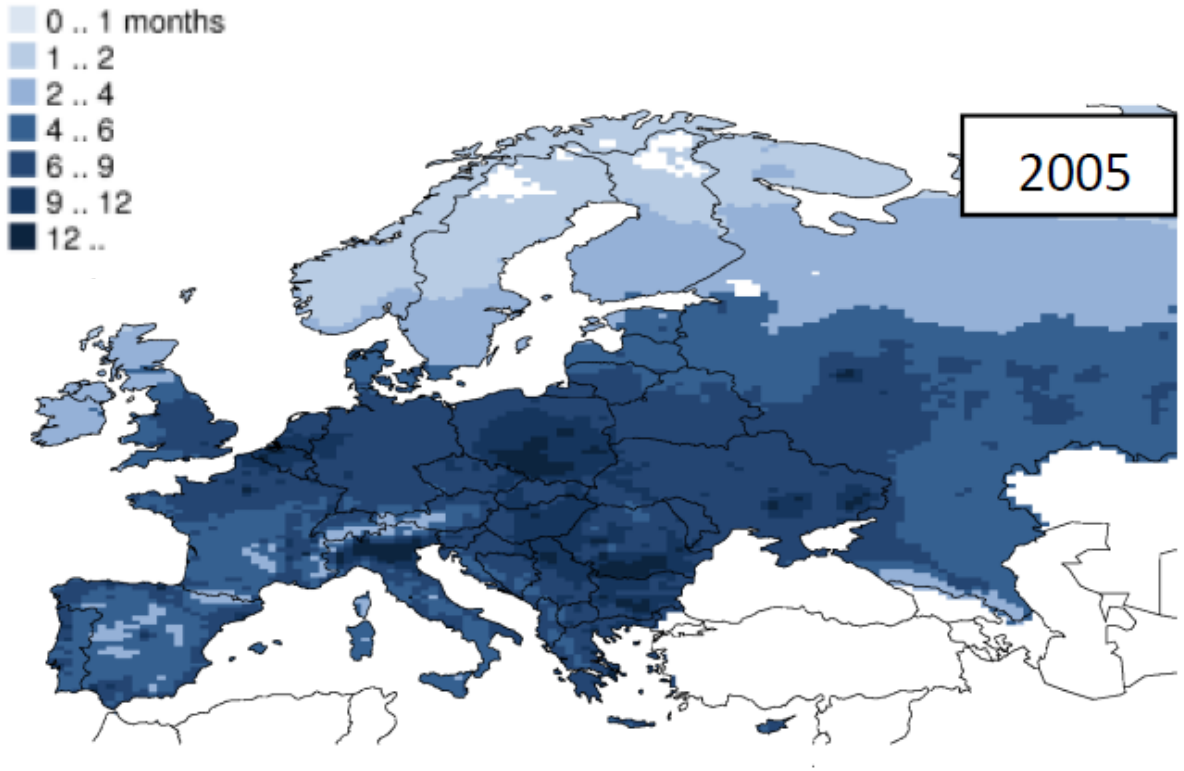
AIR QUALITY IN EUROPE

Current Situation

AQ health impacts in Europe:

- loss in life expectancy ~8.5months
- 400,000 anticipated death each year



Loss in life expectancy due to PM2.5
TSAP Report #10, IIASA 2013

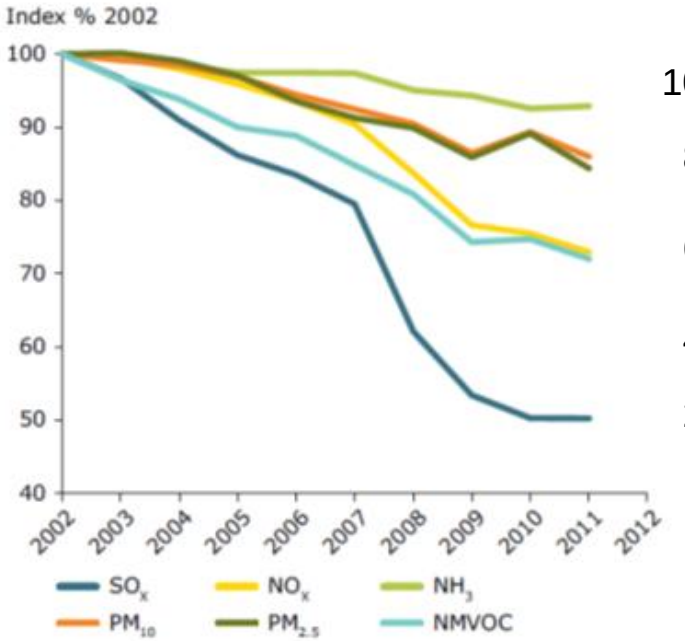
AIR QUALITY IN EUROPE

reducing emissions of pollutants

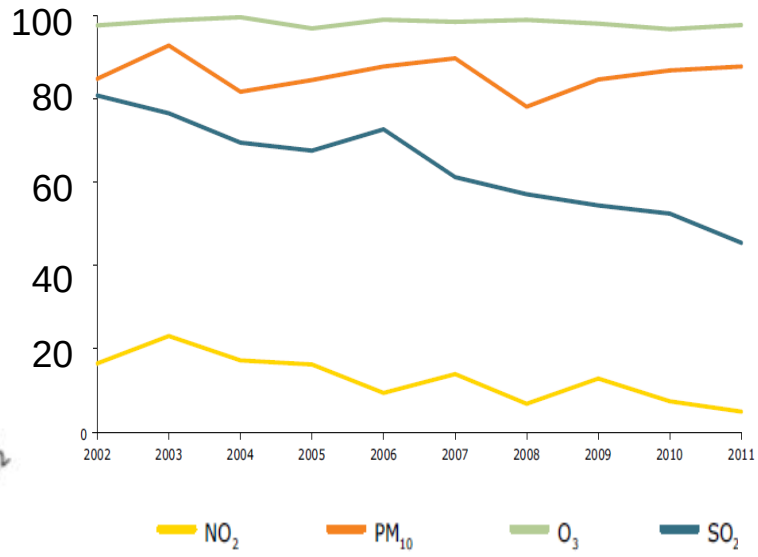
Emission reduction

- NOx and VOC (O3 precursors) reduced by up to 30%
- Primary PM2.5 emissions reduced by 10-20%

The downward trend of the past 10 years in emissions of PM and O3 precursors is not reflected in the observations

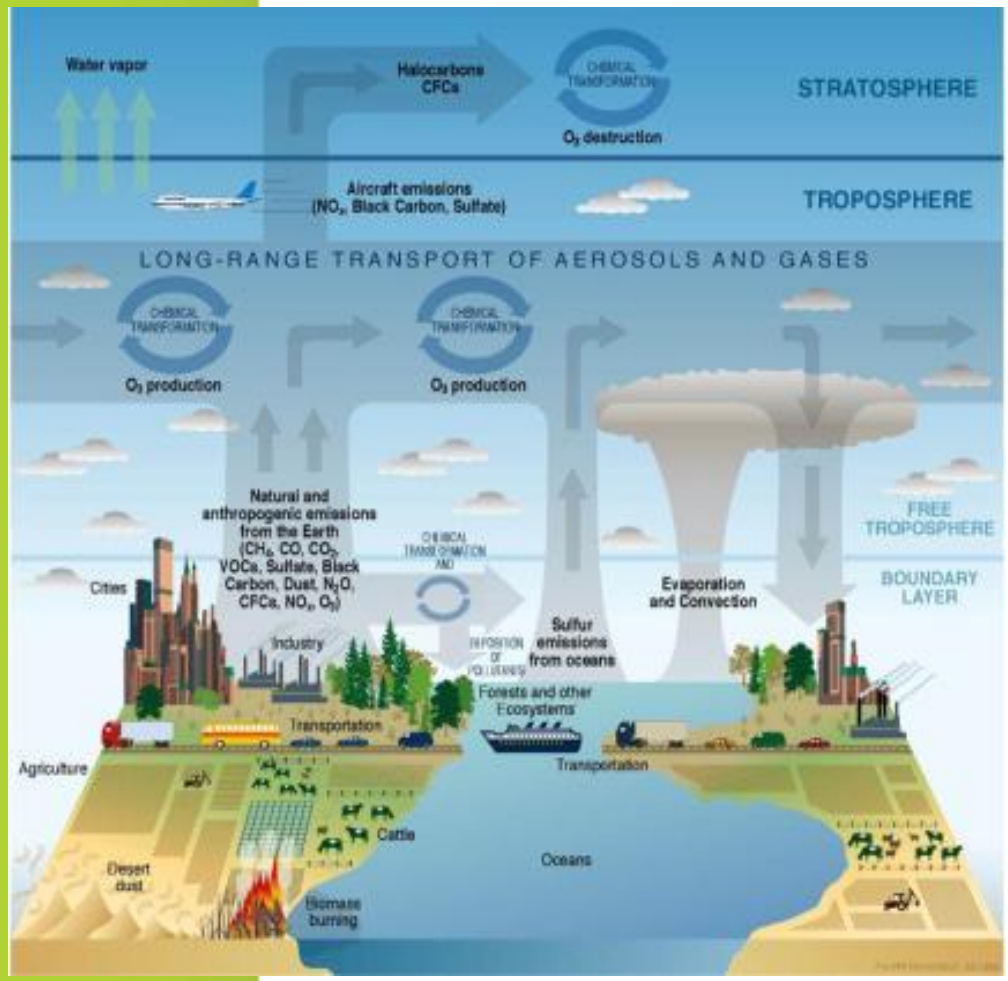


Emissions reduction relative to 2002 for the main pollutants and precursors



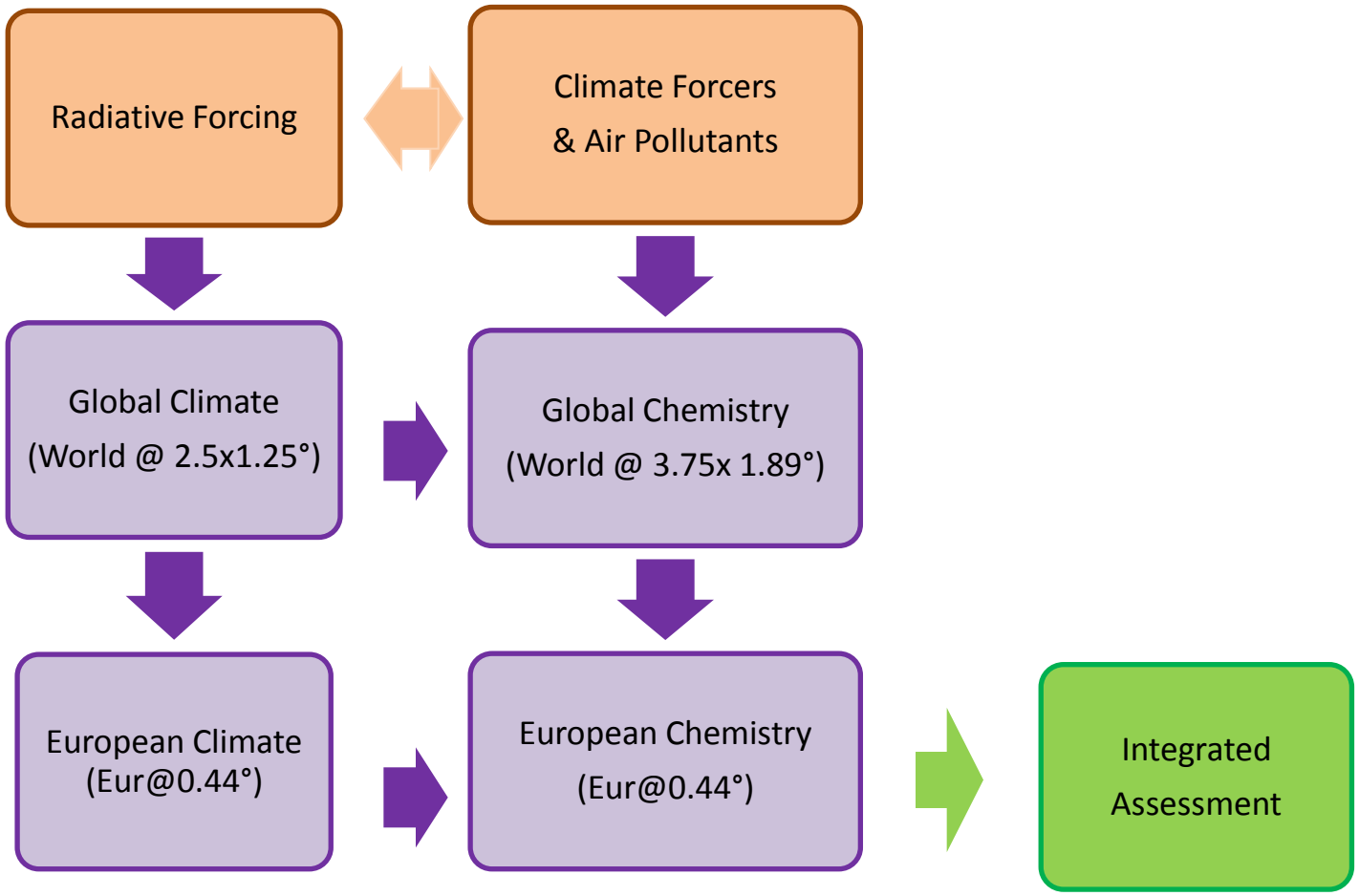
Fraction of the urban population exposed to air pollution exceeding WHO air quality guidelines (EEA, 2013)

The drivers of air pollution



- Emission
  - Primary pollutants
  - Precursors
- Chemistry
  - Gas phase
  - Heterogeneous
- Microphysics
  - Particulate matter formation
- Transport
  - Mixing
  - Diffusion
  - Long range transport

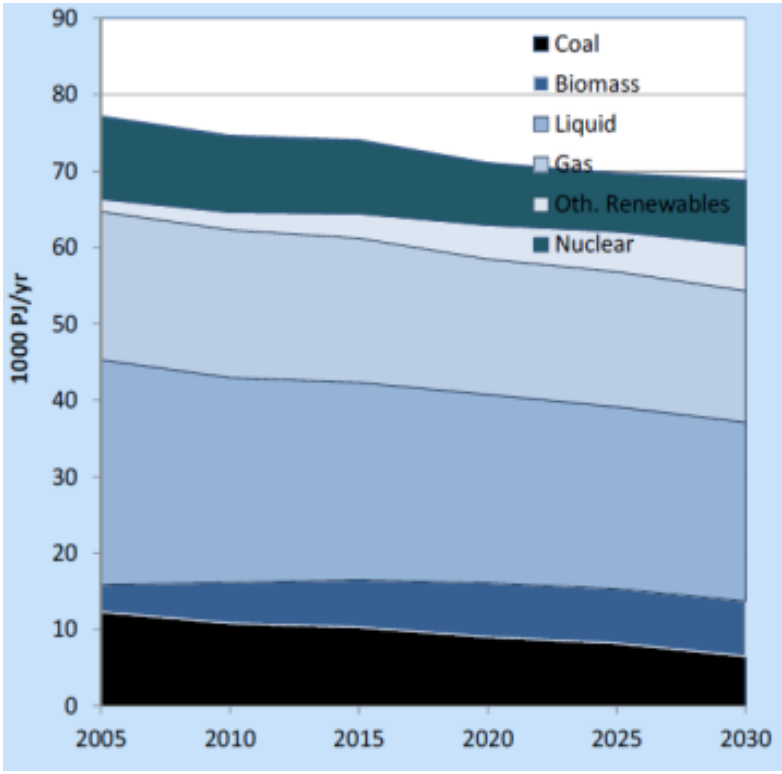
Climate and Air Quality Modelling



ENERGY CONSUMPTION

EU Thematic Strategy on Air Pollution

- Policy storylines
  - Higher value added products
  - Higher share of services
  - Higher growth of non energy intensive industries
- Outcome:
  - Enhanced energy efficiency, renewable energy policies and climate strategies
  - 10% lower fuel consumption in 2030 compared to 2005 despite increase of 35% of GDP/capita

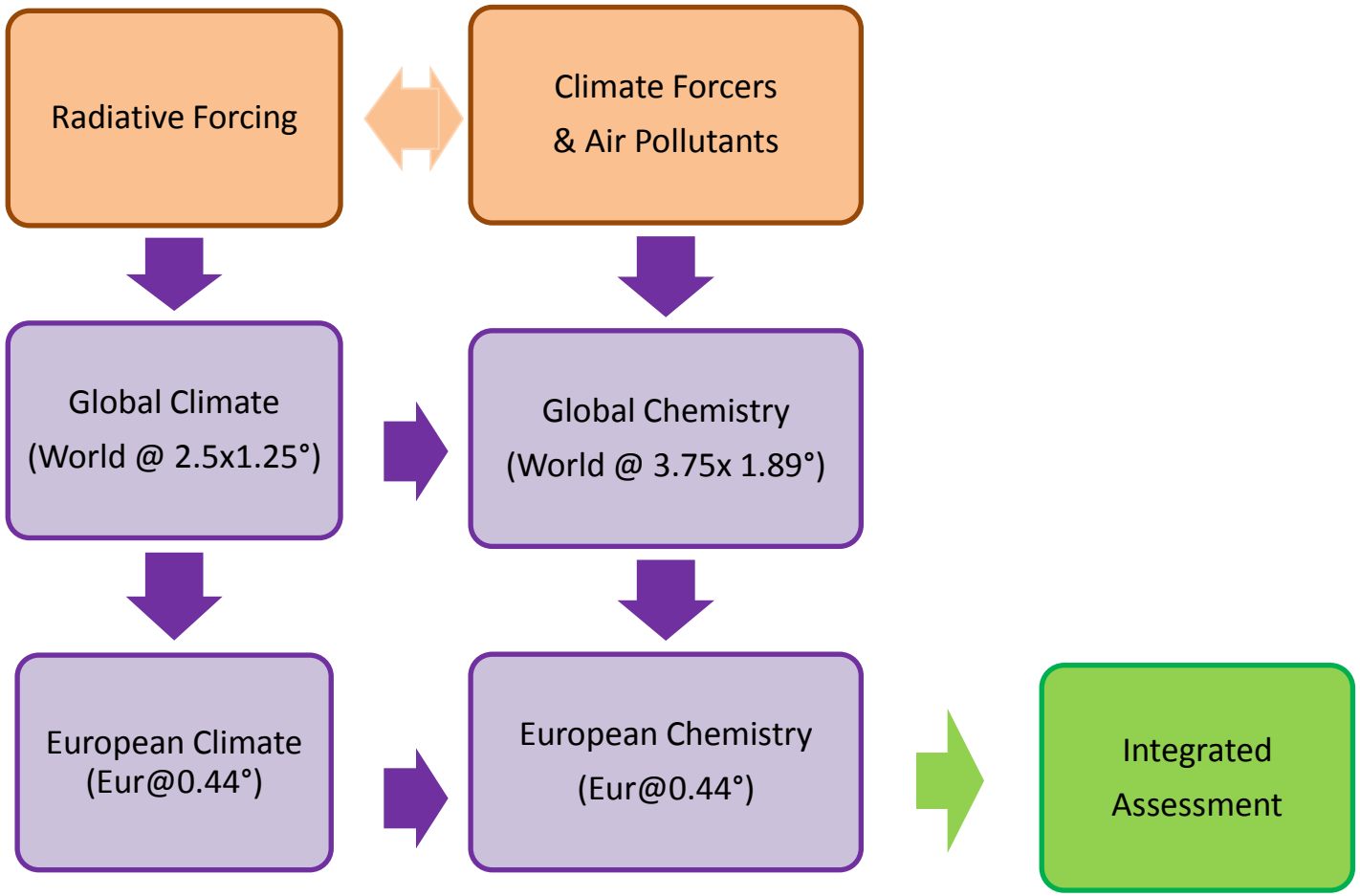


Energy consumption by fuel of the PRIMES-2013 Reference projection, EU-28, TSAP IIASA 2013

Declined into two Air Quality policy variants:

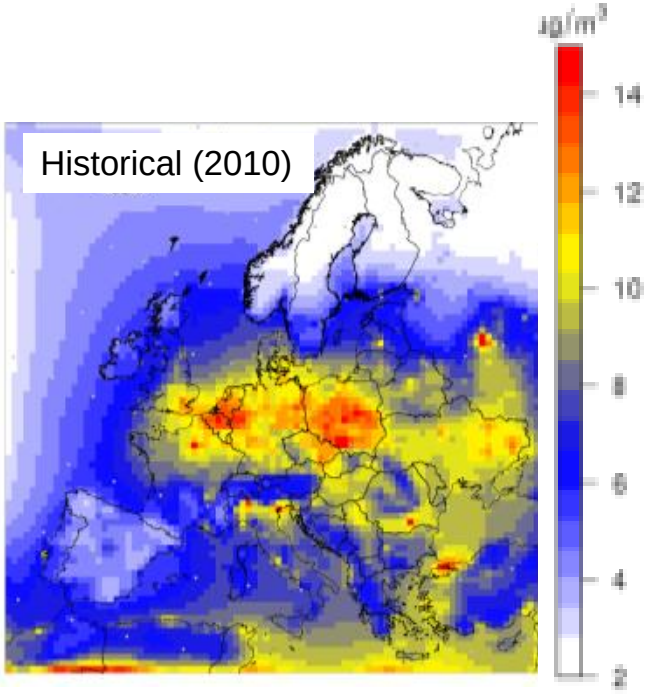
- Current Legislation applied in the future
- Maximum Technically Feasible Reduction

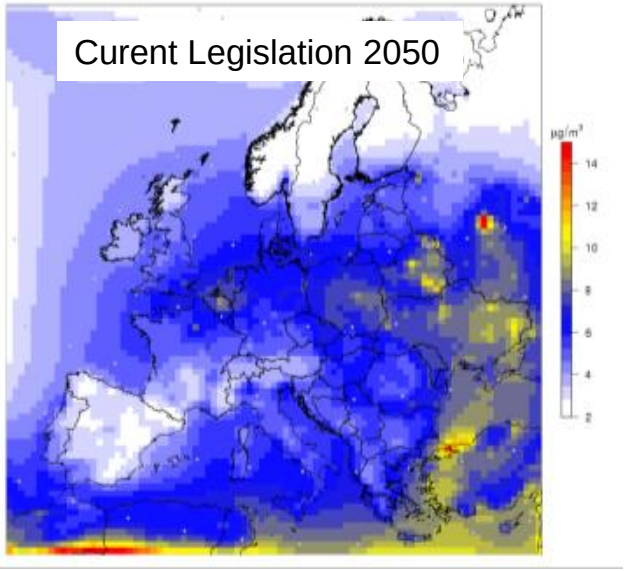
Climate and Air Quality Modelling

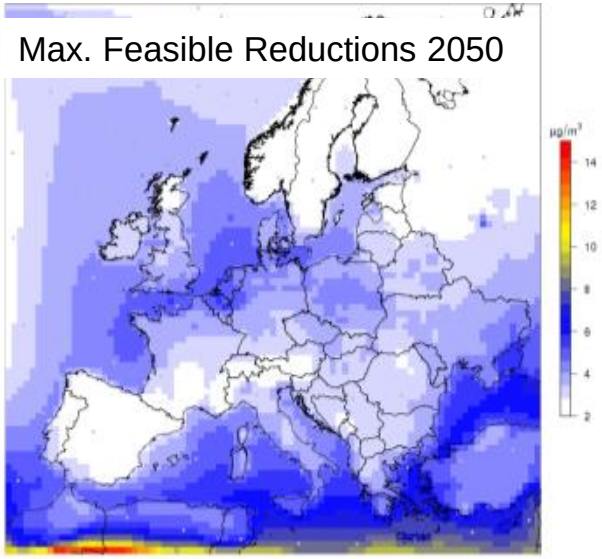


Annual PM25

SHARP REDUCTION BY 2050, ESPECIALLY IN THE MORE AMBITIOUS SCENARIO



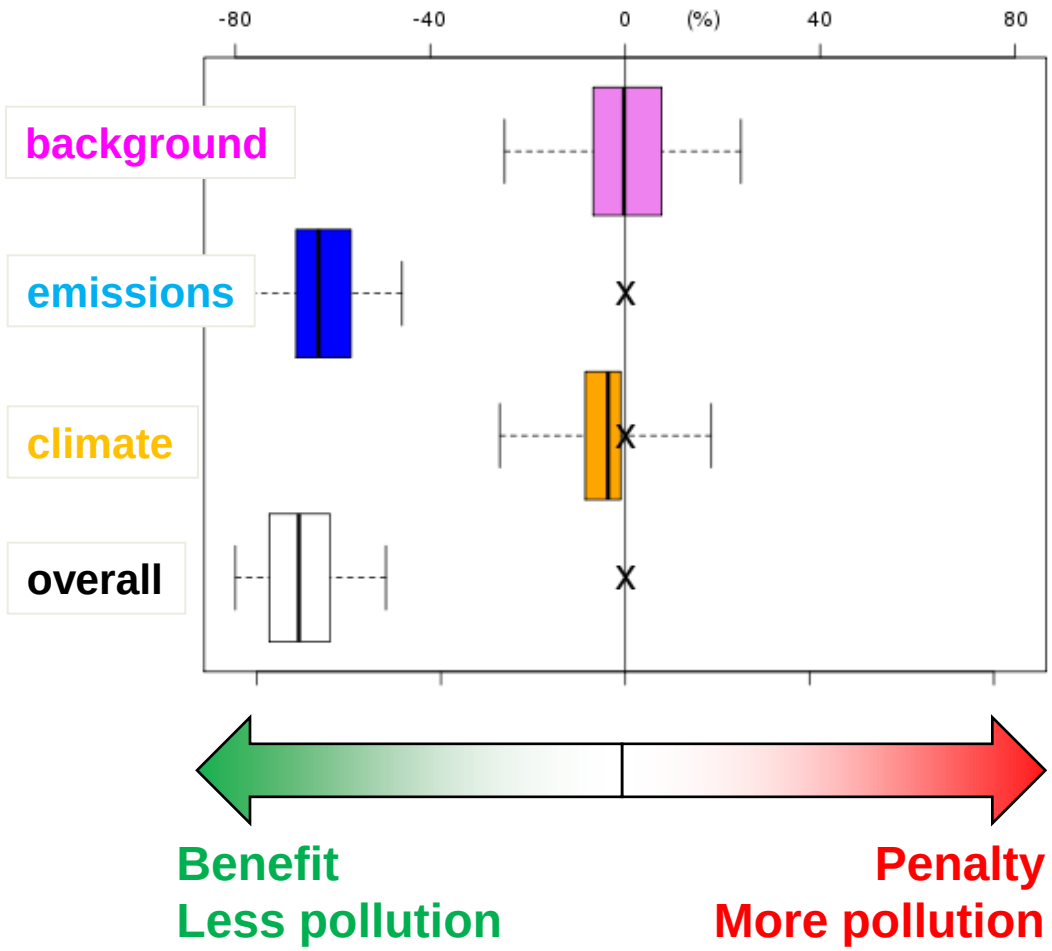




Drivers of change: PM_{25}

EMISSIONS DOMINATE

Limited climate « benefit »



Surface O3 (summertime daily maxima)

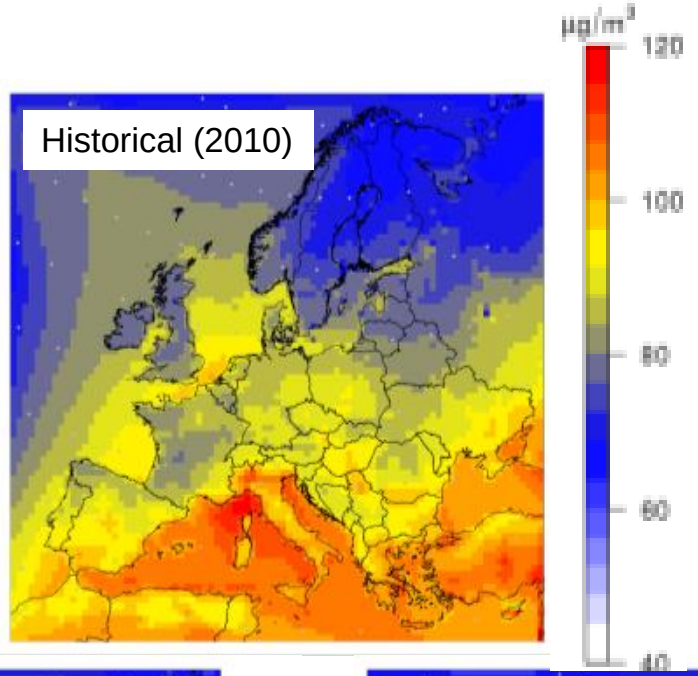
IMPORTANT REDUCTION

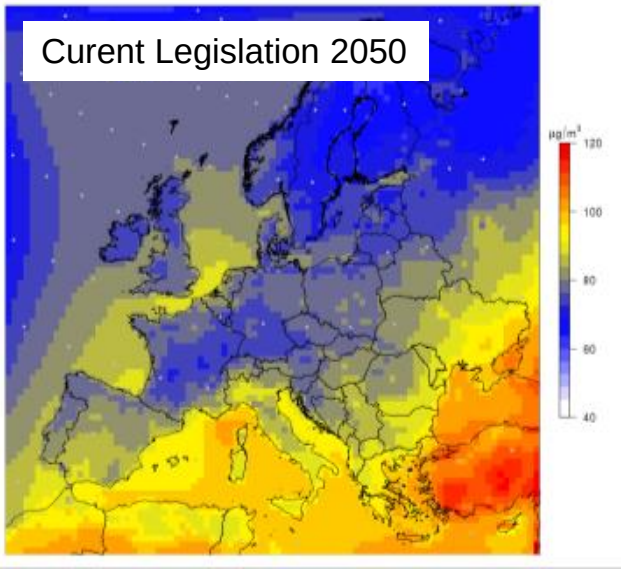
FOR BOTH SCENARIOS

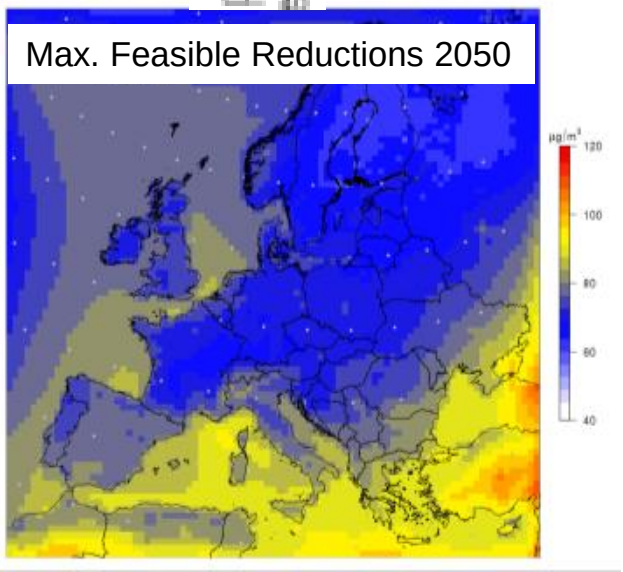
DESPITE PENALTY

BROUGHT ABOUT BY

CLIMATE ON OZONE







Drivers of change: Ozone (SOMO35)

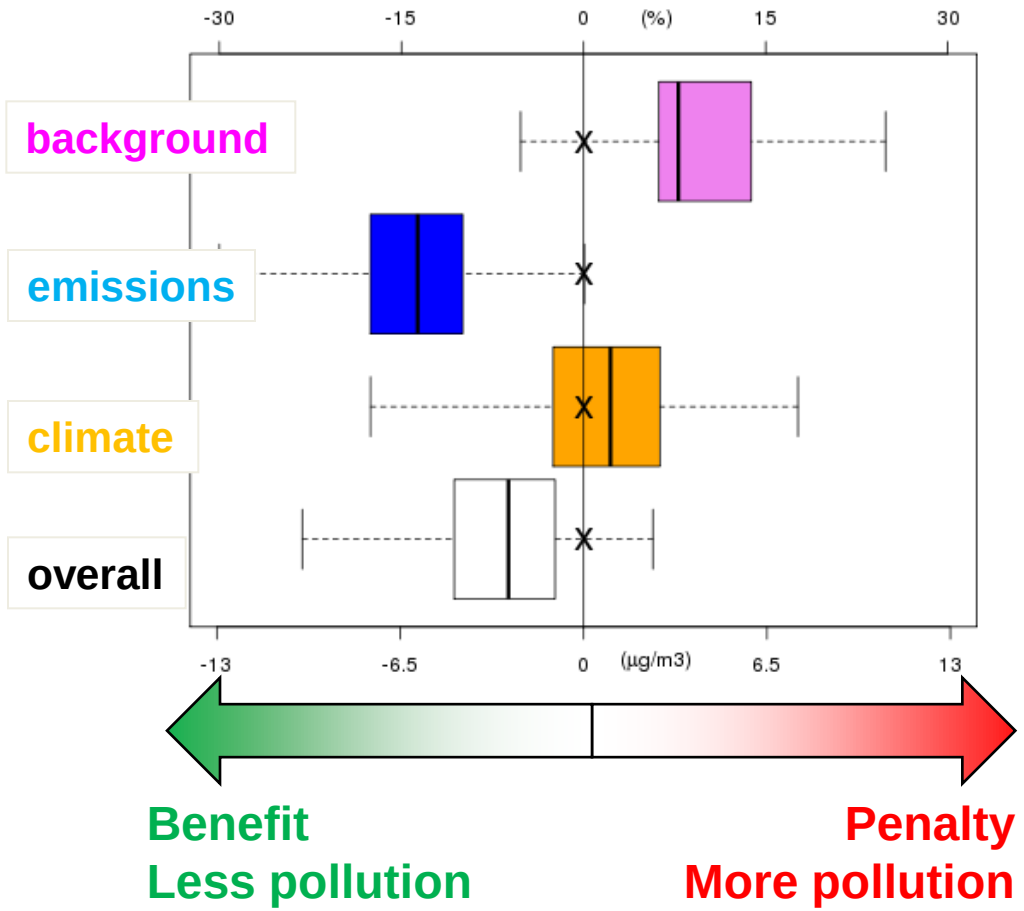
EMISSION AND

LONG-RANGE

TRANSPORT

DOMINATE

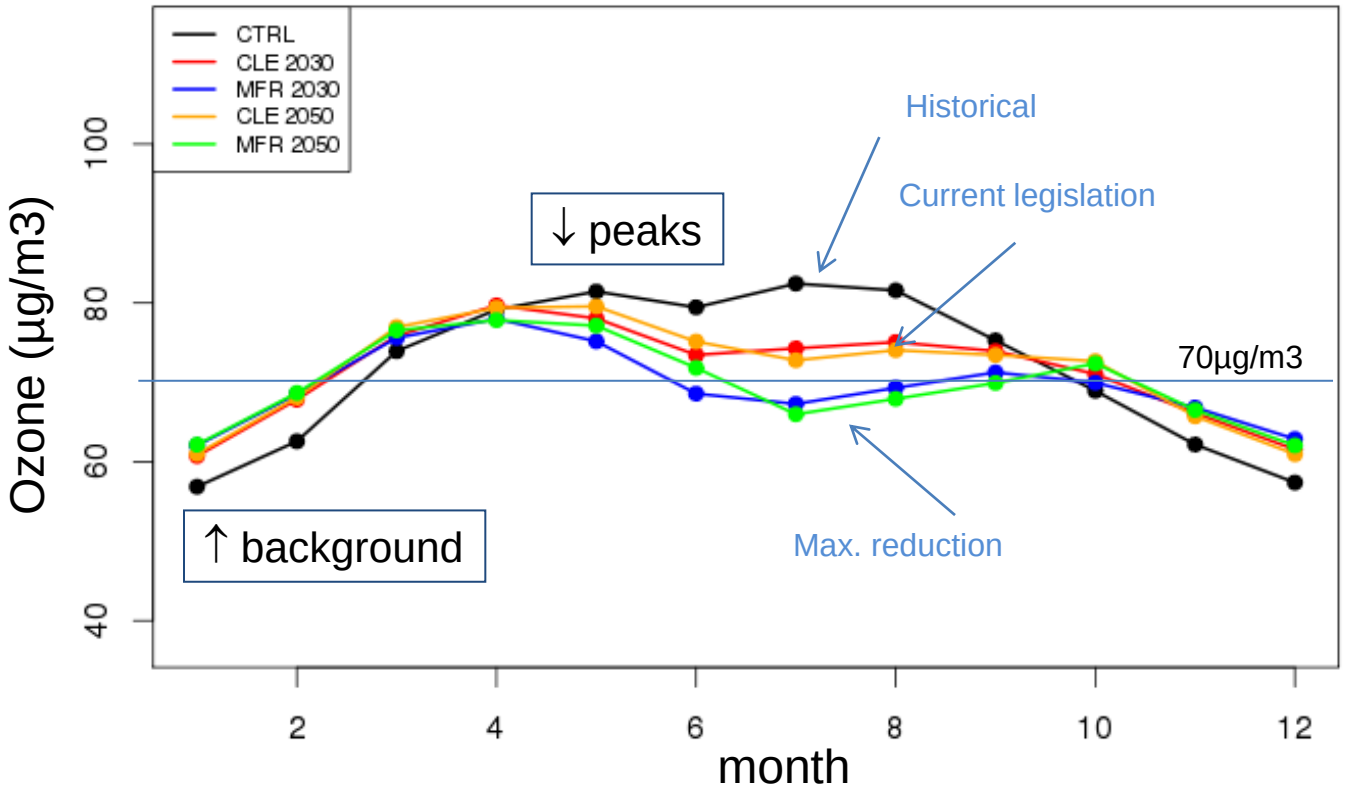
Climate penalty is confirmed



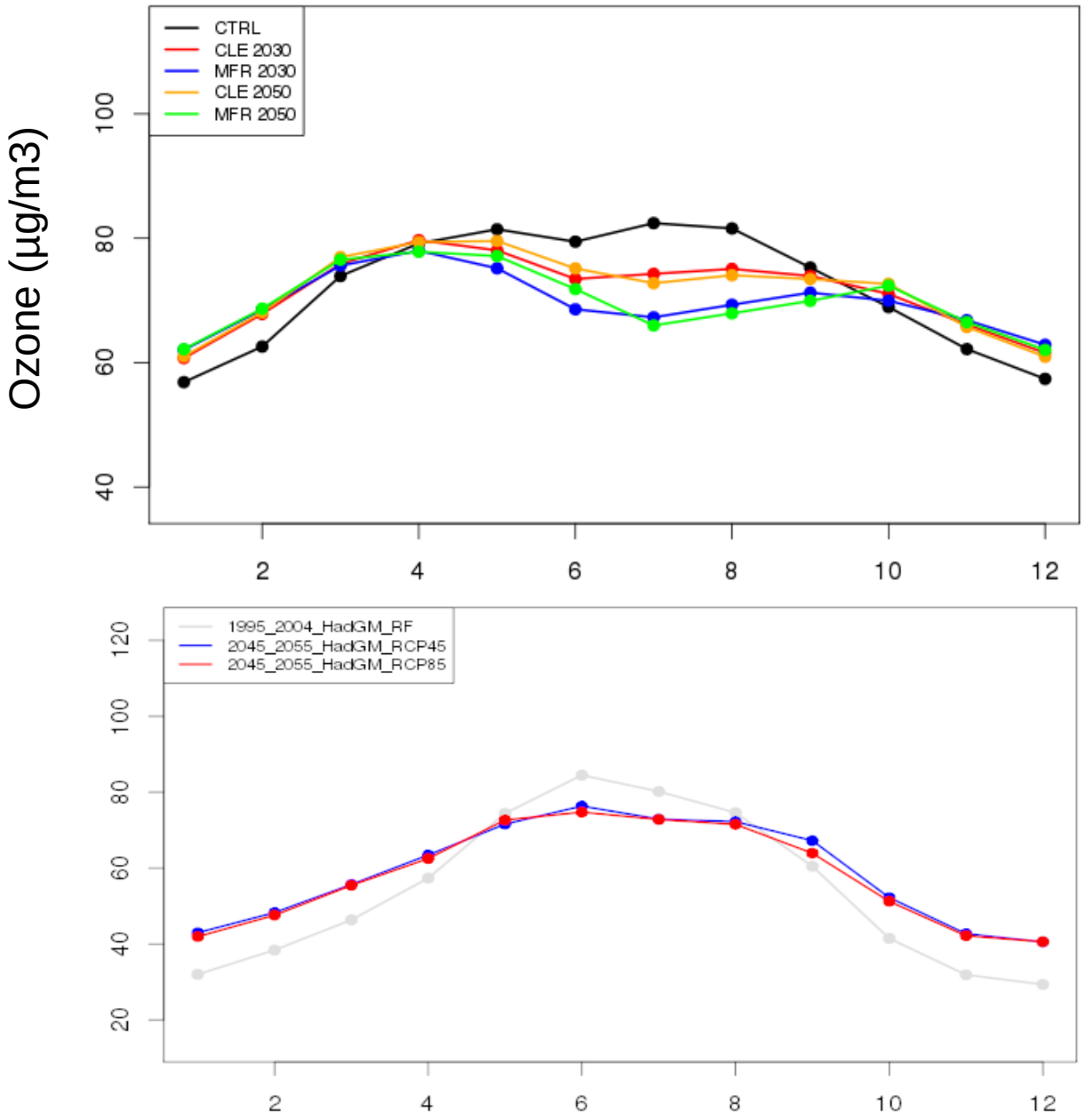
Ozone changes (summertime daily maxima)

REDUCTION IN THE PEAKS (SOMO35)

INCREASES IN THE BACKGROUND (SOMO10)



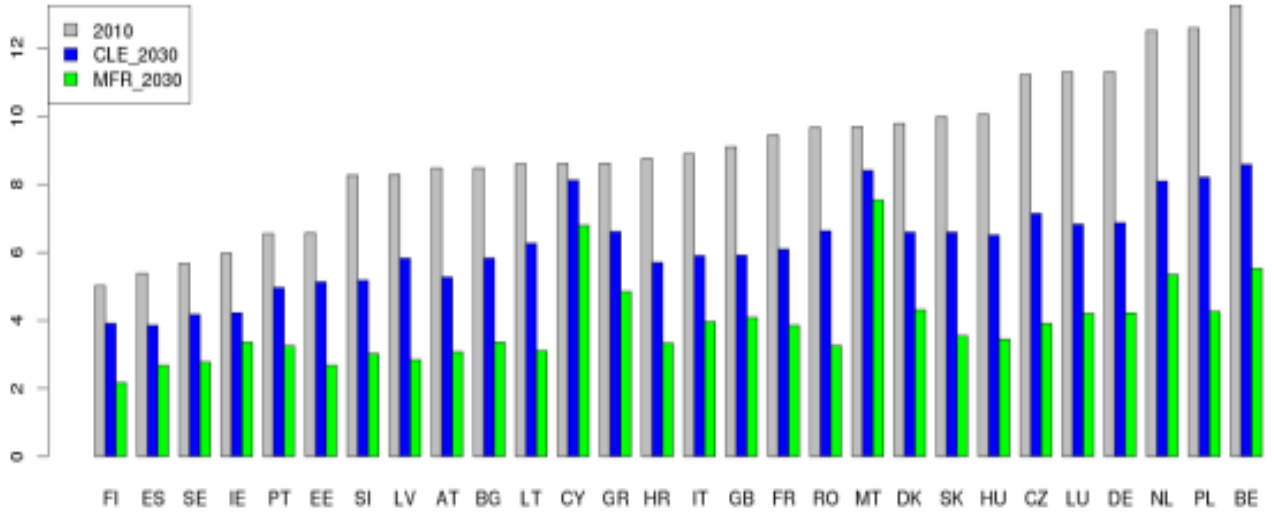
CHIMERE & REG-CM PROVIDE CONSISTENT RESULTS



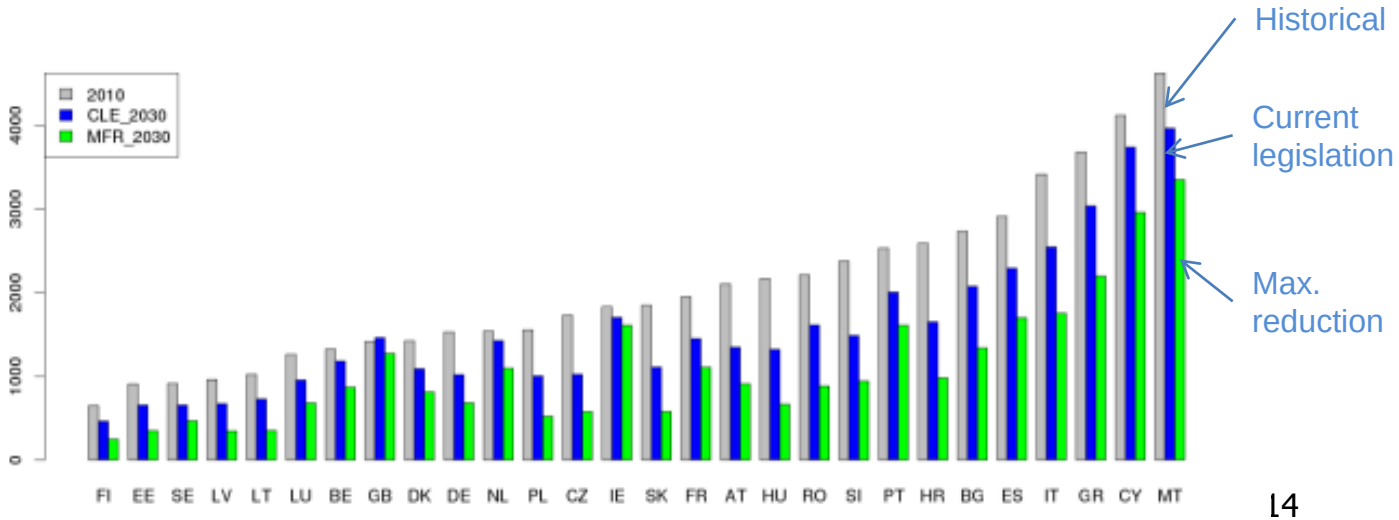
Country-level air exposure changes

SIGNIFICANT REDUCTIONS IN ALL CASES

- For **PM2.5** the Max. Feasible Reduction scenario yields uniform exposure to pollution in Europe

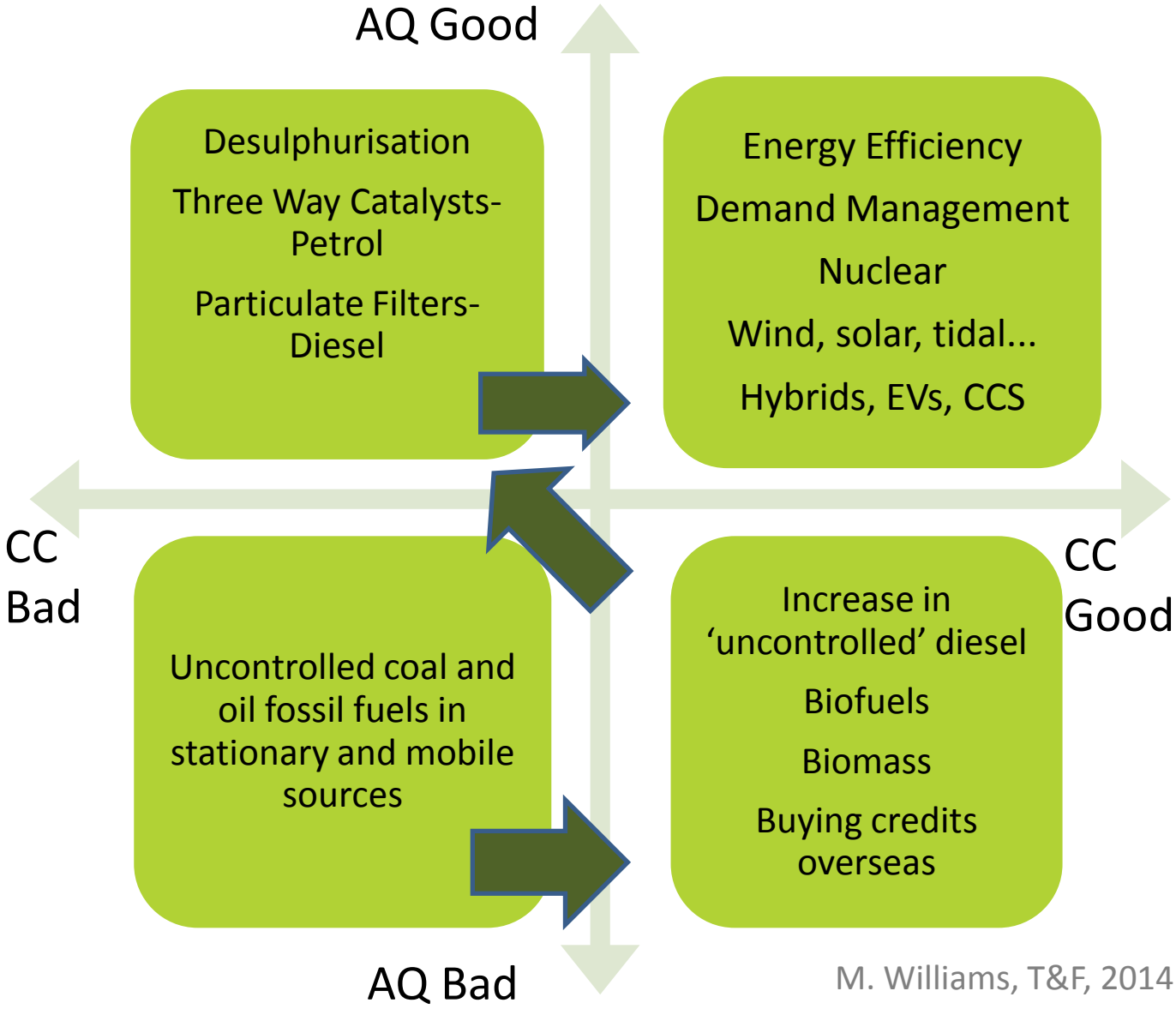


- For **ozone peaks**, north/south gradients remain



The challenge of the transition

AVOID ZIG-ZAG IN AIR QUALITY AND CLIMATE POLICIES



M. Williams, T&F, 2014

Summary

- Air quality and climate are closely related
  - Mitigation: same sources
  - Adaptation: geophysical feedbacks
- Comprehensive modelling framework:
  - Air & climate, global and regional
  - Latest source of input data (EU Thematic Strategy on Air Pollution)
- Results:
  - A reduction of PM2.5 and O3 levels could be achieved by implementing air quality policies despite climate penalty

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MONTH

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