International Institute for Applied Systems Analysis
www.iiasa.ac.at

science for global insight

Across policy and pollution scales

Zbigniew Klimont
Center for Integrated Assessment Modelling (CIAM)

Task Force for Integrated Assessment Modelling (TFIAM), 50th session, 21-23 April, 2021

Second Clean Air Outlook

- Assesses prospects for achieving the objectives of the NECD for 2030 and beyond.
- Update of the First Clean Air Outlook (CAO1) , including National Air Pollution Control Programmes (NAPCP) and an increased level of ambition for fighting climate change.

For reference: NECD negotiations and CAO1 baseline

- PRIMES 2016 Reference scenario (-30% GHGs in 2030)

CAO2 baseline:

- (PRIMES) Baseline of the Commission's June 2019 assessment of the draft NECPs (National Energy and Climate Plans) of the MS (-40% GHGs targets for 2030)

Additional climate policy variants:

- '1.5 TECH' and '1.5 LIFE' scenarios of the EU 2050 climate strategy vision: Net zero GHG emissions in 2050

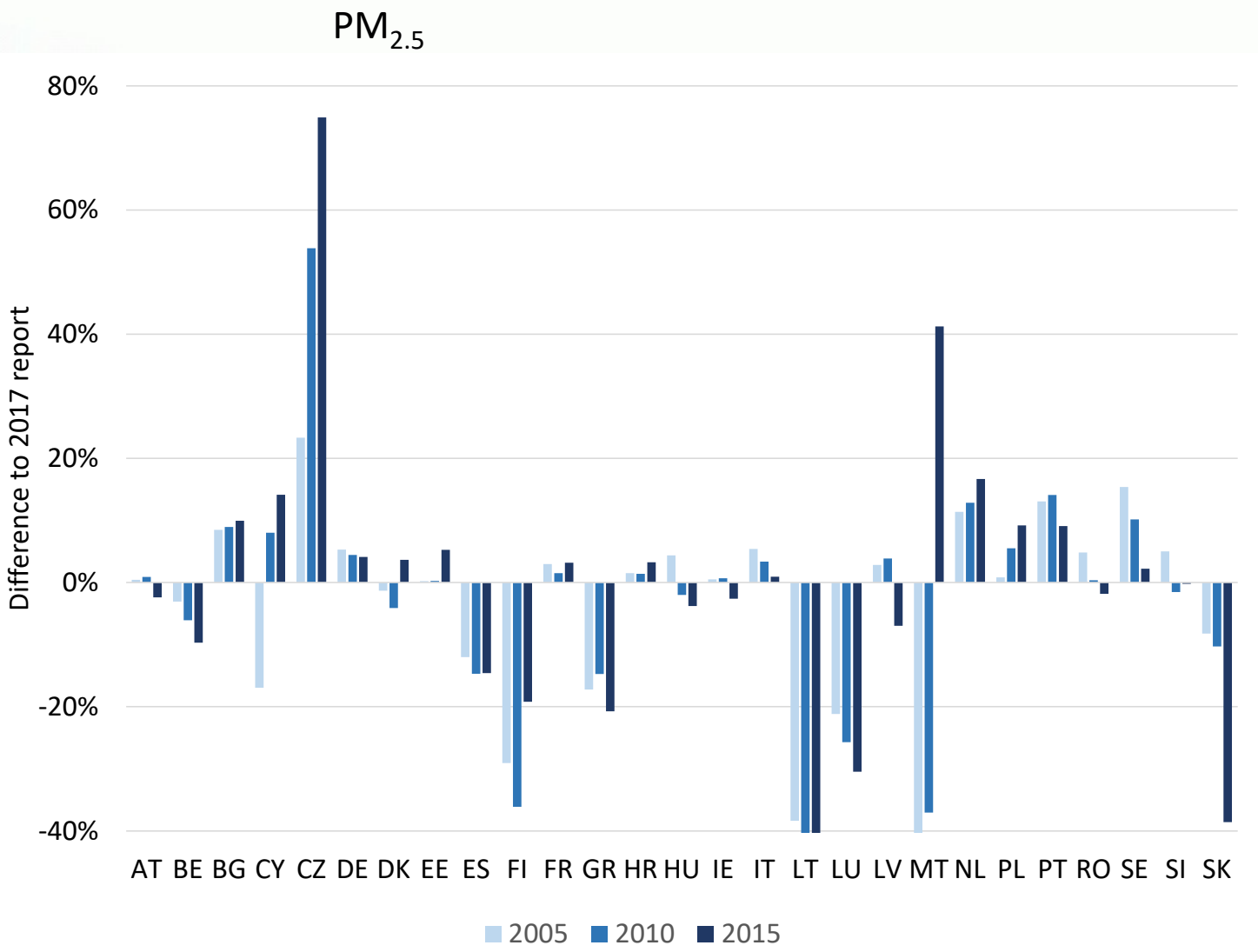
The 2030 Climate Ambition of the European Green Deal

- (-55% GHGs in 2030) – The Mix55 Scenario of the Commission's Impact Assessment

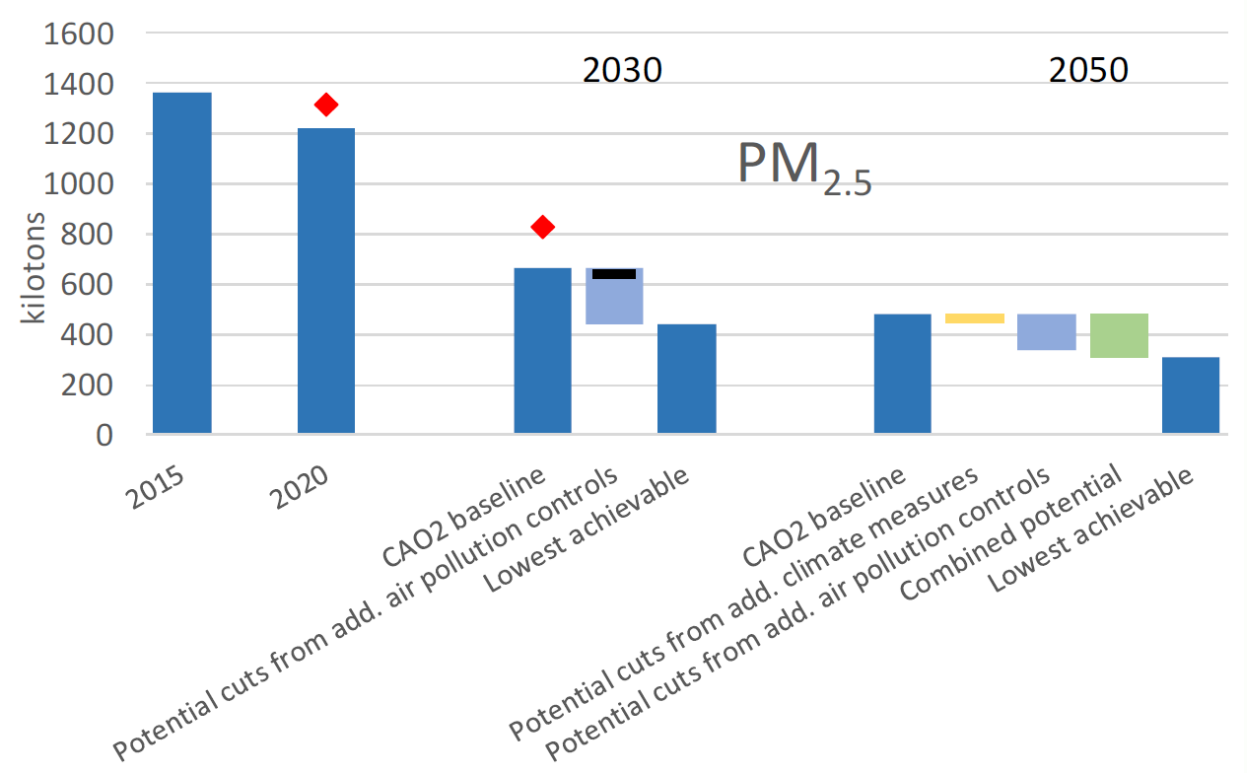
Published in January 2021: https://ec.europa.eu/environment/air/clean_air/outlook.htm

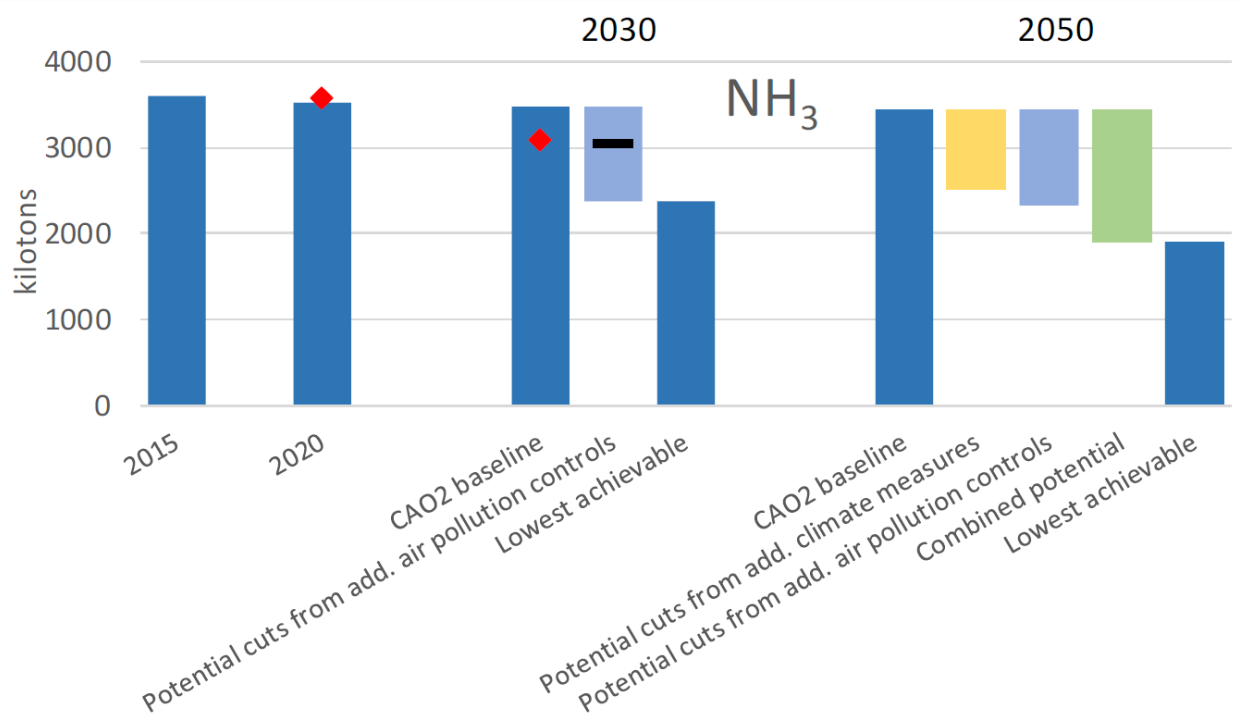
Updates of emission inventories for 2005/10/15: from 2017 to 2019

- After CAO1, many MS reported significant changes in historic inventories due to new inventory guidebook and improved statistics
- But only little change of total EU-27 emissions (~2-6%, depending on pollutant)
- Further changes to be expected from full implementation of new inventory reporting guidelines



Emission projections for selected air pollutants under various scenarios for EU-27





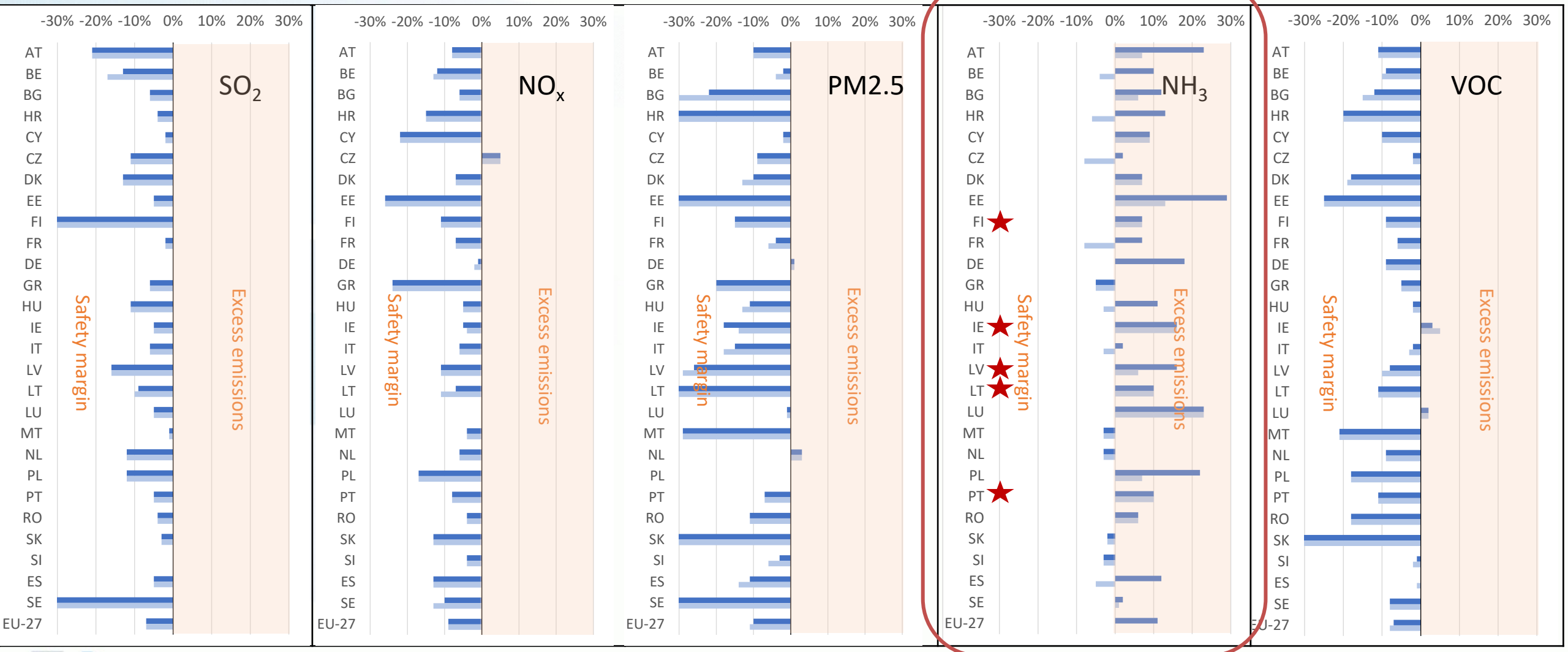
: maximum emissions allowed under the NEC Directive

: level of emission reduction achieved With the Additional Measures announced in the NAPCP

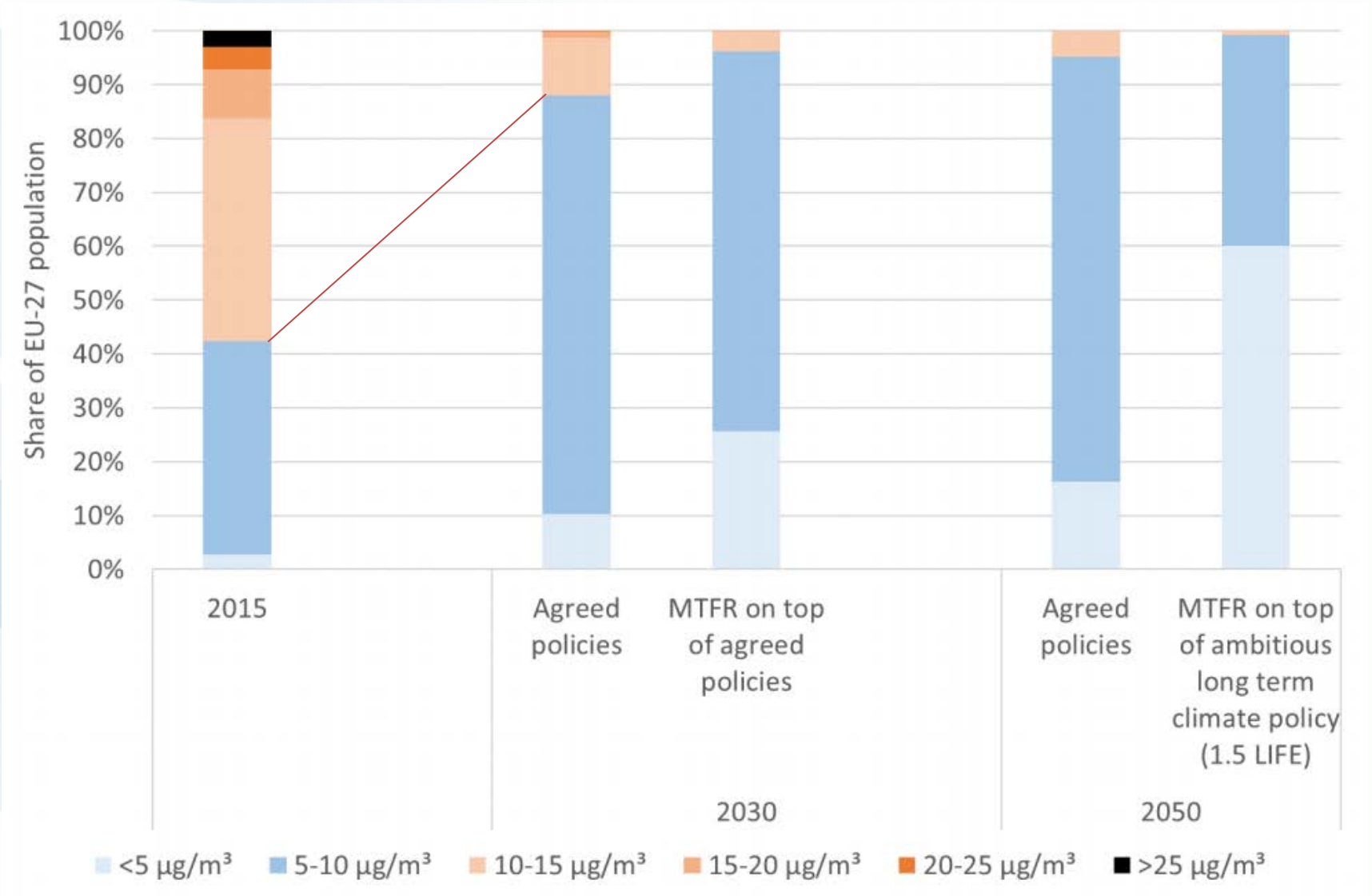
Source: GAINS model (IIASA)

Key results: Emissions - Differences between emission reduction commitments (ERCs) and emission projections for 2030

(% of 2005 emissions)

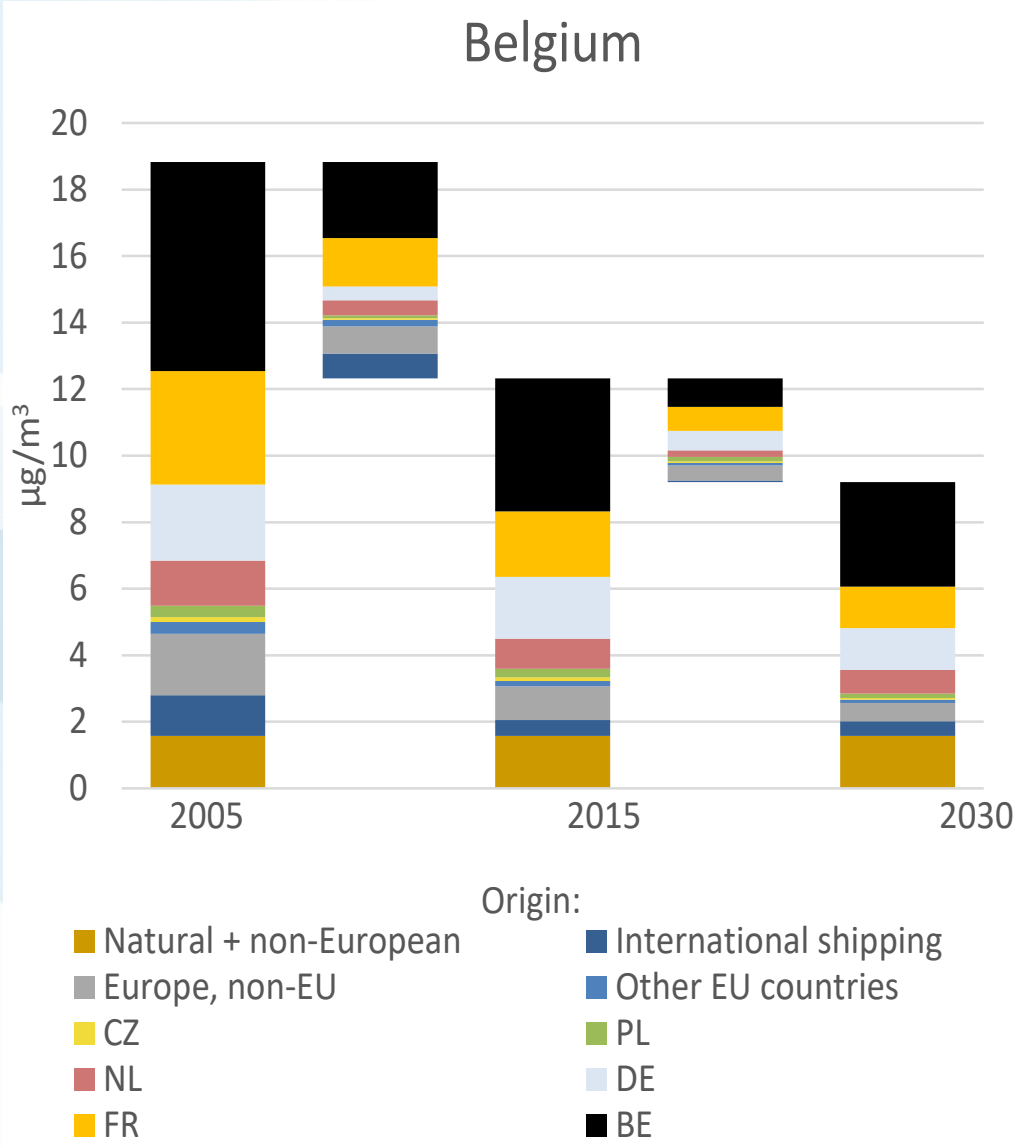


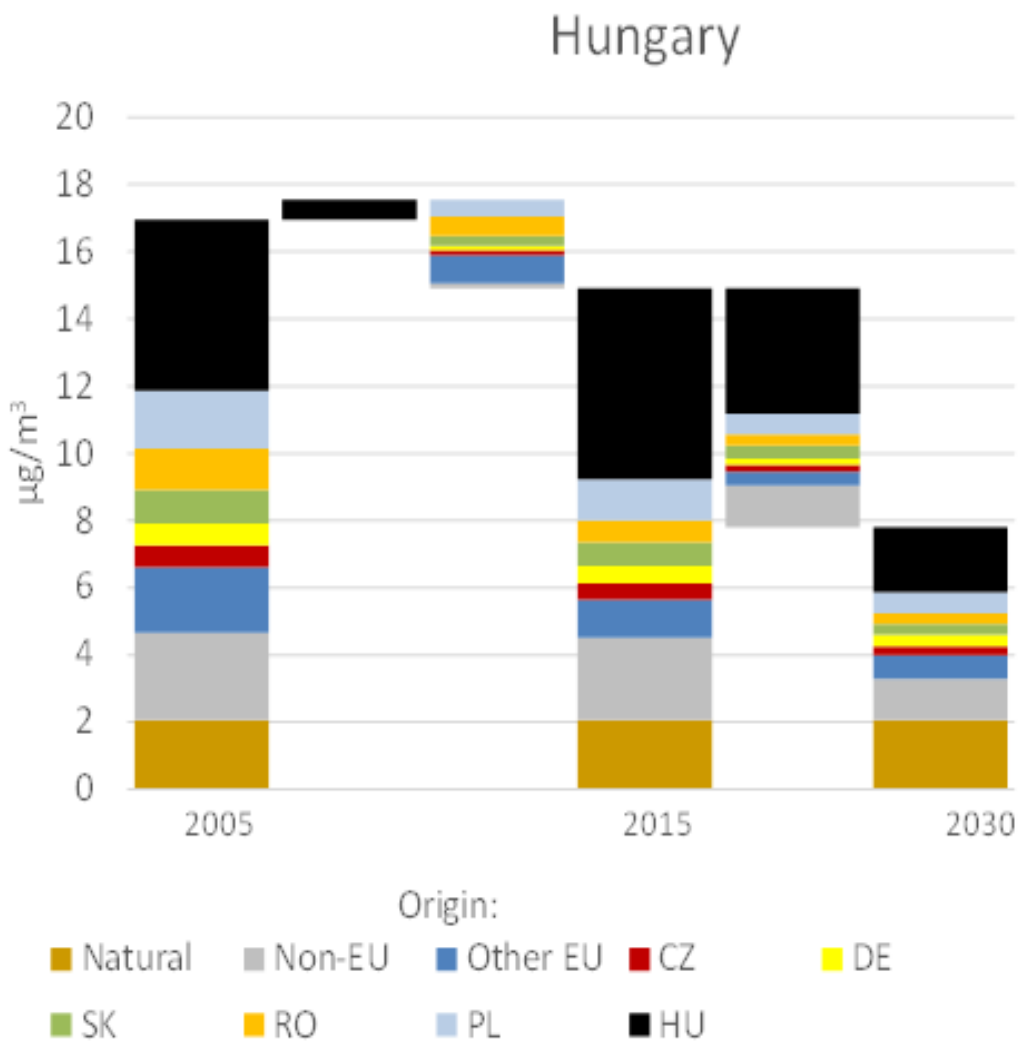
Distribution of population exposure to PM2.5 for key scenarios, EU-27



Source: GAINS model (IIASA)

Much of the AQ improvements in MSs emerge from EU coordinated policy





Source: GAINS model (IIASA)

Summary – Second Clean Air Outlook

- Emission inventories continue to be updated/improved, however, implications on modelling results for compliance are limited.
- NH_3 remains the most challenging pollutant for the achievement of the NEC reduction commitments. However, several MS have reported new measures in the NAPCPs that, if fully implemented, can contribute to reaching them.
- The analysis reconfirms the relevance of the international component of air pollution and reveals the importance of (past and future) EU-wide coordinated policies
- The increased ambition of European climate policies leads to important reductions of energy-related air pollutants and thereby reduces the pressure on other sectors for reaching compliance with the NECD reduction commitments – but not for NH_3.

Local vs. regional/national policy; *PM2.5 concentrations and source apportionment for Ha Noi, Vietnam*

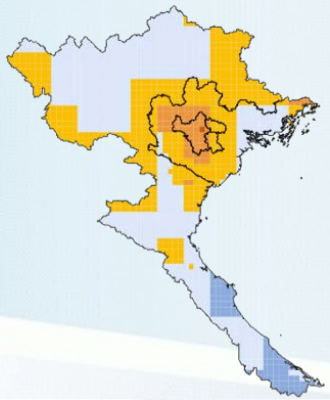
2015

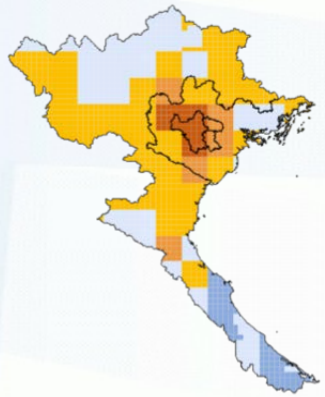
2030

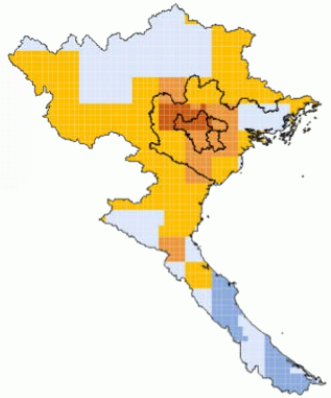
Current legislation

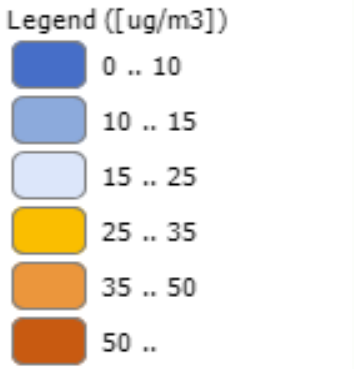
Advanced controls in Ha Noi

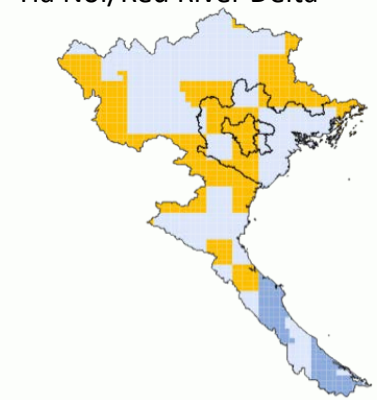
Advanced controls in Greater Ha Noi/Red River Delta

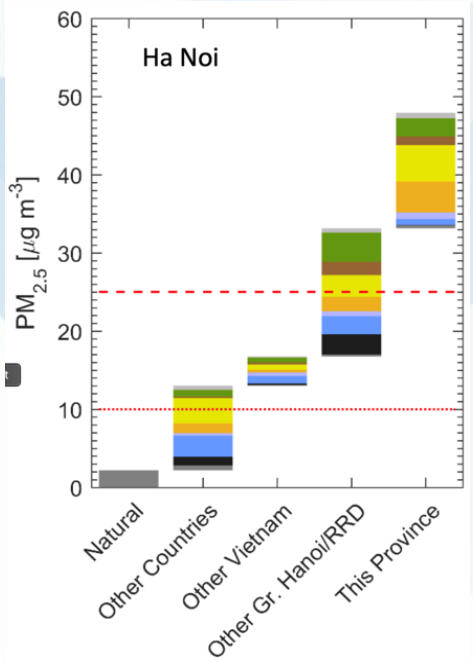


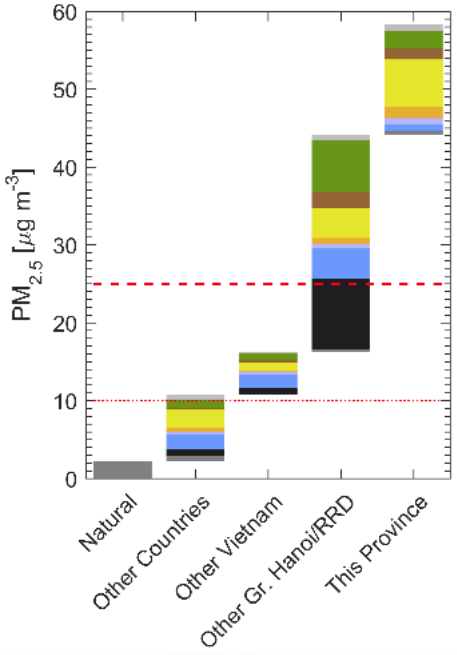


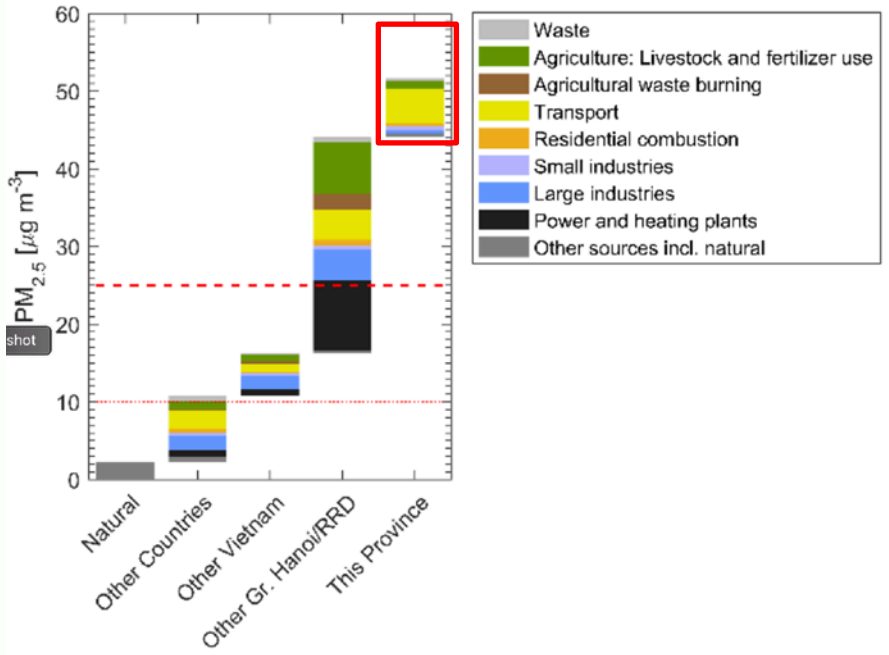


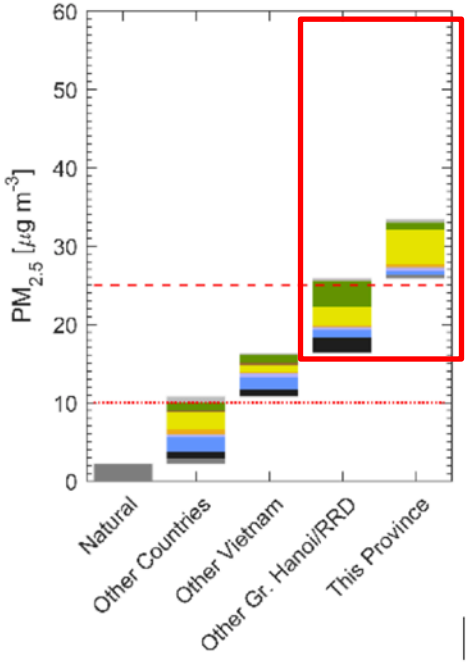








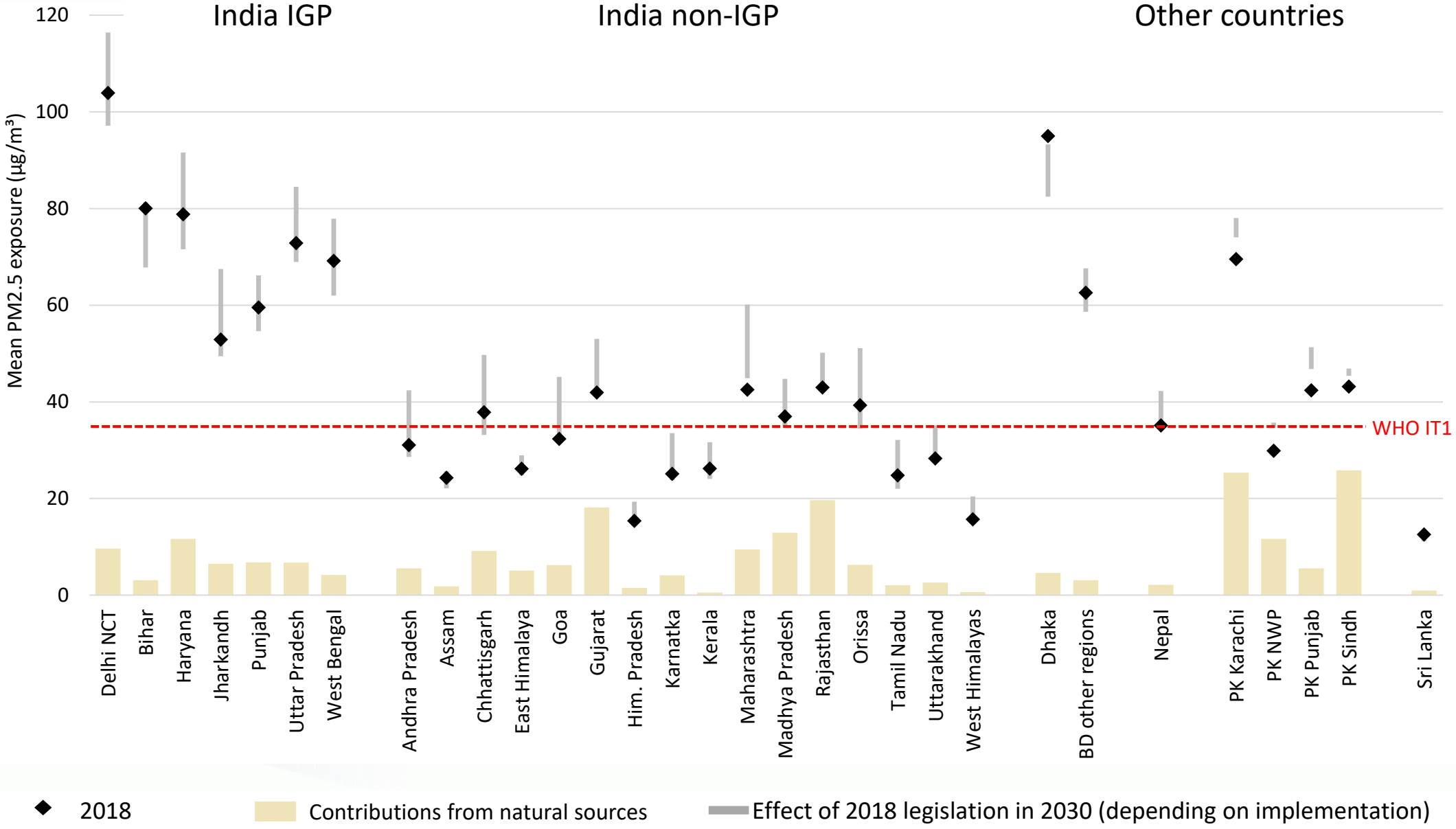




Source: GAINS – *Vietnam, collaboration with Vietnamese Academy of Science and Technology (VAST)*

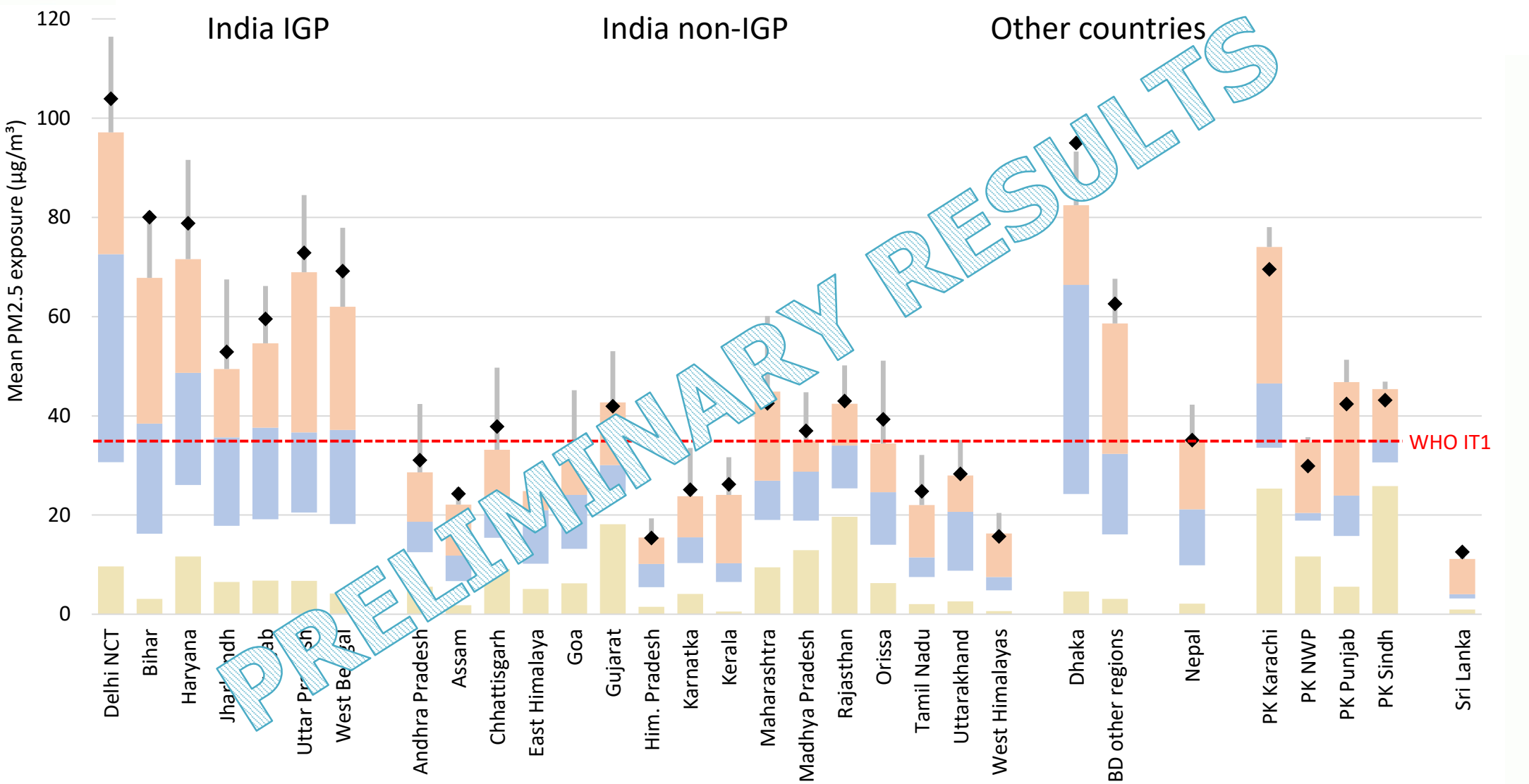
World Bank Flagship Study: Ambient Air Quality and Public Health in South Asia

Impact of recent AQ policies on exposure in 2030



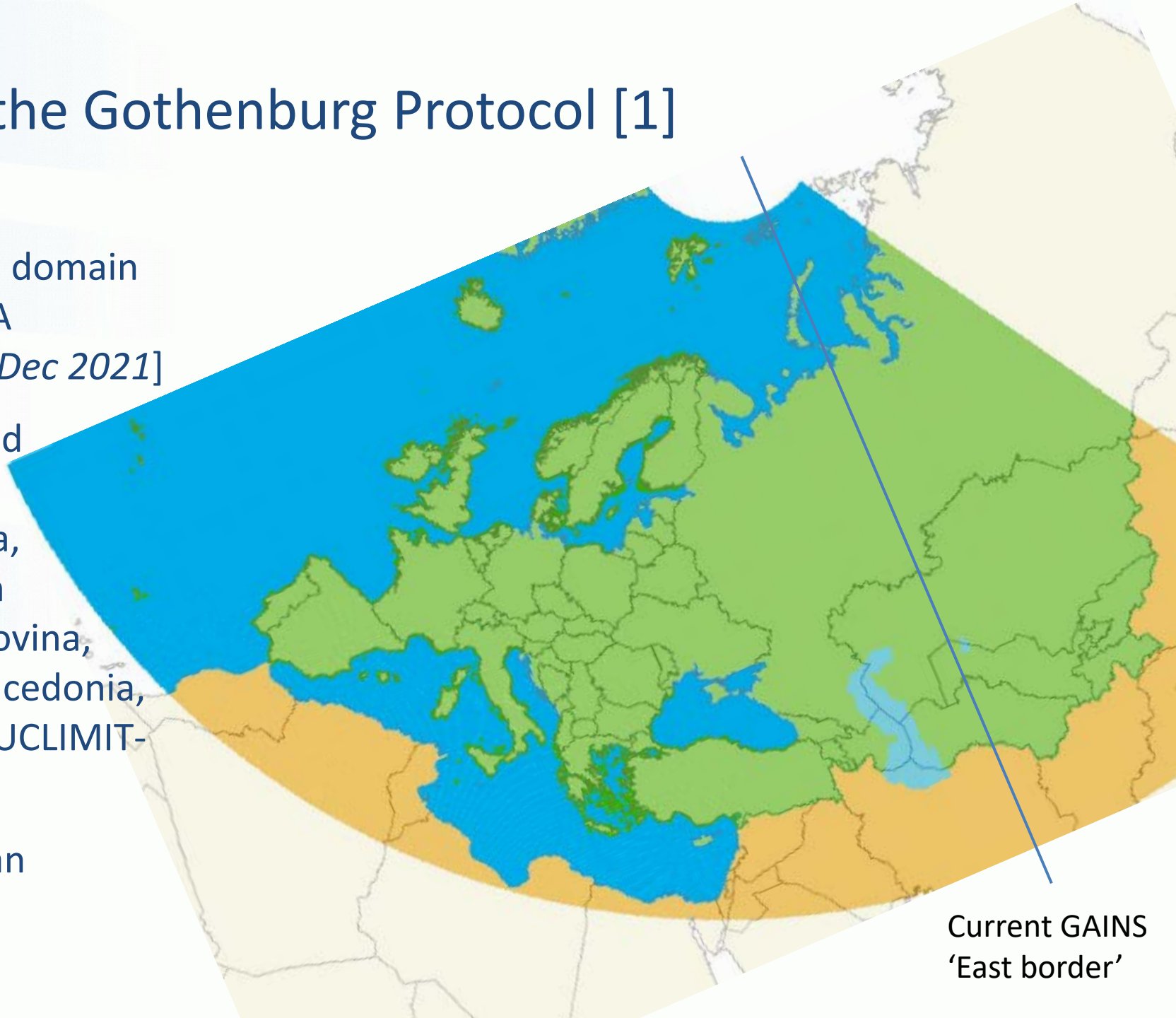
World Bank Flagship Study: Ambient Air Quality and Public Health in South Asia

Scope for additional exposure reductions in 2030



Support to review of the Gothenburg Protocol [1]

- Extending GAINS-Europe model domain to include consistently all EECCA countries- jointly with MSC-W [*Dec 2021*]
- Review of data, assumptions and development of new scenarios for some of the EECCA (Georgia, Moldova, Ukraine) and Western Balkan (Albania, Bosnia-Herzegovina, Kosovo, Montenegro, North Macedonia, Serbia) countries - EU funded EUCLIMIT-9EAST project [*Dec 2021*]
- Dedicated version for Kazakhstan operational



Support to review of the Gothenburg Protocol [2]

- GAINS model developments/updates
  - New representation of waste management sector
  - Revised implementation of high-emitting vehicles
  - Finer (10km) spatial resolution for primary PM dispersion – jointly with MSC-W
  - Participate in the Nordic Council funded project on update of estimates and development of methods to implement condensables (led by MSC-W and TNO)

- Further development of multiscale modelling (joint work with MSC-W); building on experience in recent Asian projects (urban/rural interactions) similar analysis could be done for EECCA and Balkan countries

Key messages

European policy

- NH_3 remains the most challenging pollutant for the achievement of the EU NEC reduction commitments. However, new measures in the NAPCPs, if fully implemented, can contribute to reaching them.
- The increased ambition of European climate policies leads to important reductions of energy-related air pollutants and thereby reduces the pressure on other sectors for reaching compliance with the NECD reduction commitments – but not for NH_3

Local/regional air quality management (AQM)

- A large variety of emission sources contribute to PM2.5 pollution in ambient air - thus, effective AQM needs to balance measures across these sources.
- There is limited scope for cities to achieve major reductions of PM2.5 on their own.
- There is scope for further measures beyond current policies that could approach the WHO Targets

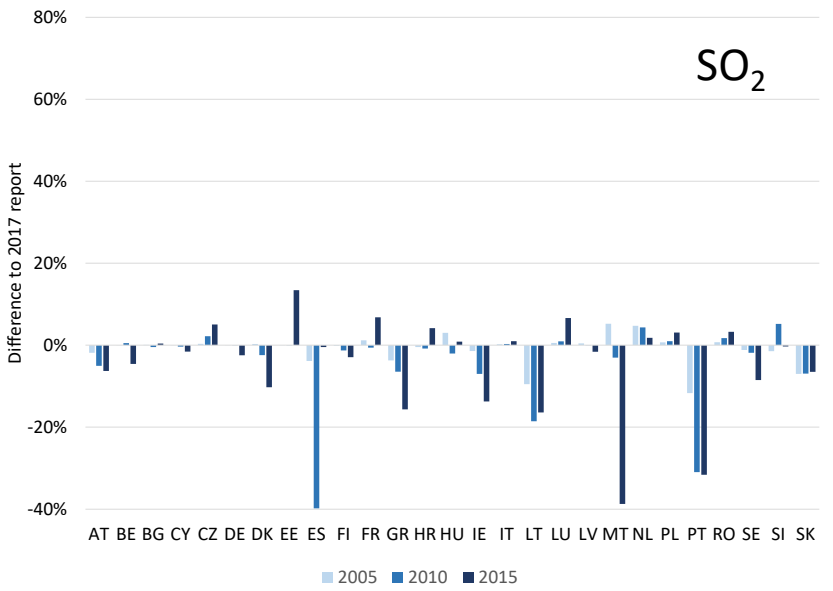
Gothenburg Protocol review support

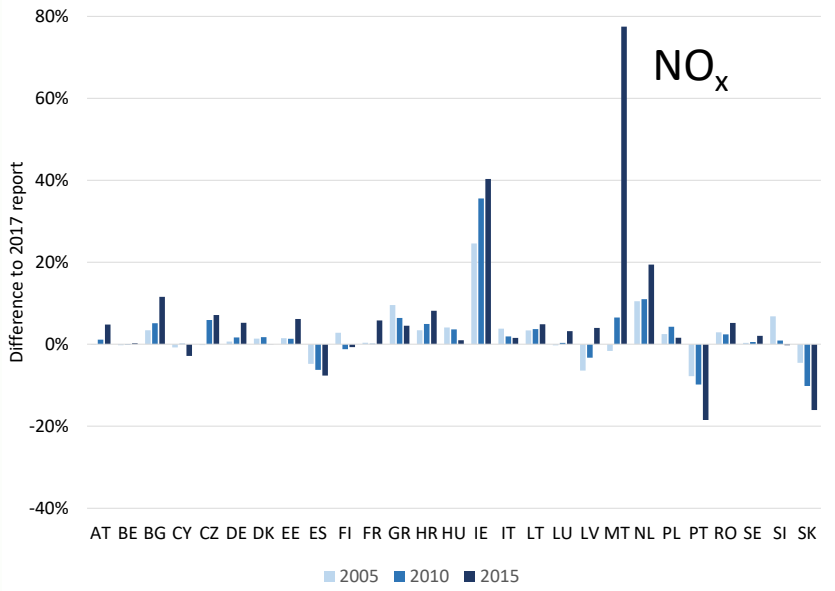
- GAINS extended domain to include EECCA
- Further model development will, among others, support improved multiscale modelling

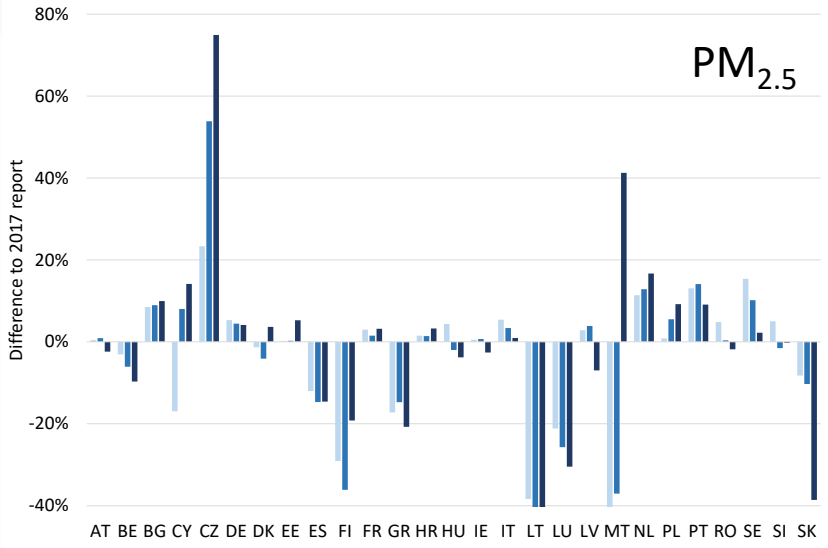
Additional slides

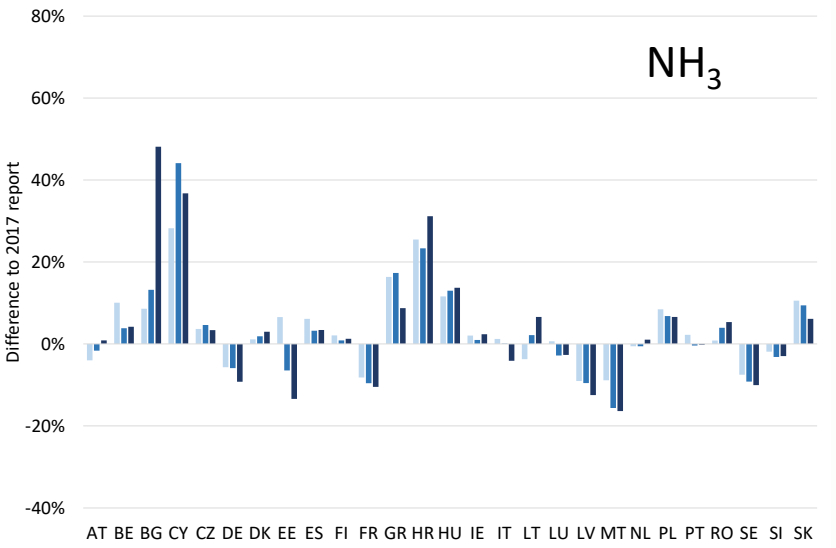
Updates of emission inventories for 2005/10/15: from 2017 to 2019

- After CAO1, many MS reported significant changes in historic inventories due to new inventory guidebook and improved statistics
- But only little change of total EU-27 emissions
  (*<~2% for NO_x, PM2.5, NH_3; <6% for SO_2 and VOC*)
- Further changes to be expected from full implementation of new inventory reporting guidelines



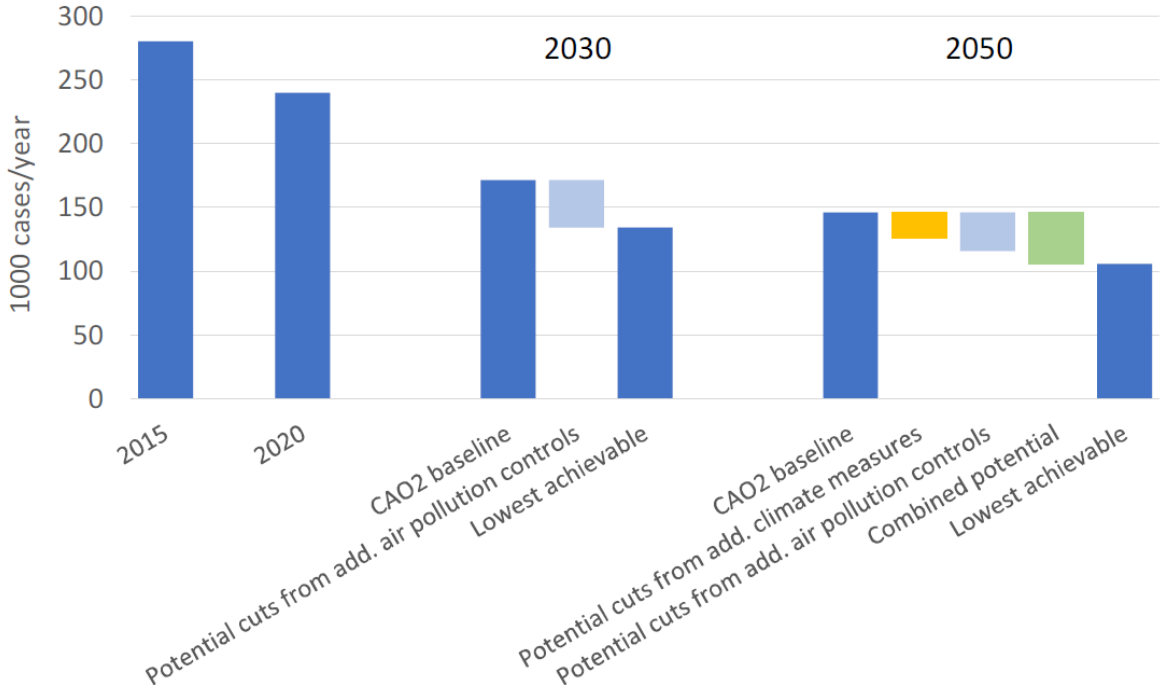




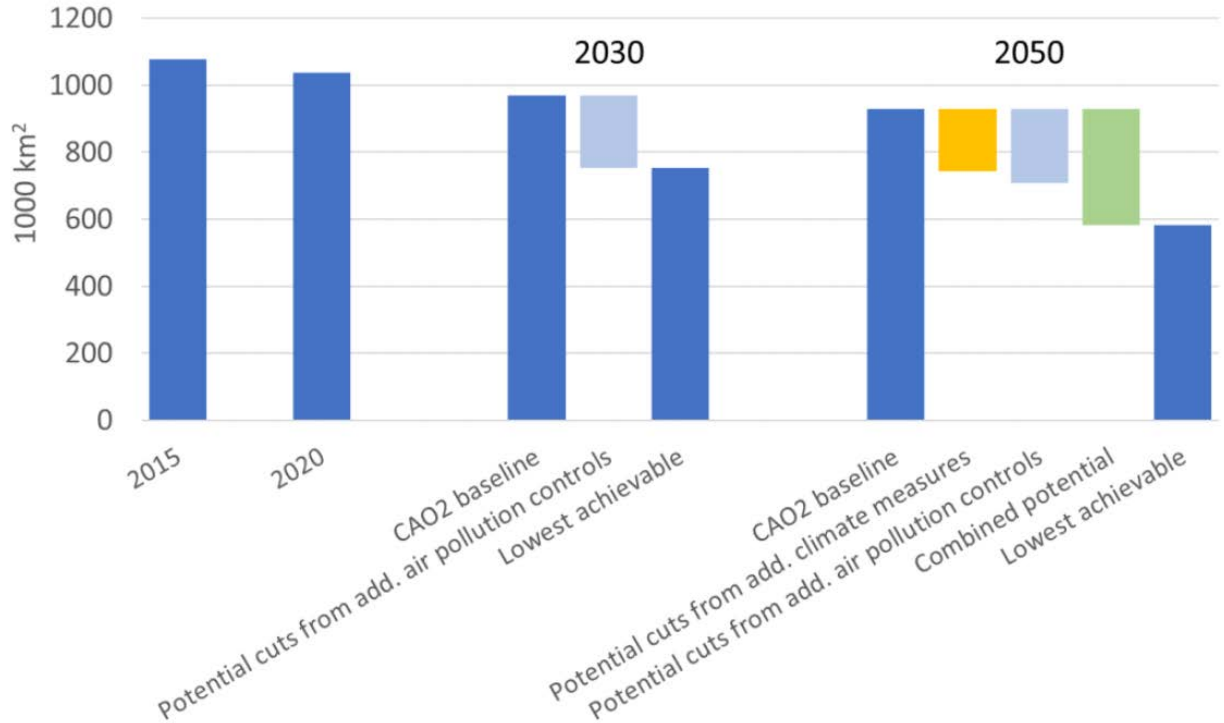


Cases of premature deaths attributable to the exposure to PM2.5 and area of terrestrial ecosystems where N deposition exceed the critical loads for eutrophication, EU-27

Premature deaths - PM



Eutrophication - all ecosystems

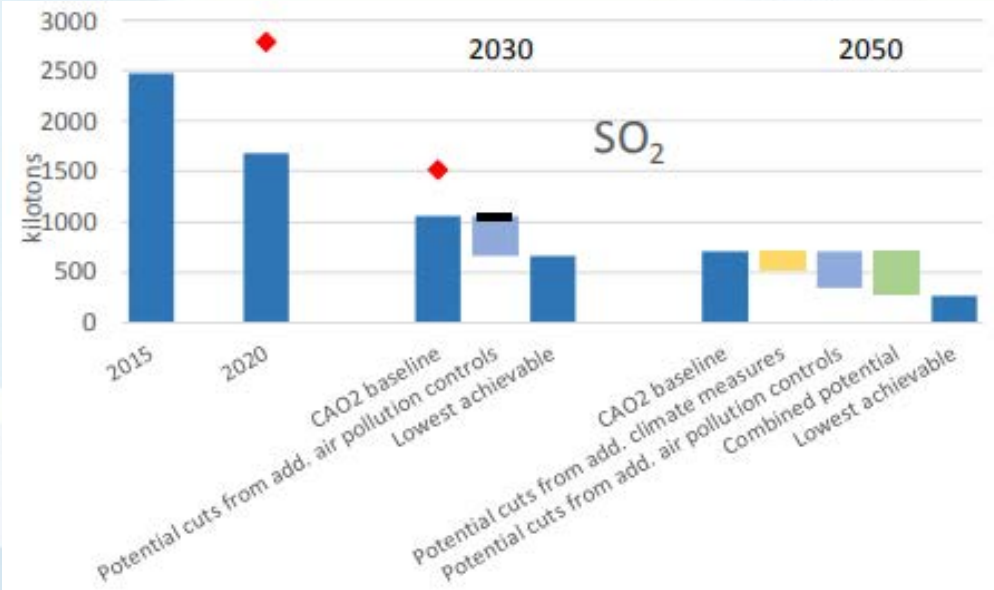


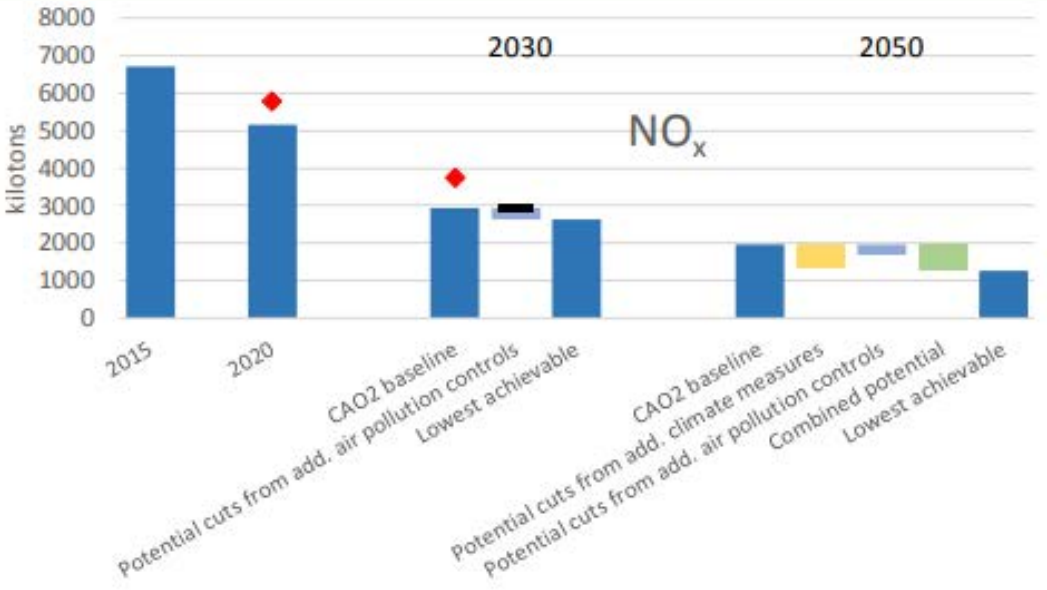
: maximum emissions allowed under the NEC Directive

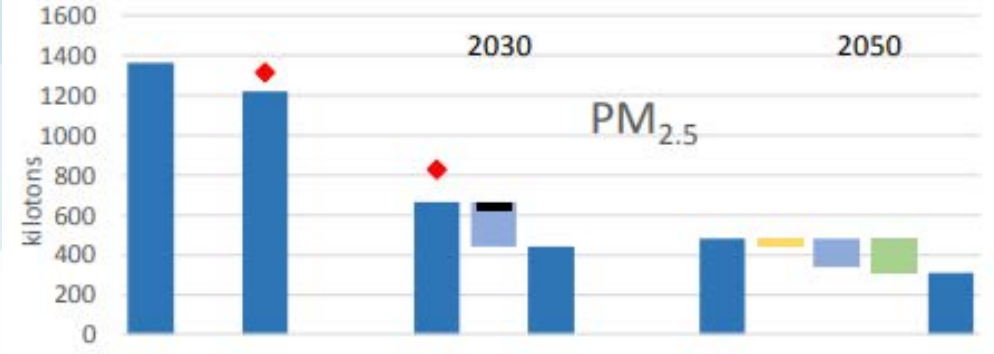
: level of emission reduction achieved With the Additional Measures announced in the NAPCP

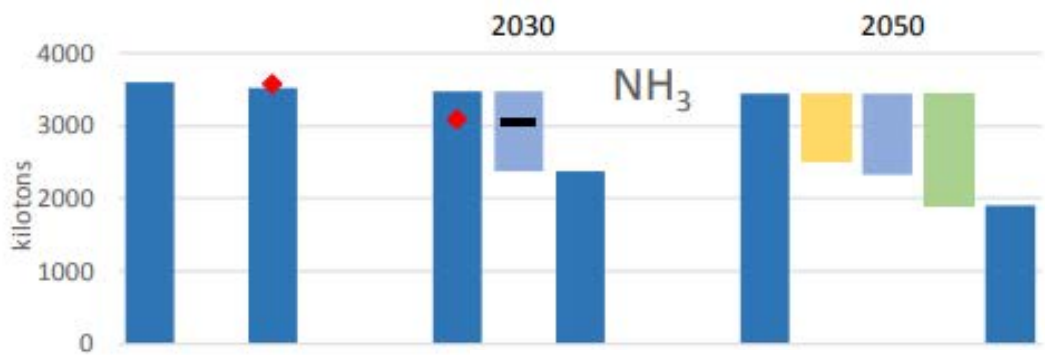
Source: GAINS model (IIASA)

Emission projections for key air pollutants under various scenarios for EU-27









: maximum emissions allowed under the NEC Directive

: level of emission reduction achieved With the Additional Measures announced in the NAPCP