Multi-scale health impact assessment of air pollution under changing climate conditions – The AC-HIA project

Task Force on Health Effects of Long-range Transboundary Air Pollution
15/05/2014

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Outline

- Rationale
- HIA Framework
- Climate and air pollution modeling framework
- Some results
- Lessons learnt
- Ways forwards

Rationale

- Air pollution, weather and climate are deeply connected
  - Well-planned, coordinated strategies to tackle these issues offer unique opportunities for improving public health
  - Health impact assessment (HIA) should be use to compare, assess and promote such strategies

- Objectives of AC-HIA
  - HIA of future air pollution on the global, European and Ile-de-France geographical scales using constistent methods
  - Under alternative climate and air pollution emissions pathways

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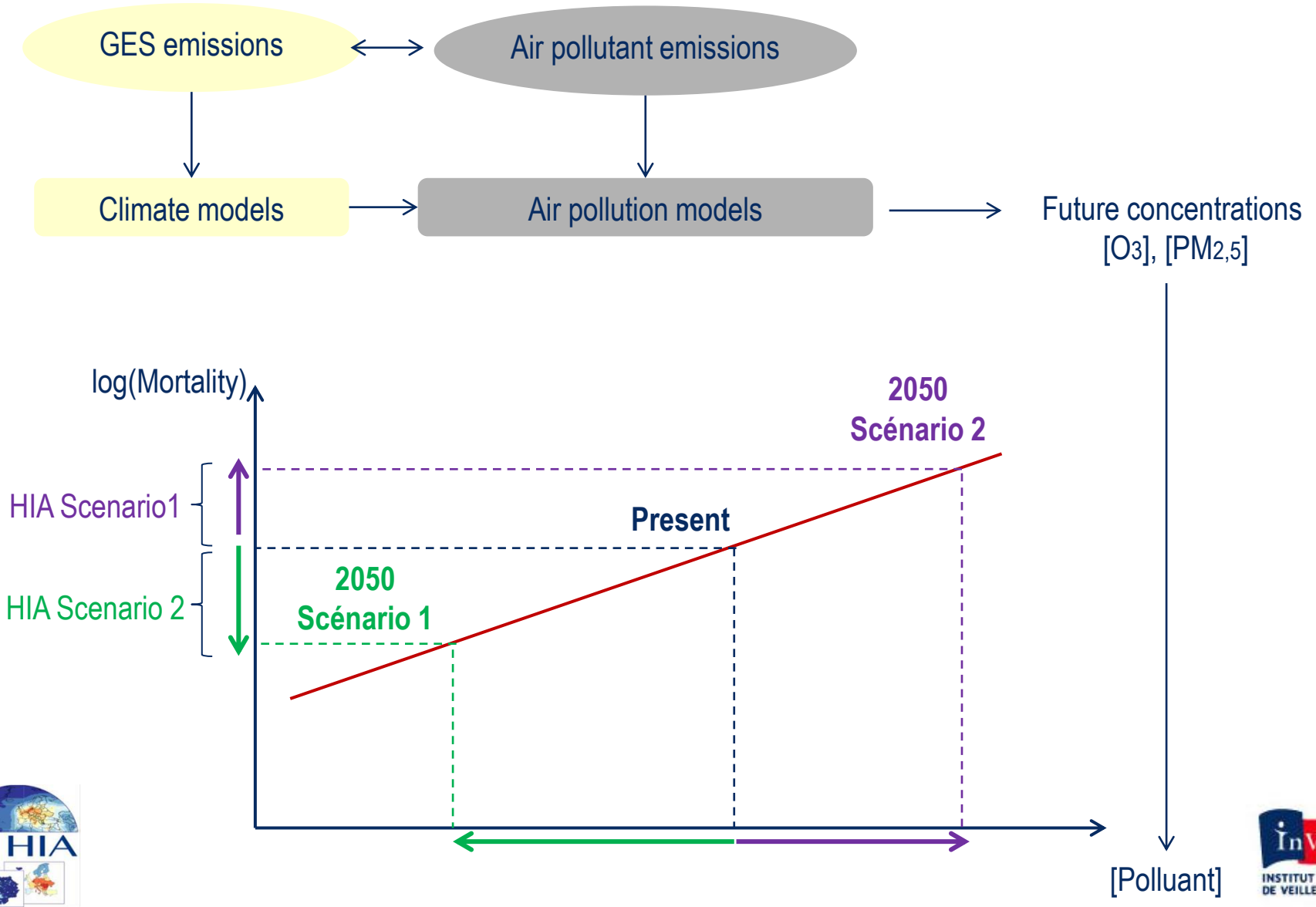
HIA framework



Modeling framework

(*examples of emissions scenarios*)

Present day, RCP4.5 ↔ *ECLIPSE CLE, MFR*

Global climate (World 2,5*1,25°) [IPSLcm5A-MR]	Global chemistry (World 3,75*1,89°) [INCA]
Regional climate (Eur 0,44°) [WRF]	Regional chemistry (Eur 0,44°) [CHIMERE]
Regional climate (Eur 0,11°) [WRF]	Local chemistry (Eur 4 km) [CHIMERE]

Other scenario tested: Climate: RCP 2.6, RCP 8.5; Air pollution: GEEA

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ECLIPSE

- In Europe
  - AP emissions scenarios consisent with the policy storylines of the 2012-2013 Revision of the Thematic Strategy on Air Pollution of the European Commission
  - E.g.
    - Current legislation (CLE): Euro-5 & 6 succeed in reducing trafic-related emissions
    - Maximum feasible reduction (MFR): Stringent standards on technologies using biomass burnings
- Outside Europe
  - Current national legislation (CLE)
  - MFR: unconditional implementation of technologies with lowest emission factors

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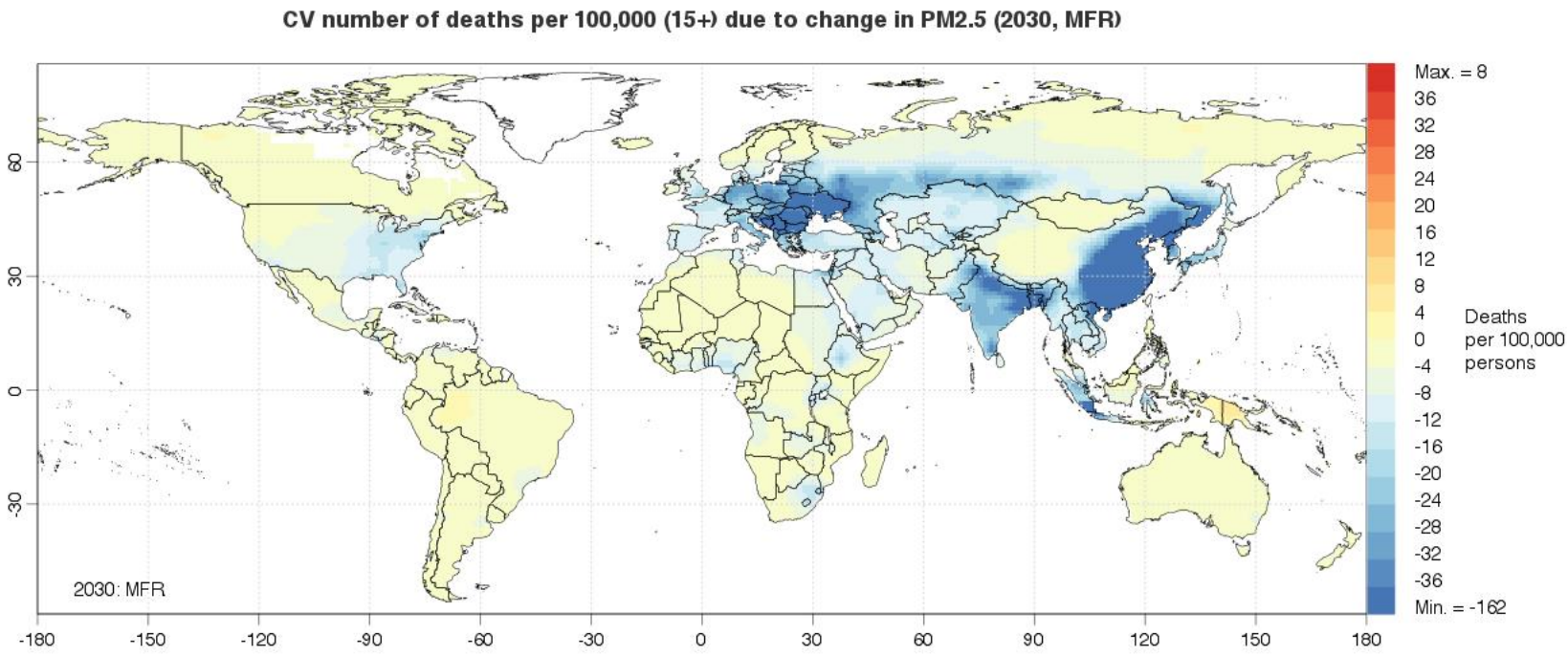
At the global scale

In 2030 –> CLE: + 0,1 millions $PM_{2.5}$ related CV deaths

–> MFR – 1,6 millions $PM_{2.5}$ related CV deaths



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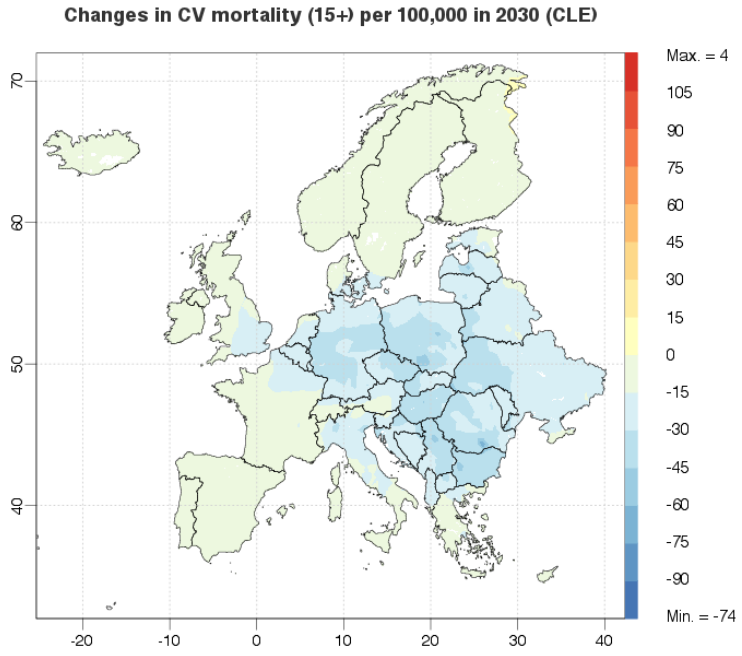
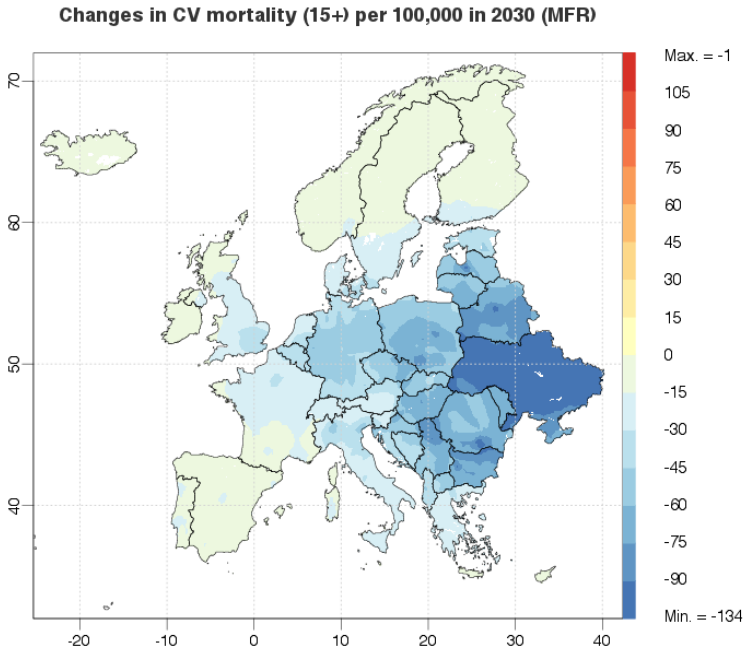
In Europe
$PM_{2,5}$ / CV mortality changes in 2030





CLE
-109 000 CV
deaths per year

MFR
-219 000 CV
deaths per year

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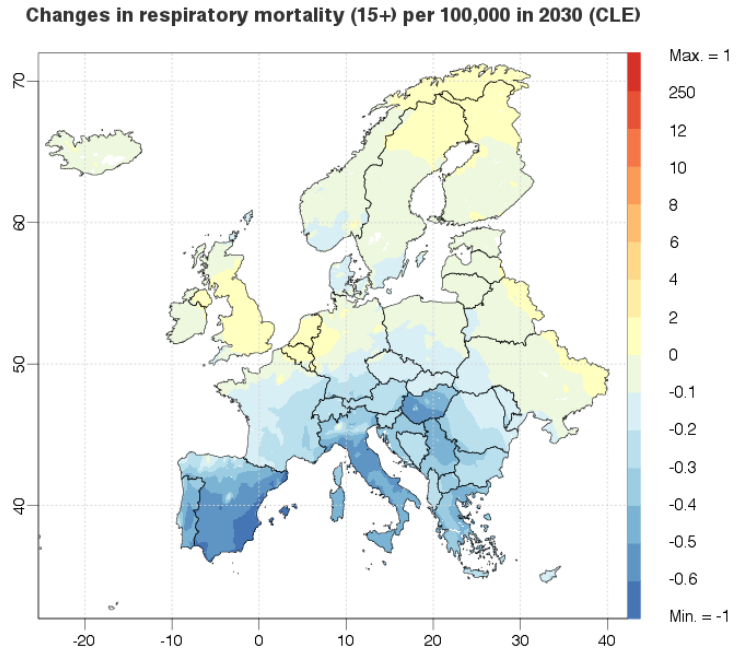
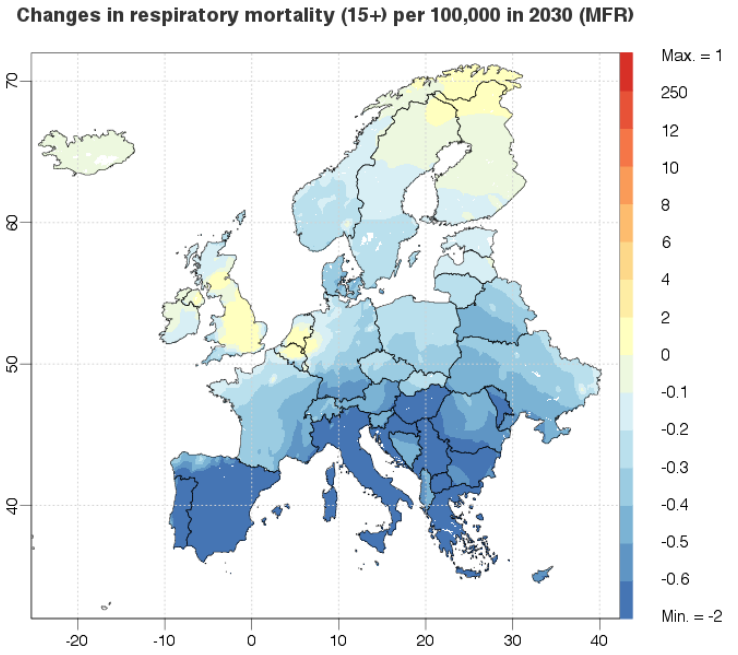
O_3/ Resp. mortality changes in 2030





CLE (worst)
- 600 Resp
deaths per year

MFR (best)
-2 000 Resp
deaths per year

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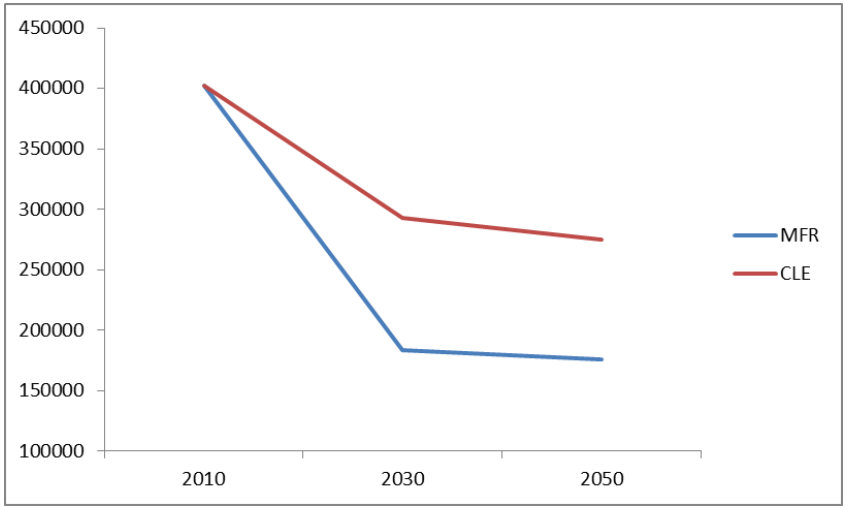
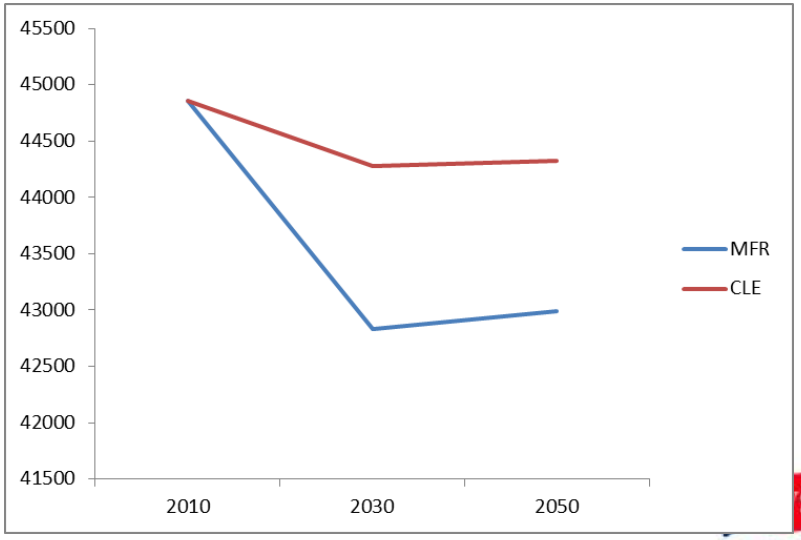
Europe - Summary

- $PM_{2.5}$ / CV mortality
- improves everywhere, larger benefits in Eastern Europe
- most of the benefits already observed in 2030

- O_3 / Respiratory mortality
- improves almost everywhere
- increases in Northern Europe e.g. ~200 deaths per year in UK
- less benefits in 2050 ("climate penalty")



CV deaths attributable to $PM_{2,5}$



Resp. deaths attributable to O_3

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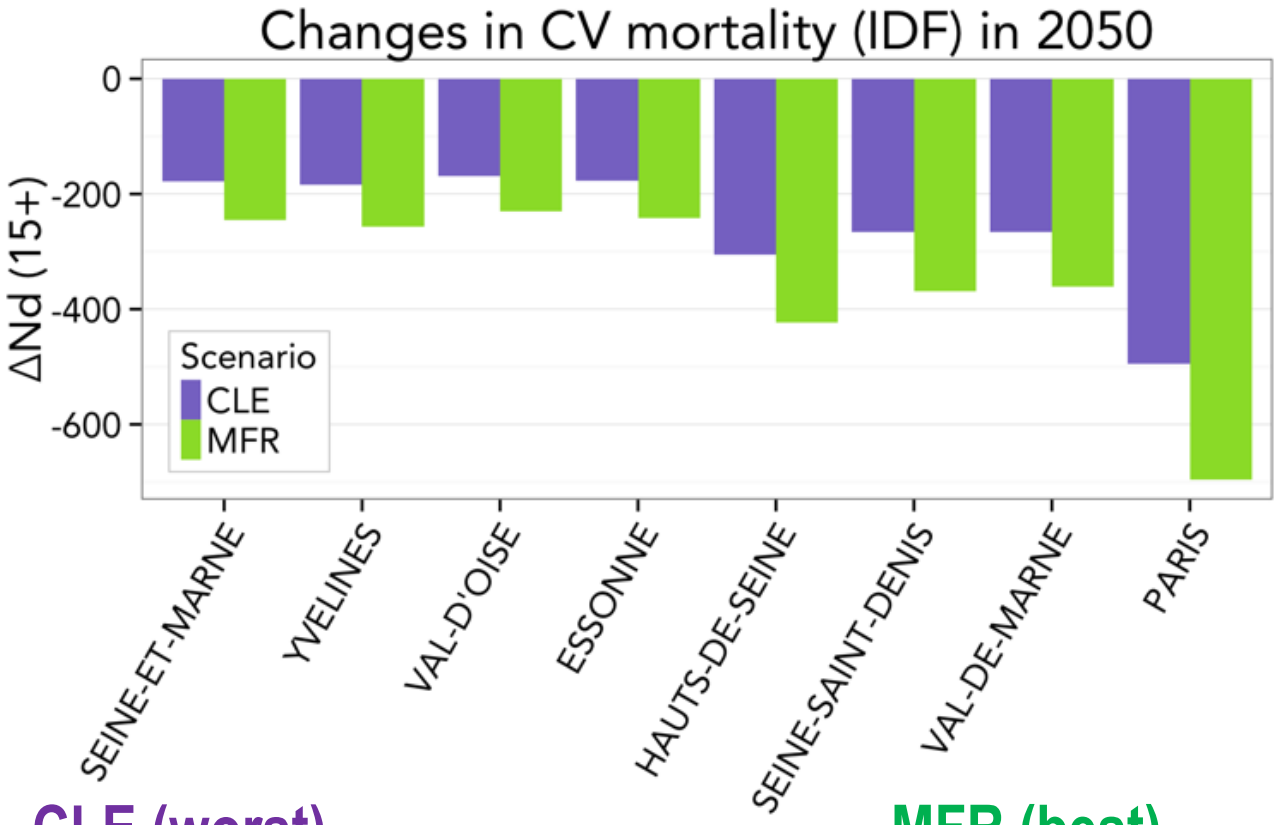
Ile de France
$PM_{2,5}$/CV mortality changes in 2050



CLE (worst)
- 2 000 CV
deaths per year

MFR (best)
-2 800 Resp
deaths per year

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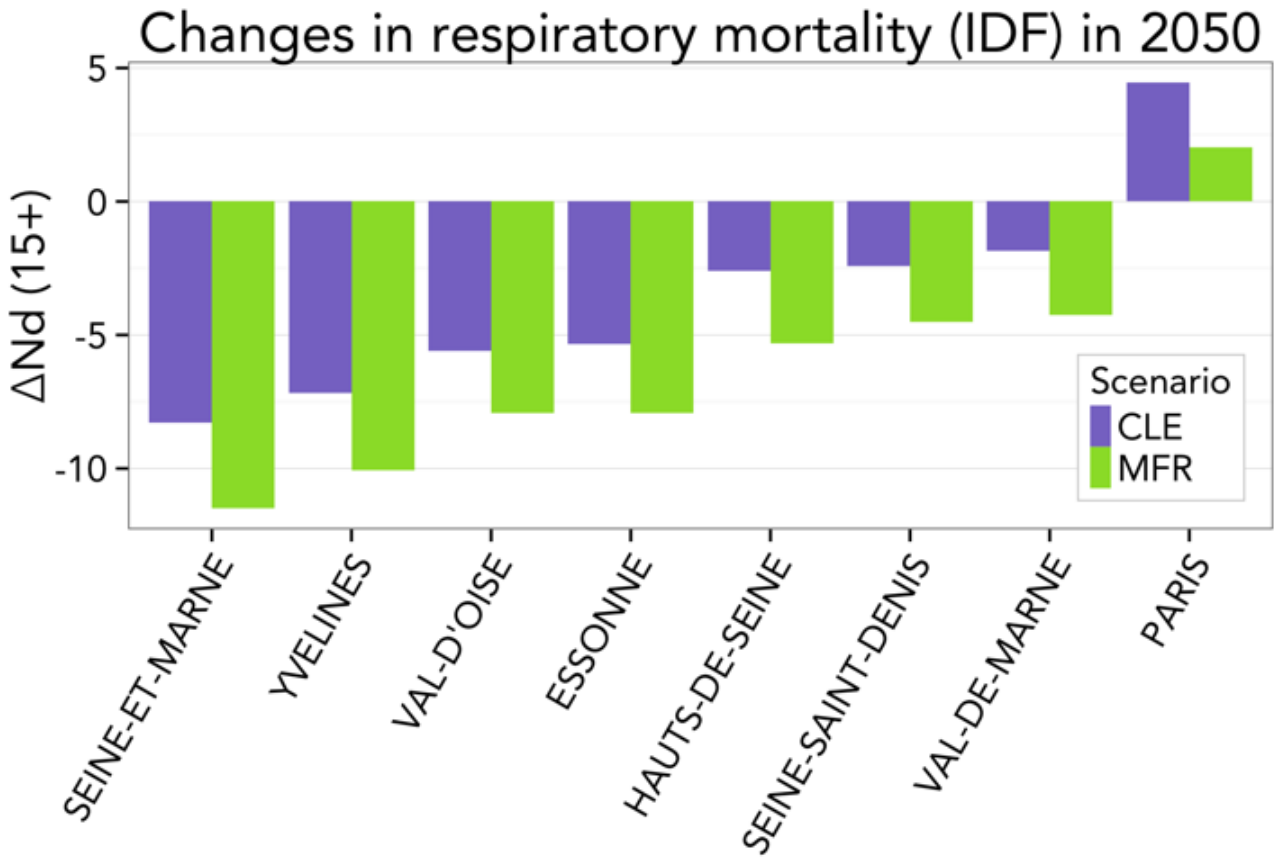
O_3/Resp mortality changes in 2050



CLE (worst)
- 30 CV
deaths per year

MFR (best)
- 50 Resp
deaths per year

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Lessons learnt

- It is critical that climate and air pollution control policies be planned in a coordinated way
- HIA can be a powerful tool to concretize, compare and communicate on the health impacts
- Results were presented to stakeholders during a 1-day workshop in March 2014 (scientists, NGOs, institutions)
  - multiscales HIA are useful to interact with different policy-makers
  - they help them understanding that climate change is not a only a global, distant issue
- Because of the underlying uncertainties, we interpret the results in trends and order of magnitude rather than absolute numbers

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Ways forward

- Uncertainties
  - reliability of health and population data
  - concentration-response functions
  - exposure assessment
  - uncertainties of the air quality and climate models

Can be partly qualified/ quantified/ reduced

- The HIA is simplistic
  - only considers mortality
  - does not take into account the joint impacts of temperature and air pollution on health

Can be updated when relevant data is available

- But we will never be able to predict the future
  - emissions scenarios = policies storylines
  - how to choose a relevant storyline, both for air pollution and climate, relevant across scales?

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- http://ac-hia.com/

- Support for this analysis was funded through GIS-Climat, the French Environment and Energy Management Agency ADEME, contract n° 1110C0073

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