



# THE ECONOMIC CONSEQUENCES OF OUTDOOR AIR POLLUTION

*Global Assessment and Some Implications for the Arctic*

**Shardul Agrawala**

Head, Environment and Economy Integration Division  
OECD Environment Directorate

*Northern Dimension Future Forum on Environment  
Brussels, 19 November 2018*



## I. Context

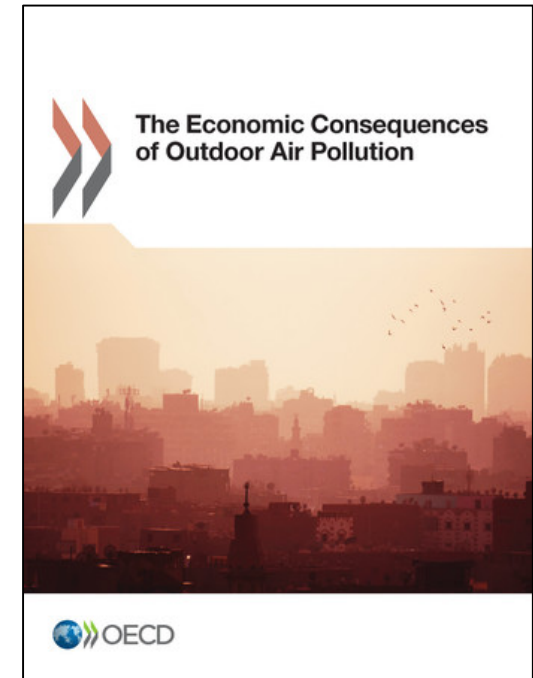
---

- Focus on Black Carbon in the Arctic motivated primarily by impacts on climate (potentially 20-25% warming of the Arctic)
- Black Carbon is also a significant share of fine particulates, particularly PM<sub>2.5</sub>, which have major impacts on human health and productivity.
- These costs of inaction, provide further motivation for reduction of BC and other particulates.



## II. The OECD Study on Economic consequences of Outdoor Air Pollution

- Quantify how changes in outdoor air quality affect the economy, and prospects for long-term growth
- Regional and sectoral quantitative approach where possible, coupled with general insights where needed
- Global assessment, 2060 time horizon





## II.2 Methodological steps

### Economic activity

- ENV-Linkages model

### Emissions

- ENV-Linkages model (GHGs)
- Emission coefficients of air pollutants from IIASA's GAINS model
- Projections for SO<sub>2</sub>, NO<sub>x</sub>, BC, OC, CO, VOCs, NH<sub>3</sub>

### Concentrations

- EC-JRC's TM5-FASST model for PM<sub>2.5</sub> and O<sub>3</sub>

### Biophysical impacts

- Impacts on crop yields with TM5-FASST model
- Health impacts using functions based on Global Burden of Disease

### Economic costs

- Economic feedbacks using ENV-Linkages model
- Non-market costs calculated based on results of valuation studies



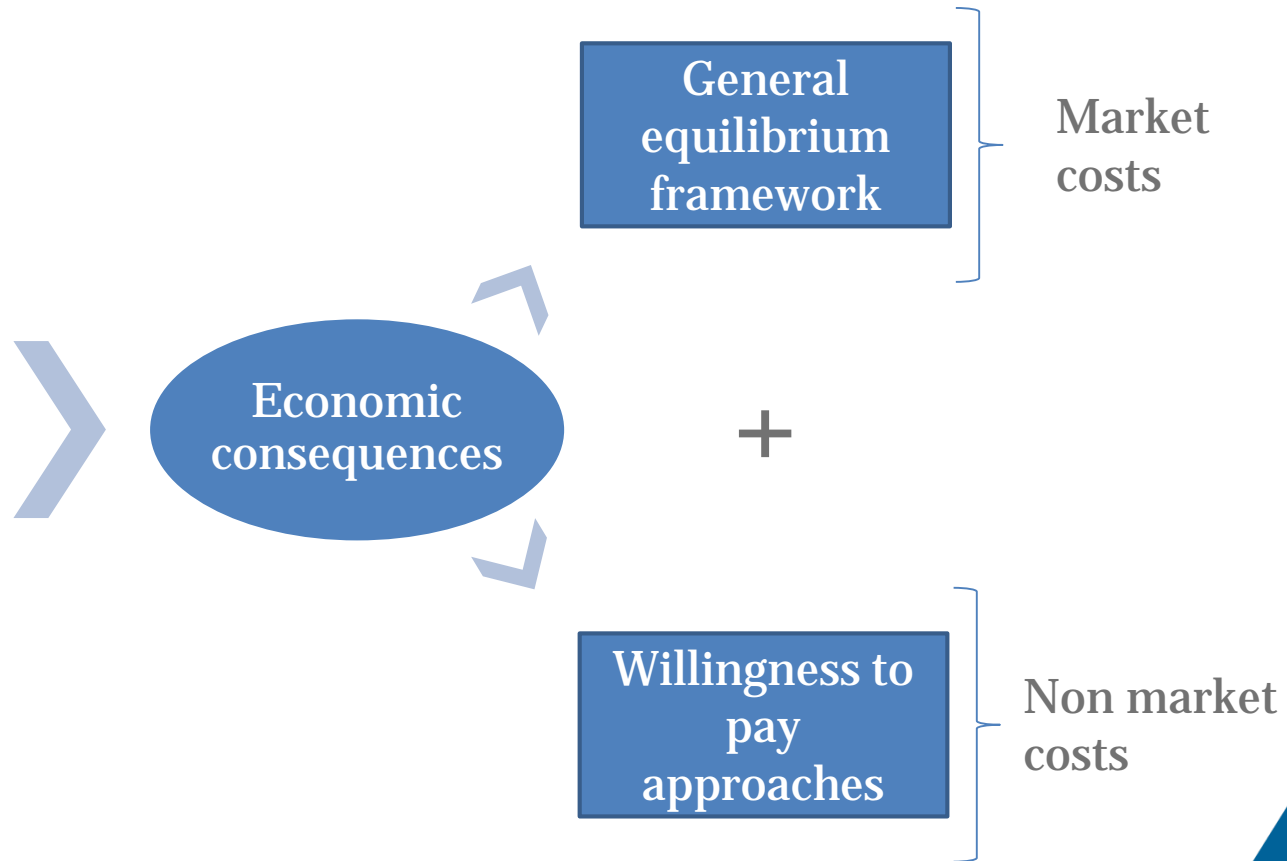
## II.3 From biophysical to Economic Impacts

### Health impacts

- **Mortality**
- **Morbidity**: illness (especially respiratory and cardiovascular diseases)

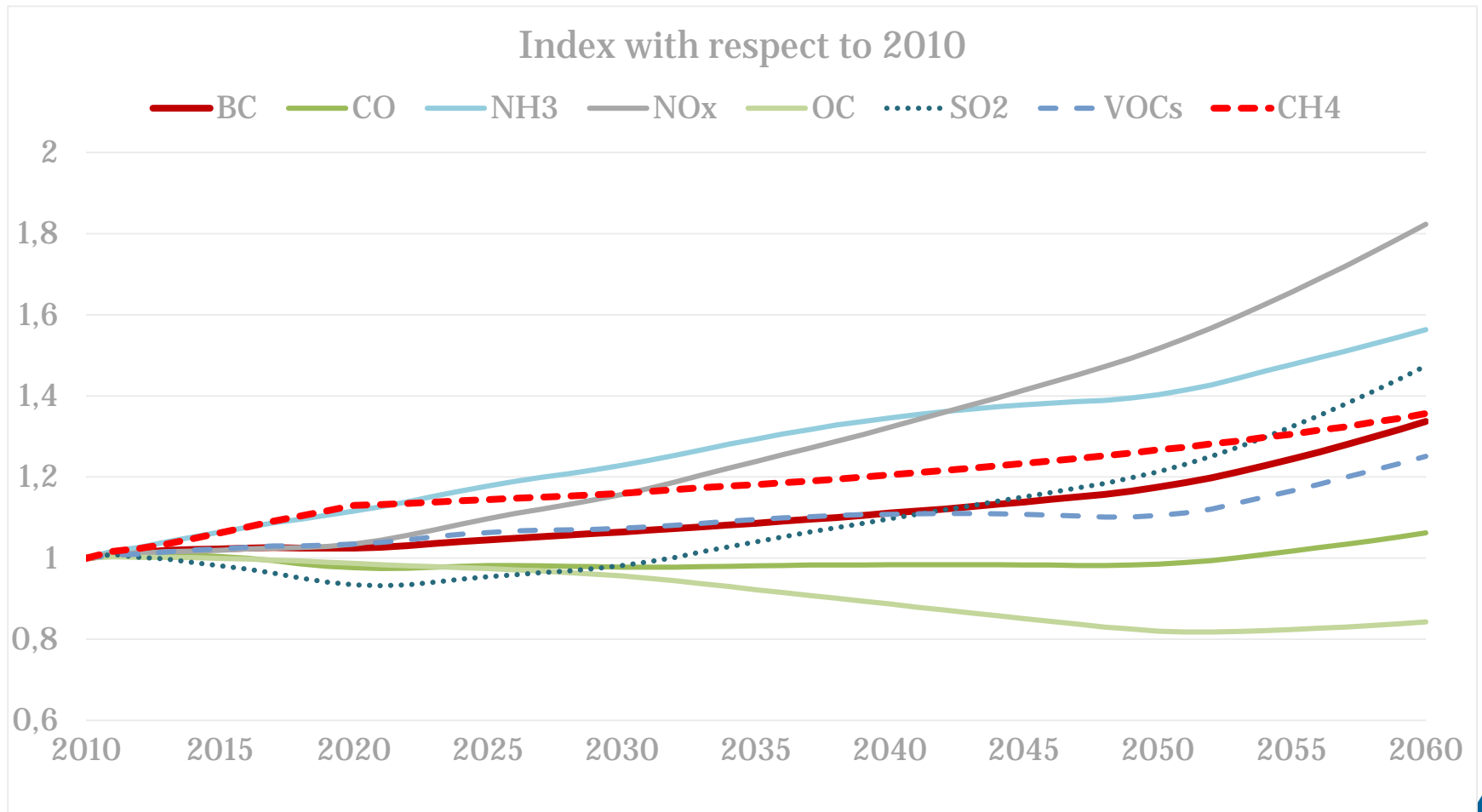
### Other impacts

- **Agriculture**
- Biodiversity and ecosystems
- Buildings and cultural heritage
- Visibility





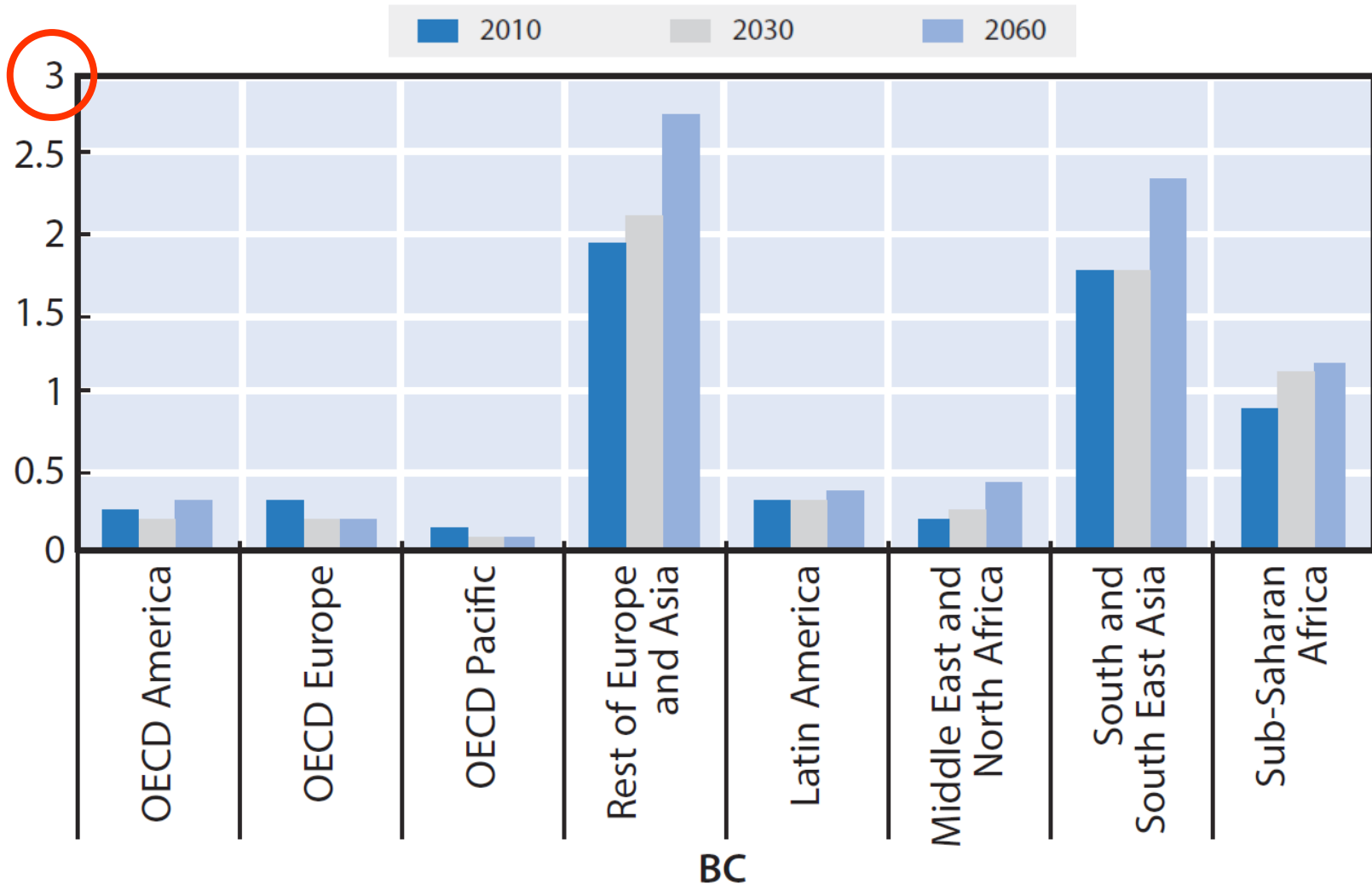
### III. Results: Projections of air pollutant emissions



Source: ENV-Linkages model, based on projections of emission factors from the GAINS model.



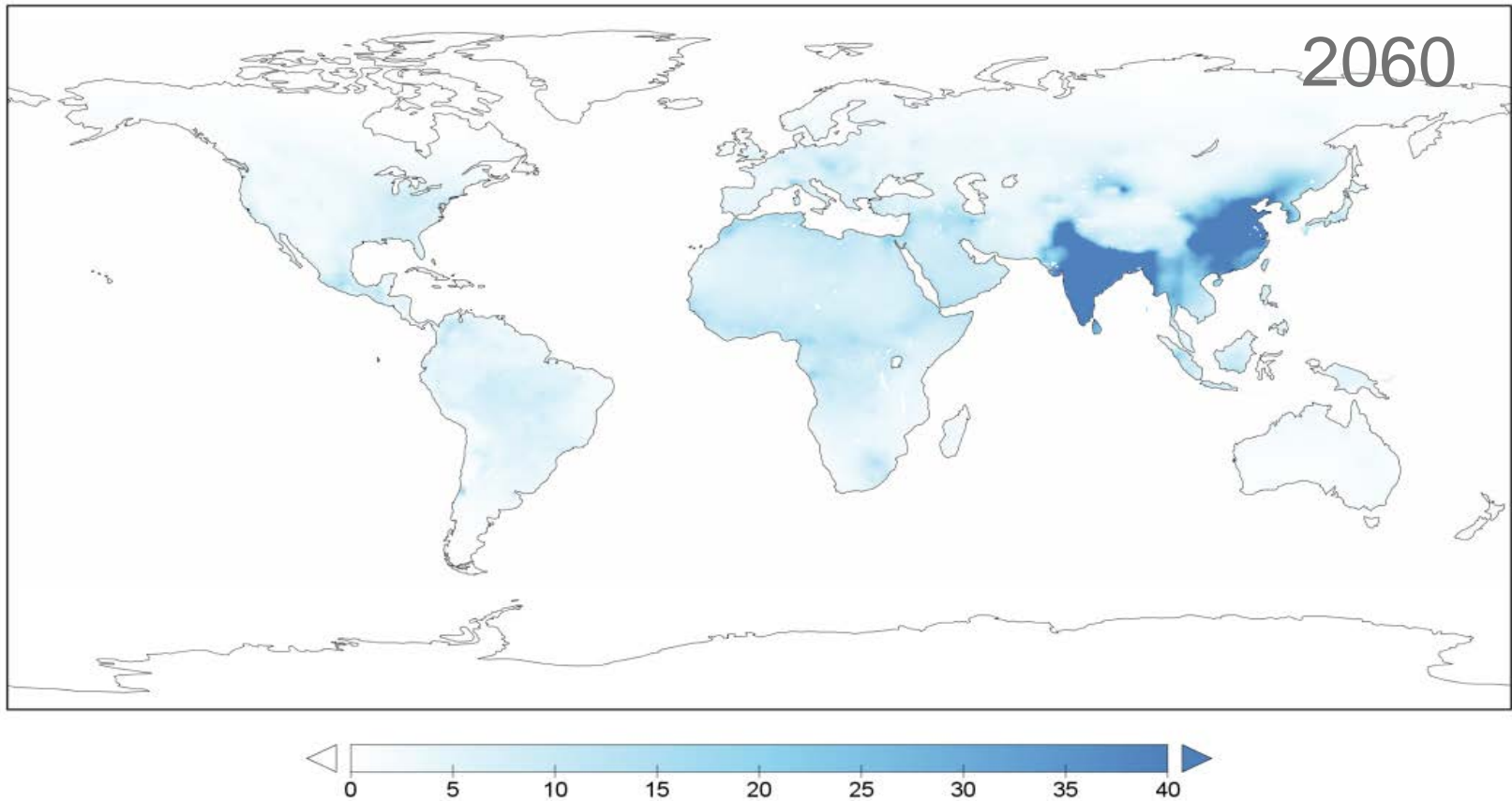
# Focus on black carbon emissions (megatonnes)





# Concentrations of air pollutants

Annual average total anthropogenic PM<sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ )

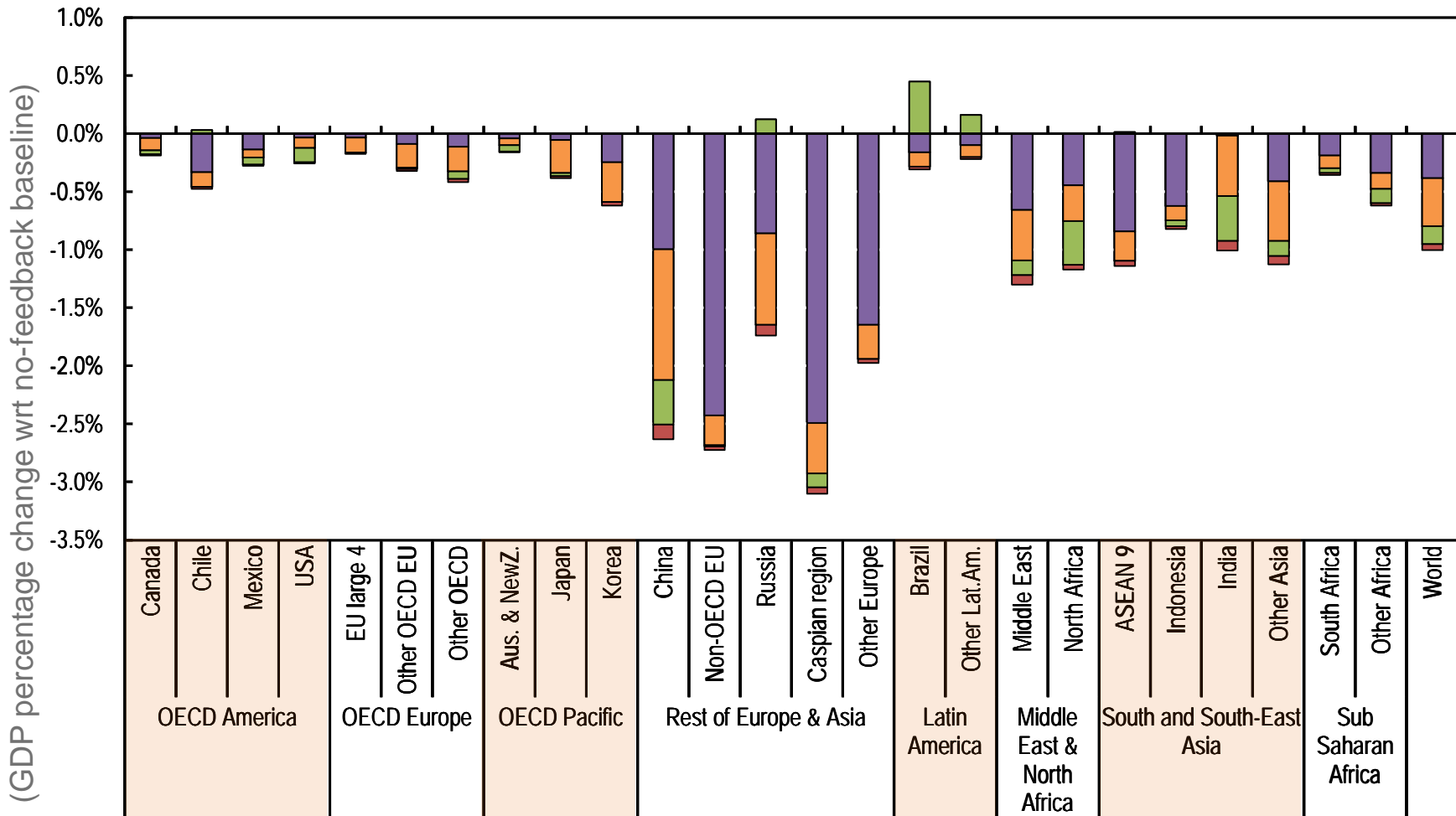






# Regional market costs

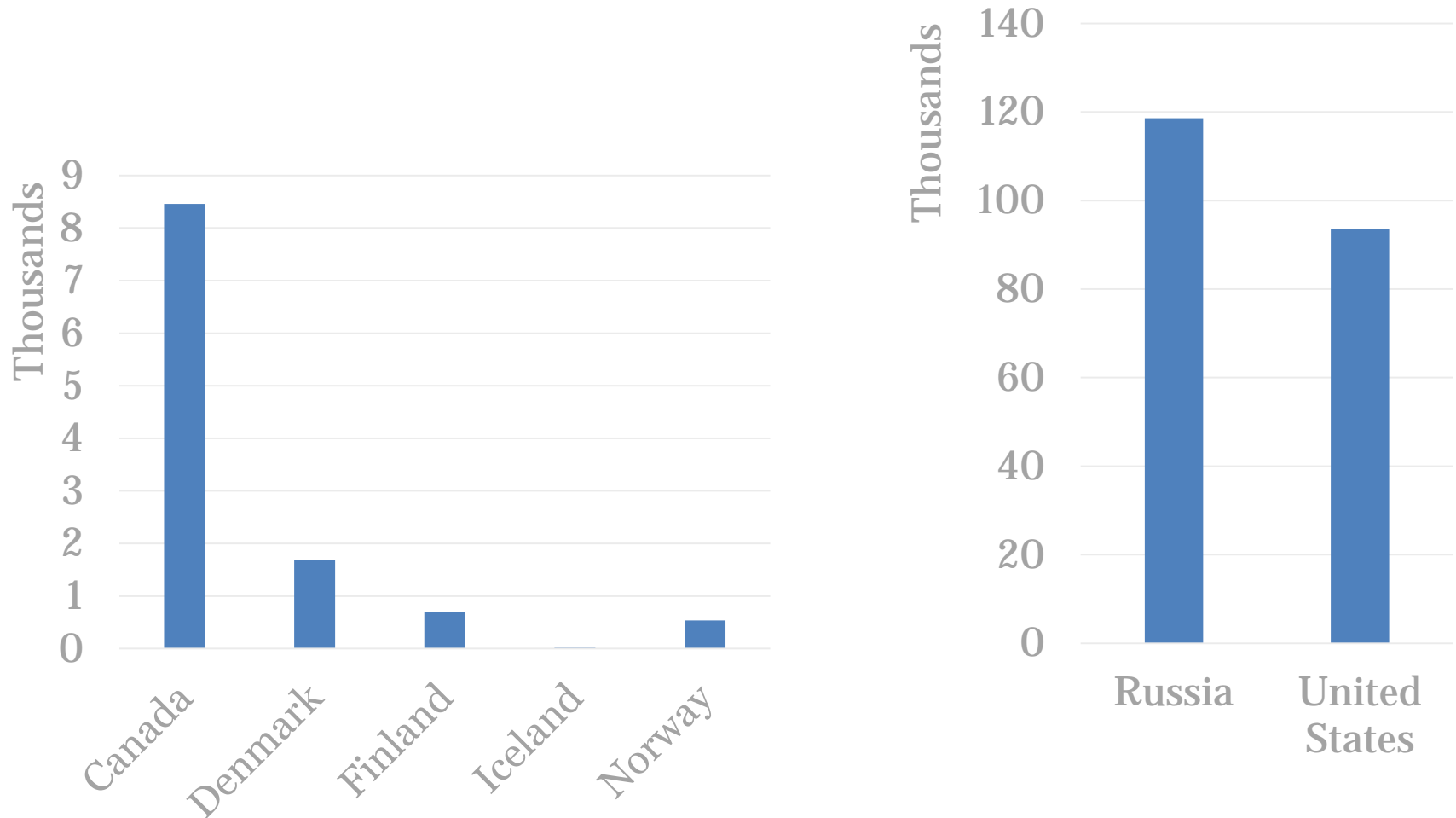
Interaction effects    Agriculture    Labour productivity    Health Expenditures



Source: OECD (2016), *The economic consequences of outdoor air pollution*



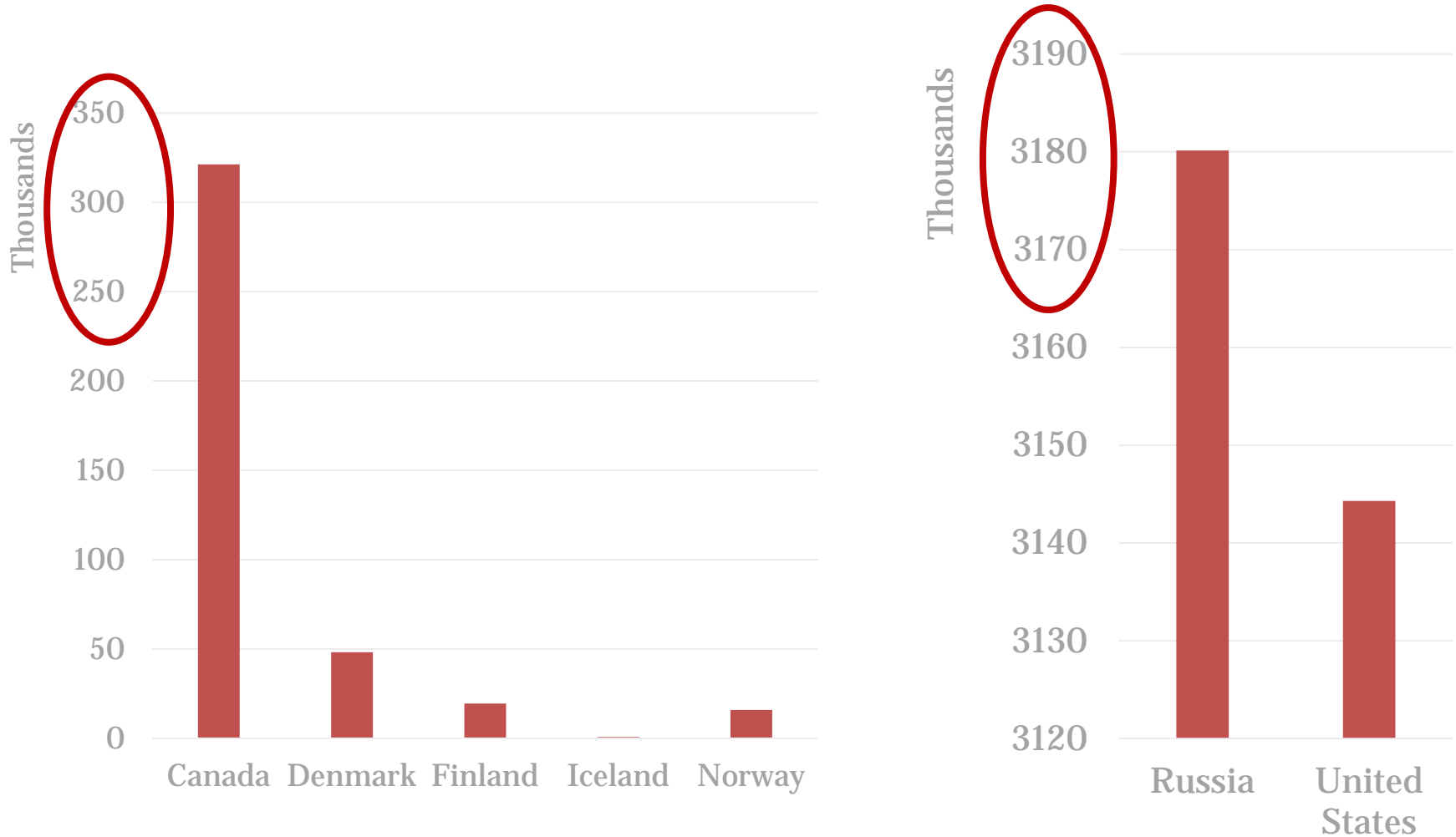
# Non Market Impacts: Premature deaths caused by outdoor air pollution in Arctic countries, 2010



Source: ENV-Linkages model.



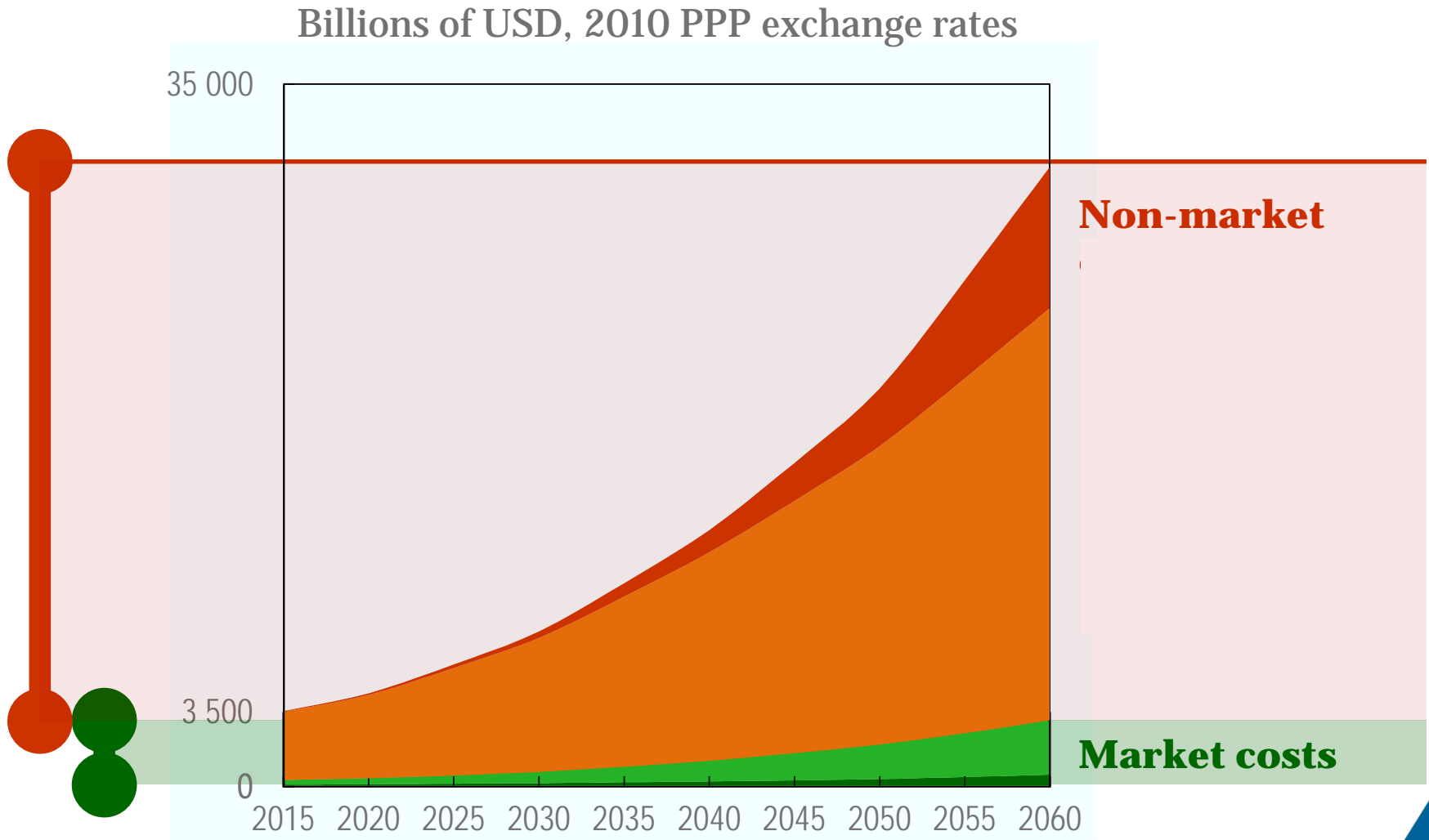
## Non Market Impacts: Projections of premature deaths caused by outdoor air pollution, 2060



Source: ENV-Linkages model.



# Global welfare costs of outdoor air pollution: evolution over time



Source: OECD (2016), The Economic Consequences of Outdoor Air Pollution



## Final remarks

---

- The public health and economic consequences of air pollution are a significant additional motivation for Black Carbon reduction (beyond climate).
- The health impacts and costs of inaction are significant in Arctic countries, and even more so if we include Arctic Council observers.
- The most dangerous consequences are premature deaths, but there are significant market costs as well.
- The OECD is initiating a project to assess the economic consequences of the Arctic Council Black Carbon reduction target



**Thank You**

[Shardul.Agrawala@oecd.org](mailto:Shardul.Agrawala@oecd.org)

[www.oecd.org/environment](http://www.oecd.org/environment)