



THE ECONOMIC CONSEQUENCES OF AIR POLLUTION POLICIES IN ARCTIC COUNCIL COUNTRIES: A SECTORAL ANALYSIS

Daniel Ostalé Valriberas, Elisa Lanzi
Environment and Economy Integration Division
OECD Environment Directorate

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Context and Motivation

- **Air pollution** is one of the **more severe environmental risk in the world.**
- The Arctic is **vital to preserve the balance of the global climate.**
 - Very sensitive to short-lived climate pollutants, notably black carbon (BC)
- Collective, aspirational goal of Arctic Council countries to reduce BC emissions by 25-33% relative to 2013 by 2025. But need to reduce all pollutants to effectively reduce the negative socio-economic impacts of air pollution



Aim of the report

Objectives

This report aims to analyse how air quality policies in different sectors contribute to reduce the health, environmental and economic consequences of air pollution, with focus on Arctic Council countries

Two main policy scenario

- **Current Legislation (CLE) scenario**
 - National and regional regulation (2017)
- **Maximum Technical Feasible Reduction (MTFR) scenario**
 - Combustion plants, industrial processes, transport, agriculture, use of solvents and the residential sector
 - Geographical coverage: Arctic Council countries, but consider a global scenario to study competitiveness issues

MTFR scenario by sector

Agricultural

Waste treatment

Residential and commercial

Road Transport

Industry

Energy

International Shipping

(full) MTFR-AC



Literature review

- OECD (2021), *The Economic Benefits of Air Quality Improvements in Arctic Council Countries*, OECD Publishing, Paris
- Caiazzo, F. et al. (2013), “Air pollution and early deaths in the United States. Part I: Quantifying the impact of major sectors in 2005”, *Atmospheric Environment*, Vol. 79, pp. 198-208
- Lanzi, E., R. Dellink and J. Chateau (2018), “The sectoral and regional economic consequences of outdoor air pollution to 2060”, *Energy Economics*, Vol. 71, pp. 89-113,
- Gu, Y. et al. (2018), “Impacts of sectoral emissions in China and the implications: air quality, public health, crop production, and economic costs”, *Environmental Research Letters*, Vol. 13/8, p. 084008
- Vandyck, T. et al. (2020), “Quantifying air quality co-benefits of climate policy across sectors and regions”, *Climatic Change*, Vol. 163/3, pp. 1501-1517,



METHODOLOGY AND SCENARIOS



The OECD ENV-Linkages model

- Computable General Equilibrium (CGE) model
 - Multi-regional (25 regions), multi-sectoral (42 sectors)
 - Full description of economies
 - All economic activity is part of a closed, linked system
 - Simultaneous equilibrium on all markets
 - Structural trends, no business cycles
- Dynamics
 - Solved iteratively over time (recursive-dynamic)
 - Capital vintages (less malleability of technology in Short Run)
- Link from economy to environment
 - Feedbacks from air pollution damages on economy



An Integrated Modelling Framework

OECD ENV-Linkages model



IIASA's **GAINS** model



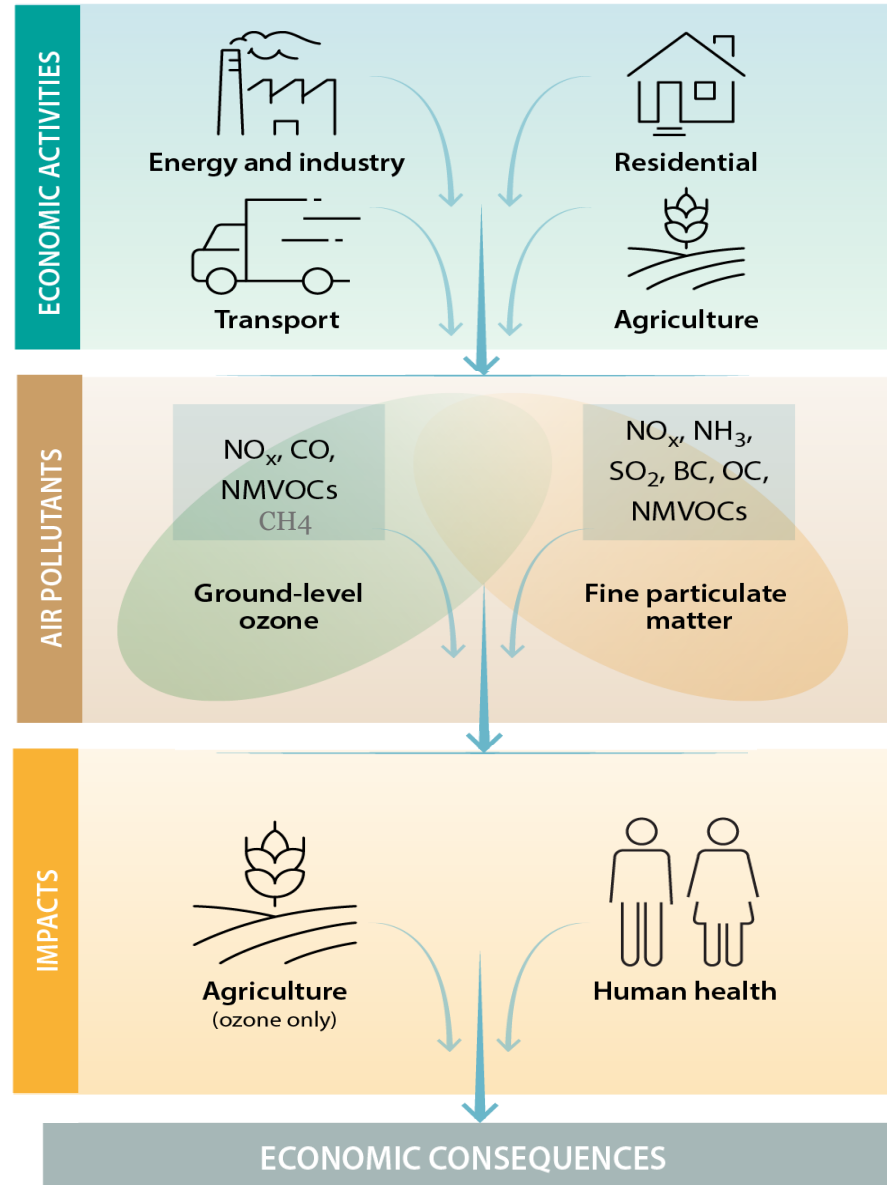
EC-JRC's **TM5-FASST** model
and IIASA's **GAINS** model



•Global Burden of Disease
•**TM5-FASST**

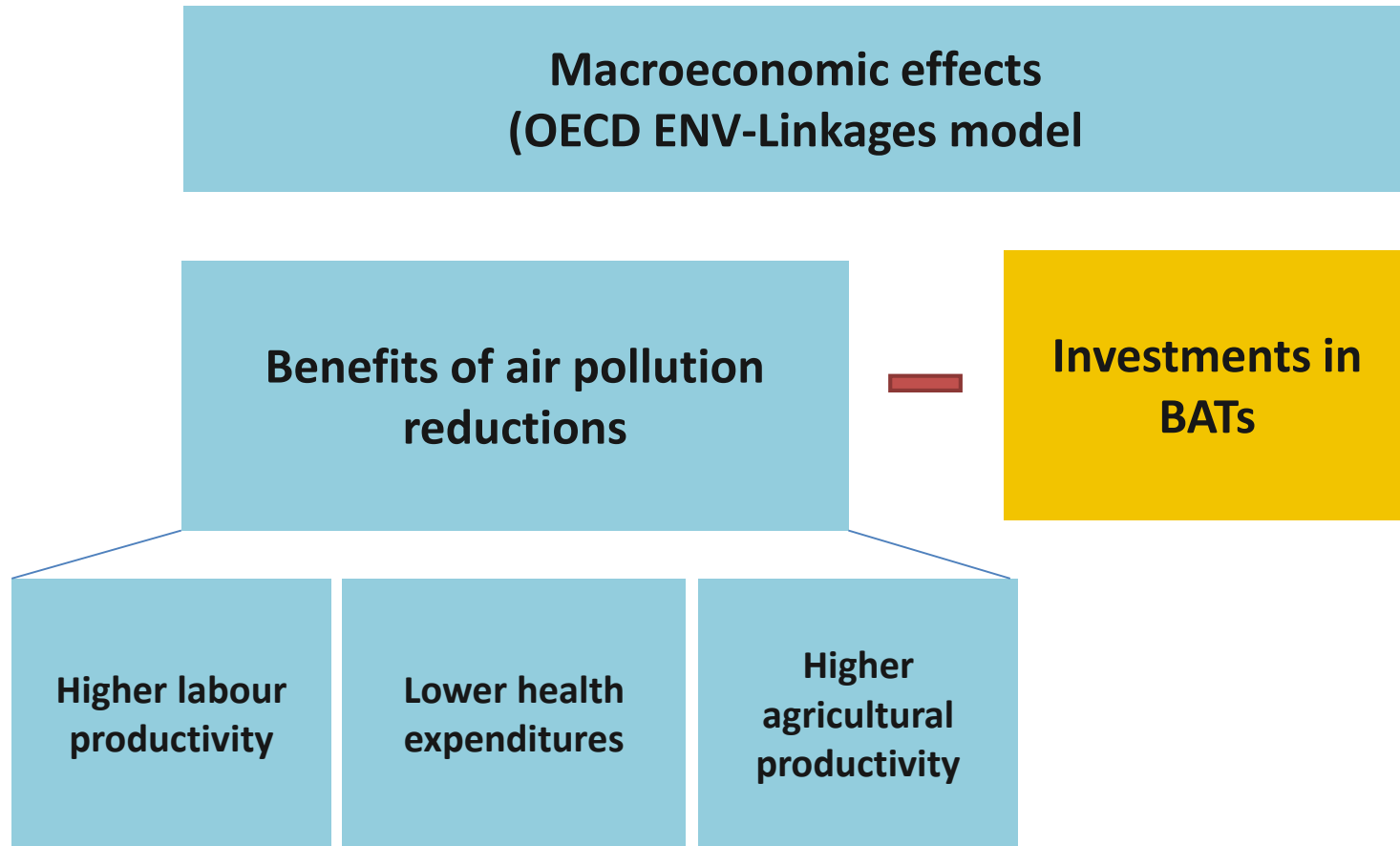


•**OECD ENV-Linkages**
•Valuation studies





Methodology: economic consequences

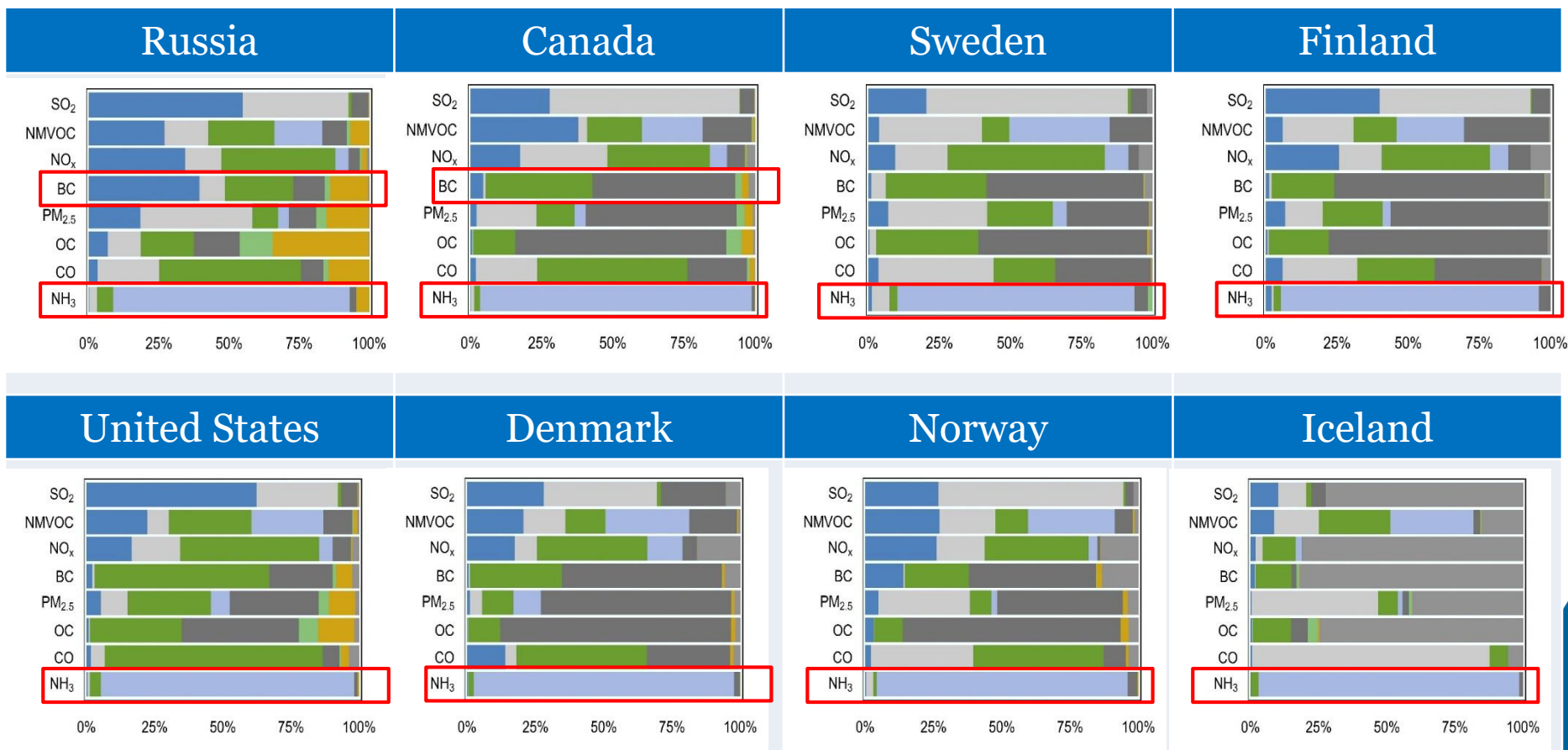




RESULTS: SECTORAL EMISSIONS IN THE ARCTIC COUNCIL COUNTRIES



Sectoral emissions in Arctic Council countries in 2019

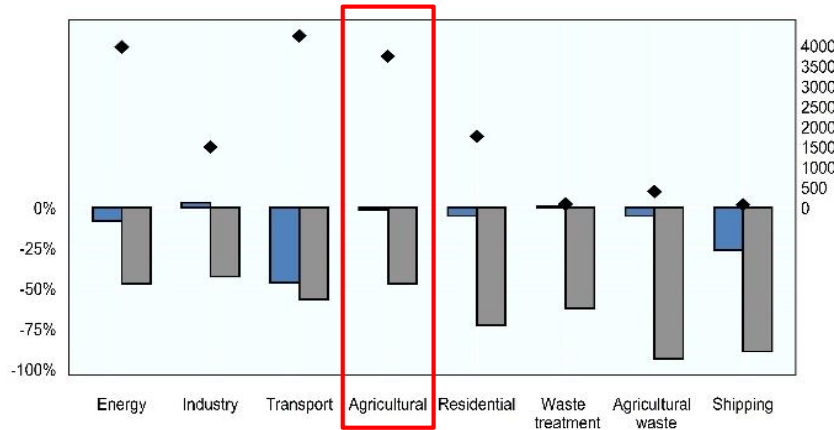




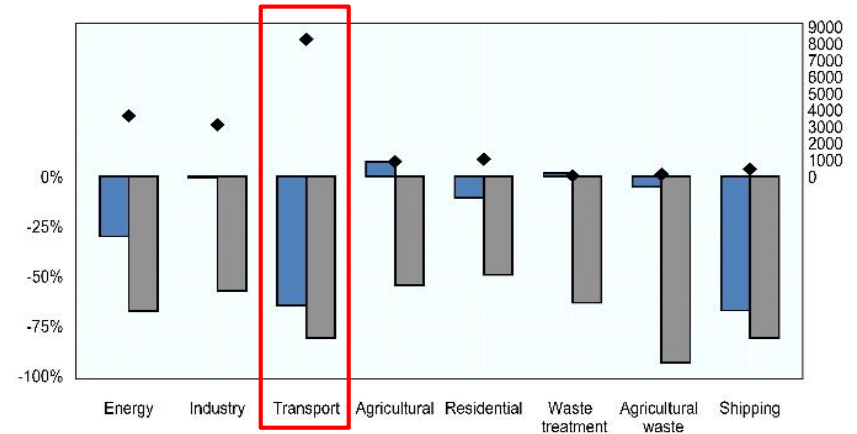
Reduction by sector and pollutant with Maximum Feasible Reductions

■ 2050 MTRF-AC ■ 2050 CLE ◆ Kt emitted in 2019

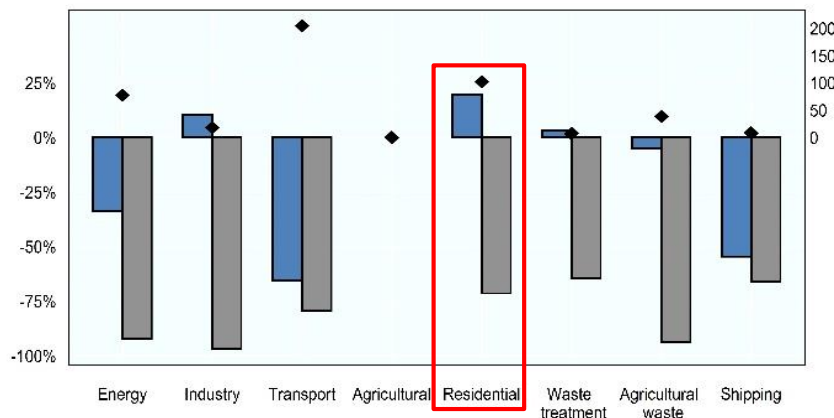
NM VOC Emissions



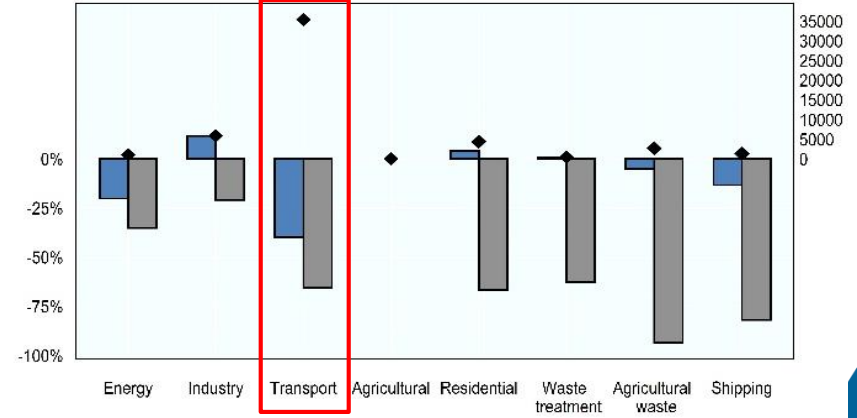
NOx Emissions



BC Emissions



CO Emissions

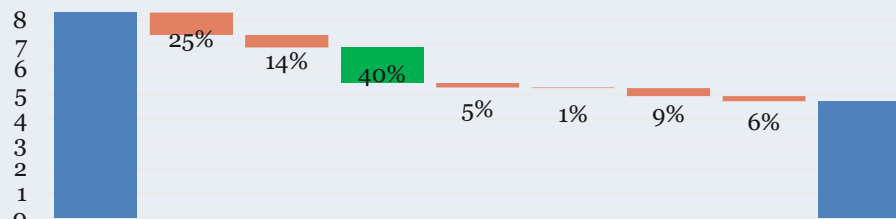


Source: GAINS model.

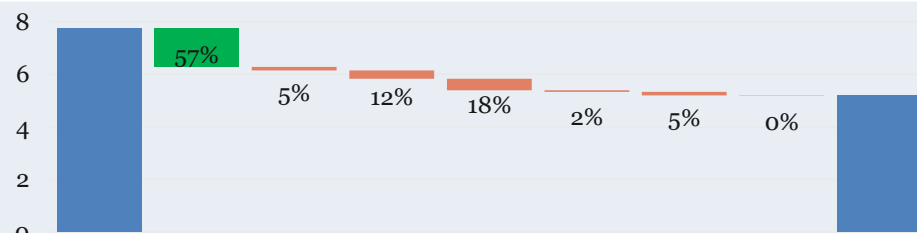


Concentrations of PM_{2.5} in 2050

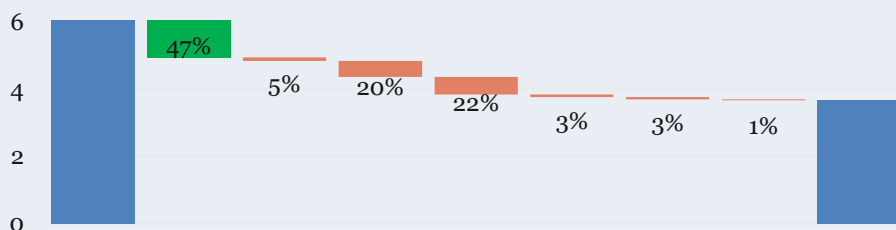
Russia



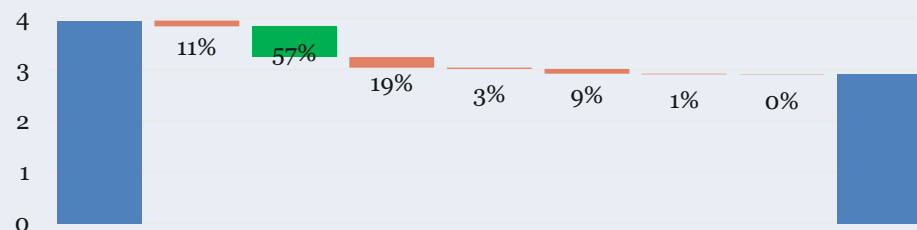
United States



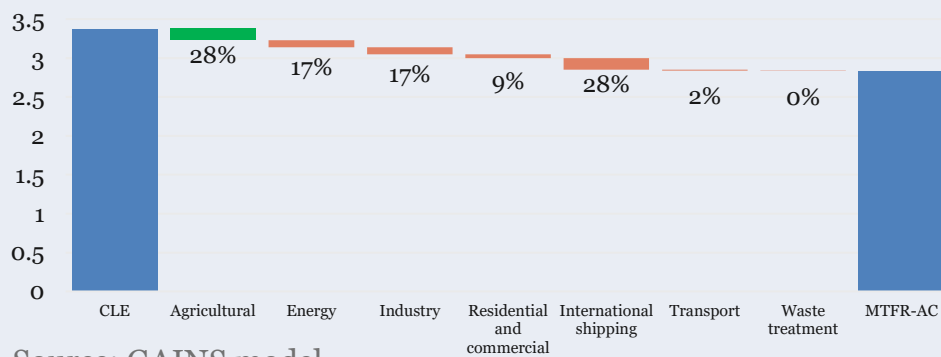
Canada



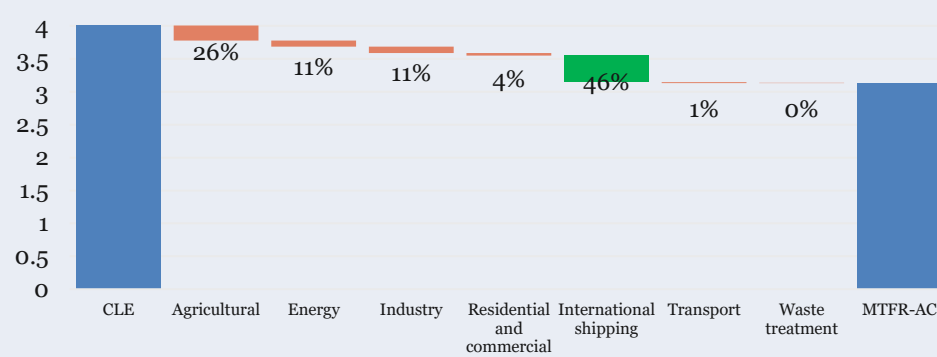
Norway



Sweden (similar Finland and Iceland)



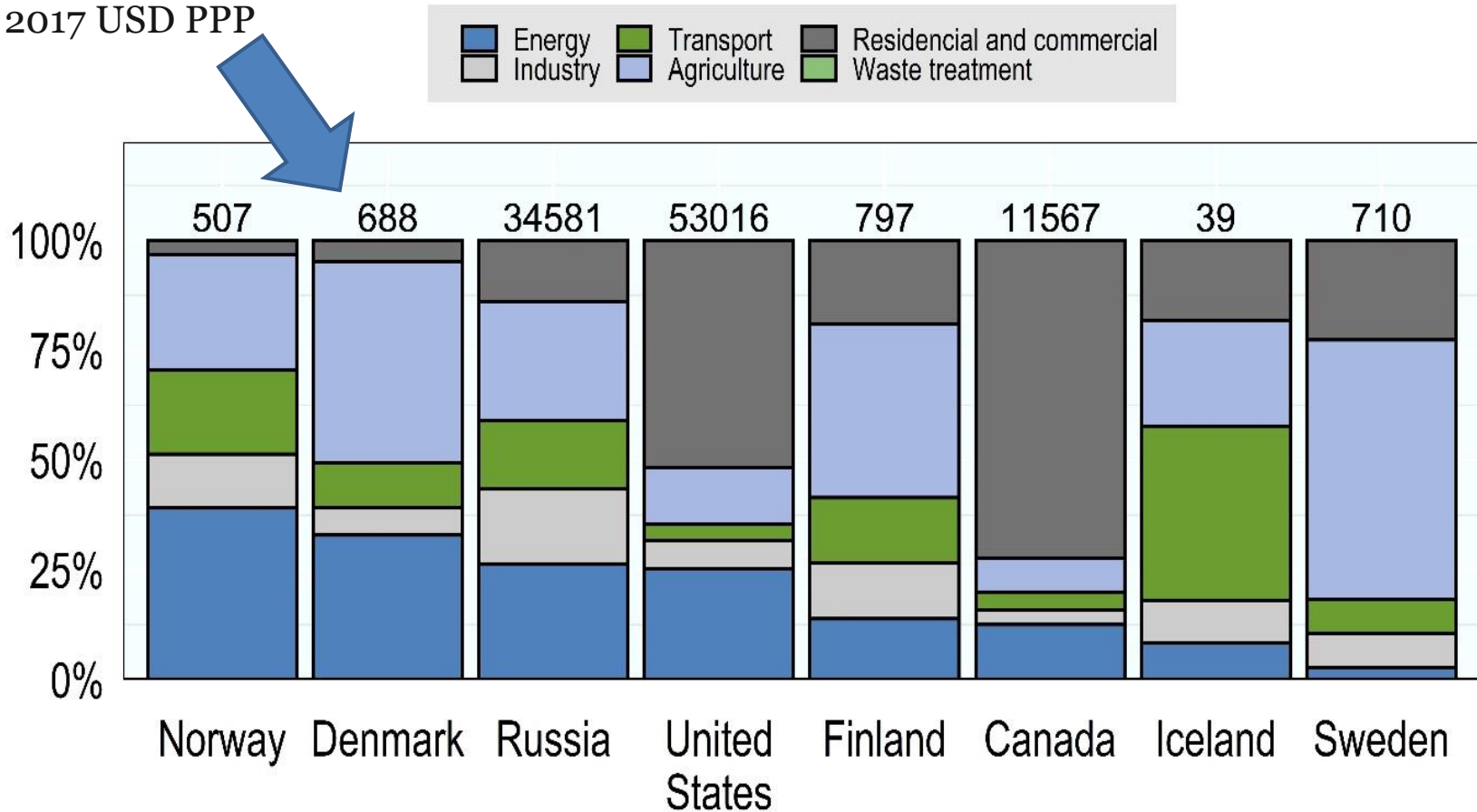
Denmark





Sectoral investment costs in Arctic Council countries in 2050

Total investment
in 2017 USD PPP



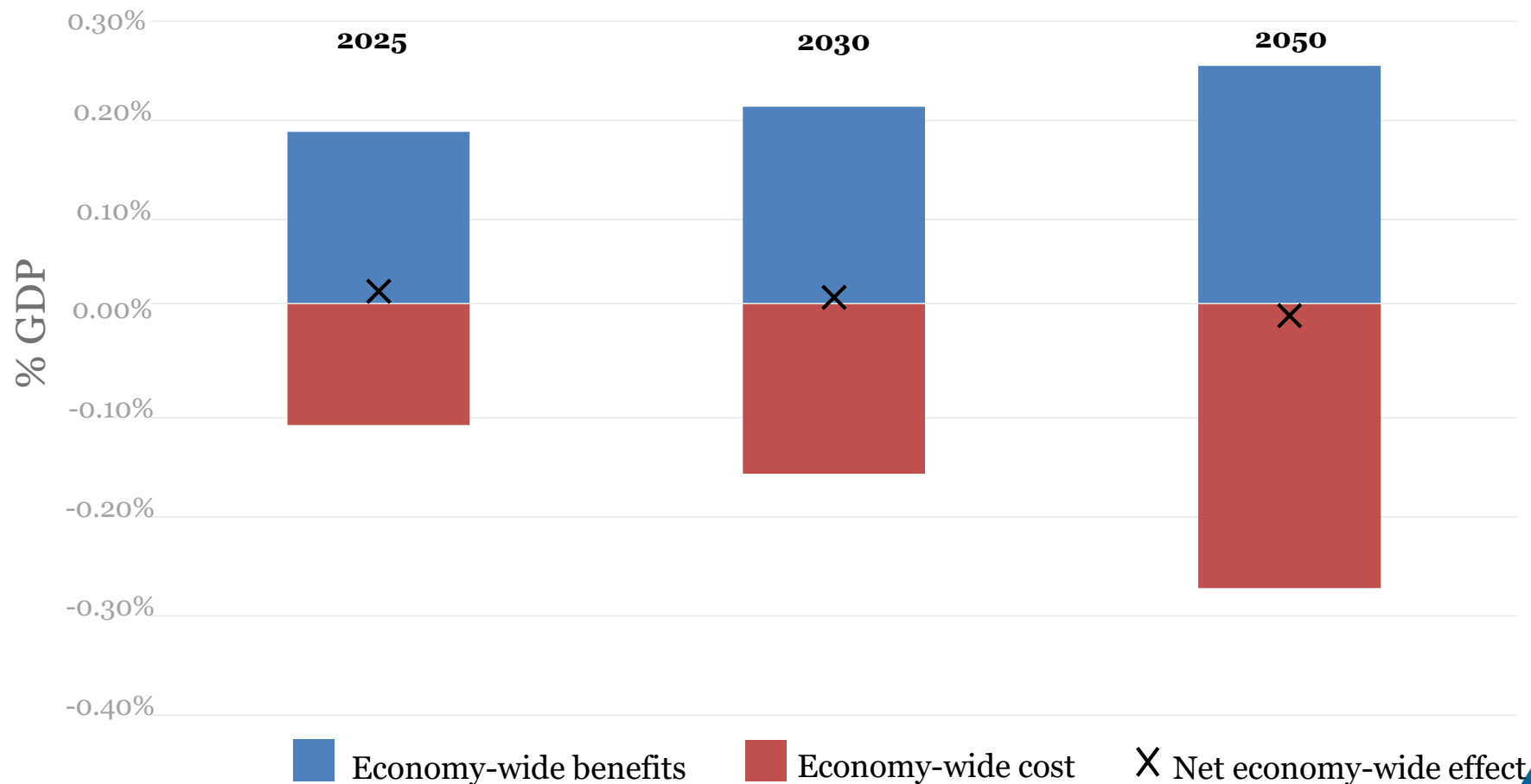


RESULTS FROM THE ECONOMIC ANALYSIS



Economy-wide effects on GDP (all sectors together)

% change in GDP in MTFR-AC w.r.t. CLE scenario

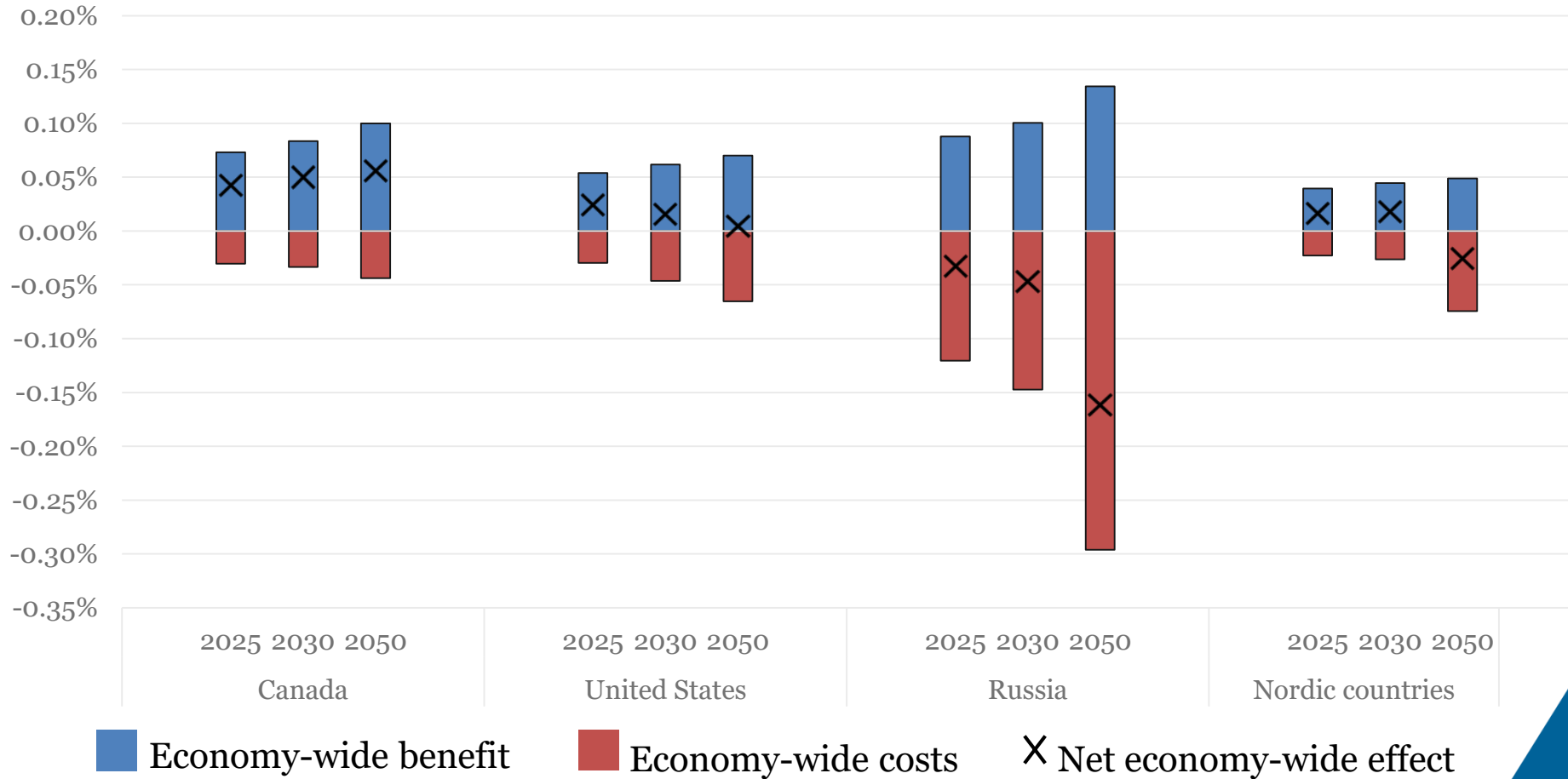


Source: OECD's ENV-Linkages model



Economy-wide effects by region

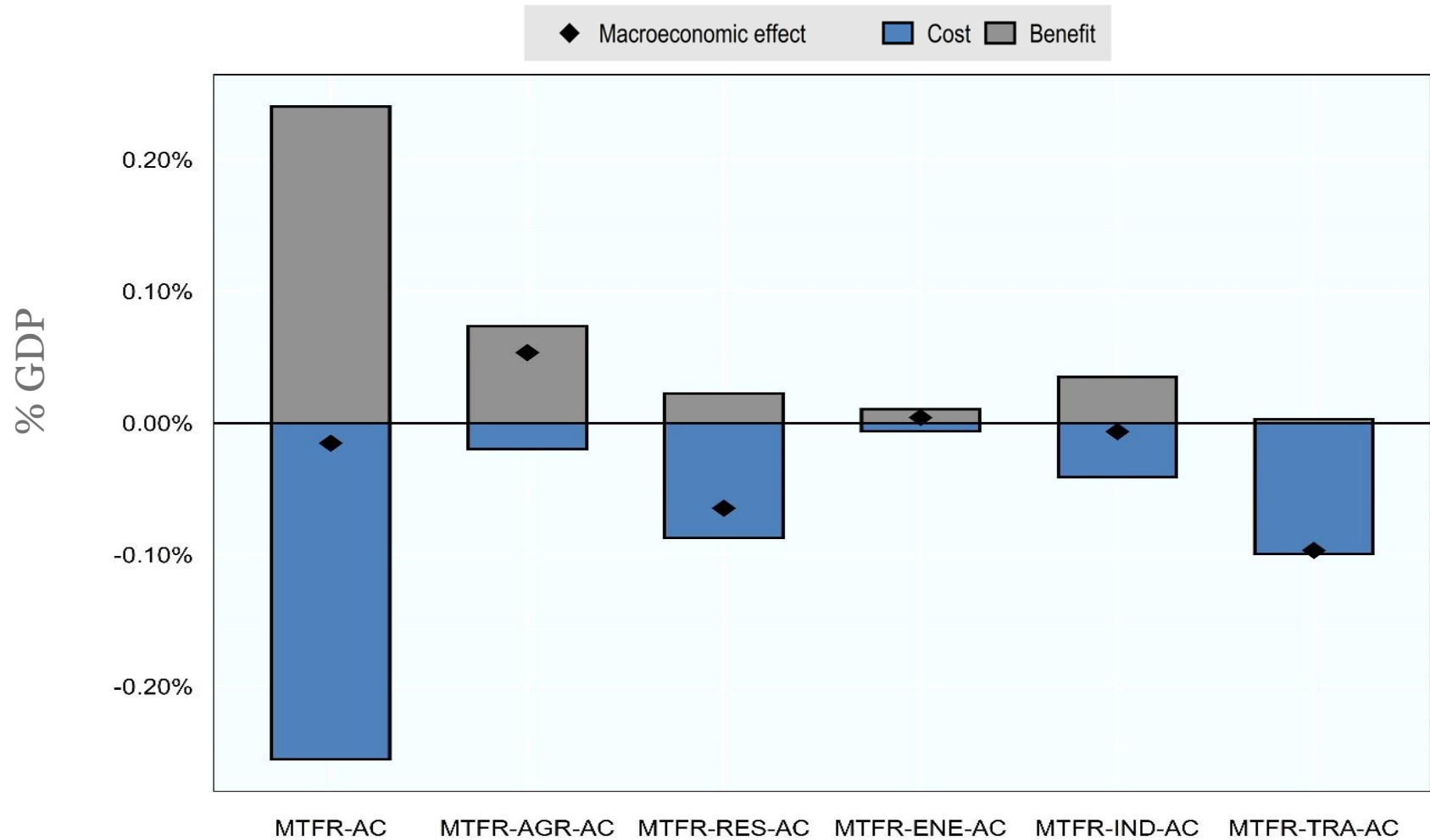
% change in GDP in MTR-AC w.r.t. CLE scenario





Economy-wide effects on GDP

% change in GDP in MTFR-AC w.r.t. CLE scenario



Source: OECD's ENV-Linkages model



Summary and next steps

- Concentrations reduction differ by sector and countries
 - E.G. USA in agriculture, Russia in industry, Norway in energy sector
- When considering the economic consequences of sectoral MTFR-AC scenario.
 - Some sectors lead to benefits, while others to costs.
- The “full” MTFR-AC scenario overall does not lead to significant effects on economic growth but there are large differences across sectors
- These results reinforce the idea that policy action should be tailored by country and target several sectors altogether

Thank you!

Contact:

Elisa.Lanzi@oecd.org

Daniel.Ostalevalriberas@oecd.org