# 4. Economic consequences of air pollution policies

This chapter presents the economic consequences of air pollution policies including both macroeconomic and welfare effects. The macroeconomic effects cover the benefits from reduced air pollution and the costs of the policy-induced deployment of best available techniques. These effects are presented in terms of GDP and with a breakdown of costs and benefits by region. The chapter also estimates the economic impacts of welfare improvements arising from improved health, specifically lower mortality and morbidity.

## 4.1. Macroeconomic effects

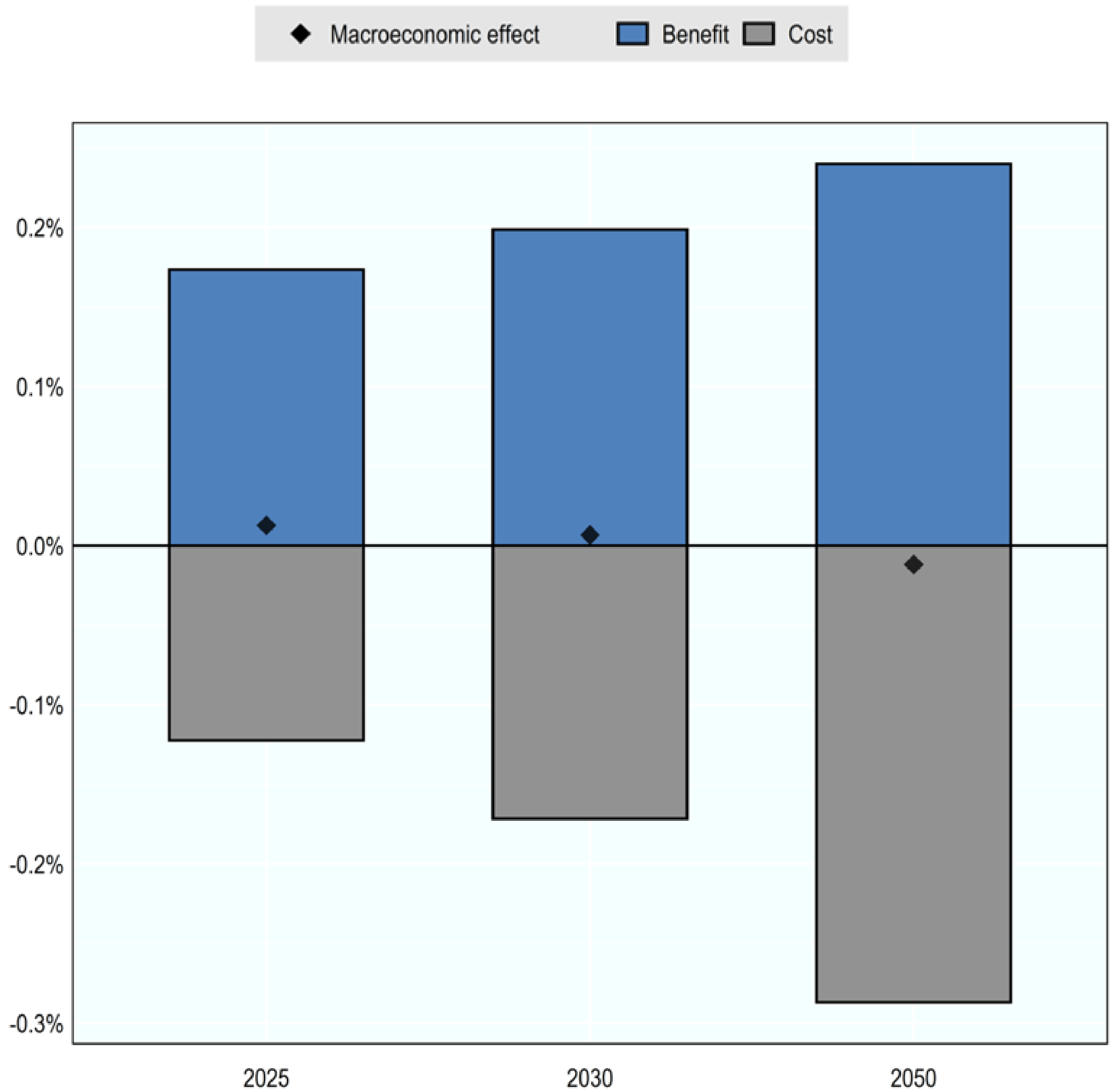
There are both macroeconomic costs and benefits associated with reducing air pollution. The biophysical impacts of air pollution can affect sectoral productivity and consumption choices, resulting in what are referred to as "market costs". In particular, air pollution leads to lower labour and agricultural productivity and higher health expenditures. When air quality improves, the market costs of air pollution decrease, with resulting macroeconomic benefits. However, improving air quality is not free of cost. The emission reductions considered in this report result from policies that stimulate investments in the best available techniques (BATs) to abate emissions. Investments in new technologies entail additional expenditures for firms in a variety of sectors, as well as for households (e.g. for acquiring and installing pollution filters), which result in macroeconomic costs. The market costs of air pollution and the investments in BATs also have indirect effects, which can be either negative or positive (e.g. lower disposable income due to expenditure on BATs versus higher output thanks to increased labour productivity). Together, these lead to a net "macroeconomic effect" calculated as an overall change in GDP, as described in Section 2.3.

The MTFR-AC scenario suggests that by 2025, Arctic Council countries' actions to improve air quality would have no significant impacts on economic growth. Overall, in these countries in the short term, the macroeconomic effect of the air pollution policies considered in the MTFR-AC scenario is minimal and even slightly positive (Figure 4.1). The economic benefits from the reduced market impacts of air pollution in Arctic Council countries in 2025 amount to 0.2% of their aggregate GDP, while the total cost of adopting BATs to reduce air pollution amounts to 0.1% of their aggregate GDP.

In the longer term, the economic benefits from improved air quality keep increasing. The costs of technological investments also increase at the same time, as newer – and thus more expensive – technological options are adopted. As firms and households in Arctic Council countries incur additional expenditures, several economic sectors are likely to lose out to competitors from countries that are not adopting any additional air pollution policies. As a result, the macroeconomic effects of reducing air pollution are projected to become slightly negative by 2050. Nevertheless, these effects are very small and overall the air pollution policies reflected in this modelling analysis can be considered GDP-neutral.

**Figure 4.1. Overall GDP impact of adopting BATs to reduce air pollution in Arctic Council countries**

% GDP in the MTFR-AC scenario




*Source*: OECD ENV-Linkages model.

StatLink https://stat.link/41wq5r

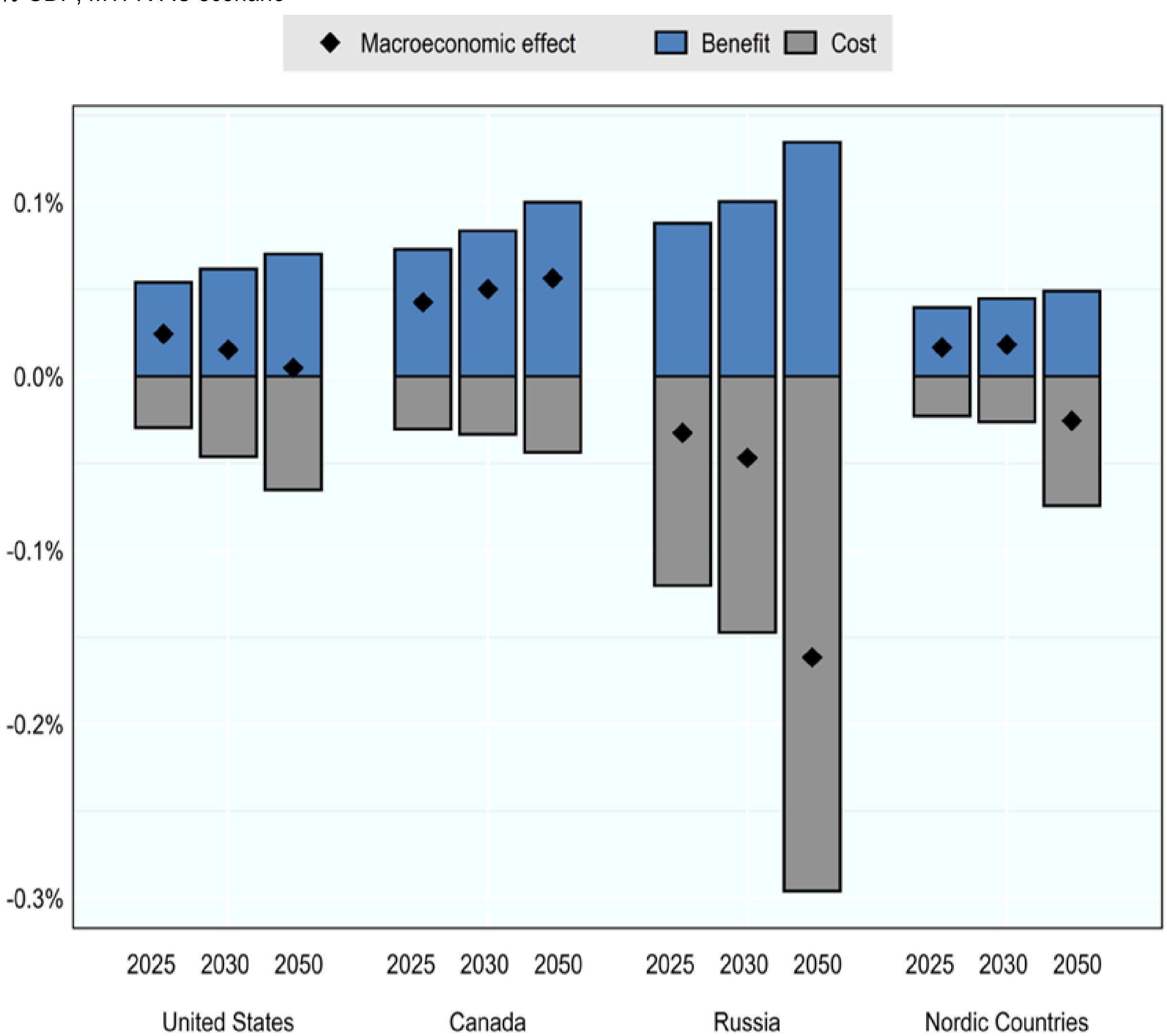
The aggregate results mask differences across countries (Figure 4.2). Whereas all Arctic Council countries benefit economically from reduced air pollution in the MTFR-AC scenario, these benefits are higher in the three largest countries – the United States, Canada, and Russia – than they are in the Nordic countries.[1] Nordic countries are projected to experience smaller changes in emissions between the CLE and MTFR-AC scenarios, as many of the technological improvements have already been implemented in the current legislation scenario.[2] In addition, differences in population density across and within countries further influence the results. In a country like Canada, the population density is drastically different between the north, which has very low population density, and the south, where the largest share of the population lives in urban areas with higher exposure to air pollution. Consequently, as more people benefit from decreased exposure to air pollution, the health and economic benefits are likely to be higher than in other countries.

The costs associated with the BATs deployment also differ by country. Investment costs are particularly high in Russia due to the lower existing technological standards and the less stringent current legislation – this makes it more costly to achieve more ambitious emission reductions. In addition, policy costs are projected to increase substantially in Russia and the Nordic countries by 2050 as their competitiveness declines as they implement stricter regulations than other European countries.

Overall, in the MTFR-AC scenario, the costs resulting from the policy-induced investments in BATs are generally compensated for by the economic benefits of reduced air pollution, making the implementation of such policies close to GDP-neutral in all Arctic Council countries. Specifically, in 2050 the net change in GDP is marginally positive in the United States and Canada, while Nordic countries incur a small GDP loss. In Russia, the net GDP effects of implementing air pollution policies are close to zero but marginally negative, amounting to less than 0.2% of GDP.

## Figure 4.2. Regional GDP impact of adopting BATs to reduce air pollution in Arctic Council countries

% GDP, MTFR-AC scenario




*Source*: OECD ENV-Linkages model.

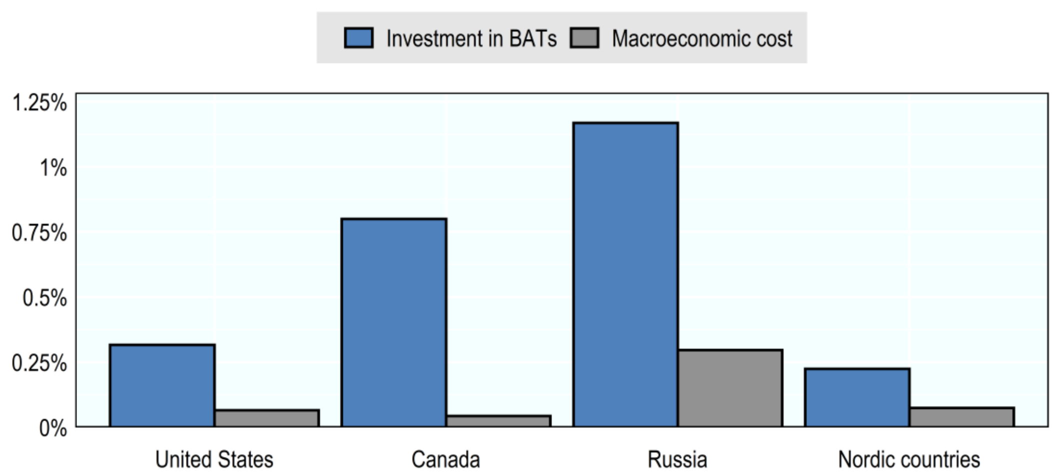
StatLink https://stat.link/p6d3qs

The size of the benefits, costs and net macroeconomic effects of air pollution policies in Arctic Council countries are small.[3] This is because both policy costs and benefits are the result of adjustments that take place within the economy, as the additional investments and expenditures shift production and trade flows. For example, losses in labour productivity will result in a sectoral loss of output, and if products from these sectors are substituted with imported products; this would imply a loss in competitiveness. On the other hand, investments made in specific sectors comprise an additional sale (e.g. pollution filters), and thus create value added in those sectors.

For these reasons, while the investments needed to deploy BATs in Arctic Council countries imply substantial financial outgoings, the net macroeconomic costs are much lower (Figure 4.3). At the aggregate level in Arctic Council countries, investments in BATs are projected to amount to USD 500 billion in 2050 – i.e. 0.4% of aggregate GDP.[4] Yet the net macroeconomic costs are approximately five times lower, amounting to around USD 100 billion and thus equivalent to 0.07% of the regional GDP. This observation also applies to individual countries that face high costs, such as Russia, where investments in BATs would amount to over 1% of GDP in 2050, but the macroeconomic costs are approximatively equivalent to 0.3% of GDP.

### Figure 4.3. Projected investment in BATs versus resulting macroeconomic costs by region

% GDP, MTFR-AC scenario, 2050




*Source*: OECD ENV-Linkages model.

StatLink https://stat.link/lckn42

## 4.2. Economic effects of welfare improvements

In addition to the macroeconomic effects presented above, the welfare improvements resulting from air pollution policies also have economic benefits. Welfare improvements result from a reduced risk of mortality and a lower incidence of illness. As outlined in Section 3.3 and Annex B, a variety of valuation techniques can be used to attribute an economic value to mortality and morbidity. The welfare cost of air pollution-related mortality is calculated using the value of a statistical life (VSL; see Box 2.3 in Chapter 2), relying on the OECD methodology to calculate country-specific VSL values (OECD, 2014[1]) as well as the OECD database "Mortality and welfare cost from exposure to environmental risks" (OECD, 2020[2]).

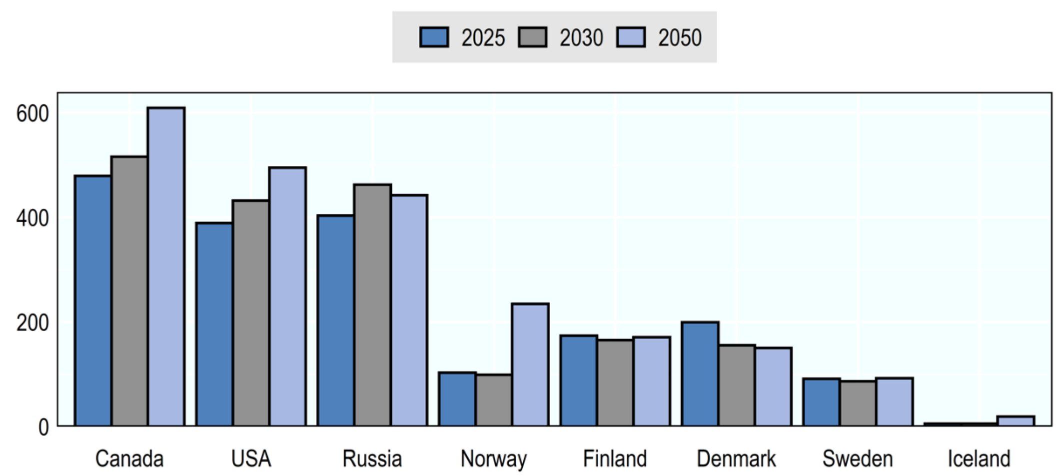
Morbidity impacts are calculated on the basis of previous work by the European Commission on the *Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package* (Holland, 2014[3]).[5]

In the current legislation scenario (CLE), air pollution-related mortality in Arctic Council countries is projected to result in high welfare costs, exceeding USD 750 billion per year by 2050. These costs are projected to occur despite the air quality improvements achieved. While air pollution-related deaths are projected to slightly decrease until 2050, the projected income increases over the period imply a higher VSL, which results in higher welfare costs.

The implementation of additional air pollution policies in Arctic Council countries (MTFR-AC scenario) is projected to result in a significant reduction in the number of deaths, thus translating into welfare improvements. These improvements are projected to already occur in all Arctic Council countries by 2025 and to increase over time in most countries. The countries benefitting the most from these welfare improvements – both in absolute and per capita terms – are Canada, Russia and the United States (Figure 4.4).[6] The main driver of the welfare improvements in these countries is the significant decrease in mortality in the MTFR-AC scenario. Altogether, at the aggregate level, additional air pollution policies are projected to lead to welfare improvements from reduced mortality equivalent to USD 210 billion in 2025, and to reach almost USD 280 billion by 2050.

## Figure 4.4. Projected welfare improvements from avoided mortality in Arctic Council countries

USD per capita, 2017 PPP exchange rates, difference between MTFR-AC and CLE scenarios



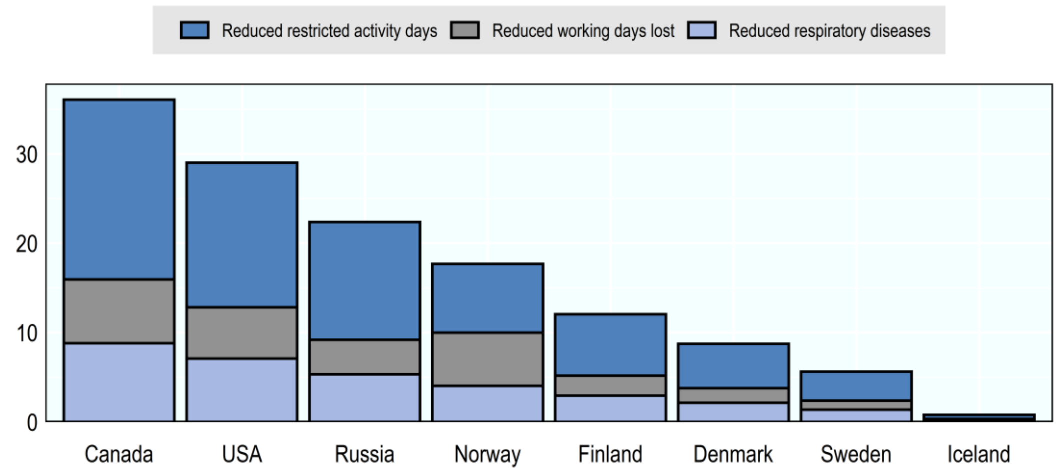

*Note:* While this report presents a single value estimate for the welfare cost associated with mortality, these values are uncertain. Uncertainty ranges are presented in (OECD, 2016[4]).
*Source*: (OECD, 2020[2]), *Air Quality and Health: Mortality and welfare cost from exposure to air pollution* (database); Holland (2014[3]), *Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package*; and ENV-Linkages' model projections.

StatLink https://stat.link/hordvw

In the MTFR-AC scenario, the reduced incidence of air pollution-related illnesses (morbidity) also generates additional welfare improvements. In all Arctic Council countries, the largest welfare improvements result from a reduced number of days on which normal activities are disrupted (i.e. a lower number of restricted activity days) and from the lower incidence of respiratory diseases, such as asthma and bronchitis (Figure 4.5). At the aggregate level in Arctic Council countries, the yearly welfare improvements associated with reduced morbidity impacts are estimated at USD 12 billion in 2025 and USD 16 billion in 2050. Canada is the country benefitting the most from reduced morbidity, followed by the United States and Russia.

### Figure 4.5. Projected welfare improvements from avoided illnesses in Arctic Council countries

USD per capita, 2017 PPP exchange rates, difference between MTFR-AC and CLE scenarios, 2050




*Note:* "Reduced respiratory diseases" includes reduced cases of chronic bronchitis in adults, reduced cases of bronchitis and asthma symptoms in children, and reduced hospital admissions.
*Source*: (OECD, 2020[2]), *Air Quality and Health: Mortality and welfare cost from exposure to air pollution* (database); Holland (2014[3]), *Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package*; and ENV-Linkages' model projections.

StatLink https://stat.link/0cut4l

While in macroeconomic terms the implementation of additional air pollution policies is likely to be GDP-neutral in the eight Arctic Council countries (Section 4.1), this analysis of welfare effects highlights the large additional benefits of implementing air pollution policies. In summary, this analysis supports the implementation of air pollution policies in Arctic Council countries on the basis of their environmental, health and welfare benefits, which can be achieved without significant impacts on long-run economic growth.

## Notes

[1] The results for the Nordic countries are partly driven by the modelling set up. In the ENV-Linkages model, Nordic countries are part of larger aggregate regions also containing European countries that are not part of the Arctic Council (see Table A.2 in Annex A) and that, in the MTFR-AC scenario, do not undertake any new policy action to reduce air pollution. Thus, the aggregate results for this region are likely to be smaller than they would be if the Nordic countries were analysed separately in ENV-Linkages.

[2] For this same reason, any comparison of changes in competitive position among sectors and countries has to be interpreted carefully, as the starting point is not necessarily the same.

[3] This result is similar to the outcome of the analysis of the costs and benefits of air pollution policies in the European Union, performed by the European Commission using the GEM-E3 model (Amann et al., 2017[6]).

[4] All monetary values in this chapter are expressed in 2017 USD PPP.

[5] For details see Annex B.

[6] Per capita costs are calculated using UN population projections (United Nations, 2017[5]).

## References

Amann, M. et al. (2017), *Costs, Benefits and Economic Impacts of the EU Clean Air Strategy and their Implications on Innovation and Competitiveness*, International Institute for Applied Systems Analysis (IIASA), Laxenburg. [6]

Holland, M. (2014), *Cost-benefit Analysis of Final Policy Scenarios for the EU Clean Air Package*, Corresponding to IIASA TSAP Report No. 11, International Institute for Applied Systems Analysis (IIASA), Laxenburg, http://ec.europa.eu/environment/air/pdf/TSAP%20CBA.pdf (accessed on 9 March 2021). [3]

OECD (2020), *Air quality and health: Mortality and welfare cost from exposure to air pollution (database)*, Statistics, OECD Environment, https://doi.org/10.1787/c14fb169-en (accessed on 3 November 2020). [2]

OECD (2016), *The Economic Consequences of Outdoor Air Pollution*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264257474-en. [4]

OECD (2014), *The Cost of Air Pollution: Health Impacts of Road Transport*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264210448-en. [1]

United Nations (2017), *World Population Ageing 2017*, (ST/ESA/SER.A/408), https://population.un.org/ProfilesOfAgeing2017/index.html (accessed on 8 December 2020). [5]


**From:**

# The Economic Benefits of Air Quality Improvements in Arctic Council Countries

**Access the complete publication at:**

https://doi.org/10.1787/9c46037d-en

**Please cite this chapter as:**

OECD (2021), "Economic consequences of air pollution policies", in *The Economic Benefits of Air Quality Improvements in Arctic Council Countries*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/de7ef16b-en