OECD Health Policy Studies

Decarbonising Health Systems Across OECD Countries

OECD Health Policy Studies

Decarbonising Health Systems Across OECD Countries

OECD
BETTER POLICIES FOR BETTER LIVES

Please cite this publication as:
OECD (2025), *Decarbonising Health Systems Across OECD Countries*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/5ac2b24b-en.

ISBN 978-92-64-66867-6 (print)
ISBN 978-92-64-89270-5 (PDF)
ISBN 978-92-64-54022-4 (HTML)

OECD Health Policy Studies
ISSN 2074-3181 (print)
ISSN 2074-319X (online)

Photo credits: Cover © Halfpoint/Shutterstock.com.

Corrigenda to OECD publications may be found at: https://www.oecd.org/en/publications/support/corrigenda.html.

Foreword

In recent years, growing evidence and urgency have drawn increasing attention to the close links between a changing climate and health, and to the risks that related events bring to population health and health systems infrastructure. Yet despite these documented impacts, this issue has until recently been given relatively little attention in the broader health policy agenda.

Health systems themselves represent an important source of greenhouse gas emissions across OECD countries. On average across OECD countries, more than 4% of greenhouse gas emissions were associated with countries' health sectors in 2018, a share in some cases higher than sectors that have received more attention for their roles in producing emissions, like aviation. At the same time, there is significant scope for health systems to take steps that lower their greenhouse gas emissions – so called, mitigation policies. While this applies to any health system, this is even more relevant for health systems across the OECD, where important levels of waste and overutilisation of healthcare represent a challenge not only in terms of costs, but also in terms of environmental impact.

This report looks at the state of decarbonisation efforts in the health sector across OECD countries, including the contribution of the health system to greenhouse gas emissions and what countries are doing to reduce the environmental impact of their health sectors by reducing the carbon footprint. It leverages datasets from both the OECD System of Health Accounts and OECD Inter-Country Input-Output Tables to provide novel measures of the emissions from health systems, including decomposing health sector emissions by scope and healthcare provider.

It further shows that countries that are committed to reducing emissions associated with their health systems have a range of policies they can follow to support decarbonisation efforts. For example, on average across OECD countries, hospitals represent an estimated 30% of emissions associated with the healthcare sector. A transformation of healthcare that places additional emphasis on primary care could lower emissions and also generate savings for health systems. Reducing inappropriate care and waste and the time spent in hospitals could reduce the emissions associated with hospital care by as much as 25% on average across OECD countries. Other relevant policy levers could include introducing environmental criteria in the procurement of medical products; and scaling up public health policies that create healthier populations and reduce the overall need for care services.

Acknowledgements

This report was produced and prepared by Elina Suzuki, Michael Mueller and Sophie Wang, with significant support from Cedric Doucet and Utku Aksaray. We are grateful to the many experts in OECD countries who contributed their time to providing information and commenting on the chapters in this report. We would also like to thank Francesca Colombo, Frederico Guanais, Mark Pearson and Stefano Scarpetta for their valuable feedback and guidance, as well as Lucy Hulett and Teba Criado Fiuza for their production and administrative support. We also extend our gratitude to the Ministry of Health of France, who provided financial support for the work undertaken in this report.

Table of contents

FIGURES

TABLES

Executive summary

On average across OECD countries, some 4.4% of overall greenhouse gas emissions were linked to the health sector in 2018. Yet until recently, relatively little attention has been given to health systems as a driver of greenhouse gas emissions. Looking closely at what sectors and processes within health systems contribute most to greenhouse gas emissions can help countries committed to take action to reduce their carbon footprint make more informed decisions.

Nearly nine in ten OECD countries report having taken action to decarbonise healthcare and the structures that deliver it. In most cases, the primary focus of these policies has been to harness opportunities that reflect broader governmental strategies towards decarbonisation, such as shifting towards renewable energies and developing lower-emission, environmentally friendly building standards.

At the same time, there remain significant opportunities for countries to reduce the environmental impact of their health systems by taking steps that are specific to the health sector, such as by addressing how, where and when care itself is delivered. In this report, total health sector emissions were estimated and further disaggregated based on three separate frameworks – looking at the type of provider, emission "scopes" and country of origin of emissions. These approaches provide different perspectives on the drivers of health sector emissions, by disaggregating the same overall footprint into different categories. Analysis developed for this report found that highly resource intensive care settings, notably hospitals, contribute disproportionately to the emissions of the health sector. On average across OECD countries, hospitals represent an estimated 30% of emissions associated with the healthcare sector. Shifting care away from intensive settings such as hospitals towards outpatient care, and strengthening primary care to help reduce avoidable and preventable care, are already key priorities of health systems that wish to deliver high quality outcomes while reducing costs.

Reducing inappropriate care and waste and the time spent in hospitals, for example, could contribute to reducing the emissions associated with hospital care by as much as a quarter on average across OECD countries. Prioritising policies that promote appropriate care and reduce low-value care and waste in the health system have not only health and financial benefits, but also environmental ones. Recognising the potential environmental benefits of low-value care further strengthens the arguments for efforts to promote appropriate care.

Increasingly, medicines and other healthcare inputs are being scrutinised at the product level for their potential environmental impact. In several cases, clinical products, including anaesthetic gases and respiratory inhalers, have lower-emission substitutes readily available and largely clinically indistinguishable, pointing to opportunities for clinicians and care organisations to make adjustments to their practices that contribute to decarbonisation efforts in the healthcare sector. However, the range of healthcare products that have been environmentally screened, let alone identified as having a lower environmental-impact substitute, remains comparatively small. Significant gaps in data availability – as well as challenges related to the comparability of data across methods and countries – mean that healthcare policymakers, clinicians and administrators are often faced with making decisions with limited high-quality data.

The report further underscores the extent to which the complex, global medical supply chains contribute to the greenhouse gas emissions of the health sector. Analysing overall emissions using the framework of scope (classifying company emissions based on direct and indirect emissions, including across companies' value chains) and country of origin, this report finds that the majority of health sector emissions can be traced back to health sector supply chains. Moreover, half of health sector emissions on average were found to originate from sources outside the country in which healthcare was delivered – meaning that even conscious efforts to reduce emissions in the delivery of care may be insufficient to successfully decarbonising health systems.

The enormous complexity and difficulty of rapidly shifting away from long-established and interconnected health supply chains was underscored during the recent COVID-19 pandemic. Yet the high environmental costs associated with existing supply chains in the health sector drives home the need to look not only at what products and services are used in healthcare, but at how these are produced and delivered. Many countries and health companies, including in the pharmaceutical and health technology sectors, have increasingly recognised the important role of supply chains in driving emissions and are taking steps to address them. Policy options include the development of health-specific green procurement policies and of multi-country guidance and standards, enabling companies to benefit from greater clarity in the market and economies of scale that can help to shift behaviour.

Promoting public health policies that improve population health by reducing risk factors for chronic diseases such as cancer and cardiovascular diseases offer the opportunity for policymakers to achieve wins across multiple domains. Many of the risk factors that contribute to the development of highly prevalent chronic diseases also contribute to significant greenhouse gas emissions, the use of cars in urban areas or large-scale factory farming of unhealthy foods. Scaling up policies that promote the adoption of healthier behaviours, such as reducing pollution exposure and increasing physical activity through the promotion of active transportation initiatives, can lead to both improved health outcomes and lower greenhouse gas emissions. Modelled OECD estimates suggest that shifting towards sustainably-produced plant-based diets could help to reduce greenhouse gas emissions by 304 $MtCO_2$ equivalent – similar to removing 72 million cars from the road for a year – and reduce premature deaths from cancer by 27 000 deaths a year across OECD countries.

Health systems are not immune to the consequences of emissions put into the air. Indeed, many are already contending with addressing growing health needs related to rising temperatures and extreme weather events. By presenting novel estimates and thorough policy analysis, this report demonstrates how many of the policies that can help to mitigate greenhouse gas emissions already align with many of the key objectives of health systems – to delivering high-quality care while making populations healthier.

1 Overview

Across OECD countries, health systems are increasingly recognising the environmental impact of the services they deliver. Many are taking steps to mitigate the emissions impact of the health sector. At the same time, health systems are under pressure to deliver high-quality care with limited resources, and many healthcare workers feel burned out by the demands of their work and its administrative burden. This chapter provides an overview of the key findings from the analysis presented in this report, demonstrating how many of the same policies that can help countries to deliver high-value care at lower costs can also help move them towards reducing the environmental impact of their health systems.

In Brief

- **A new OECD analysis indicates that greenhouse gas emissions linked to the health sector made up 4.4% of overall emissions on average in OECD countries in 2018**. This is higher than the share of emissions from industries that have received scrutiny for the impact of their emissions, such as the aviation industry. It underscores the important role health systems play not only in improving health outcomes but in helping to deliver services more efficiently and with greater environmental sustainability. New OECD estimates bring insights into the emissions impact of the health sector by providing an overview of the health sector's greenhouse gas emissions. Total health sector emissions were further disaggregated using three complementary frameworks, focussed on provider type, scope, and domestic versus international origin. Each analysis partitions the same emissions baseline into distinct categories, without changing the overall footprint.
- **While most carbon emission mitigation efforts in OECD health systems have so far focussed on choices not directly linked to health policy, nearly all responding OECD countries report that they are taking steps towards decarbonising their health sectors.** Reducing the carbon footprint of the health sector requires a combination of policies. Some are directly linked to choices about energy use or transportation**,** which are not directly linked to health policy but nonetheless require action on the part of policymakers in the health sector. Nearly 90% of countries report that initiatives are underway to reduce the emissions associated with energy consumption in the health sector. More than three-quarters of countries report that energy efficient building standards have been adopted which are applicable to the health sector. A number of countries, including Austria, France, the Netherlands and the United Kingdom, have reported proactive steps towards institutionalising policymaking that takes into account and aims to counteract the emissions impacts of their health sectors.
- **Health policy can have a direct impact on the carbon intensity of health systems. This report focusses on opportunities for transforming healthcare delivery with an awareness of its emissions and broader environmental impacts.** It identifies key levers through which health policy can contribute to reducing emissions of the health sector: transforming healthcare delivery to reduce emissions, including reducing low-value care; decarbonising medical supply chains; substituting high-emissions products for low-emissions alternatives; and strengthening public health policies that encourage healthier choices and healthier cities**.**
- **Emissions from supply chains represented nearly four-fifths (79%) of health sector emissions on average across OECD countries in 2018 (latest available year), which shows the importance of prioritising mitigation efforts in the area.** Twelve per cent of emissions relate to direct emissions coming from a health facility, with a further 9% of emissions associated with the electricity purchased by health facilities. These estimates are derived from new OECD analysis using data from environmentally-extended OECD Inter-Country Input-Output tables and System of Health Accounts data. Initiatives to decarbonise supply chains that encourage the transformation of production and products and introduce green procurement standards for healthcare products and services are emerging in OECD countries.
- **A high share of health systems emissions derived from supply chains and their high level of global integration means that half of emissions associated with the health sector are estimated to originate outside the country where the healthcare is consumed.** Some examples of initiatives to develop green procurement guidelines and rules for the health sector

have been implemented, such as requirements to include environmental considerations in all procurement for specialist health services and hospitals in Norway. However, with few exceptions, such as a collaboration across Denmark, Iceland, Norway and Sweden to develop joint criteria for sustainable packaging for medical products, green procurement guidelines for the health sector remain in their infancy and have not been scaled up.

- **When allocating emissions across providers, the new OECD analysis suggests that hospitals account for 30% of emissions on average across countries.** Encouraging more carbon neutral pathways of care and lower dependence on hospital activities can help health systems to deliver lower-emissions care. Many of the most resource intensive parts of the health sector are also the most emissions intensive. New estimates suggest that reducing avoidable admissions and the average length of stay in hospital could help health systems to reduce their hospital-based emissions by a quarter across OECD countries. Initiatives such as Denmark's strategy for sustainable hospitals, launched across all five regions in 2024, are important steps towards developing joint objectives and actions to underpin a shift towards environmental sustainability throughout healthcare delivery.
- An important percentage of health systems emissions could be modified by **transforming healthcare delivery to reduce emissions in the health system.** This includes **promoting policies that reduce emissions through reducing low-value care.** New OECD calculations find that healthcare delivery and administration-related emissions could be reduced by an equivalent of taking nearly 19 million gasoline-powered cars off the road for a year by reducing the average length of stay in hospital, reducing avoidable hospital admissions, lowering administrative costs to healthcare, and reducing unnecessary tests and imaging. Furthermore, policies that help to reduce the delivery of low-value care help countries to both reduce the costs associated with healthcare while also reducing the emissions impact of the health system, all while benefiting health outcomes for patients.
- **Examples are emerging of ways for health systems to substitute high-emissions products for low-emissions alternatives with little clinical or financial impact.** While the evidence base around the emissions and other environmental impacts of health products and services is still nascent, there are possibilities to move away from widely used high-emitting products for lower-impact alternatives, such as with the use of specific anaesthetic gases and inhalers. Generally, policy action in this regard has lagged behind, but rapid changes have been seen where concerted efforts have been made to reduce the use of high-emitting products. This is the case of in the United Kingdom (NHS England), shifting away from high-emitting anaesthetic gas (desflurane) for lower-emissions alternatives.
- **Public health policies that reduce risk factors for non-communicable diseases also have a strong impact on greenhouse gas emissions**. A range of policy options are available to promote healthier and more sustainable choices across food, transportation, and household energy. A fundamental shift towards healthy diets that are sustainably produced, consisting of mainly plant-based foods with little to no red and processed meats, may reduce GHG emissions by 304 MtCO2eq, equivalent to emissions of 72 million cars over one year, and 27 000 premature deaths due to cancer annually in OECD countries, according to modelled estimates.
- A number of OECD countries have begun integrating climate-related considerations into key public health domains. In Belgium, for example, environmental sustainability is considered alongside health impacts in the development of dietary guidelines, while in countries including Denmark and the Netherlands, the development of policies and infrastructure to support active

mobility options such as cycling superhighways and network help to both reduce car travel and improve health outcomes.

- **Policymakers continue to lack sufficient data on the emissions impacts of healthcare products and services, limiting their ability to make informed decisions and to monitor the impacts of mitigation actions.** National approaches to measuring the carbon footprint have used different methodologies, hindering comparability, while international comparisons have frequently remained at the sectoral level. This has complicated the comparability across countries and challenged the ability to identify areas for policy action. More action to develop more frequent, harmonised and detailed approaches to measuring the impacts of the health system is needed.

Transforming healthcare delivery to reduce emissions in the health system

Healthcare accounted for 4.4% of greenhouse gas emissions on average across OECD countries in 2018

Over recent years, as the impacts of a changing climate on societies – and on health outcomes – have become increasingly apparent, many health systems have begun to reckon with the impact that climate change will have on the care they provide and the patients they serve. Much of this attention has focussed on the impacts of climate change on health outcomes and on the resilience of health systems itself. But there is also a growing awareness among policymakers, healthcare workers, administrators and others, that health systems themselves also have a role to play in reducing their carbon footprint.

Box 1.1. Focus of the analysis: Decarbonisation – rather than broader environmental sustainability

Anthropogenic environmental pollutants encompass a wide array, ranging from greenhouse gases (i.e. carbon dioxide, methane, nitrous oxide, fluorinated gases), air pollutants (i.e. particulate matter, ozone, carbon monoxide, lead, sulphur dioxide, nitrogen dioxide), heavy metals, pesticides (i.e. organochlorine compounds), plastic additives (i.e. phthalates, and bisphenol A) – all of which have varying levels of negative health impacts depending on the level, duration, and mode of exposure.

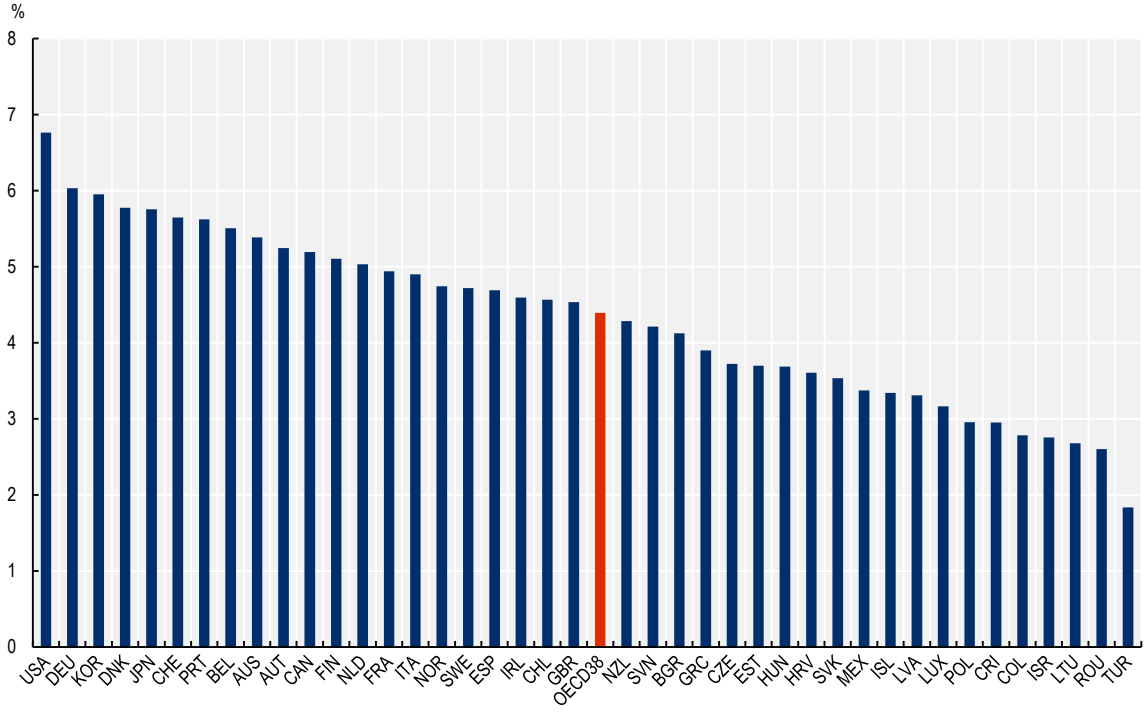
Greenhouse gas emissions, predominately generated by human activities, serve as the primary driver of climate change, resulting in far-reaching consequences on a global scale. Despite ongoing efforts to curb emissions, global greenhouse gas emissions have surged exponentially since 1750, with a 1.5% increase observed in 2022 (Liu et al., 2023[1]). The urgent need to address greenhouse gas emissions arises from their pivotal role in exacerbating climate change and its increasingly severe and interconnected repercussions including extreme weather events, disruptions to food production, population displacements and migration.

Like all other economic sectors, the health sector plays a role in contributing to climate change via its associated greenhouse gas emissions. While the delivery of healthcare produces broader environmental impacts beyond the generation of greenhouse gas emissions, the focus of this analysis is on the impacts of the health sector on greenhouse gas emissions and the policies that have been adopted to help mitigate this contribution, in line with the recent focus on climate mitigation policies in many OECD countries.

Despite growing attention to the issue, few international comparisons exist that look at both the emissions associated with health systems overall, as well as the emissions impacts of various sub-domains of the health sector. While governments and researchers have begun to develop estimates of the health system's contribution to greenhouse gas emissions across many OECD countries, the availability of approaches that measure the emissions of health systems across multiple countries has been more restricted, and limited either to whole-of-sector analyses or one-off estimates that do not allow for regular updating.

According to new analysis using data from the OECD's environmentally extended Inter-Country Input-Output database and data from the System of Health Accounts, 4.4% of overall greenhouse gas emissions were associated with activities in the health sector in 2018 on average across OECD countries (Figure 1.1). A brief description of the methodology used to calculate the emissions estimates described in this chapter can be found in Box 1.2. Across the OECD overall, emissions associated with the health sector amounted to nearly 963 million tonnes $CO2_e$ in 2018, representing a total level of emissions higher than that of Germany – the third-largest greenhouse gas emitter within the OECD.

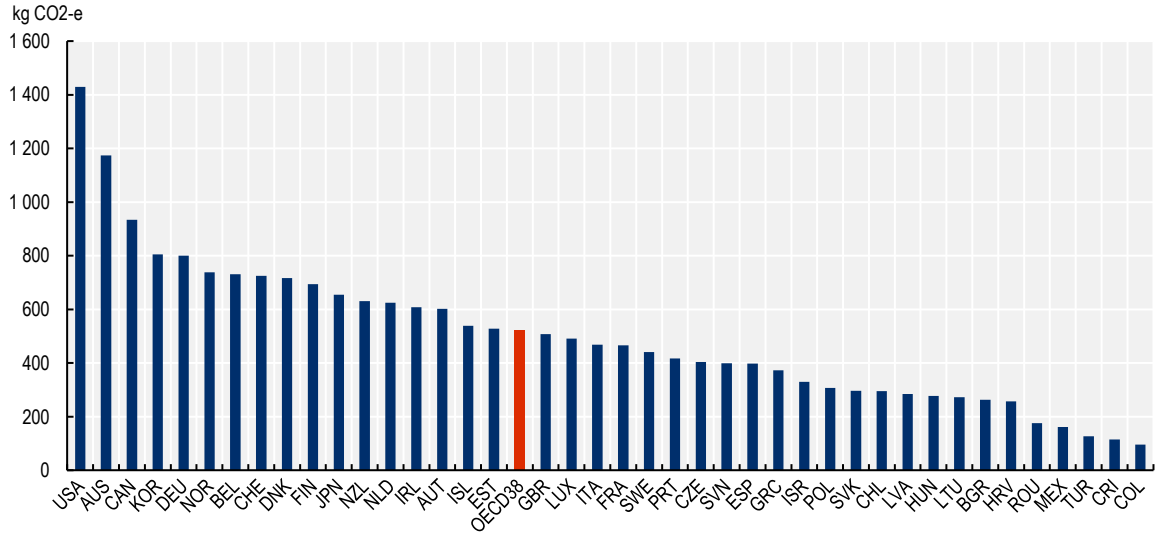
Figure 1.1. Estimated greenhouse gas emissions related to healthcare (% of all emissions), 2018



Note: Emissions refer to demand-based emissions.
Source: OECD analysis based on environmental extension of OECD Inter-Country Input-Output database and System of Health Accounts data.

Emissions associated with healthcare varied on a per-capita basis even more significantly than as a share of the overall emissions of the country, reflecting among other factors differences in spending, healthcare utilisation, emission intensity in production and the structure of healthcare supply chains. On average across OECD countries, 523 kg of CO2-equivalent emissions per capita were associated with healthcare demand in 2018 (Figure 1.2).

Figure 1.2. Per-capita health sector emissions vary nearly 15-fold across OECD countries



Source: OECD analysis based on environmental extension of OECD Inter-Country Input-Output database and System of Health Accounts data.

Box 1.2. Developing new estimates of the health sector's contribution to global emissions

Two broad approaches have typically been adopted to measure greenhouse gas emissions, including for health systems. *Top-down* approaches to emissions accounting look at the contributions of a sector, such as healthcare, to greenhouse gas emissions at a macro level, and build on environmental extensions of multi-regional economic input-output tables to link the economic transactions that occur within the health sector with the environmental (emissions) impacts of these transactions. *Bottom-up* approaches use a life-cycle approach to account for emissions associated with the entire production process, use, and disposal of a specific product.

In the health sector, emissions have been calculated using both approaches, together with a hybrid approach that supplements top-down accounting methods with limited bottom-up data (for example, combining a top-down input-output-based model with the emissions associated with patient transportation).

While a growing number of countries have developed national estimates of their health systems emissions, the methodology underpinning these estimates have varied. Initiatives to develop internationally comparable estimates of health sector emissions have been more limited. Where these have been developed, they have been largely focussed on health sector emissions overall and have not looked at the emissions associated with different sub-sectors within health systems.

The OECD has undertaken new work to develop internationally comparable estimates of the greenhouse gas emissions of the health sector and its various domains. This analysis is based on an environmental extension of the OECD's Inter-Country Input-Output (ICIO) database, which includes estimates of carbon dioxide, as well as CO2-equivalents for methane, nitrous oxide, and fluorinated gases (Yamano, Lioussis and Cimper, 2024[2]), and granular health spending data from OECD's health spending data collection based on the System of Health Accounts (OECD/Eurostat/WHO, 2017[3]) Using annually updated environmentally extended inter-country input-output tables from the OECD, this new approach offers an opportunity for countries to understand the source of their greenhouse gas

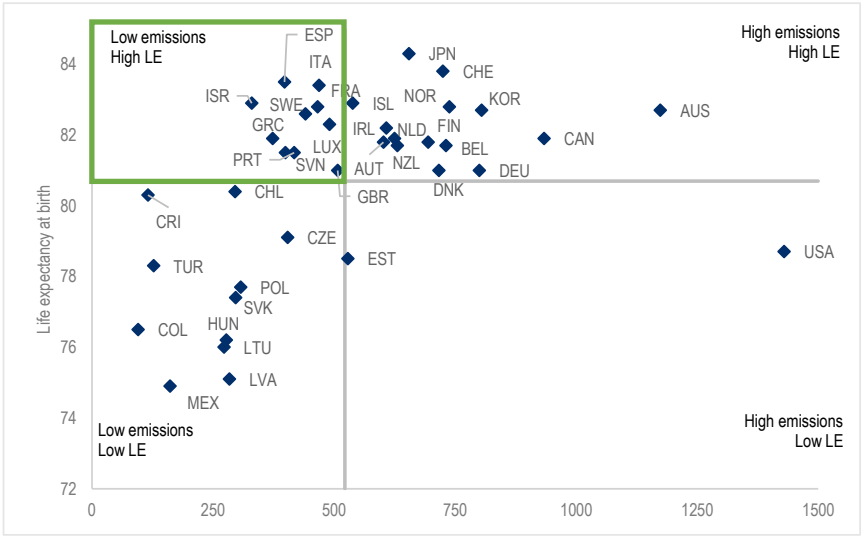
emissions across the health sector and within specific areas of care and delivery, using a method that is comparable and allows for tracking progress over time.

Results presented in this report are based broadly on a set of parallel analyses of health sector emissions. These three analytical approaches should be seen as complementary but are not additive; each is a distinct analysis of how the totality of health sector emissions can be allocated across the sub-categories within each.

- Health sector emissions were estimated at the sub-sectoral level by categorising health spending from the health provider perspective to categorise consumption-based emissions by hospitals, nursing homes, outpatient care, medical goods (including pharmaceuticals), investments, and other (other healthcare providers, including public health providers, administrative agencies, ancillary service providers such as laboratories or patient transportation, providers of informal LTC at home (in care of care allowance) and non-resident health providers). Care should be taken in the interpretation of sub-sectoral breakdowns, as certain methodological assumptions (notably around the identical input structure across hospital and outpatient care and identical emissions intensity) are unlikely to reflect the reality. The basis of the sub-sectoral analysis by health provider further means the level of spending by provider play an outsized role in driving some of the differences between countries. Nonetheless, while there is scope for further refinement of the model, the initial results provide a useful starting point for countries to understand broadly where there is room for action.
- Emissions were further categorised according to the "scope" classification defined by the Greenhouse Gas Protocol for emissions measurement within companies. In this categorisation, emissions are allocated based on whether they represent direct GHG emissions (Scope 1, e.g. sources owned or otherwise controlled by the company); whether they represent indirect GHG emissions linked to purchased electricity and consumed by the company (Scope 2); and indirect GHG emissions that are linked to the production and transport of goods and services (Scope 3, e.g. the supply chain).
- Lastly, the proportion of emissions that occurred domestically versus in other countries was further investigated. The share of domestic emissions is shaped primarily by two factors: the reliance of the country's health sector on foreign healthcare products and inputs, and the relative energy intensity of its domestic energy sector.

Associating measures of health systems performance with health sector emissions highlights countries that have delivered relatively good health outcomes at lower emissions. For example, ten countries have achieved higher-than-average life expectancy at lower-than-average health sector emissions intensity (Figure 1.3). While the model's reliance on health spending means some of these differences may be driven by relative spending levels, this does not explain all of the variation seen across countries. The quadrants represented in Figure 1.3 (and in subsequent Figure 1.4) are set based on the OECD averages of the two variables being compared.

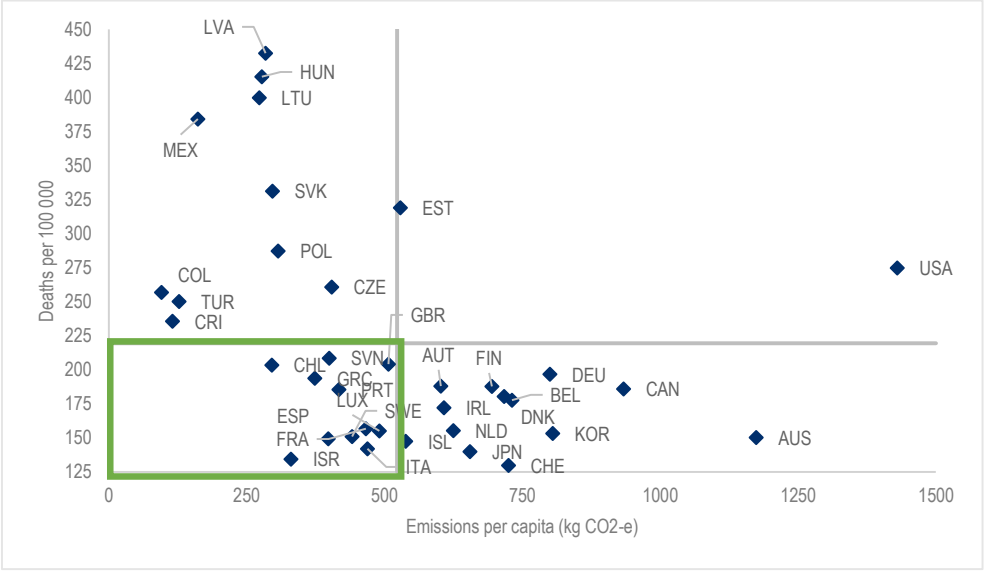
Figure 1.3. Ten countries achieve high life expectancies with lower emissions per capita cost relative to the OECD average



Note: Data for health sector emissions are expressed in per-capita terms and normalised to the OECD average. Data on life expectancy at birth is normalised to the OECD average. Quadrants are centred around the OECD average of the two variables.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Data on avoidable mortality similarly highlights that 11 countries have lower-than average rates of avoidable mortality delivered at a per-capita emissions intensity lower than the OECD average (Figure 1.4).

Figure 1.4. Eleven OECD countries have lower avoidable mortality and low health sector emissions relative to the OECD average



Note: Data for health sector emissions are expressed in per-capita terms and normalised to the OECD average. Data on avoidable mortality is normalised to the OECD average. Quadrants are centred around the OECD average of the two variables.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Policies to reduce health sector emissions are well aligned with efforts to reduce low-value care

Reducing low-value care in hospitals could reduce hospital emissions by 25%

There is an important role that healthcare delivery and practice can play in reducing the greenhouse gas emissions associated with the health sector. There is particular alignment between policies to reduce low-value care – a key policy objective across many OECD countries – and policies that can support the reduction of greenhouse gas emissions within the health sector. Previous work by the OECD has found that as much as one-fifth of expenditures on healthcare across OECD countries may be wasted, suggesting that there is considerable scope to reduce ineffective and inappropriate care that drives up financial and emissions costs, while maintaining a neutral or even delivering a positive impact on health outcomes (OECD, 2017[4]).

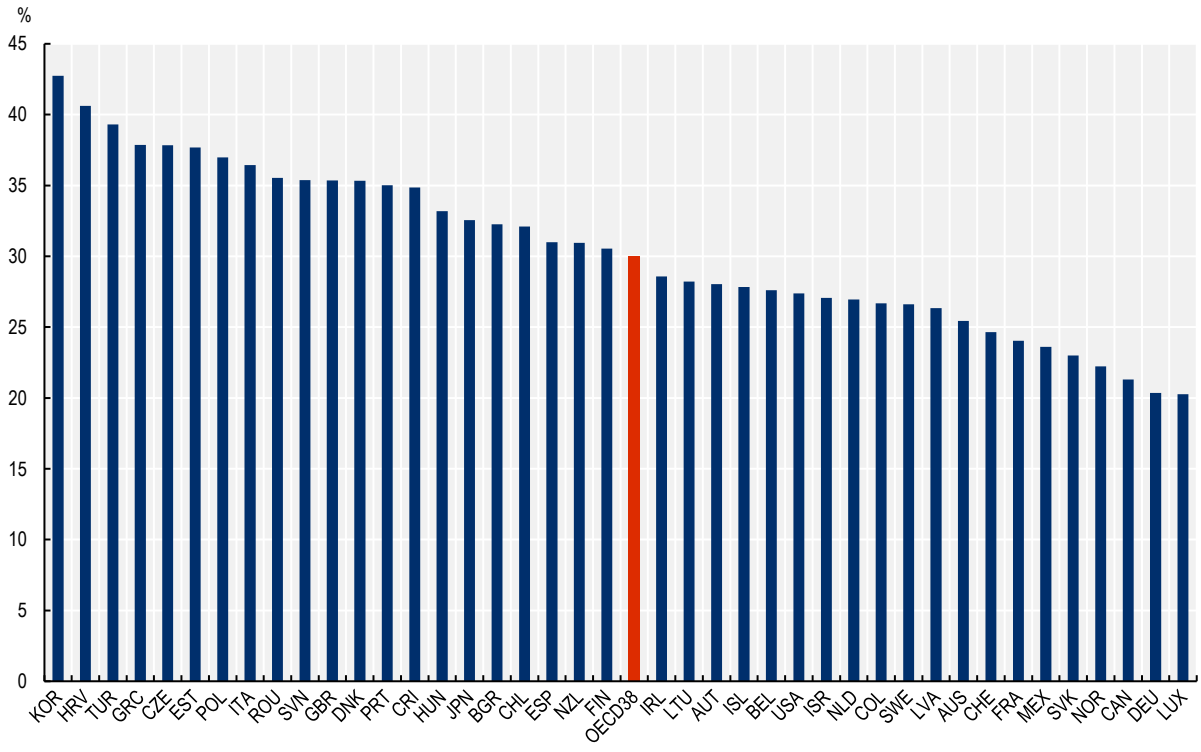
Moving care that can be delivered effectively out of hospitals into the community, both by scaling up outpatient care and by reducing unnecessary hospital procedures, has been a focus of policies to reduce low-value care for decades. Yet, too much care is still delivered in locations that are more complex and more costly than necessary, with a large body of evidence demonstrating that primary healthcare can help to reduce both hospitalisations and spending on healthcare (OECD, 2020[5]). Patients who visit primary care practitioners regularly have been reported to have both improved health outcomes and lower healthcare costs, while better continuity of care and care management for patients living with chronic conditions, including hypertension and diabetes, have been associated with better health outcomes (Chan et al., 2021[6]; Lee et al., 2021[7]).

Analysing the healthcare emissions associated with different locations of care[1] demonstrates that hospitals continue to be the most important driver of health sector emissions by place of location or healthcare domain. Across OECD countries on average, about 30% of health sector emissions were associated with hospital care, much higher than the emissions impact of the outpatient or long-term care sectors.

With an important plurality of health sector emissions taking place in hospitals, reducing care based in hospitals and scaling up lower emissions outpatient care has the potential to both improve health outcomes and reduce costs and to further mitigate the impact of the health sector on the environment. Bringing down the overhead associated with healthcare administration, reducing low-value care in hospitals and pharmaceutical prescribing, scaling up existing low-emissions alternatives in outpatient care and reducing low-value excess services including laboratory tests and medical imaging would play an important part in improving the carbon footprint of the health sector, all while promoting the kinds of policies and strategies that countries have already identified as adding important value.

Reducing low-value care in hospitals would have an impact on mitigating the emissions associated with hospital care. On average across OECD countries and using a top-down approach, hospitals produced an average of nearly 200 kg of CO2-e emissions per patient bed day in 2018, an intensity much higher than the emissions associated with an outpatient care visit. In addition to decreasing hospital costs, long hospital stays are often an indication of suboptimal care co-ordination, with patients sometimes staying in hospitals longer than clinically needed because follow-up care, including long-term care beds or outpatient rehabilitation services, are not available or not efficiently arranged. While policies to reduce the length of stay in hospitals must be implemented carefully to ensure patients are not discharged when they are not clinically ready – which could result in complications or readmissions – the variation in average lengths of stay across OECD countries suggests there is some scope to bring down the amount of time many patients stay in hospital.

Figure 1.5. Hospitals represent the largest share of healthcare emissions among places of care



Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Reducing avoidable admissions for preventable long-term, chronic conditions would also offer important cost and emissions savings to health systems. Chronic conditions including asthma, congestive heart failure and chronic obstructive pulmonary disease are preventable conditions for which good, primary- and outpatient-care based treatment pathways have been developed. As such, where hospitalisations occur, they are often seen to have been avoidable had better outpatient-based care management been practiced. While extremely low levels of hospital admissions for avoidable conditions may be a sign that access to hospitals is limited – rather than that countries are practicing effective care management in primary care – lower levels of avoidable admissions are generally considered to be a good marker of care quality in health systems. In recent years, countries have already begun to see reductions in avoidable hospital admissions. Between 2011 and 2019, admission rates for asthma and COPD fell by 13% across OECD countries on average and by 6% for congestive heart failure (OECD, 2023[8]).

Reducing the length of an average hospital stay and the rate of avoidable hospital admissions to the OECD average for countries currently above the OECD mean would make an important contribution towards reducing hospital-based health sector emissions. On average, hospital-based emissions across OECD countries could decline by as much as a quarter under a scenario where average lengths of stay were reduced to the level of the best performing quartile of countries, while avoidable admissions were reduced to zero.

Moving care out of hospitals and into the community and improving care management for chronic conditions associated with avoidable hospital admissions serves as one example of how pursuing policies that reduce low value could also help to achieve important environmental benefits. OECD countries currently experience significant differences in hospitalisation rates for avoidable admissions, including hospitalisations related to chronic conditions such as diabetes and asthma (OECD, 2023[8]).

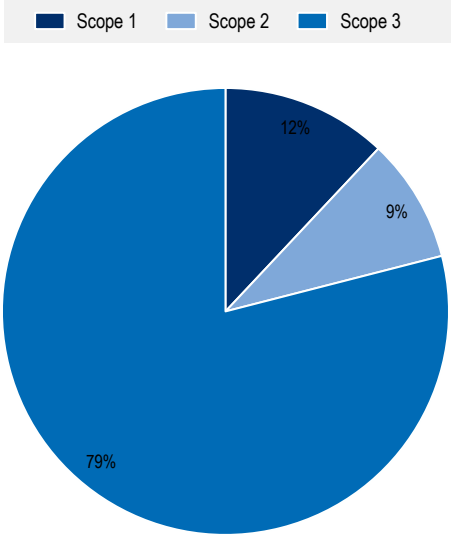
Many of the policies that would help to meaningfully reduce greenhouse gas emissions are the very same policies that health systems should be prioritising anyway, to achieve other core system objectives, including better health outcomes, delivered more efficiently. Policies that help to reduce low-value care, such as reducing unnecessary digital imaging and laboratory tests, or moving avoidable care out of hospitals and into the community can help to both reduce unnecessary healthcare consumption and lower the emissions associated with the health sector.

Reducing emissions from pharmaceuticals and medical inputs: Addressing supply chains

OECD countries play a central role in both the consumption and production of pharmaceuticals and medical goods globally. Nine of the ten largest exporters and importers of pharmaceuticals and other medical goods are OECD countries. The extreme complexity and global nature of pharmaceutical and other medical goods production means that their supply chains make up a large share of overall health sector emissions. The OECD model not only allows to identify several sub-sectors that are responsible for the overall greenhouse gas emissions in the health sector but can trace back emissions to their industry of origin. This type of analysis is needed when attributing health sector emissions across the "scope" classification as defined by the Greenhouse Gas Protocol.[2] Applying this concept on average across OECD countries, emissions not directly generated or consumed by a producer but rather related to its value chain (so-called scope 3 emissions) made up more than three-quarters of overall emissions in 2018 (Figure 1.6).

Figure 1.6. More than three-quarters of all GHG in health are emitted in the supply chain

All GHG emissions, as allocated based on the Scope concept by the GHGP, 2018, OECD

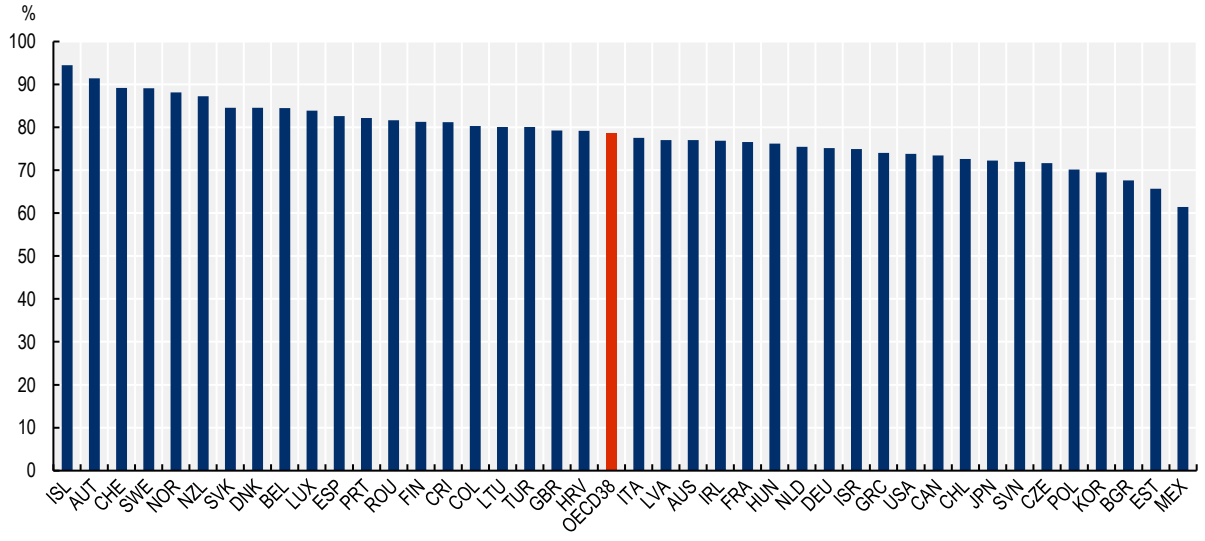


Note: Data refers to the OECD mean.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Pharmaceutical supply chains are extremely complex. The production process, including both sourcing and supplying raw materials, primary manufacturing (producing the active primary ingredient), secondary manufacturing (finalising the product) and distribution, can involve multiple companies and stakeholders

spread out across many locations and countries for the production of a single product (OECD, 2023[9]). In contrast, modelled estimates from the OECD suggest that just about 12% of all GHG emissions associated with final healthcare demand were related to direct emissions that occurred at domestic health facilities[3] (e.g. fuel combustion to generate heat in hospitals), while a further 9% related to indirect emissions from domestically purchased electricity by health providers.

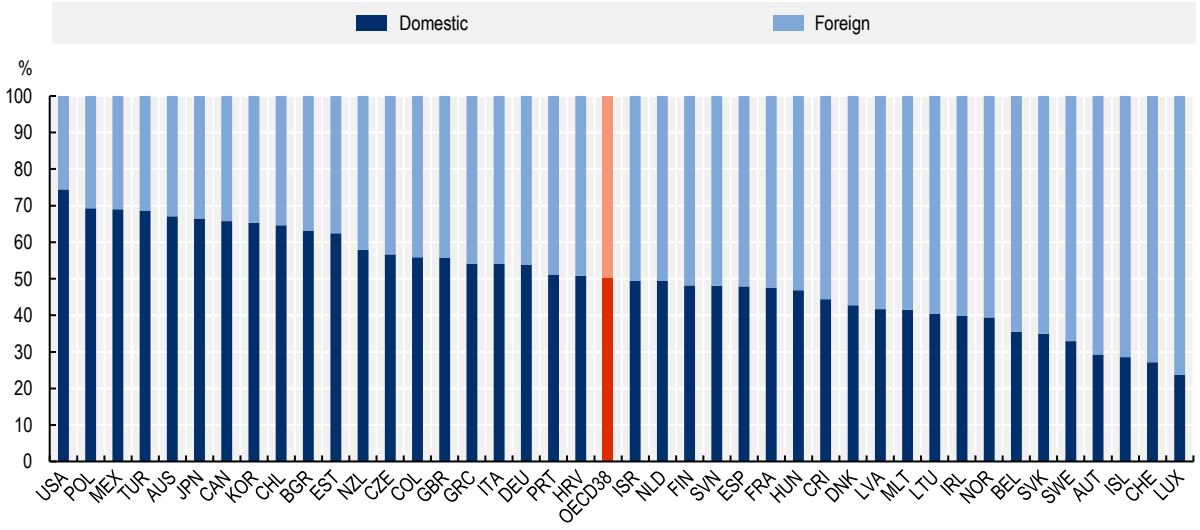
Figure 1.7. Supply chains represent nearly four-fifths of health sector emissions



Note: Data refers to Scope 3 emissions according to the classification of the Greenhouse Gas (GHG) Protocol and refers to indirect emissions not related to electricity purchased directly by healthcare facilities.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Across OECD countries on average, more than half of countries' emissions associated with healthcare demand by its residents were generated abroad. Countries with a strong reliance on foreign inputs but a relatively low emissions intensity in domestic production, such as Austria, Iceland, Luxembourg and Switzerland, demonstrate a lower domestic share of emissions. In contrast, countries with a lower reliance on foreign inputs and a higher emissions intensity in domestic production, such as Mexico, Poland and the United States, saw a higher share of emissions generated domestically. the global and interdependent dynamics of the health sector.

Figure 1.8. Half of health sector emissions originate from health sector supply chains abroad



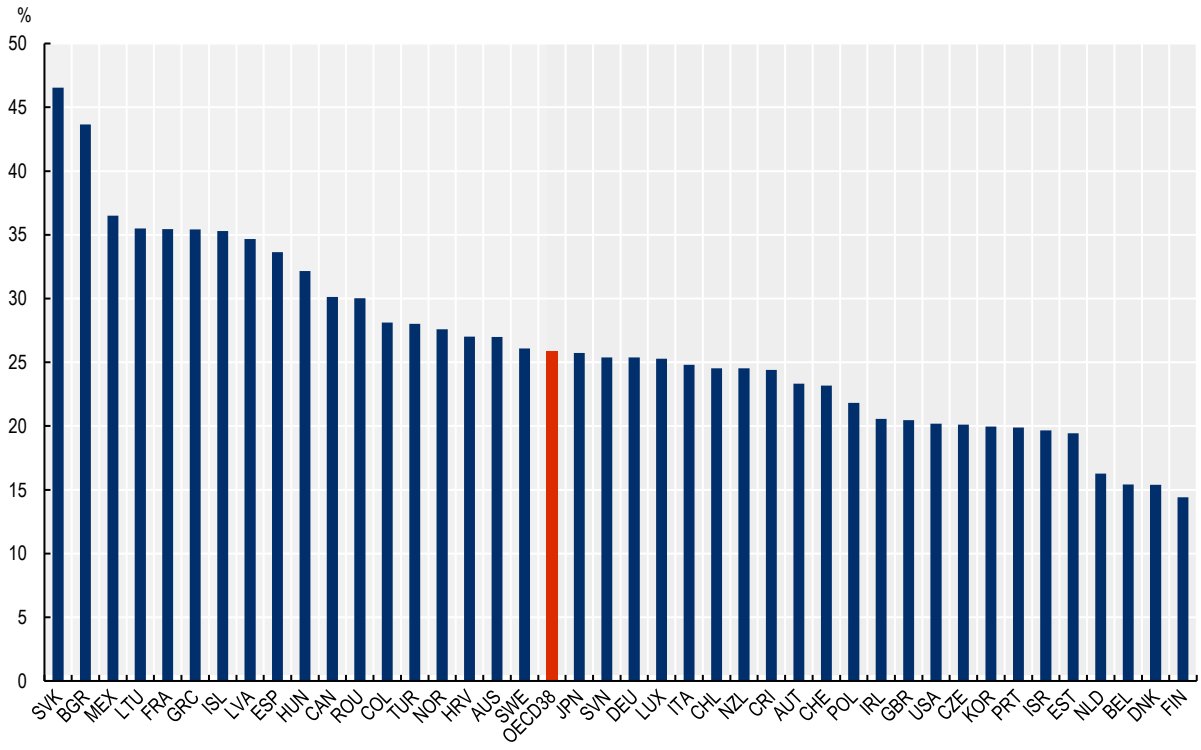
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

The large share of health sector emissions stemming from health sector supply chains and particularly from sources abroad, as in the production of many pharmaceutical products imported from abroad, underscores the reality that policies that facilitate changes in emissions in healthcare delivery domestically can have only a limited impact on emissions in the health sector overall. To deliver reductions in health sector greenhouse gas emissions, practices that promote the reduction of emissions within its supply chains more broadly are likely to deliver a meaningful impact.

Pharmaceuticals and medical goods represent 26% of health sector emissions; substituting away from some high-emission products is already possible

On average across OECD countries, the consumption of medical goods and pharmaceuticals was associated with a quarter of all health sector greenhouse gas emissions in 2018, the second largest cause of GHG emissions in health after hospitals (Figure 1.9).

Figure 1.9. The consumption of medical goods and pharmaceuticals represents one-quarter of all health sector emissions



Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

There is a growing body of evidence around cases where pharmaceutical and medical goods consumption can be substituted or reduced without negative clinical impact, but with notable emissions benefits. For example, commonly used anaesthetic gases, including notably desflurane, sevoflurane and isoflurane, differ greatly in their greenhouse gas emissions and warming potential. In most clinical cases desflurane can be substituted with little clinical impact for sevoflurane, which has been estimated to have a greenhouse gas impact just 5% of that of desflurane (Sherman et al., 2012[10]).

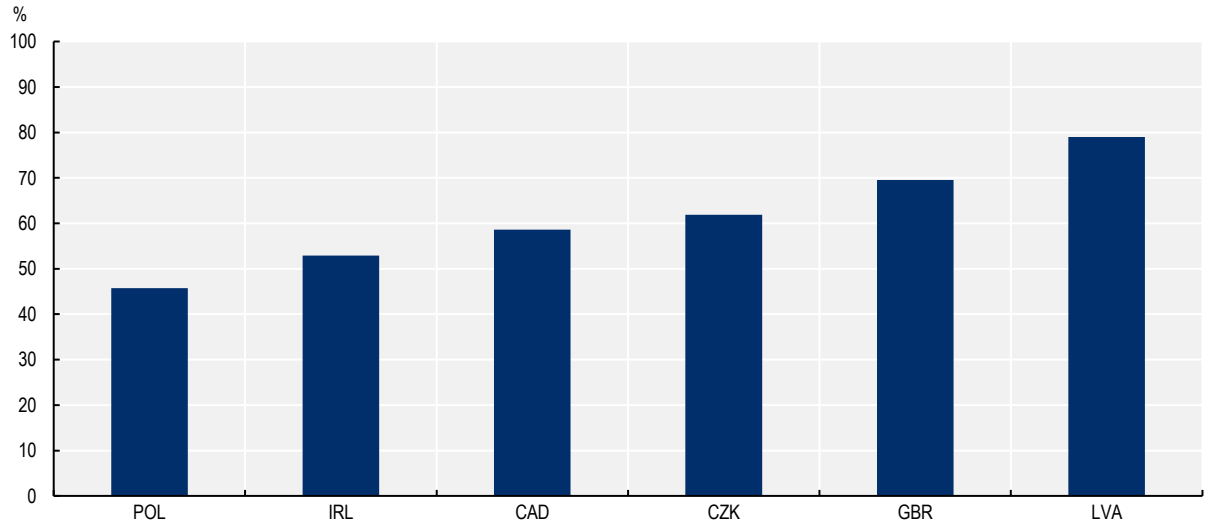
Despite the potential for low-emission and substitutable alternatives to be adopted with relative ease, current data gaps and lack of specific guidance constrain clinicians' ability to make emissions-informed choices for products such as anaesthetic gases. Across OECD countries, two countries – the United Kingdom (England, Scotland) and Australia (Western Australia) have removed desflurane from use as an anaesthetic gas, with the European Union slated to follow suit in 2026. In Western Australia, for example, removing desflurane has been estimated to have delivered both emissions and cost reductions, reducing an estimated 1800 tons of CO2-equivalent emissions annually, while driving down costs by 750 000 AUD (Department of Health and Aged Care, 2023[11]). Some medical associations and other clinician-oriented initiatives have further developed guidelines around promoting lower-emission alternatives in specific clinical contexts, such as developing more environmentally-friendly *Green Surgery* guidance (Brighton and Sussex Medical School, Centre for Sustainable Healthcare and UK Health Alliance on Climate Change, 2023[12]).

Similar alternatives exist for other products outside of the surgical ward. Inhalers, used to support treatment in people with different respiratory conditions, similarly exhibit a significant variation in greenhouse gas emissions with marginal clinical difference for the majority of patients. Metered dose inhalers currently on the market have an emissions impact much higher than other forms of inhalers, such as soft mist or dry

powder inhalers, due to the emissions intensity of their propellant. But for many patients, switching to a different type of inhaler can be undertaken without significant clinical impact. For example, researchers have found that asthma patients can be switched from pressurised metered dose inhalers to dry powder inhalers without impacting control of their condition, while cutting inhaler-related emissions by more than half (Woodcock et al., 2022[13]). Across OECD countries who provided data, the share of metered-dose inhalers (the highest emitting inhalers) used as a proportion of all inhalers varied close to two-fold in 2023 (Figure 1.10). The wide variation in consumption patterns for respiratory inhalers across OECD countries currently underscores that environmental considerations and emissions impacts are not regularly incorporated into clinical decision making currently used by healthcare professionals.

Figure 1.10. High-emission metered-dose inhalers remain dominant across the OECD countries who provided data

Metered dose inhalers as a share of all prescribed inhalers, 2023



Source: OECD analysis based on data from the 2025 OECD Health and Climate Data Collection on High-Emission Clinical Inputs.

Switching from the high-emitting pressurised metered dose inhalers currently on the market to dry powder or soft mist inhalers could help OECD countries cut the greenhouse gas emissions associated with inhalers significantly. At the same time, new products may be accompanied by higher costs than higher-emitting existing alternatives, as occurred when chlorofluorocarbons were banned, forcing policymakers and clinicians to balance environmental considerations with questions of costs to the health system and implications for access (Jena et al., 2015[14]). A number of major pharmaceutical companies have been working in recent years to reformulate their metered-dose inhalers to reduce their emissions intensity and have begun applying for regulatory approval, with the first metered dose inhaler using a low-emission propellant approved in the United Kingdom in May 2025 (AstraZeneca, 2025[15]).

Reshaping the impact of health systems supply chains

Harnessing public procurement represents an important tool for countries to help shape the environmental impact of their health sectors and of supply chains more broadly. Across OECD countries, public procurement by governments made up more than a quarter of all government expenditures in 2021, representing nearly 13% of GDP on average. Critically, healthcare procurement represents the largest share of government procurement in OECD countries (OECD, 2025[16]).

OECD countries have increasingly developed guidelines and rules related to procurement policy to help achieve their environmental goals – including objectives towards mitigation. Close to four-fifths of OECD countries report having adopted "green" procurement policies for government procurement. Fewer – about one in six countries – have adopted guidelines for green procurement that relate specifically to the health sector.

The development of joint procurement policies across countries – particularly where markets are small – can help to offer clarity and sufficient market size to incentivise companies and their suppliers to adapt their production processes to meet the desired environmental standards. Such practices have a well-established track record in some regions with small countries, including Nordic countries, while initiatives to develop joint procurement standards for environmental sustainability in healthcare procurement have also more recently been undertaken by a range of larger countries from more disparate parts of the world, though the process is still underway (Sykehusinnkjop, 2023[17]).

Health Technology Assessments (HTA) could offer an opportunity to incorporate environmental considerations into healthcare decision making

In the medium term, health technology assessments (HTAs) may offer the opportunity for health systems to more systematically consider the environmental impacts of new healthcare products and technologies. While countries, including Australia, Canada, Poland, Spain and the United Kingdom, have begun to explore how environmental factors can ultimately be incorporated into HTAs, the actual application of environmental considerations in HTAs remains limited. In Canada, for example, environmental impacts are included as one of the ten domains within the deliberative framework developed by the Canadian Agency for Drugs and Technologies in Health (CADTH) Health Technology Expert Review Panel. However, not all of the domains must undergo a full evaluation during the deliberation process, and while environmental impacts (largely unrelated to emissions) have on occasion been considered in HTA decision making – notably around dental interventions – this is not the norm (Walpole et al., 2023[18]). With countries beginning to explore whether and how to factor in environmental impacts into health technology assessments, it will be important to collect further information on what scope of environmental factors is under consideration, and to assess how different approaches to evaluating environmental impacts could affect existing HTA processes.

A major barrier remains the lack of sufficient high-quality data on the environmental impact – including the greenhouse gas emissions – of different medical technologies and healthcare products. Acting on uncertain or incomplete data could risk complicating well-established assessment practices without delivering clear environmental benefits. This is particularly true in cases where trade-offs exist between different types of environmental impacts, such as between the impacts of a product on greenhouse gas emissions and its impact on other environmental factors, such as water pollution. For example, while a decision around recommending a new medical device in the United Kingdom in 2022 noted that that while there was a lack of evidence on its impact on greenhouse gas emissions, there was the "potential" that the device could help to reduce greenhouse gas emissions compared to other products (National Institute for Health and Care Excellence, 2023[19]). However, the environmental considerations were neither taken into account as evidence nor cited as a reason the product was recommended (Szawara et al., 2023[20]).

Countries have stepped up climate action in health systems, but most efforts reflect broader government mitigation priorities

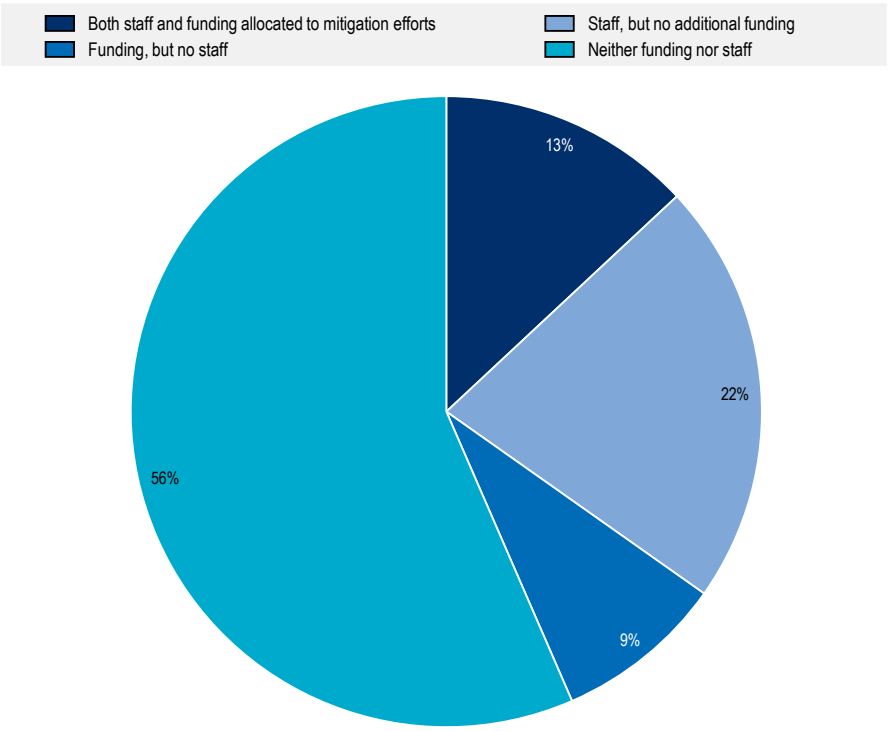
While efforts to reduce the health systems impact on the environment, and on greenhouse gas emissions more specifically, remain fairly new, important policies have already emerged that can help countries deliver environmentally sustainable care, including models of sustainability and circularity in hospitals,

targeted guidance to specialists, and the promotion of low-emission products and alternatives that are available with similar clinical outcomes and costs to existing practices. At the same time, the extent of concrete policy options and evidence around the effect of different interventions on changing greenhouse gas emissions is still imperfect and incomplete. This is due primarily to limitations in the availability of data and what is more broadly understood in terms of the environmental impact of different interventions, products, and models of care.

Despite this uncertainty, avenues for health systems to move towards high quality, lower emissions care in ways that contribute to health systems goals exist, including delivering high-quality healthcare that promotes better health outcomes at lower costs. Governments across many OECD countries have scaled up efforts to reshape their economies in a way that promotes growth while accelerating efforts to decarbonise their societies. Health systems have been no exception to this. Strategies to decarbonise the health sector in OECD countries have been led by Ministries of Health, who in many cases have shared the responsibility for mitigation policies with Ministries of the Environment and others responsible for broader decarbonisation efforts in the country. In the Netherlands, for example, the Ministry of Health, together with other stakeholders and relevant ministries, committed to a Green Deal on Sustainable Healthcare in 2022. The Green Deal sets out a range of actions that signatories undertake to commit to improve the environmental sustainability of healthcare, including moving towards carbon neutrality by 2050, scaling up circular practices and reducing waste, reducing the environmental impact of pharmaceutical products, improving knowledge and awareness around the environmental impacts of the health sector, and promoting public health interventions (Ministry of Health, Welfare and Sport, 2022[21]).

While policymakers responsible for the health sector have given increased attention to promoting policies to reduce greenhouse gases associated with the production and consumption of healthcare services, most OECD countries report that mitigation efforts have not been significantly staffed or funded, with just over one-third of 23 responding countries reporting that a team or division focussed on mitigation policies has been developed. Only three responding countries – Australia, Austria and the Netherlands – reported that they had both teams and funding allocated for mitigation efforts within the health sector. Nearly four in five responding countries (18 of 23) reported that there was no funding allocated within the health budget to emissions reduction efforts.

Figure 1.11. Staff and financial resources allocated to mitigation efforts are still emerging



Note: 23 OECD countries responded to the survey.
Source: OECD (2024[22]), OECD Policy Survey on Climate Change and Health 2024.

The vast majority of OECD countries have developed policies and regulations aimed at helping to reduce the greenhouse gas emissions from energy use inside healthcare facilities. For example, nine in ten surveyed OECD countries reported having policies to support upgrading the energy efficiency of buildings, such as energy efficiency standards and requirements in the construction of new healthcare facilities. These rules and standards reflect broader energy efficiency measures in the construction sector, rather than being tailored for the healthcare sector specifically. Two in three OECD countries have further developed policies to help healthcare facilities strengthen their response to climate change events, including through vulnerability assessments at the facility level and support for upgrades that support resiliency.

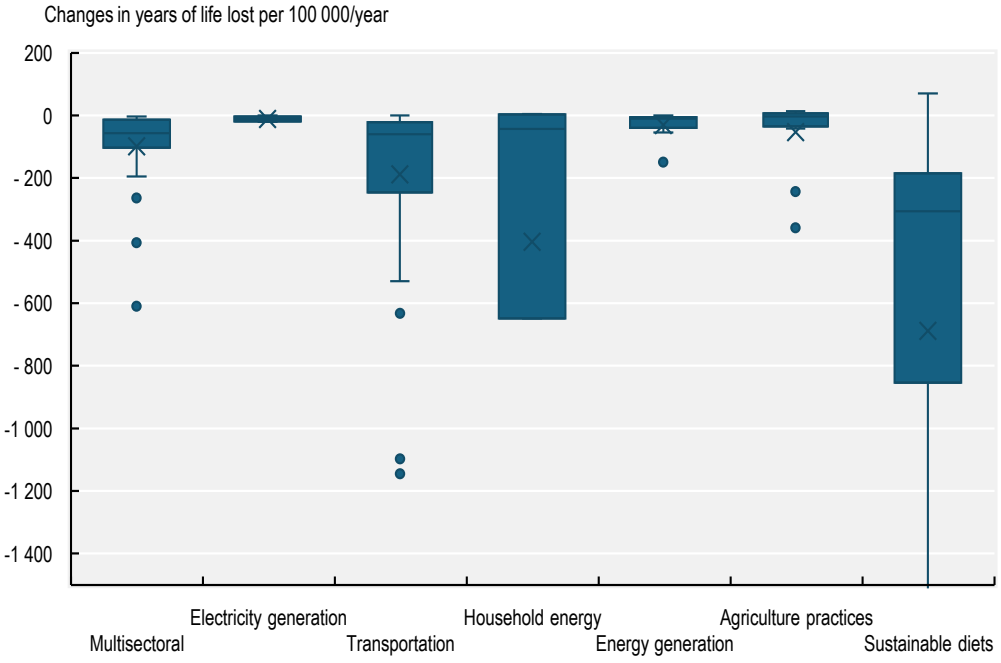
Many of the policies that have been put in place to help improve environmental sustainability reflect wider economy-wide approaches that have been adopted by countries to facilitate mitigation, rather than targeting the health sector specifically. While more than three-quarters of responding OECD countries (17 of 22) report having energy efficiency standards and requirements applicable to the construction of new healthcare facilities, for example, just 3 of the 17 countries that reported such standards were in place reported that they had been developed specifically for healthcare facilities. Where healthcare specific initiatives have been adopted, they have often been the result of bottom-up momentum from healthcare practitioners and administrators. In some cases, efforts to promote sustainability that began at a more local level have expanded to encompass a broader set of institutions. In Denmark, for example, the five Danish regions published a joint strategy for hospital sustainability in 2024 with shared sustainability objectives (e.g. 50% reduction in emissions by 2035) and initiatives covering hospitals across the country (Healthcare Denmark, 2024[23]).

Where such healthcare-focussed initiatives have emerged, they have been met by strong demand. In Austria, for example, a programme to support mitigation in healthcare facilities was expanded due to high demand, with more than 30% of Austrian hospitals participating in the initiative (Lichtenecker, 2024[24]).

Scaling up policies that improve population health and reduce emissions: Good for health and good for the environment

The potential contribution of public health policy to climate change mitigation extends far beyond the remit of healthcare systems alone. Many of the most effective mitigation measures – such as those related to urban design, transportation, food systems and energy — lie outside the traditional health sector. Public health interventions that influence these areas, including policies that promote active mobility, reduce air pollution and support healthy and sustainable diets, can achieve important emissions reductions while delivering substantial health co-benefits. Recognising and integrating these health gains into climate policy can strengthen the rationale for mitigation measures.

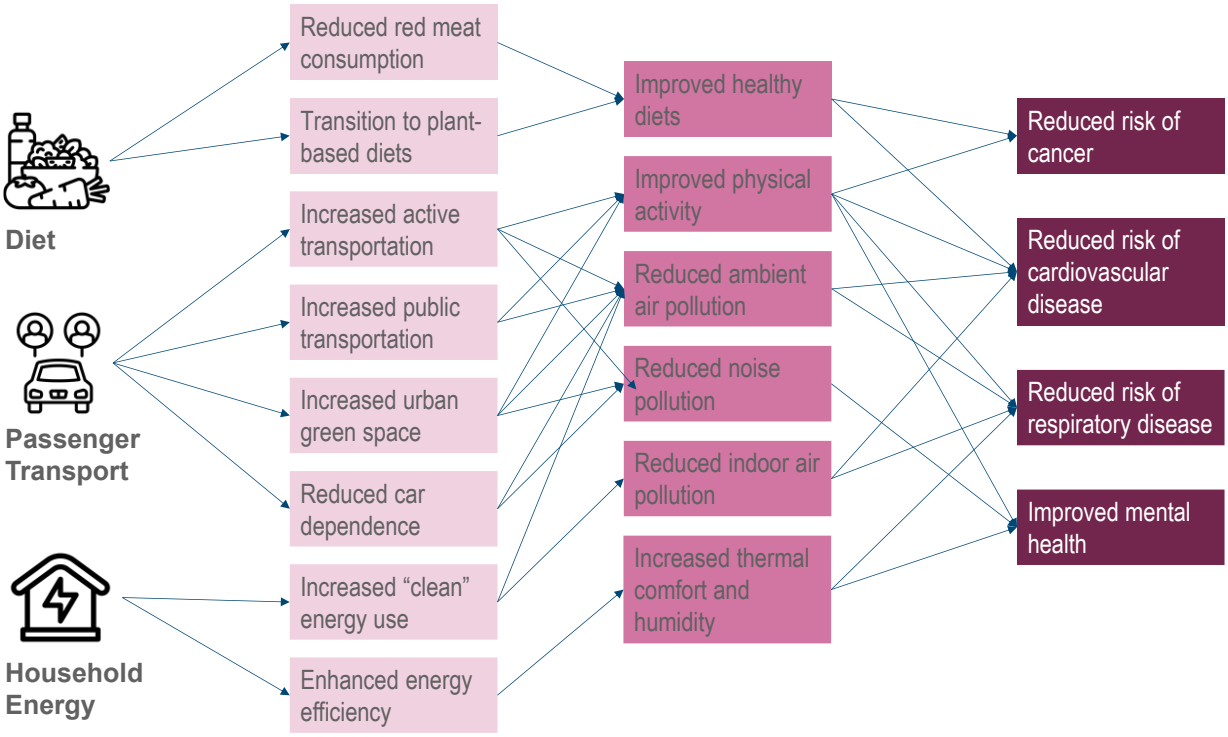
Figure 1.12. Health outcomes of climate change mitigation measures in OECD countries by sector



Note: Outliers at the tail end of 2.5% (beyond the 97.5th percentile on the upper-end and 2.5% percentile on the lower-end are removed).
Source: Whitmee, S. et al. (2024[25]), "Pathways to a healthy net-zero future: report of the Lancet Pathfinder Commission", https://doi.org/10.1016/s0140-6736(23)02466-2.

The rise of many non-communicable diseases and the acceleration of climate change share many drivers. The potential to develop win-win policies that help to improve both health outcomes and reduce greenhouse gas emissions is underscored by the fact that the burden of non-communicable disease and climate change share many of the same drivers, including the use of fossil fuels, the development of highly industrialised food systems that promote unhealthy diets, and the development of transportation systems that leave populations overwhelmingly dependent on cars for travel. Many of the policies that promote good health, inversely, can also have beneficial impacts to mitigating climate change (Figure 1.13).

Figure 1.13. Interventions to promote good health can also benefit climate



Source: Adapted from Whitmee, S. et al. (2024[25]), "Pathways to a healthy net-zero future: report of the Lancet Pathfinder Commission", https://doi.org/10.1016/s0140-6736(23)02466-2 and Gao, J. et al. (2018[26]), "Public health co-benefits of greenhouse gas emissions reduction: A systematic review", https://doi.org/10.1016/j.scitotenv.2018.01.193.

Across OECD countries, health conditions amenable to climate mitigation policies represented more than 8% of DALYs and 14% of deaths in 2022. Many public health policies have already been identified that could drive important benefits to health outcomes while also reducing greenhouse gas emissions by levels far above what can be achieved within direct health systems-related emissions alone. This section focusses on three key sectors – sustainable and healthy diets, transportation and household energy – where evidence on sector-specific mitigation policies have shown the largest benefits for health outcomes and important benefits for reducing emissions (Whitmee et al., 2024[25]). It looks at the policy options available to address the dual challenges of climate change and public health and considers the role of Ministries of Health in promoting the health benefits of mitigation actions in policies that lie beyond their area of responsibility.

Reducing unhealthy diet's impact on health and the environment

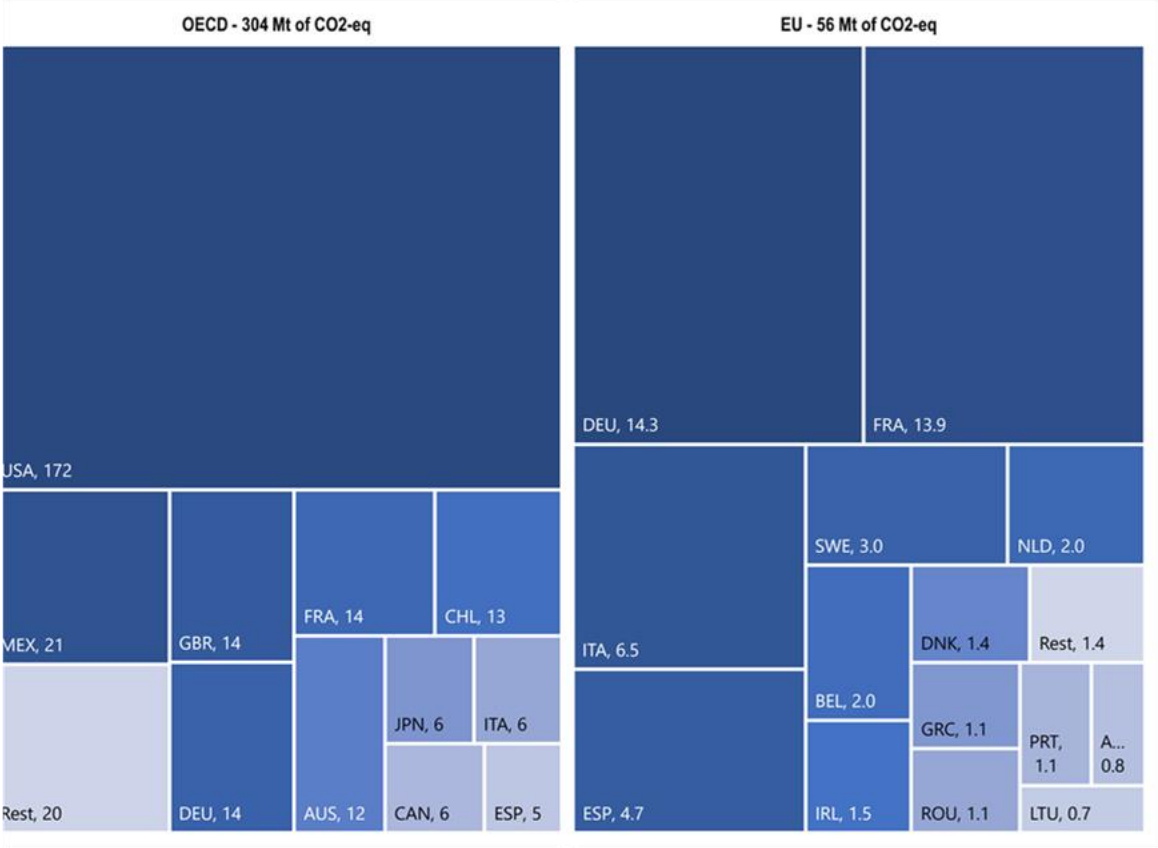
There are opportunities across OECD countries to harness healthier and sustainable dietary consumption patterns to realise win-win outcomes for both public health and environmental sustainability. Policies and approaches that reduce food waste, reduce the consumption of animal products, and move towards seasonal eating patterns can provide multiple co-benefits for health and the environment.

Some countries, including Czechia, Estonia, Greece, Lithuania and Poland, have both high burdens of diseases related to obesity and high emissions from their food and agriculture systems, suggesting that there are good opportunities to simultaneously tackle both challenges. Consumption-based policies that shift the focus from how food is produced to how it is consumed can help to can help to directly impact challenges such as unhealthy diets and food waste in ways that promote public health and sustainability.

Modelling from the OECD suggests that scaling up the adoption of more nutritionally balanced, plant-based diets in line with national dietary guidelines would reduce premature deaths from cancer by 27 000 deaths annually across OECD countries, and could reduce greenhouse gas emissions by 304 MtCO2eq, equivalent to removing all the cars from the roads of France and Spain for a year.

Figure 1.14. Achieving the diet targets would reduce GHG emissions by 304 Mt of CO2 equivalent per year in the OECD

Change in total GHG emissions, Mt of CO2-eq per year, average over 2023-2050



Source: OECD (2024[27]), *Tackling the Impact of Cancer on Health, the Economy and Society*, https://doi.org/10.1787/85e7c3ba-en.

Policies to influence the price of foods can impact the behaviour of consumers, including encouraging them to shift towards healthier and more environmentally sustainable options. A number of OECD countries, including Finland, Germany, Poland and Portugal, have focussed on reducing taxes on foods considered to be healthy or environmentally sustainable, including fruits and vegetables. Zoning regulations which discourage or prohibit the establishment of fast-food restaurants have been adopted in Canada and Ireland to promote healthier food environments and discourage unhealthy consumption. Lastly, some countries, including Austria, have begun to explore the potential to use public procurement to encourage healthier and more environmentally sustainable food options.

Promoting active transportation

The transportation sector accounted for approximately a quarter of global emissions in 2019, and represents the fastest growing source of emissions in OECD countries. Passenger transportation itself accounts for two-fifths of transportation emissions, including emissions related to the use of private cars and vehicles. While some areas in the OECD have seen a reductio in the number of vehicles per capita, many countries – including Australia, Canada, Mexico and Türkiye, as well as a number of countries in Central and Eastern Europe, have high rates of car ownership, even in urban areas with public transportation alternatives.

Strategies and policies that promote environmentally sustainable transportation alternatives can help to encourage healthier choices to be made. Scaling up safe, high-quality infrastructure for cycling has helped to shift commuters towards cycling, for example, including in countries like Denmark and the Netherlands, which have successfully moved away from car-centric models in the mid-1970s towards more environmentally sustainable alternatives today.

Financial incentives that encourage the uptake of public transportation has also helped to increase ridership. In Luxembourg, public transportation was made free for all in 2020 to encourage an increase in ridership, while reductions in the cost of public transportation in Germany led to dramatic increases in ridership, along with reductions in levels of air pollution. Other financial incentives have included policies related to congestion pricing, as implemented in Italy (Milan), Sweden (Stockholm) and the United Kingdom (London).

Countries have also adopted many policies to encourage fuel efficiency in vehicles, including by developing vehicle emissions standards, feebates and green procurement policies to encourage a switch towards lower emission vehicles.

Promoting cleaner energy use in residential settings

In recent years, there has been significant progress made towards scaling up renewable energy sources in OECD countries. Yet many residential homes continue to remain highly dependent on oil and natural gas for their heating systems. While in some countries, including Canada, Japan, Korea and Luxembourg, high-polluting energy sources represent less than 5% of residential energy consumptions, others, including Czechia, Estonia, Poland and Slovenia, report rates higher than 40%.

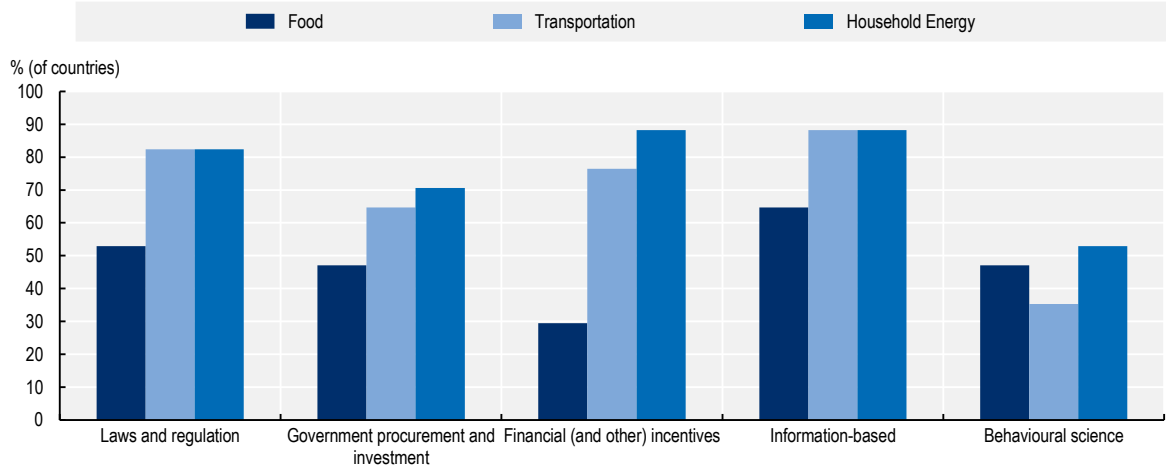
Such a dependence on high-polluting sources of energy can impact not only emissions but also public health. Estonia, Hungary and Poland all continue to experience high emissions within the residential energy sector and a high burden of diseases related to indoor air pollution. Developing policies that support cleaner energy alternatives in the residential sector can help to tackle both the health impacts of indoor air pollution and reduce emissions. A number of countries have taken important steps to shift away from polluting energy sources. In Norway, for example, oil- and paraffin-based heating has been phased out since 2016, with a full ban on new and renovated residences enacted as of 2020. Other countries, including Austria, Belgium, Denmark, Germany and Ireland, have similarly adopted restrictions on the use of fossil fuel-based heating options in new and renovated residences.

Public health policies to achieve win-wins for health and climate rely heavily on information-based approaches

The majority of public health policies impacting the food, transportation and household energy domains adopted by OECD countries have focussed on “information-based” approaches, including labelling initiatives, consumer guidelines, and awareness campaigns, with the goal of improving information and public knowledge. Regulations and government investment have been less frequently applied. There have been fewer applications of financial incentives in the food and nutrition sectors compared with the transportation and energy sectors.

Figure 1.15. More countries have employed policy tools to influence active transportation and household energy policies

Percentage of countries implementing "win-win" policies, by sector and policy instrument



Note:17 OECD Countries have responded to this survey.
Source: OECD Health and Climate Policy Survey.

Policymakers have increasingly understood the importance of complementing supply-side policies that have been the focus on decarbonisation efforts with interventions that aim to change behaviour, through the adoption of demand-side interventions. The Sixth Assessment Report from the IPCC estimates that strengthening demand-side responses which support lifestyle changes could help to reduce emissions by up to 40-70% globally by 2050 (Calvin et al., 2023[28]).

References

Arias, P. et al. (eds.) (2023), *IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.*, Intergovernmental Panel on Climate Change (IPCC), https://doi.org/10.59327/ipcc/ar6-9789291691647. [28]

AstraZeneca (2025), *Trixeo Aerosphere approved in the UK as first inhaled respiratory medicine using next-generation propellant with near-zero Global Warming Potential*, https://www.astrazeneca.com/media-centre/press-releases/2025/trixeo-aerosphere-approved-in-the-uk-as-first-inhaled-respiratory-medicine-using-next-generation-propellant-with-near-zero-global-warming-potential.html. [15]

Brighton and Sussex Medical School, Centre for Sustainable Healthcare and UK Health Alliance on Climate Change (2023), *Green surgery: Reducing the environmental impact of surgical care*, https://ukhealthalliance.org/sustainable-healthcare/green-surgery-report/. [12]

Chan, K. et al. (2021), "Effects of continuity of care on health outcomes among patients with diabetes mellitus and/or hypertension: a systematic review", *BMC Family Practice*, Vol. 22/1, https://doi.org/10.1186/s12875-021-01493-x. [6]

Department of Health and Aged Care (2023), *Natinoal Health and Climate Strategy*, https://www.health.gov.au/sites/default/files/2023-12/national-health-and-climate-strategy.pdf. [11]

Gao, J. et al. (2018), "Public health co-benefits of greenhouse gas emissions reduction: A systematic review", *Science of The Total Environment*, Vol. 627, pp. 388-402, https://doi.org/10.1016/j.scitotenv.2018.01.193. [26]

Healthcare Denmark (2024), *The Danish regions' strategy for sustainable hospitals*, https://healthcaredenmark.dk/national-strongholds/sustainability/. [23]

Jena, A. et al. (2015), "The Impact of the US Food and Drug Administration Chlorofluorocarbon Ban on Out-of-pocket Costs and Use of Albuterol Inhalers Among Individuals With Asthma", *JAMA Internal Medicine*, Vol. 175/7, p. 1171, https://doi.org/10.1001/jamainternmed.2015.1665. [14]

Lee, J. et al. (2021), "Assessment of Interprofessional Collaborative Practices and Outcomes in Adults With Diabetes and Hypertension in Primary Care", *JAMA Network Open*, Vol. 4/2, p. e2036725, https://doi.org/10.1001/jamanetworkopen.2020.36725. [7]

Lichtenecker, R. (2024), *The Austrian Strategy Towards a Net Zero Healthcare System*, https://www.gov.si/assets/ministrstva/MOPE/Podnebje/Samo1planet/Zdravstvo-po-zeleni-poti/03-dr.-Ruperta-Lichtenecker-The-Austrian-Strategy-Towards-a-Net-Zero-Healhcare-System.pdf. [24]

Liu, Z. et al. (2023), "Monitoring global carbon emissions in 2022", *Nature Reviews Earth & Environment*, Vol. 4/4, pp. 205-206, https://doi.org/10.1038/s43017-023-00406-z. [1]

Ministry of Health, Welfare and Sport (2022), *More sustainability in the health and care sector*, https://www.government.nl/topics/sustainable-healthcare/more-sustainability-in-the-care-sector#:~:text=To%20be%20carbon%2Dneutral%20by,2018%20as%20its%20reference%20year. [21]

National Institute for Health and Care Excellence (2023), *Sedaconda ACD-S for sedation with volatile anaesthetics in intensive care: Medical technologies guidance*, https://www.nice.org.uk/guidance/mtg65/resources/sedaconda-acds-for-sedation-with-volatile-anaesthetics-in-intensive-care-pdf-64372178389957. [19]

OECD (2025), *Policy Issues: Public Procurement*, https://www.oecd.org/en/topics/policy-issues/public-procurement.html. [16]

OECD (2024), *OECD Policy Survey on Climate Change and Health*. [22]

OECD (2023), *Health at a Glance 2023: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/7a7afb35-en. [8]

OECD (2023), *Ready for the Next Crisis? Investing in Health System Resilience*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/1e53cf80-en. [9]

OECD (2020), *Realising the Potential of Primary Health Care*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/a92adee4-en. [5]

OECD (2017), *Tackling Wasteful Spending on Health*, OECD Publishing, Paris, https://doi.org/10.1787/9789264266414-en. [4]

OECD/Eurostat/WHO (2017), *A System of Health Accounts 2011: Revised edition*, OECD Publishing, Paris, https://doi.org/10.1787/9789264270985-en. [3]

Sherman, J. et al. (2012), "Life Cycle Greenhouse Gas Emissions of Anesthetic Drugs", *Anesthesia & Analgesia*, Vol. 114/5, pp. 1086-1090, https://doi.org/10.1213/ane.0b013e31824f6940. [10]

Sykehusinnkjop (2023), *New environmental criteria for the procurement of pharmaceuticals*, https://www.sykehusinnkjop.no/en/nyheter/nyheter-2019/new-environmental-criteria-for-the-procurement-of-pharmaceuticals/. [17]

Szawara, P. et al. (2023), *Environmental sustainability in HTA: Are HTA bodies applying environmental criteria in their decision-making?*, https://www.ispor.org/docs/default-source/euro2023/isporeurope23wagnerhta290poster132526-pdf.pdf?sfvrsn=fdefc172_0. [20]

Walpole, S. et al. (2023), "How can environmental impacts be incorporated in health technology assessment, and how impactful would this be?", *Expert Review of Pharmacoeconomics & Outcomes Research*, Vol. 23/9, pp. 975-980, https://doi.org/10.1080/14737167.2023.2248389. [18]

Whitmee, S. et al. (2024), "Pathways to a healthy net-zero future: report of the Lancet Pathfinder Commission", *The Lancet*, Vol. 403/10421, pp. 67-110, https://doi.org/10.1016/s0140-6736(23)02466-2. [25]

WHO (2023), *The Diet Impact Assessment model: a tool for analysing the health, environmental and affordability implications of dietary change*, World Health Organization Regional Office for Europe, https://iris.who.int/handle/10665/373835. [27]

Woodcock, A. et al. (2022), "Effects of switching from a metered dose inhaler to a dry powder inhaler on climate emissions and asthma control: post-hoc analysis", *Thorax*, Vol. 77/12, pp. 1187-1192, https://doi.org/10.1136/thoraxjnl-2021-218088. [13]

Yamano, N., M. Lioussis and A. Cimper (2024), "Measuring greenhouse gas footprints in global production networks: New perspectives on emissions embodied in production chains and final demand patterns", *OECD Science, Technology and Industry Working Papers*, No. 2024/12, OECD Publishing, Paris, https://doi.org/10.1787/fc426ab9-en. [2]

Notes

[1] The analysis carried out distinguished between six subsectors in health: Hospitals, nursing homes, outpatient providers (such as offices of GPs or specialists, outpatient clinics and other ambulatory health providers), medical goods, other health providers (such as public health institutes, health administration, imaging centres, laboratories, patient transportation), and investment goods.

[2] The allocation across Scopes 1, 2 and 3 allocates all health sector emissions across direct and indirect (purchased electricity / other indirect) emissions. It provides complementary information to the allocation of GHG emissions by healthcare subsector presented earlier in the chapter. The approaches are not additive, as both allocate the same amount of total emissions, but according to different categorisations.

[3] Also includes domestic manufacturers, transport and trade.

2 Transforming healthcare delivery to reduce emissions in the health system

While many countries are increasingly recognising – and responding – to the environmental impact of their health systems, many of the policies that have thus far been enacted to mitigate the greenhouse gas emissions of the health sector have reflected broader mitigation actions taken in countries, such as focussing on transitioning to renewable energy sources and improving energy efficiency in buildings. This chapter argues that there is further scope for health systems to reduce their environmental impact by changing practices in the delivery of healthcare itself, including reducing low-value and wasteful care.

In Brief

Health systems represent an important – and growing – share of greenhouse gas emissions in OECD countries. **On average across OECD countries, the health sector contributed 4.4% of countries' overall greenhouse gas emissions in 2018.** The health systems of OECD countries collectively emit more greenhouse gas emissions than other highly cited sectors of the economy, such as aviation.

As a provider, **hospitals represent the most important driver of health sector emissions**: 30% of health sector emissions were driven by hospital care on average across OECD countries. New OECD estimates suggest that by reducing avoidable admissions and the average length of stay in hospital, countries could reduce hospital-based emissions by a quarter. In contrast, emissions associated with outpatient providers were estimated to contribute 20% of health sector emissions.

Long-term care also drives an important share of emissions. On average across OECD countries, nursing homes represented 6% of health sector emissions. This figure is almost certainly an underestimate of the true contribution of long-term care to health sector emissions, as it does not count long-term care delivered at home or in hospital settings, but only in residential care. Without changes to how long-term care is delivered, the emissions associated with ageing and long-term care will continue to rise as populations age further.

Across OECD countries, an increasing number of health systems have taken steps to measure health systems emissions. Nevertheless, the number of products and services for which emissions have been estimated remains a small fraction of the overall number of individual medical products and supplies, and there remain significant challenges in ensuring measurement approaches are harmonised and comparable across countries.

The majority of countries have reported taking steps towards reducing the health sector's impact on greenhouse gas emissions. Some have invested important resources into measures meant to transform the environmental sustainability of their health systems, putting in place strategies, guidelines, climate change and health teams, and rules and regulations intended to embed awareness of healthcare's environmental impact across the sector. At the same time, not all care can be substituted, and policies designed to reduce emissions must be designed carefully to ensure quality of and access to needed care are not compromised.

At the same time, majority of OECD health systems have in many cases not meaningfully begun to integrate climate change considerations into the way that healthcare is procured, delivered, and practiced. Where efforts have been undertaken to address greenhouse gas emissions, the policies that have been focussed on and scaled up have broadly aligned with broader mitigation initiatives spearheaded by governments. These policies, including promoting energy- and building-related sustainability, have often been brought into health systems as part of more comprehensive national efforts at greenhouse gas mitigation.

In contrast, the potential for reductions in greenhouse gas emissions due to changes in healthcare *delivery*, including in prevention, reducing the use of inappropriate care, and reducing demand for healthcare through better health outcomes, has not received a similar level of focus in health systems mitigation. **There remains significant opportunity to align efforts to reduce inappropriate care with healthcare-focussed mitigation initiatives**. The most effective way to reduce emissions in the health sector is not to need care in the first place. Policies that promote reducing low-value care and waste in

health systems deliver win-win outcomes for the environment by also contributing to reducing health sector emissions.

Across OECD countries, **health sector emissions could be impacted – and reduced – by healthcare delivery policies that prioritised low-emissions alternatives to existing practices**. Policies that prioritise better care management, primary care, and the balanced use of telemedicine could help to drive down healthcare emissions while improving health outcomes.

Four-fifths of OECD countries report that no funding for mitigation actions in the healthcare sector has been allocated. Allocating funding and scaling up the development of climate change and health teams within Ministries of Health, and across government, is critical to ensure health systems have sufficient support to transition towards more environmentally sustainable care.

A major challenge in developing climate-responsive healthcare is that the evidence base for what works is still emerging, and measurement challenges continue to hamper the evaluation of progress. Ensuring that governments and the private sector have the tools they need to measure and track the environmental impact, including emissions, of the health sector in a comparable and harmonised way is indispensable to driving meaningful change.

Compared with some other sectors, the health system has turned its attention on its contribution to climate change relatively late. As a growing understanding of the health system's greenhouse gas emissions has developed over the last decade, political will to take action has grown.

Nevertheless, attention to climate change mitigation within the health sector broadly lags behind the prioritisation that many health systems have given to *adapting* to the health consequences of climate change. Nearly four-fifths of responding OECD countries reported that no funding has been earmarked for mitigation-related measures in their health systems (OECD, 2024[1]).

Across OECD countries, all countries have made commitments to reduce greenhouse gases at the national level, via the nationally determined contributions (NDC) set every five years and reported to the United Nations Framework Convention on Climate Change (UNFCCC). Far fewer countries have developed more concrete guidelines or strategies around reducing greenhouse gas emissions for their health sector. Among countries that have begun to develop health sector-specific strategies, many plans have been established only very recently – many in the past 2-3 years – and are still in the process of development or implementation.

Table 2.1. Not all countries have developed health sector roadmaps or commitments for mitigation

	National (NDC) commitment	Health sector-specific commitments?	Details
Australia	Reduce GHG emissions by 43% by 2030 (2005 baseline)	Yes	
Austria	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	Net zero emissions for all healthcare facilities (Scope 1 and 2) by 2040; for entire healthcare sector by 2040; for Scope 3 by 2050
Belgium	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	
Canada	Reduce emissions by 45-50% by 2035 (2005 baseline); net zero emissions across sectors by 2050	No	
Chile	GHG emission budget max of 1 100 MtCO2eq between 2020 and 2030, with a GHG emissions maximum (peak) by 2025, and a GHG emissions level of 95 MtCO2eq by 2030	Yes	Health sector goals and targets included in Long-Term Climate Strategy
Colombia	Reduce GHG emissions by 51% by 2030 compared to 2015 baseline	No	Though commitments to measure GHG emissions
Costa Rica			
Czechia	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	Some mention of climate change in health strategic framework but no mitigation targets
Denmark	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	Reduce public hospital emissions by 75% by 2030 (2018 baseline)
Estonia	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	Modernisation of health facilities included as policy to reaching national emission reduction target
Finland	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	
France	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	
Germany	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	
Greece	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	Action plan to reduce energy footprint of health facilities by 38% by 2030

	National (NDC) commitment	Health sector-specific commitments?	Details
Hungary	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)		
Iceland	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	
Ireland	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	Various; including 50% reduction in energy use and 51% in GHG emissions (energy-related) by 2030; net zero by 2050
Israel	27% reduction by 2030 (2015 baseline)	No	
Italy	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	
Japan	Reduce GHG emissions by at least 46% by 2030 (2013 baseline)	No	No health sector plan, but Voluntary Action Plan to reduce carbon emissions in hospitals
Korea	40% emissions reduction by 2030 (2018 baseline)	No	
Latvia	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)		
Lithuania	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)		
Luxembourg	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)		
Mexico	35% reduction by 2030		
Netherlands	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	Carbon neutrality by 2050; 30% reduction in carbon emissions (buildings/energy) by 2026 (2018 baseline); 25% reduction in waste production
New Zealand	51% reduction in GHG emissions by 2030 (2005 baseline)	No	No, but annual inventories of greenhouse gas emissions reported
Norway	50-55% reduction by 2030 (1990 baseline)	Yes	Extensive
Poland	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)		
Portugal	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	
Slovak Republic	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)		
Slovenia	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)		
Spain	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	Yes	
Sweden	Reduce GHG emissions by at least 55% by 2030 (1990 baseline)	No	
Switzerland	Reduce GHG emissions by 65% by 2035 (1990 baseline)	No	
Türkiye	41% reduction by 2030 compared to business as usual (2012 baseline)		
United Kingdom	81% GHG reduction by 2035 (1990 baseline)	Yes	

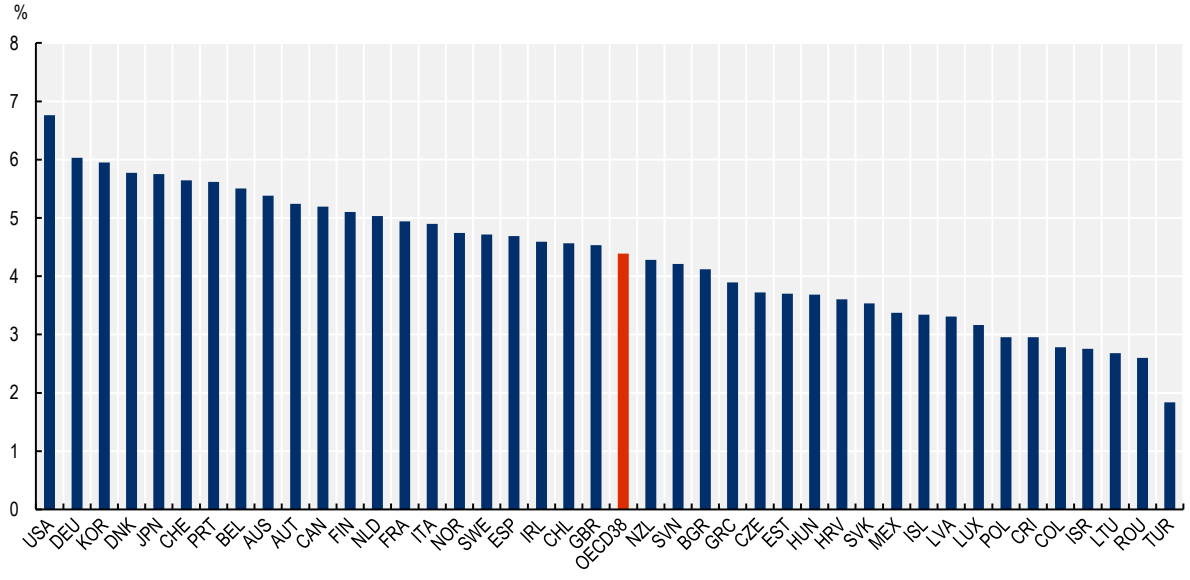
Note: UK commitment excludes emissions from international aviation and shipping.

In 2018, 4.4% of greenhouse gas emissions in OECD countries were associated with the health sector

In recent years, estimates of the health sector's contribution to greenhouse gas emissions have been developed at the country and at the international level. While estimates differ across countries and methods, estimates have previously suggested that some 4-7% of overall greenhouse gas emissions in OECD countries stem from the health sector. Given OECD countries spend close to 9% of their GPD on health, this would suggest that the health sector is a comparatively low emissions-intensity sector. Nevertheless, given the significance of the health sector to the economy, it nonetheless plays an important role in emissions.

New estimates from the OECD have built on the organisation's environmentally extended Inter-Country Input-Output (ICIO) data, together with data from the OECD-WHO System of Health Accounts, to estimate emissions in an internationally comparable manner at the health sector level. This data from the OECD indicates that in 2018, greenhouse gas emissions across OECD countries averaged 4.4% of overall greenhouse gas emissions in OECD countries. On average across OECD countries, emissions associated with the health sector amounted to close to 976 million metric tonnes $CO2_e$ in 2018. Put in other terms, this would represent level of emissions close to that of the total emissions of the third-highest emitting country in the OECD, Germany.

Figure 2.1. Greenhouse gas emissions related to healthcare (% of all emissions), 2018



Note: Emissions refer to demand-based emissions.
Source: OECD analysis based on environmental extension of OECD Inter-Country Input-Output database and System of Health Accounts data.

Box 2.1. How are emissions measured in the health sector?

In measuring greenhouse gas emissions in the health sector and beyond, researchers have typically adopted one of two general approaches. These can be broadly categorised as taking a *top-down* or *bottom-up* approach to emissions accounting.

Bottom-up emissions analysis adopts a life-cycle accounting approach to calculate the emissions associated with the production (including extraction of materials), transportation, use, and disposal of a product or service. This approach requires very granular detail, such as the distance between the location of production and location of use, and can be very time-consuming to generate, particularly given the extensive number of products and services used in the health sector. One of the most extensive living repositories of healthcare-related life cycle analyses, for example, included about 1 500 unique results as of January 2025 (Drew and Rizan, 2022[2]). Moreover, the geographic specificity needed in estimated emissions based on a life-cycle analysis may make generalising the findings of an LCA from a specific context challenging in others.

Top-down emissions estimates generally look at emissions at a more macro level, such as at the level of the health system, region or country. They are built on extending economic input-output tables to link emissions to economic transactions within sectors and countries and offer a broader and more holistic perspective on emissions. At the same time, the top-down approach can sacrifice depth for breadth, with much less precision at more granular levels compared with a life-cycle approach. Some analyses have combined the two approaches, complementing top-down input-output analysis with country-specific information based on life cycle assessments for certain products or services, where it is available, as in the case of estimates of NHS England's greenhouse gas footprint.

Emissions estimates based on the two approaches can vary dramatically. A comparison of emissions estimates for medical imaging in Australia, for example, found significant differences in the emissions impact of imaging including X-rays, CT scans and MRI scans when estimated using a life-cycle versus environmentally extended input-output approach (McAlister et al., 2024[3]).

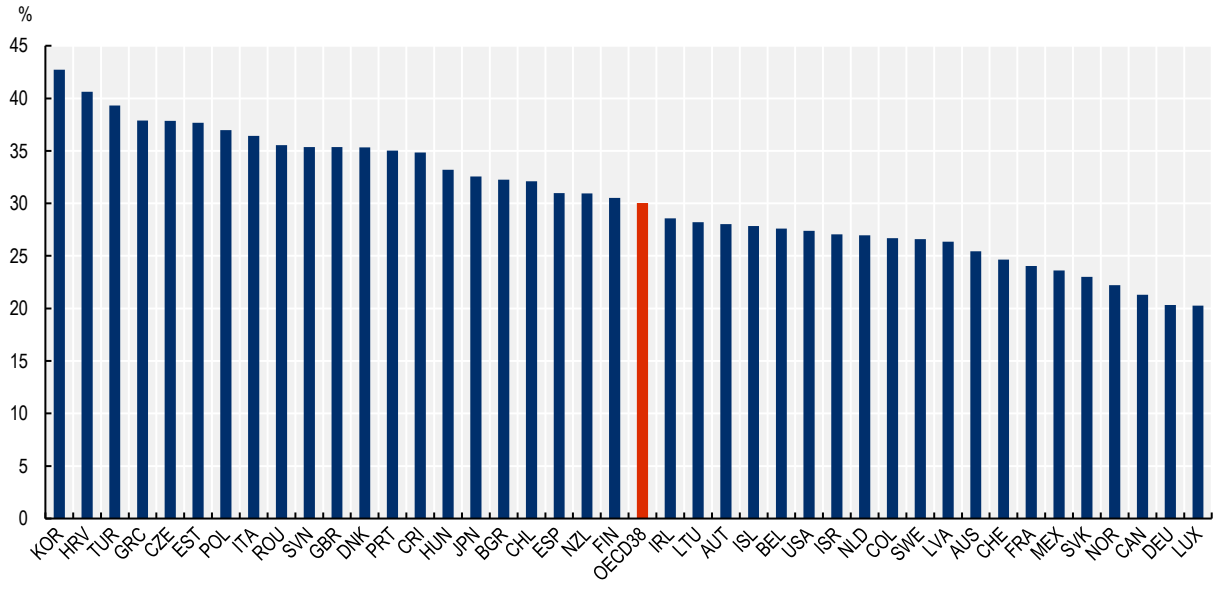
Where do health systems have room to reduce their emissions?

Understanding where in the process of the production and consumption of emissions are concentrated can help policymakers to better target policies to reduce the health system's emissions footprint. The latest OECD estimates provide new insights into the health sector's greenhouse gas emissions, presenting a detailed picture of its environmental impact. To analyse these emissions more effectively, the total footprint was disaggregated using three complementary frameworks: by provider type, by scope, and by domestic versus international origin. Each framework organises the same emissions baseline into distinct categories, without affecting the overall total.

Hospitals and outpatient care collectively made up half of health sector emissions in 2018

Examining health sector emissions by type of provider, hospitals made up the largest share of health sector emissions, significantly higher than the emissions associated with outpatient or nursing home care. On average across OECD countries, hospitals represented 30% of health sector emissions in 2018.

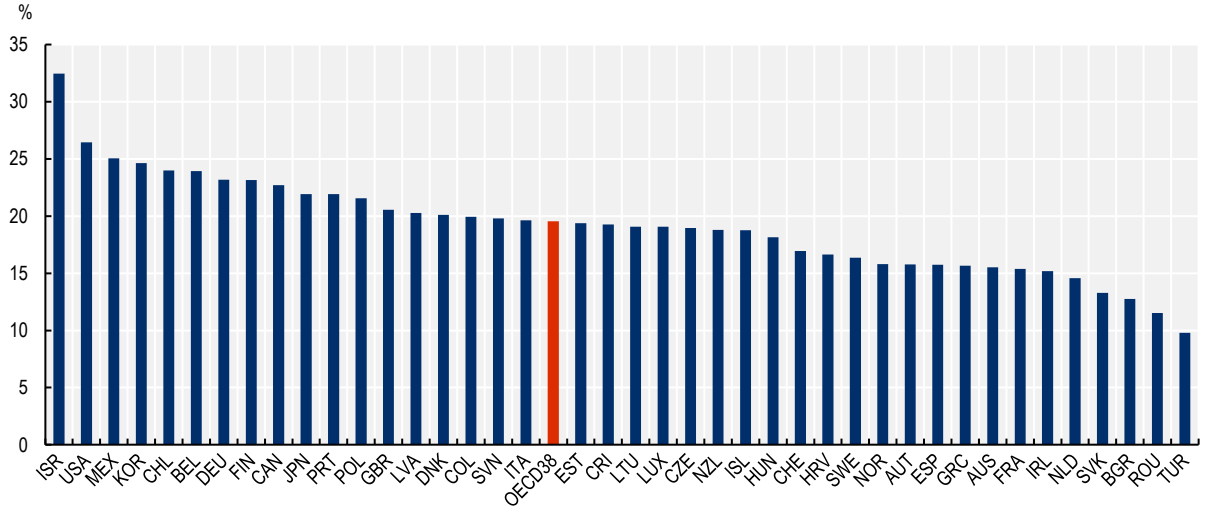
Figure 2.2. Hospitals accounted for close to one-third of health sector emissions in 2018



Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

In contrast to hospitals, outpatient care accounted for one-fifth of health sector emissions in 2018. Given the very high number of consultations taking place in outpatient care, however, the emissions associated with a single consultation in outpatient care was substantially lower than the average emissions associated with one occupied bed day in hospital, representing less than one-tenth of the average emissions of a hospital bed day (180 vs. 16 kg CO2-e on average in 2018).

Figure 2.3. Emissions associated with outpatient care made up 20% of health sector emissions in 2018



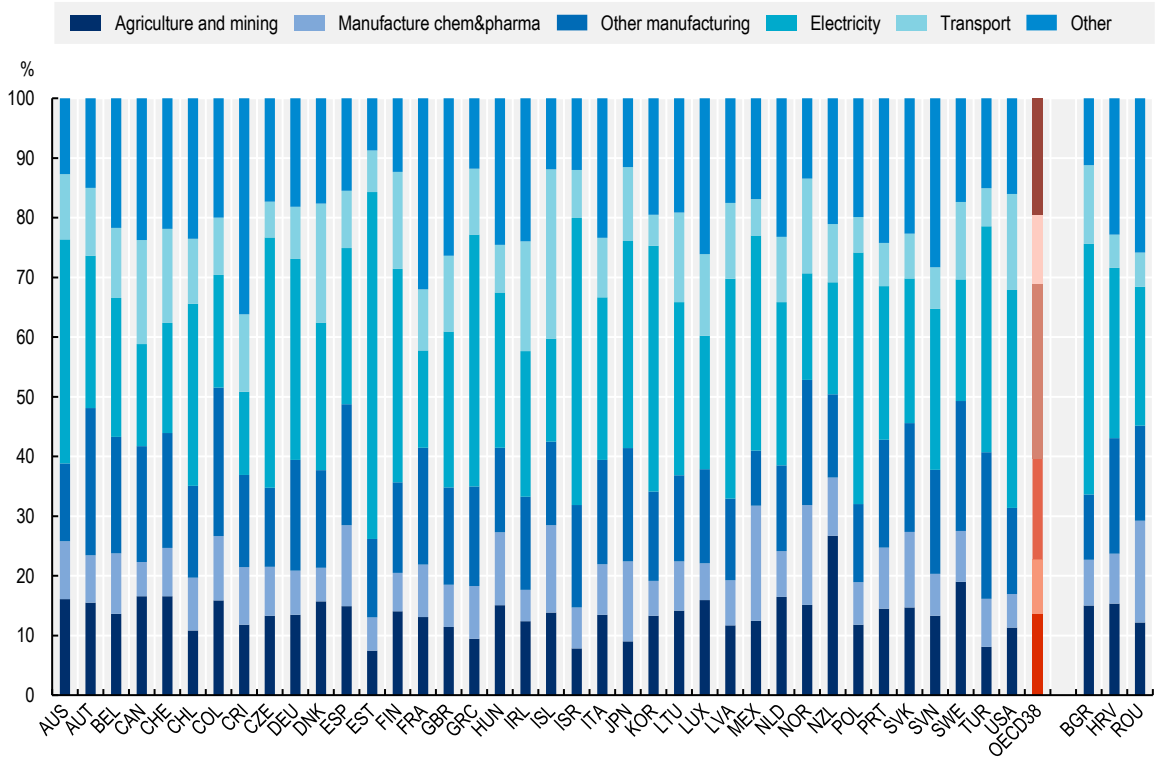
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

30% of health sector emissions can be traced to the electricity, gas and steam used to power health facilities and healthcare service and products

Despite growing sector-specific efforts by health professionals to mitigate the environmental impacts of the health sector, factors largely outside health decisionmaker's authority can have an outsize influence on the level of emissions associated with health facilities and care. The available energy sources to power hospitals and facilities, for example, have an outsize impact on the emissions associated with their operations. Yet the majority of hospitals remain powered by fossil fuels in many OECD countries (Healthcare Without Harm, 2017[4]).

New OECD analysis looking at the industries of origin for health sector emissions has found that on average across OECD countries, 30% of emissions in the health sector are related to the production of electricity, gas and steam, including both for the operation of health facilities directly, but also as inputs into the production of goods used in the healthcare system.

Figure 2.4. Allocation of all GHG emissions related to healthcare demand by industry of origin, 2018



Note: Categories based on Inter-Country Input-Output (ICIO) categorisation.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

More than three-quarters of emissions can be traced to health system supply chains, while half of emissions are produced outside the country where healthcare is delivered

Breaking down greenhouse gas emissions within the health sector into Scopes 1, 2 and 3, and by the source of emissions (such as hospital facilities, specific medical products, or patient and staff travel) is important in helping the health sector to understand where there are opportunities to intervene and reduce its climate impact.

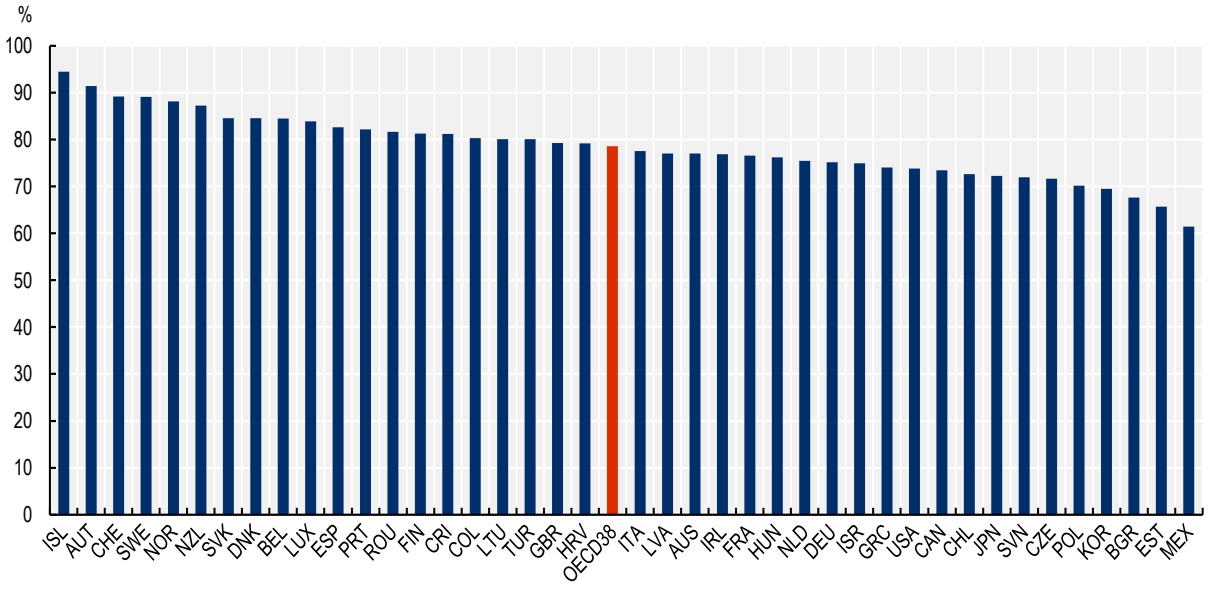
Box 2.2. Categorising emissions by scope

One commonly used approach to understanding the emissions uses a "scope" classification developed by the Greenhouse Gas Protocol, which was established to help develop better measurement and reporting methods for the private sector. The classification covers three scopes:

- **Scope 1: *Direct GHG emissions***, which occur from sources that owned or controlled by a company. This can included emissions associated with combustion in owned or controlled vehicles, for example.
- **Scope 2: *Indirect GHG* emissions,** which arise from electricity that is purchased and consumed by the company.
- **Scope 3: *Other indirect GHG emissions***, which occur in the production and transportation of goods and services used by the company, and includes the full supply chain.

Across OECD countries on average, new analysis from the OECD indicates that the vast majority – nearly 80% – of health sector emissions are related to health system supply chains. In 2018, emissions from supply chains represented an average of 78% of health sector emissions.

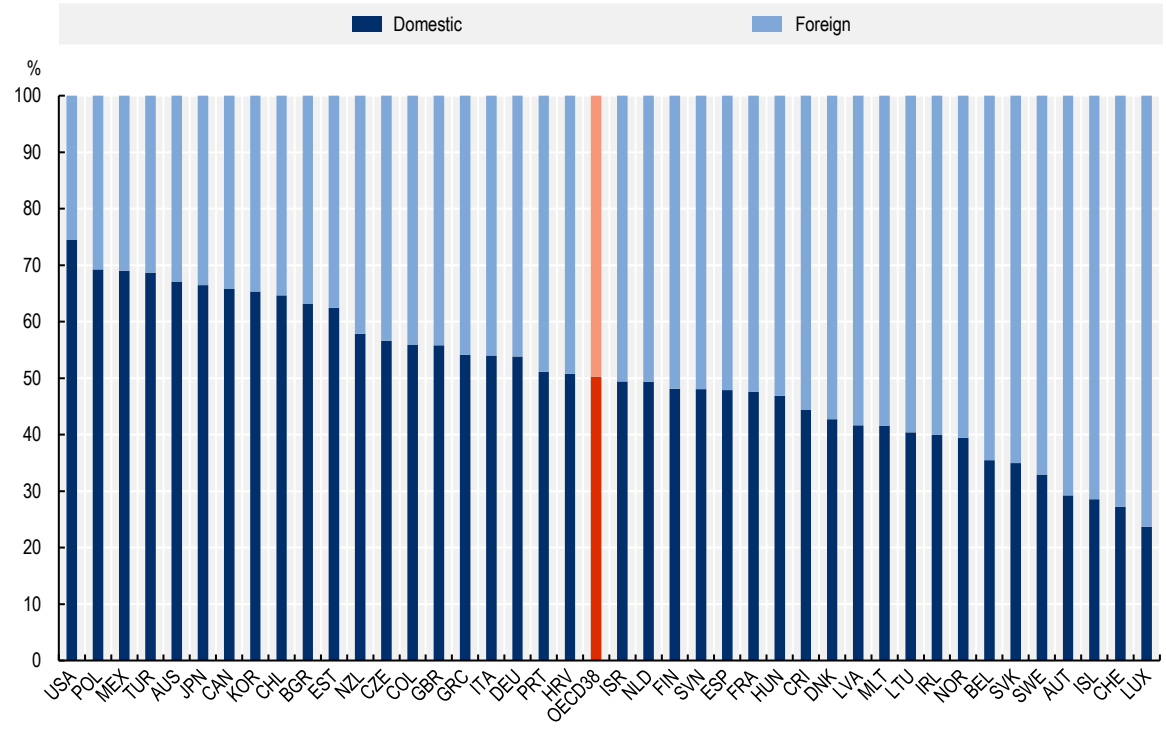
Figure 2.5. Supply chains represent nearly four-fifths of health sector emissions



Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Moreover, on average across OECD countries in 2018, half of emissions found to have originated from production that occurred outside the country in which healthcare was consumed (Figure 2.6). The outsize importance of supply chains, including foreign production, in the emissions associated with healthcare underscores the importance of shifting not only the way healthcare is delivered domestically, but how healthcare supply chains operate across border (see Chapter 3 for more on supply chains).

Figure 2.6. Half of health sector emissions originate from health sector supply chains abroad



Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

At the same time, many of the interventions that the health sector must take to meaningfully reduce its greenhouse gas emissions stem from policies and actions within the purview of actors within health systems, but are peripheral to what might be considered to be *health* policies themselves. Some of the biggest "value" interventions for reducing health systems emissions have nothing to do with the health system per se, and are rather actions that can and are being taken across different sectors in society, such as fleet electrification or shifts towards renewable or greener energy sources.

Many of these structural changes are being driven by mitigation policies that have been set outside of the health sector, such as in commitments related to a country's nationally defined contribution, but nevertheless have enormous potential impacts for the emissions of the health sector itself. In addition to such structural mitigation actions that can be applied to the health sector, health systems have the potential to further reduce their emissions impact via actions that target the actual approach to healthcare delivery.

The breadth of policy responses needed to reduce the climate impact of health systems requires an all-hands-on-deck approach that empowers stakeholders across the health system to take the actions necessary to meaningfully reduce greenhouse gas emissions from the health sector. This necessitates that not only clinicians, but also other decisionmakers, including healthcare administrators, policymakers, and even patients, are equipped with both the knowledge and authority to implement changes that reduce the emissions impact of the sector.

Reducing low-value care: A win-win-win for outcomes, costs and environmental impact

Breaking down emissions within the health sector by those amenable to changes in healthcare practice, OECD estimates suggest that an important share of health sector emissions could be reduced with better care delivery and focus on policies that drive down low-value care. In a scenario where avoidable hospital admissions were eliminated and the average length of stay in hospitals fell to that of the best-performing

quartile, emissions associated with hospital care could be reduced by up to 25% on average across OECD countries.

Identifying low-emission alternatives to currently used medical products, reducing low-value care, strengthening care management and shifting care out of inefficient settings can all contribute to reducing emissions while also delivering on broader goals for high-performing health systems.

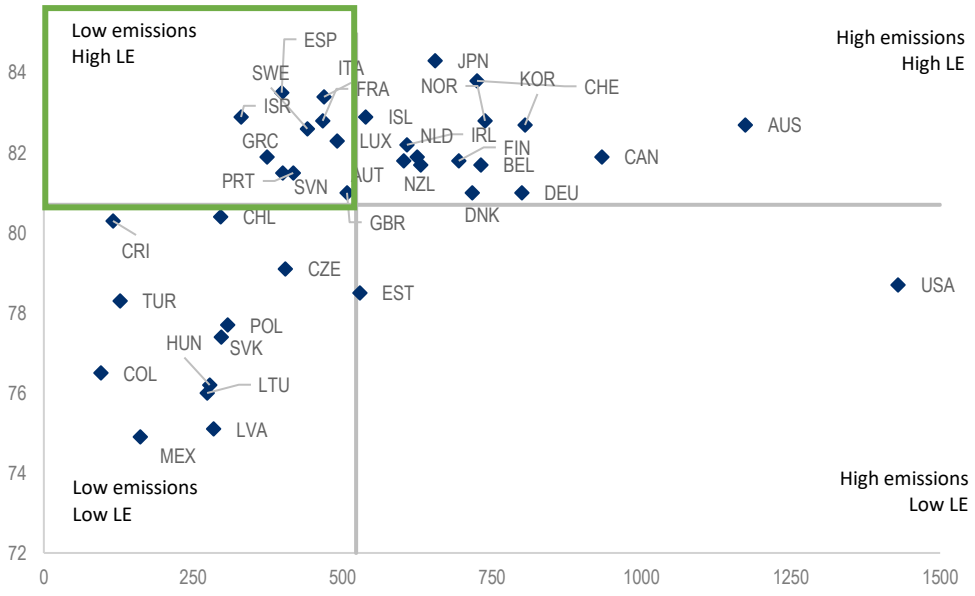
A number of factors may explain this. While information on the emissions contributions of different healthcare products, interventions and care pathways is growing, it remains extremely limited in the context of the breadth of the services provided by health systems, restricting the evidence base upon which to respond and act. Moreover, the role of governments in health systems across OECD countries is very significant. On average in OECD countries, nearly three-quarters (73%) of health spending comes from public sources (OECD, 2023[5]). Many of the mitigation actions being undertaken in the health system reflect policies being driven by national (or sub-national) commitments on greenhouse gas mitigation, such as energy efficiency standards for the construction of new buildings.

Nevertheless, recent developments suggest growing momentum towards more deeply embedding environmental sustainability considerations, including reducing greenhouse gas emissions, into healthcare delivery. These include growing efforts to quantify the emissions and broader environmental impact of healthcare products, medical devices, pharmaceuticals, and entire care services and pathways, as well as developing guidelines and incentives to reduce the use of high-emitting options where lower emissions alternatives already exist.

Reducing emissions without compromising care

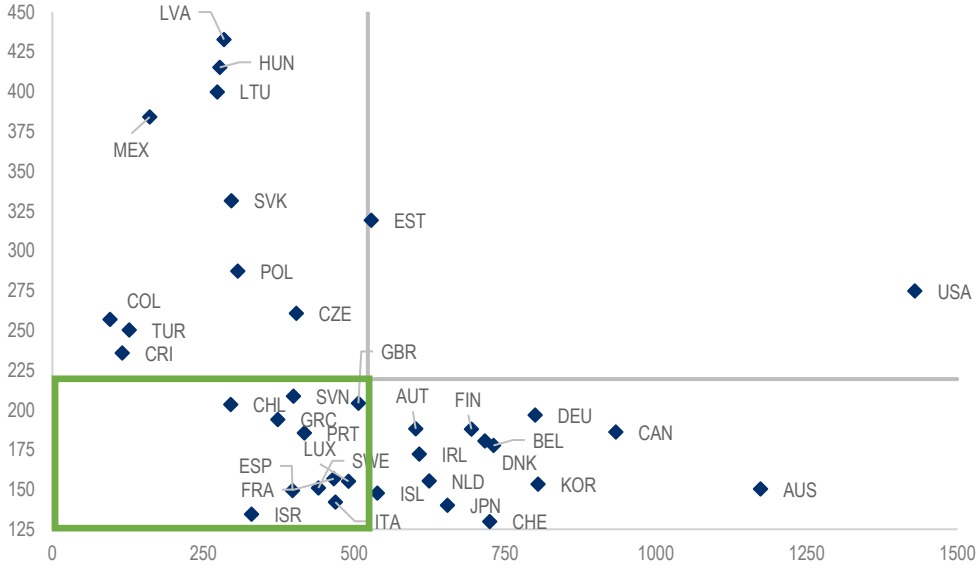
Looking at the association between health sector emissions and measures of high performance in health systems offers an illustration of the extent to which higher emissions are – or are not – necessary or inevitable in delivering high-quality care. An analysis of health sector emissions compared to life expectancy, avoidable (preventable and treatable) mortality, quality of care, and patient satisfaction indicate that while there appears to be a clear positive relationship between health sector emissions and high performance across a number of measures, there are an important number of high-performing, low-emissions outliers that indicate quality, access, and other key dimensions of performance do not need to be compromised in exchange for lower emissions.

Figure 2.7. Life expectancy and health system emissions: Many countries perform well with lower-than-average emissions



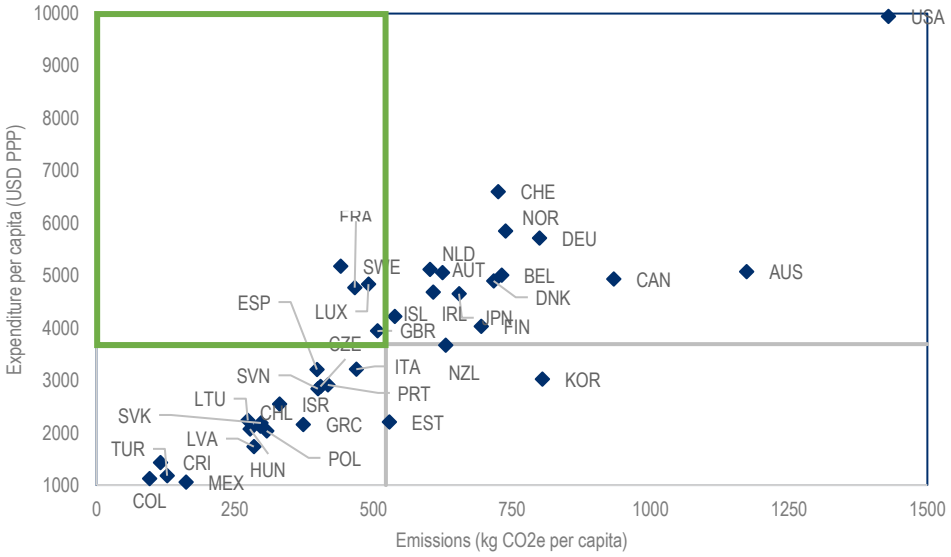
Note: Data for health sector emissions are expressed in per-capita terms and normalised to the OECD average. Data on life expectancy at birth is normalised to the OECD average.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Figure 2.8. Avoidable mortality and health sector emissions



Note: Data for health sector emissions are expressed in per-capita terms and normalised to the OECD average. Data on avoidable mortality is normalised to the OECD average.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Figure 2.9. Four OECD countries have higher-than average health spending but lower-than-average emissions



Note: Data for health sector emissions are expressed in per-capita terms and normalised to the OECD average. Data on health expenditure per capita is normalised to the OECD average.
Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Comparing emissions with dimensions of strong performance in health systems indicates that there are clear examples of countries who deliver consistently strong healthcare at lower emissions levels.

Governing health systems mitigation

Across OECD countries, sectoral decarbonisation efforts are strongly influenced by national mitigation commitments and policy. As such, ministries responsible for broader mitigation approaches – including the Ministry of Environment, Ministry of Energy, Ministry of Finance and others – often play a role in designing policies implemented by health systems. While Ministries of Health are responsible for formulating and implementing mitigation policies for the health sector in nearly 70% of countries, the Ministry of the Environment also shares this responsibility in more than three-fifths of countries (OECD, 2024[1]).

Attention to mitigation efforts within the health sector have only recently drawn more widespread attention, and nationally co-ordinated policymaking is still being scaled up across many countries. Within Ministries of Health, for example, just over one-third of countries report having a team or division dedicated to mitigation policies, and nearly four-fifths have not dedicated funding within the health budget to support emissions reduction (OECD, 2024[1]).

In recent years, a number of countries have begun setting up climate change and health units tasked with addressing and co-ordinating both adaptation- and mitigation-related efforts within the health system.

- **Australia** funded and established a National Health, Sustainability and Climate Unit in December 2022 within its Department of Health and Aged Care. The Unit was set up to support the development and implementation of the National Health and Climate Strategy (Australian Government Department of Health and Aged Care, 2024[6]).

- In **Austria**, the Competence Centre Climate and Health was established in early 2022, bringing together efforts both to adapt the health system to climate change and to deliver a net zero health system (Agenda Gesundheitsförderung, 2024[7]).
- In **Canada**, greenhouse gas emissions from the health sector are largely under the jurisdiction of provinces and territories. The Treasury Board Secretariat leads the Greening Government Strategy, which is responsible for achieving the government's climate resilience (by 2035) and net zero (by 2050) goals (OECD, 2024[1]). The Climate Change and Health Office within Health Canada complements the strategy by supporting the Canadian health system in reducing its emissions.
- In the **Netherlands**, a dedicated team in the Ministry of Health was established in 2019 focused on sustainability and health. It is responsible for co-ordinating the efforts of the Ministry of Health and the broader healthcare sector, as well as stimulating other ministries to take healthcare into account when making climate policy (OECD, 2024[1]). Additionally, in 2023 four sustainability coordinators were appointed in different directorates within the Ministry of Health to function as focal points on relevant subjects and opportunities to link their work with sustainability and to make sustainability an integrated part of the policy work of the Ministry.
- **Portugal** has allocated responsibility for the implementation of the Environmental Sustainability Program of the Ministry of Health, known as *ECO@SAÚDE*, to the Central Administration of the Health System (ACSS) (Central Administration of the Health System, Portugal, 2021[8]). The programme focusses on monitoring the consumption of electricity, gas, water and waste production within the health system, the use of renewable energy, monitoring the sustainable renovation of health facilities owned by the Ministry of Health, and tracking and monitoring the environmental impact of government-owned vehicles (OECD, 2024[1]).
- In the **United Kingdom**, the Sustainable Development Unit (SDU) was initially established within the National Health Service (NHS) in 2008, after the publication of the 2008 Climate Change Act, and was responsible for strengthening local efforts to promote sustainable healthcare (NHS England, 2024[9]). Following on the work of the SDU, NHS launched the *Greener NHS Programme* in 2022, when the Health and Care Act made the NHS the first health system in the world to legally commit to achieving a net zero health system (NHS England, 2024[10])

Many countries have not dedicated specific funding to health systems mitigation efforts

Even where governance structures to support climate change and health have been developed, funding has varied widely across countries. More than two-thirds of OECD countries report having no dedicated financing for mitigation measures. In some, such as **Belgium**, funding is still available at the project level even if not included in the recurrent budget. In other countries, such as **Portugal**, funding is available outside of the health system – such as through the Environmental Fund and the Recovery and Resilience Plan – to support initiatives towards health systems mitigation and environmental sustainability.

A minority of countries have allocated specific funding in their health budgets to supporting the development of sustainable and low-carbon health systems, with funding often covering both aspects of health systems mitigation and climate adaptation-related resilience approaches.

- In **Australia**, the National Climate and Health Strategy received AUD 3.4 million in funding over its first four years, with AUD 0.7 million allocated for subsequent years (Australian Medical Association, 2022[11]).
- In **Austria**, the Competence Centre Climate and Health has been scaled up quickly since its founding in 2022, currently encompassing more than 60 staff members. The Centre was supported with EUR 24 million in funding for its first three years (2022-2024), not including funding dedicated to specific adaptation- and mitigation-related projects. Its projects have received significant funding, including EUR 350 million allocated from the Ministry of Climate Protection through

2030 for a project co-ordinated together with the Ministry of Health and Competence Centre to improve the energy efficiency of hospitals, rehabilitation facilities, retirement homes, and nursing facilities (Lichteneker, 2024[12]). The Competence Centre Climate and Health serves as an instructive example of how public health institutes can be brought in to support interdisciplinary work to strengthen the response to the links between climate change and health.

- In **Canada**, Health Canada and Indigenous Services Canada were supported with CAD 55 million over five years to bolster efforts to build climate-resilient and low carbon health systems, protect people in Canada from extreme heat, and to support climate change and health adaptation for First Nations and Inuit Communities. Additional funding for climate change-related health initiatives is available at the provincial level in some provinces.
- In the **Netherlands**, EUR 42 million has been allocated within the budget of the Ministry of Health for 2023-2026 to, amongst other things, support projects and initiatives that facilitate the transition towards a more environmentally sustainable health system (Ministry of Finance, Netherlands, 2025[13]).

Countries are scaling up efforts to measure the emissions impact of healthcare

While many barriers to the regular measurement of health systems emissions still exist, a growing number of countries have begun to estimate the emissions associated with health systems, or even to adopt reporting requirements in part or fully across the health system.

Reporting requirements have been adopted across health systems

- In **Australia**, the National Health and Climate Strategy has required the government to work towards best aligning the different approaches to emissions measurement that have been adopted at the state and territorial levels by health systems. While all states and territories have begun measuring at least Scope 1 and 2 emissions from their health systems, and some also measure Scope 3, the methodologies adopted across the country have varied, often in accordance with both the targets set in the respective regions or territories, as well as with reporting requirements in the regional area. The Strategy's call to harmonise methodologies is intended to improve the comparability across jurisdictions and across health systems, as well as to better integrate bottom-up, granular data on emissions into current estimates (Commonwealth of Australia (Department of Health and Aged Care), 2023[14]).
- In **New Zealand**, an initiative to promote emissions reductions within the public sector, the Carbon Neutral Government Programme, was launched in December 2020 with the goal of achieving carbon neutrality by 2025. The programme requires organisations, including the Ministry of Health, to measure and report their greenhouse gas emissions, to introduce a plan for further emissions reductions, and to offset emissions starting in 2025 to ensure organisations are carbon neutral (Ministry for the Environment, New Zealand, 2023[15]). The Ministry of Health first reported their emissions in 2022 (for 2019-2020 activities) and continue to do so on an annual basis.
- In the **United Kingdom**, the 2022 Health and Care Act mandated service providers and commissioners within NHS England to develop 'green' plans in support of efforts to achieve net zero within the health system. As part of efforts to promote sustainability within the health system, NHS England began tracking and reporting its emissions in 2008, with more recent initiatives adopted that take a more detailed approach to calculating emissions, including at the local (e.g. trust or integrated care board) level. In addition to green plans and monitoring within service providers, NHS England has further launched a Net Zero Supplier Roadmap, which requires suppliers themselves to publish emissions reduction plans, report both their targets and emissions, and ultimately estimate the carbon footprint of the products that are supplied to the NHS. The net

zero supplier roadmap has been introduced gradually since 2022, with full requirements in effect as of 2030, to allow suppliers enough time to adjust to the new standards (NHS England, 2025[16]).

Other countries have developed approaches to measure and report emissions at the facility level, particularly in hospitals.

- In **Austria**, a greenhouse gas calculator is being developed by the Competence Centre Climate and Health, which will enable healthcare facilities to estimate their emissions using an approach that will enable standardised reporting across the country (OECD, 2024[1]).
- In **Belgium**, the first baseline health sector emissions were developed and published in February 2025, following which a structured database to monitor emissions in the healthcare sector will be developed (OECD, 2024[1]; Environnement-Santé Belgique, 2025[17]).
- In **Canada**, some provinces have adopted rules requiring public emissions disclosure for public sector organisations, including health services such as hospitals. In the province of Ontario, for example, hospitals are required to report their annual greenhouse gas emissions and energy consumption and to develop a five-year plan for energy conservation, while in British Columbia, the Carbon Neutral Government Program requires all provincial public sector organisations to be carbon neutral and report yearly on their status through the Public Sector Organisation Climate Change Accountability Report. While the measurement of greenhouse gas emissions in Canada is largely a provincial and territorial jurisdiction, there have been more recent attempts to develop better national estimates and more consistent approaches to measurement across the country. A community of practice providing support to healthcare facilities in measuring their emissions, as well as guidelines on estimating emissions in healthcare in Canada, has been developed jointly by the Canadian Coalition for Green Healthcare together with CASCADES Canada, supported by federal funding (OECD, 2024[1]).
- In the **Netherlands**, guidelines and roadmaps to help healthcare providers meet emissions targets and reporting requirements areset up by the Expertise Centre on Sustainable Healthcare (Expertisecentrum, Verduurzaming Zorg or EVZ) and the Environmental Platform Healthcare (Milieu Platform Zorg or MPZ) which is subsidised by the Ministry of Health. There are also plans by healthcare insurers to develop joint reporting templates to avoid overly cumbersome reporting requirements for healthcare providers.
- In **Norway**, standards for hospital emissions measurement emerged from initiatives around environmental, social and governance (ESG) reporting. All hospitals in Norway comply with certified environmental standards (ISO 14 001) (Nordic Centre for Sustainable Healthcare, 2019[18]). The Directorate for Health has developed an online dashboard publishing information on carbon emissions and other sustainability-related information for hospitals and other specialist services, covering Scopes 1, 2 and 3 as of 2024 (Alliance for Transformative Action on Climate and Health, 2024[19]).
- In **Spain**, a preliminary study was undertaken to measure the emissions associated with healthcare in both public and private facilities. Following the analysis of this initial benchmarking project, guidelines on the measurement of healthcare-related emissions and on emissions reduction in health will be published (Ministry of Health, Spain, 2023[20]).

Box 2.3. Refining health systems emissions measurement in the Netherlands

In the Netherlands, the Ministry of Health, Welfare and Sport made a commitment in 2021 at COP26 in Glasgow to support the sustainability of its health sector, including promoting the development of sustainable supply chains and measuring the environmental footprint of the healthcare sector regularly, and at least every four years.

A baseline report published in 2022 estimated that the healthcare sector represented 7% of the country's national carbon footprint, with 80% of emissions originating from supply chains, and 40% from pharmaceuticals and chemicals used in healthcare (Steenmeijer et al., 2022[21]). It also went beyond greenhouse gas emissions to estimate the health sector's contribution to other environmental impacts, including water use (8%), land use (7%), abiotic (non-living) resources (13%), and waste production (4%) as a proportion of the country's overall footprint (Steenmeijer et al., 2022[21]). The publication of a second environmental footprint study of the Dutch healthcare system is expected in 2026.

Researchers at the National Institute for Public Health and the Environment (RIVM) are working to further refine the healthcare sector's environmental footprint estimates. Building on their initial work, they are working towards improving the accuracy of top-down input-output databases and complementing the information provided in environmentally-extended input-output tables with bottom-up data from life cycle assessments and existing national databases, including data on anaesthetic gases, patient and visitor travel and mobility, and direct water consumption and waste production from facilities. Data is being collected from institutions across the government and across the healthcare sector in the Netherlands, including Statistics Netherlands, the Dutch Healthcare Authority, healthcare providers, the Ministry of Infrastructure and Waste Management, the Expertise Centre for Sustainable Care, the Netherlands Enterprise Agency, the National Healthcare Institute, and the association of emergency medical service providers. Results of the more granular analysis are intended to help to better identify "hotspots" of high emissions in the healthcare sector, as well as to monitor changes to emissions over time.

As they have worked to improve estimates of the Dutch healthcare sector's environmental footprint, experts in the Netherlands have encountered challenges related to both data availability and transparency as well as data processing and reporting. They report that much core data remains fragmented, decentralised and non-harmonised, while different methodologies and a lack of harmonisation around data categories and terminologies has created significant challenges related to comparability in results (van Bodegraven et al., 2025[22]).

Three-fifths of OECD countries have not put in place measurement frameworks to benchmark environmental sustainability

Benchmarking and regularly measuring emissions across and within the health system is important to measuring progress and to identifying where further improvements have the potential to be made. Yet progress towards better benchmarking current health sector emissions remains very fragmented. Even within the OECD, countries are at very different level of development when it comes to measuring the emissions associated with the health sector as a whole, and its subsectors. Life-cycle analyses, which help to estimate the emissions associated with the life cycle of a product or service, have similarly been developed for just a fraction of the total products and services used within healthcare. Moreover, efforts to better harmonise measurement approaches across countries are still developing, making it difficult to compare and apply emissions estimates developed in one health system to others.

- In **Australia**, the National Australian Built Environment Rating System (NABERS) helps both public hospitals and long-term care facilities understand opportunities to further reduce their emissions and to track emissions over time. Information included in the NABERS tool include energy output, water management, evaluation of waste management practices, and measures related to the comfort of the indoor environment (e.g. air quality, temperature, acoustic quality). Tools for private health facilities and hospitals are currently under development, as the development of a certification pathway for carbon neutrality for use among public hospitals.
- In **Canada**, the Canadian Coalition for Green Healthcare has developed a *Green Hospital Scorecard*, allowing hospitals to evaluate their environmental performance across a range of dimensions and compare their performance to other hospitals and healthcare facilities across the country. As of 2021, 81 facilities participated in the data collection for the scorecard, which is open to community, academic, non-acute and small hospitals ((The Canadian Coalition for Green Health Care, 2024[23])).
- The Green Operating Room Barometer, a measurement toolkit to help improve the environmental sustainability in operating rooms and surgery has been developed in the **Netherla**nds and is intended to be rolled out across all hospitals in the country. Roadmaps to measure and reduce greenhouse gas emissions have also been developed for the curative care sector and the long term care sector, partially subsidised by the Ministry of Health.
- **Norway** has adopted both an overarching emissions mitigation target for the health sector, as well as eight more detailed sub-objectives aimed at reducing emissions and the broader environmental footprint of the health sector while improving health outcomes (South-Eastern Norway Regional Health Authority, 2025[24]).
- In **Sweden**, annual reports on the environmental impacts of different regions include a number of measures related to the impact of the health system on the environment and on emissions, as well as policies with important health co-benefits, including healthy eating and public transportation. Metrics to track the environmental impact of healthcare include antibiotic consumption and the environmental impact of medically used gases. Cross-regional comparison is intended to improve knowledge exchange and progress towards environmental sustainability across the country (Sveriges Kommuner och Regioner, 2023[25]).

Better and more consistent measurement approaches are still lacking in many cases

Even as the number of countries undertaking emissions analyses for their health sector has increased, further work is needed to better quantify the potential environmental impact of the products, services and processes used across the health sector. Even as initiatives such as Healthcare LCA have compiled an extensive repository of life-cycle analyses related to health products, the number of analyses that have been conducted is dwarfed by the sheer number of products and items used in healthcare.

Ensuring standardised approaches to life-cycle analysis are adopted to best allow for cross-product and cross-country comparability is integral to this process. As countries have begun to adopt stricter reporting and measurement requirements among their suppliers, some have also begun turning to the question of helping develop better methods of estimation for the emissions associated with products.

- In **France**, recent guidance co-published by the Ministry of the Economy, Finance and Industrial Sovereignty is intended to help establish an assessment methodology for the carbon footprint of medicines used in the sector. The guide was developed for healthcare professionals across the medicines supply chain, from manufacturers and suppliers to policymakers and clinicians, to help develop comparable and rigorous estimates of emissions using an approach that is not overly resource intensive (Ministry of the Economy, Finance and Industrial Sovereignty, France/EcovaMed, 2024[26]).

Transforming energy use in the health sector

Most countries have in place energy standards applicable to the health sector – but these are often broader energy regulations, rather than designed for health systems in particular

The vast majority of OECD countries have put in place laws, regulations, policies or strategies to reduce energy-related emissions from healthcare facilities. Ninety per cent of responding countries reported that policies are in place to support energy efficiency upgrades to buildings, while two-thirds of countries have in place initiatives that support measures to strengthen the adaptation response, including facility-level vulnerability assessments and necessary building upgrades (OECD, 2024[1]).

In most cases, the development of stricter emissions rules and support to achieve better environmental sustainability are linked to broader mitigation measures that apply across economic sectors. More than three-quarters of countries reported having in place requirements that specifically apply to the new construction of healthcare facilities to comply with climate change-related emissions standards. Of the countries that report such requirements, however, more than 90% report that such requirements are part of broader requirements promoting sustainability in construction, rather than specific to the health sector.

Some countries report that both health-specific and broader emissions standards have been developed that apply to the health sector.

- In **Australia**, the Australasian Health Facility Guidelines have been developed to serve as a general guide for all standards applicable to health facilities. These include specifications on regulations and standards related to environmental sustainability, including anaesthetic gas leakage and energy efficiency standards. Some regional states and territories have also developed initiatives to promote the decarbonisation of health facilities. In the state of Victoria, for example, the Victorian Government has committed all new public hospitals to be fully electric, using 100% renewable sources of energy, by 2025. Across the state, all new healthcare buildings – regardless of their size – are required to be fully electric. Sustainability guidelines have been published by the Victorian Health Building Authority to support the development and transformation of sustainable health facilities. In addition, the federal government is in the process of updating the National Construction Code to strengthen energy efficiency, with new building requirements applicable to the healthcare sector, including the construction of hospitals. Guidelines are also being developed that target the sustainability and resilience of the long-term care sector, with the Department of Health and Aged Care in the process of creating the *National Aged Care Design Principles and Guidelines*, which will help inform the renovation and construction of long-term care facilities.
- In **Austria**, EUR 350 million has been allocated to support the development of “climate-friendly” healthcare facilities, including hospitals, outpatient clinics, rehabilitation centres, pharmacies and long-term care facilities. The project takes a holistic approach to sustainable building transformation, looking not only at structural changes to reduce greenhouse gas emissions, but the further promotion of sustainable procurement, mobility and transportation, food systems, and waste management, as well as broader awareness raising and staff training. More than 400 facilities are currently involved in the project.
- In **Canada**, for example, the province of British Columbia published guidelines for environmental sustainability and low carbon resilience (the *Low Carbon Resilience and Environmental Sustainability Guidelines for Healthcare New Construction*) to help influence and inform both the construction of new healthcare infrastructure and major renovations of existing health and long-term care facilities (EES, 2024[27]). As a living document, the guideline is intended to be updated as best practices in low-carbon and environmentally sustainable healthcare construction evolve.

- **Denmark's** five regions published a strategy for sustainable hospitals in 2024, setting a national goal to reduce halve consumption-based CO2 emissions by 2035 (compared to a 2022 baseline) (Danish Regions, 2024[28]).
- In **Estonia**, national targets are being set at the sectoral level (e.g. buildings, waste management, energy, agriculture, transport, oil and shale, and other processing industries and construction) to reduce greenhouse gas emissions. Sectoral targets will apply across the economy, including to health systems, once the anticipated Climate Resilient Economy Act is passed (Republic of Estonia (Ministry of Climate), 2024[29]; Estonian Public Broadcasting, 2024[30]). The development of a standardised reporting framework that would also apply to the health sector is also planned (OECD, 2024[1]).
- In **France**, mandatory requirements related to the energy efficiency of new healthcare facilities have been in place since 2012. As of 2025, healthcare facilities are required to comply with even stricter standards, including standards around carbon emissions.
- In **Hungary**, a Building Renovation Monitoring System is being developed to better track progress towards emissions reductions goals in public buildings. Data will be collected on the number of public buildings that have undergone energy renovations, the emissions and energy impact of these renovations, and the cost of renovations.
- In **Israel**, standards for green hospital construction have been developed. While non-binding, they have served as a standard that has moved new building construction towards more sustainable methods.
- In the **Netherlands**, national regulations on building sustainability have been complemented by additional guidelines and information through the Expertise Centre on Sustainable Healthcare (Expertisecentrum Verduurzaming Zorg, or EVZ), which is a joint activity of the Environmental Plaform Healthcare (MPZ) and Netherlands Organization for Applied Scientific Research (TNO) in co-operation with branch organizations who participate in the Green Deal Sustainable Healthcare. The EVZ has published guidelines on sustainable building materials and circular construction applicable to the health and care sectors (Expertisecentrum Verduurzaming Zorg, 2024[31]). Information on the website EVZ is free available for all healthcare suppliers to use. Subsidies and grants are also available for healthcare providers for making their buildings sustainable, both on regional and national level, specifically to support small and medium-size organizations.
- a joint activity of the country's hospital association, social care association, university medical centre association, and disability care association. EVZ has published guidelines on sustainable building materials and circular construction applicable to the health and care sectors (Expertisecentrum Verduurzaming Zorg, 2024[31]).
- In **Portugal**, energy efficiency and environmental targets have been set for public health buildings, including long-term care facilities, to improve their environmental performance over time. Annual reduction targets have been set for water consumption, energy consumption, and broader materials consumption, with goals for a threshold of renewable energy consumption to be reached by 2030.
- **Slovenia**'s technical guidelines for the construction of new medical facilities requires certain standards of energy efficiency are taken into account in new healthcare construction.
- In the **United Kingdom**, legislation passed in 2022 enshrines into law requirements for NHS England to achieve reductions in emissions targets. The targets apply to all healthcare trusts. As of 2024, close to two-thirds of hospitals reported making sustainability-related building upgrades, with close to half of hospitals tracking their energy consumption. Seventy per cent of trusts report measuring their greenhouse gas footprint, though about one-third of trusts had not yet developed or implemented plans to reach the mandatory net zero goals (Hignett, 2024[32]).

Other countries have not developed specific standards or guidelines applicable to the health sector but have requirements applying to new construction across all sectors, including healthcare.

In the **Czech Republic**, for example, the "Construction Act" requires all new buildings, including healthcare facilities, to comply with a set of environmental standards in their construction, including an energy efficiency assessment and environmental impact assessment. While specific standards for the health system have not been developed, a number of hospitals have independently invested in energy renovations to reduce energy consumption and increase financial savings. To promote the uptake of such energy-saving renovation projects, the Ministry of Health has created an interdepartmental working group to raise awareness and encourage further adoption, particularly in large hospitals. Facilities can access subsidies for energy renovations, including from the Ministry of Environment's "New Green Savings" programme. Twenty-six Energy Performance Contracting projects have been undertaken in the health sector, with estimated annual savings amounting to more than CZK 190 million (approximately EUR 7.7 million) (OECD, 2024[1]). Similar requirements are in place for all or public construction in other countries, including in **Estonia, Greece,** and **Norway**.

Most countries have not introduced policies to encourage lower-emission or more sustainable alternatives in healthcare delivery

While countries are taking steps to better quantify the potential emissions impact of their healthcare sector, many are lagging behind when it comes to developing and scaling up policies that encourage the transformation of healthcare practices towards lower-emission approaches. Just over one-third of responding OECD countries (7 of 19) report that they have in place policies – such as changes to payment systems or other incentives – to encourage the adoption of lower-emission alternatives in healthcare delivery.

Given the relatively new focus on environmental sustainability and emissions mitigation in healthcare, as well as the emerging and evolving evidence base around best practices, collaborative platforms that promote knowledge-sharing and are flexible in adapting to new evidence can offer a useful approach to disseminating information and building momentum towards behavioural changes across the health sector.

- In **France,** the National Agency for Supporting the Performance of Health and Medico-social establishments, or ANAP, created a national platform for best practices, accessible to all health facilities and healthcare professionals to provide information on approaches they have taken to improve the sustainable development of their facilities and practices.
- Internationally, the WHO's Alliance for Transformative Action on Climate and Health (ATACH) has as one of its major objectives to promote knowledge sharing and exchange between partners. As part of this, it has launched a "First Wins" library of best practices, with the intention of providing tangible real-life examples that will help countries move towards the implementation of the WHO's Operational Framework for Building Climate Resilient and Low Carbon Health Systems (Alliance for Transformative Action on Climate and Health, n.d.[33]).

Some countries are taking steps to incorporate environmental sustainability into healthcare quality and outcomes frameworks

Across the OECD, a growing number of countries have begun developing health systems performance assessment (HSPA) frameworks to monitor quality and performance in their health sector. HSPA frameworks can help countries to identify the outcomes fundamental to what they conceive as high-quality, high-performing health systems, and what structural foundations and cross-cutting dimensions are critical to building a system that can achieve these goals. By providing a structure to systematically evaluate progress around the fundamental objectives of the health system, HSPA frameworks can help

policymakers to better identify where health systems are performing well, where improvement is needed, and how resources can be allocated to ensure key goals are met.

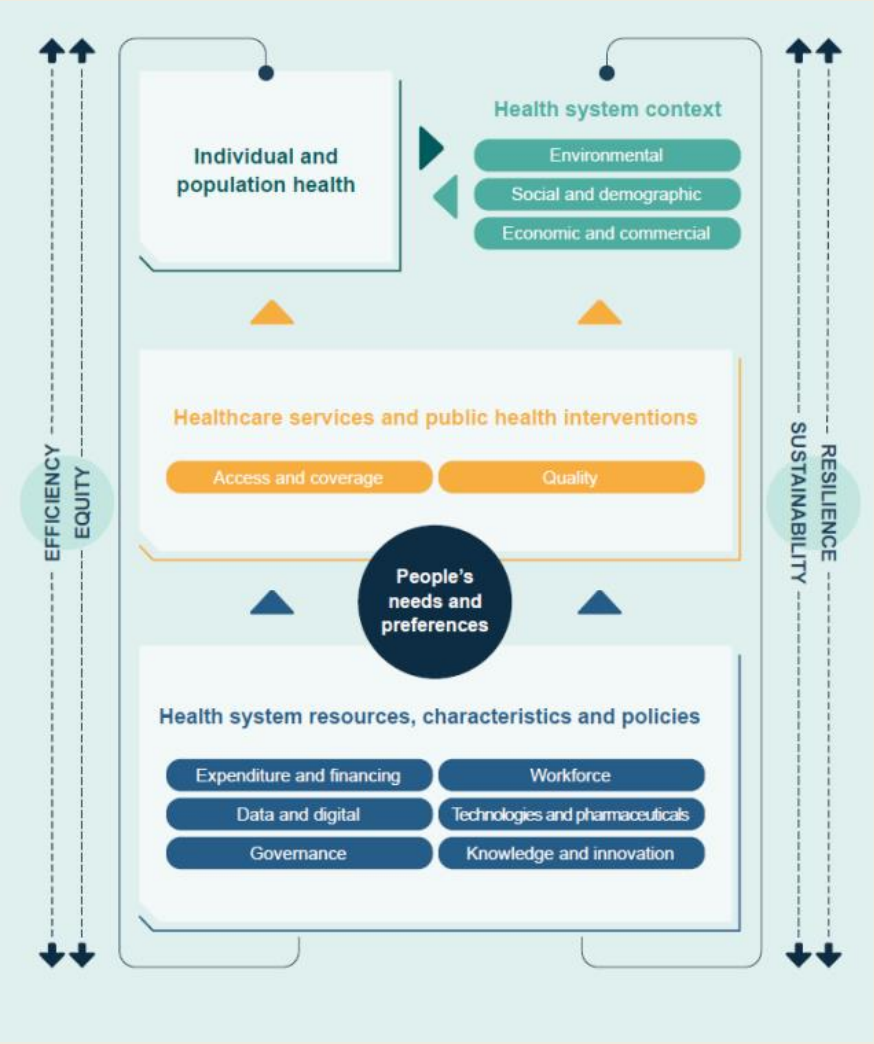
Until recently, health systems performance assessment did not consider environmental sustainability as linked to important outcomes of the health system (e.g. the impact of environmental factors on health outcomes, akin to the social determinants of health, or as a dimension of health systems sustainability).

The inclusion of environmental factors into HSPA frameworks can serve to further institutionalise environmental considerations as a key dimension of health systems performance – rather than an interesting but more voluntary or optional consideration healthcare professionals can take into account given adequate resources or time. Incorporating environmental factors – and ultimately, quantifiable, regularly monitored indicators – could serve as a powerful signal by health policymakers that taking into account environmental sustainability in health systems is as important as a measure of performance as financial sustainability or other measures. To date, at least 11 OECD countries have adopted HSPA frameworks to guide the monitoring and evaluation of health systems quality. Of these, no countries have incorporated measures of environmental *sustainability* into their assessment frameworks.

One country, **Belgium**, has plans to add an environmental sustainability dimension to their framework and is currently undertaking research and preparatory work to develop the indicators that would accompany this component of the framework. Ultimately, the assessment framework is intended to encompass multiple dimensions of environmental sustainability, expanding beyond greenhouse gas emissions to include other dimensions of environmental impact. Three further countries – **Australia**, **Czechia**, and **Estonia** – have incorporated the environmental impacts *on* health into their assessment frameworks, but do not take into account environmental sustainability itself. In **Australia**, the Australian Commission on Safety and Quality in Healthcare is piloted an Environmental Sustainability and Climate Resilience Healthcare Module in 2024 (Australian Commission on Safety and Quality in Healthcare, 2024[34]). The module represents a pilot framework aimed at helping to strengthen health systems resilience to climate change while reducing its impact on climate change through the scale-up of mitigation practices. The Module is intended to be implemented in parallel with other safety and quality standards in the health sector and is focussed on health services and clinical practices that have significant impacts on the environment, and on the environmental impact of healthcare organisation and delivery (e.g. waste systems or energy systems). Learnings from the pilot implementation are intended to be integrated into the release of a formal Module in 2025 (Australian Commission on Safety and Quality in Healthcare, 2024[34]).

Box 2.4. The OECD Health System Performance Assessment Framework

In 2024, the OECD released a revised Health System Performance Assessment framework, intended to serve as a guide for future health systems assessment. For the first time, the revised health systems performance assessment (HSPA) framework includes reference to environmental factors within the broader health systems context (OECD, 2024[35]).



The framework recognises the many different relationships between environment and health, including the impact of various environmental risk factors on health outcomes, and the environmental impacts caused by health systems themselves. Notably, the cross-cutting pillar of sustainability encompasses not only financial sustainability, but also environmental sustainability, making reference to the health system's greenhouse gas emissions and enough flexibility to expand out to define the health system's environmental impact more broadly.

Source: OECD (2024[35]), *Rethinking Health Systems Performance Assessment: A Renewed Framework*, https://doi.org/10.1787/107182c8-en.

Bottom-up action is driving many mitigation efforts within the health sector

The lack of institutionalised, national-level policy action towards health systems mitigation in many countries does not capture the full picture of how many healthcare professionals have taken steps to better integrate environmental considerations into their healthcare delivery practice. Much action has been taken at the local (e.g. hospital or regional) level, often instigated by clinicians and other healthcare professionals, to push their healthcare facilities to adopt more sustainable methods of care practice and delivery.

Some countries have more recently begun to scale up emissions reduction initiatives that originated at more local levels. In **Denmark**, for example, the Central Denmark Region's Center for Sustainable Hospitals began tracking the consumption of various medical products and waste for the hospitals in its region, communicating with clinicians in the hospitals about the consumption of high-waste and emissions products such as single-use surgical equipment to promote behavioural changes. The experiences of the region have formed the base for the development of a country-wide *Danish Regions Strategy for Sustainable Hospitals*, published in 2024. In addition to a country-wide emissions reduction goal for hospitals (halving consumption-based emissions by 2035, compared to a 2022 baseline), the strategy identifies three particular areas of intervention: procurement, behavioural change and supporting a circular economy, and reducing emissions from energy, buildings and transportation (Danish Regions, 2024[28]).

Reducing emissions through transforming clinical care

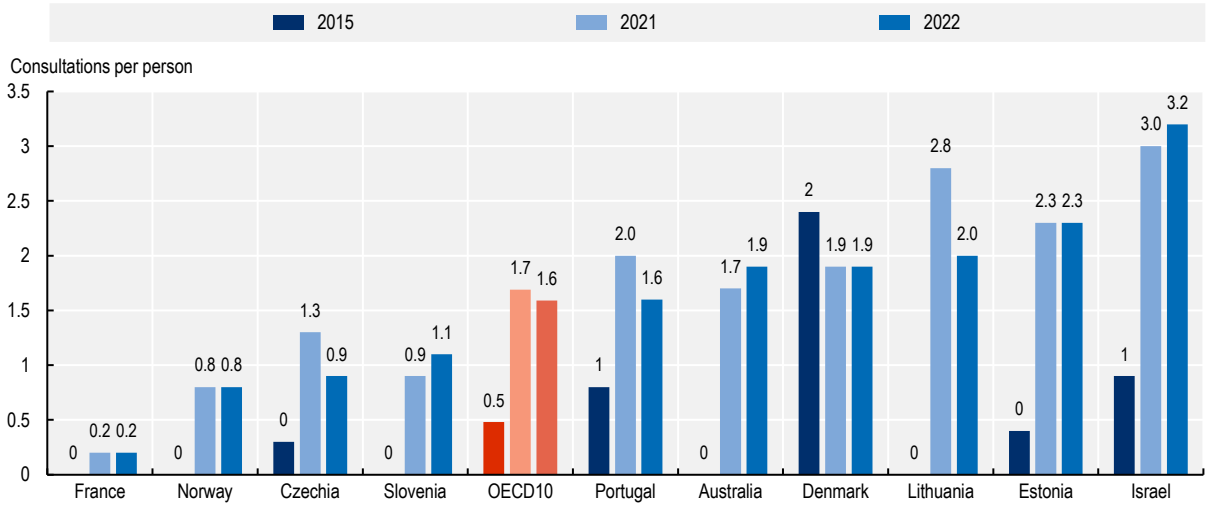
Many actions taken at the national level or outside of the health sector nevertheless heavily impact the emissions associated with health systems, with energy sources and national environmental and energy regulations impacting decision making and actions within health systems. Nevertheless, there is much that can be done *within* health systems to further drive down emissions. Many actions that can reduce health systems-associated emissions also have positive benefits for other health systems goals, such as financial efficiency, and can be delivered without impacting quality of care or patient outcomes.

Opportunities to reduce healthcare-associated emissions exist across a range of different domains, and actions and decisions can be taken at the micro-, meso- and macro levels by healthcare professionals across the field, including not only healthcare delivery, but also policymaking and administration.

Scaling up telemedicine

The use of telemedicine as a substitute for in-person appointments has increased dramatically in recent years, with its uptake sped up rapidly by the COVID-19 pandemic. Between 2015 and 2021, the number of teleconsultations rose markedly across nearly all OECD countries with available data, from virtually no consultations in 2015 to 1.6 visits per person in 2022.

Figure 2.10. The use of telemedicine has increased dramatically in recent years



Source: OECD Health Statistics 2024.

As the potential for the use of telemedicine has increased, policymakers interested in opportunities to mitigate health sector's climate impact have identified the promotion of telemedicine as a promising avenue to meaningfully reduce emissions (Purohit, Smith and Hibble, 2021[36]). For routine consultations with primary care or outpatient specialists that do not involve significant use of resource-intensive procedures such as laboratory tests or digital scans, the largest emissions impact associated with patient visits relates to the emissions associated with patient travel to a clinic or hospital.

Studies comparing in-person medical visits with their telemedical alternatives have systematically identified lower emissions associated with the use of virtual and telephone-based visits, compared to their in-person alternatives (Purohit, Smith and Hibble, 2021[36]). The majority of the emissions savings have been associated with reductions in patient travel to visits. A recent systematic review found a median distance to an appointment of 131 km, with a median emission of 25.6 kgCO2e (van der Zee et al., 2024[37]). An evaluation of the expansion of telemedicine in the province of Ontario, Canada during the COVID-19 pandemic found that the scale-up of virtual visits during the first nearly two years of the pandemic reduced carbon dioxide emissions by 545-658 million kg by saving travel-related emissions associated with 63 million virtual appointments (Welk, McArthur and Zorzi, 2022[38]). At the same time, multiple reviews have found a very wide variation in both the distance travelled to an appointment and the associated emissions "savings" from a telemedicine alternative across the literature (Purohit, Smith and Hibble, 2021[36]; van der Zee et al., 2024[37]). Moreover, evaluations of the emissions savings associated with telemedicine do not always account for the different emissions associated with telemedical care, notably virtual visits, which can vary substantially based on the length of a consultation, the bandwidth of a connection, and how often the telemedical equipment is used (Holmner et al., 2014[39]). Even where these factors have been taken into account, however, telemedical alternatives to in-person consultations appear to significantly reduce the emissions associated with a medical visit, particularly given the important contribution of travel (by patients and providers) to the place of visit on the overall emissions of an appointment (Holmner et al., 2014[39]).

Despite the potential of telemedicine to serve as a lower-emissions alternative to in-person care, however, telemedicine will only reduce health sector emissions if telemedicine serves as a replacement for – rather than a supplement to – in-person care. Should telemedicine substitute for in-person consultations, or reduce the risk that patients miss appointments and therefore need more costly future care, they may help

to reduce overall health sector emissions. However, if telemedical visits lead to additional in-person appointments, or simply supplement the same utilisation of in-person care, it could lead to further costs – in both emissions and expenditure terms – for the health system.

The impact of telemedicine on healthcare utilisation is not yet clear (OECD, 2023[40]). A recent survey of OECD countries indicates that the data on telemedicine remains fragmented across many countries, with fewer than half of responding countries reporting that they had data that would allow them to evaluate the impact of telemedicine on subsequent healthcare utilisation, including patient characteristics, the type of telemedicine service used, why telemedicine was used, and information on further care and patient outcomes (Keelara, Sutherland and Almyranti, 2025[41]).

While there is a growing recognition of the potential impact of scaling up telemedicine for reductions in health sector GHG emissions, policies to promote telemedicine have almost exclusively been pursued for other health system performance reasons, with the emissions benefits a potential additional advantage from policy changes that would be made independently of their environmental impacts.

In recent years, the number of OECD countries offering telemedicine services as an alternative to in-person visits has increased, with major policy advancements spurred by the onset of the COVID-19 pandemic. In most countries where policies were adopted to support care continuity during the pandemic, patients have had their access to telemedicine maintained even following the end of the pandemic, though financing models are in many cases evolving following the rapid expansion of services during the crisis.

Reducing wasteful care

Across OECD countries, reducing low-value care has been a key priority for many years. While what constitutes “low-value” is necessarily subjective, with the views notably of the medical workforce and patients themselves not always in alignment, policymakers have identified a range of interventions and treatments that contribute to over-treatment, including over-testing and over-diagnosis, that could be brought down substantially without attendant impacts on overall health outcomes. Previous OECD work has looked extensively at the costs and impacts of waste in healthcare, finding that up to 20% of healthcare expenditure may be wasted in some OECD countries (OECD, 2017[42]).

Healthcare has been considered to be wasteful where “patients receive health services that fail to maximise health outcomes, given available resources, for reasons that could be avoided”. The concept of waste in care can be conceptualised into two separate components. Care can be wasteful when it causes a preventable adverse event, referring to outcomes that are both undesired and possibly lead to harm which are directly caused by the care received.

Care can also be considered to be of *low value*, when the benefits of the given care do not justify either the costs associated with the care, or its risks. Low value care can be *ineffective* when the care received has clinical outcomes that are no better or worse than lower-cost alternatives and *inappropriate* when interventions are delivered in certain circumstances or to certain patients where it is unnecessary or unwanted, and has no superior clinical effectiveness to alternatives. In addition, care that is clinically more effective but significantly more expensive than alternatives can also, in some circumstances, be considered to be low value in that it is *poorly cost effective*, leading to significantly higher costs for patients or health systems for the improvement in outcomes realised.

In recent years, the number of CT and magnetic resonance imaging (MRI) scans undertaken per capita has risen markedly across many OECD countries. OECD countries demonstrate wide variation in the rate of scans per capita. For example, MRI scans per capita increased by more than one-third between 2015 and 2022 and vary more than 30-fold across OECD countries. In total across OECD countries, the number of MRI scans performed in 2022 – more than 89 million – could correspond to more than 1.5 million metric tonnes of CO2e, equivalent to driving nearly 4 million miles by car.

A recent audit of the appropriateness of CT scans across seven European countries found a significant variation in the proportion of scans that were considered to be fully appropriate, ranging from less than three-fifths (58%) in Greece to more than 85% (86%) in Denmark (European Commission, 2024[43]). Between 4-16% of CT scans undertaken and included in the audit were considered to have been inappropriate care (European Commission, 2024[43]).

Policies to reduce the use of inappropriate MRIs and CT scans have been undertaken in a number of OECD countries, including **Australia**, parts of **Canada**, **Denmark**, the **Netherlands**, **Sweden** and the **United Kingdom**. While the objective of these policies has largely been unrelated to emissions reductions goals, and instead an outcome of efforts to reduce low-value care more broadly, effective reductions in inappropriate care can have the added benefit of further reducing the health sector's contribution to greenhouse gas emissions. In **Luxembourg,** for example, a national action plan aimed at reducing the inappropriate use of medical imaging was launched in 2015 by the Ministry of Health (Santé Luxembourg, 2015[44]). Actions included developing a toolkit for doctors in French and German, as well as promoting additional training on appropriate medical imaging for clinicians and strengthening the medical justification needed for medical imaging. Two rounds of audits, in 2016 and 2023, have found that progress has been made in the appropriate use of medical imaging, with particular gains made in appropriate CT scans. Smaller improvements were observed in the use of MRIs (Health Department, Luxembourg, 2023[45]).

Moving care out of hospitals

For years, policymakers have broadly agreed that healthcare delivery remains overly focussed on in-patient hospital care, with insufficient care management and primary and outpatient care delivery leading to avoidable patient complications that require more complex interventions than necessary.

The impact of delivering care unnecessarily in high-intensity settings like hospitals on both care outcomes and costs is well established, as is the beneficial impact of strengthening primary care. Improving care continuity for patients living with chronic conditions such as diabetes and hypertension have been found to be associated with both better healthcare utilisation and lower mortality and complications, while increasing the use of multi-disciplinary teams to help manage care have been found to be associated with better outcomes for patients (Lee et al., 2021[46]; Chan et al., 2021[47]). Patients who regularly visit a primary care practitioner have been found to have both better health outcomes and significantly lower health spending than those who did not regularly seek primary care services. In the United States, analysis of patients associated with the Veterans Health Administration has found an average cost reduction of USD 721 per in-person primary care visit, with particularly large cost savings associated with sicker patients, particularly for the first in-person appointment (Gao et al., 2022[48]).

A limited number of studies have attempted to quantify the greenhouse gas emissions associated with primary care visits. In **Switzerland**, researchers have estimated one in-person consultation to generate 4.8 kg CO2e, with an average primary care practice generating 30 tons of CO2e annually (Nicolet et al., 2022[49]). In **France**¸ researchers found that the average primary care consultation in a rural region generated about 1.5 kg CO2e per visit, with annual practice emissions relatively similar (39.8 tons CO2e) to those found in Switzerland (Houziel, Prothon and Trinh-Duc, 2023[50]). In contrast, analyses in the **United Kingdom** have found much higher emissions associated with general practice visits, with a single appointment associated with 66 kg CO2e (Tennison et al., 2021[51]). While such differences may be partly explained by differences in practice organisation across countries – notably in patient and provider travel – differences in the analytical approach, including a bottom-up (Switzerland, France) versus mixed top-down and bottom-up analysis (United Kingdom) and the factors included (e.g. emissions associated with medical prescribing or facility construction) complicate international comparison and point to the importance of developing a feasible and standardised approach to emissions measurement across the sector. In all studies, travel associated with the appointment – including by patients, providers and medical

couriers – were among the most important contributors to visit-associated emissions, pointing to the potential of telemedicine to possibly offset at least some healthcare-associated emissions.

Inappropriately delivered care, whether delivered unnecessarily or in a suboptimal location, also has important emissions costs and implications for environmental sustainability. Across OECD countries, hospitalisations for avoidable admissions including diabetes, asthma, COPD and congestive heart failure vary significantly across countries, suggesting that in many countries, much more can be done to improve care management and avoid complications from chronic conditions that can result in hospitalisation.

Preliminary analysis from the OECD indicates that the emissions associated with avoidable hospitalisations from diabetes and congestive heart failure across 29 OECD countries could amount to as much as nearly 3 MtCO2e in 2021, equivalent to driving nearly 700 000 gasoline-powered cars for a year.

Ensuring care is delivered in the right setting remains a major challenge across countries. Too often, patients do not receive care where they would most benefit from it, with many patients treated at facilities more intensive than their needs would necessitate, or more intensive than they would have required had they received better care management earlier. Strengthening primary care and reducing dependency on in-patient hospital-based care has been a priority of health systems for many years. With better care management and outpatient interventions delivered through primary and specialist care, many patients with chronic diseases like diabetes, asthma, COPD and cardiovascular disease could avoid being hospitalised for complications arising from their conditions.

Policies that strengthen care management and co-ordination and increase patient visits to primary care and outpatient specialist providers can help to reduce complications and related hospitalisations among patients with chronic conditions. For many chronic conditions, countries have developed guidelines or standards for high-quality care pathways that are intended to help patients better manage their health in the community.

Training on climate and health is far from institutionalised

While surveys of health workers indicate there is a strong desire to take action on climate change, training systems have been slower to adapt to new demands for education on the intersection between climate change and health. Nearly seven in ten countries responding to the OECD Policy Survey on Climate Change and Health indicated that training is not included as part of the mandatory curriculum for medical students. Previous surveys of medical schools globally have found similarly low rates of climate change coverage in the medical school curriculum, with a survey of medical schools across 112 countries finding climate change was included in only 15% of medical school curricula (Omrani et al., 2020[52]). Moreover, even where climate change is covered in healthcare worker curriculums, training has focussed more on adaptation and the impacts of climate change on health than on health systems mitigation. A review of medical school curricula in Latin American countries found that climate change was included in the medical curriculum in just one school (Palmeiro-Silva et al., 2021[53]). A student-led Planetary Health Report Card evaluating medical schools across 18 countries found that the majority of medical schools do not perform well in providing planetary health-related content to their students (Planetary Health Alliance, 2024[54]).

Further clinical action depends on better information

In recent years, some countries have made good progress in improving the knowledge base around the environmental impact of medical products, services and procedures. Initiatives in some countries, such as climate-oriented guidance in Choosing Wisely (**Canada**) and guidelines for greener surgical procedures (**United Kingdom**) have aimed to improve how clinicians can make informed decisions when delivering climate-sustainable care. . In the **Netherlands** 12 medical scientific associations, the Federation of Medical Specialists (FMS) and the Healthcare Institute (Zorginstuut Nederland) developed the guideline ‘Sustainability in guidelines: Incorporating sustainability aspects into guideline development in the

operating room' to provide general guidance for incorporating sustainability into the revision of existing guidelines or the development of new national medical specialist guidelines in operating rooms. In **France**, the publication of guidelines around how developing a methodology for assessing the carbon footprint of medicines, as well as recent work to estimate the greenhouse gas impact of medical technologies, products and pharmaceuticals, has expanded the amount of information that health practitioners and policymakers have to make informed choices that move their health system onto a more sustainable path.

Even as similar initiatives take shape, however, such comprehensive environmental reviews of the health sector nevertheless remain the exception rather than the norm. Lacking a full mapping of the environmental impacts of the health system means that in many cases, clinicians and practitioners will be hampered even if they wish to move towards more sustainable care.

Moreover, ensuring that measurement approaches are harmonised, and that differences between approaches are well understood, will be important to ensure policymakers correctly interpret information about environmental impacts, including emissions, and take actions that do not inadvertently worsen the contribution of the health sector.

References

Agenda Gesundheitsförderung (2024), *Competence Centre for Climate and Health*, https://agenda-gesundheitsfoerderung.at/. [7]

Alliance for Transformative Action on Climate and Health (2024), *First Wins Library: National Dashboard to Track Hospitals' Progress Towards Environmental Goals*, https://www.atachcommunity.com/resources/first-wins-library/national-dashboard-to-track-hospitals-progress-towards-environmental-goals/. [19]

Alliance for Transformative Action on Climate and Health (n.d.), *Launch of First Wins library*, https://www.atachcommunity.com/atach-community/news/launch-of-first-wins-library/ (accessed on 27 January 2025). [33]

Australian Commission on Safety and Quality in Healthcare (2024), *Environmental Sustainability and Climate Resilience Healthcare Module*. [34]

Australian Government Department of Health and Aged Care (2024), *National Health and Climate Strategy Implementation Plan, 2024-2028*, https://www.health.gov.au/resources/publications/national-health-and-climate-strategy-implementation-plan-2024-2028?language=en. [6]

Australian Medical Association (2022), *Impact of climate change on public health recognised in the federal budget*, https://www.ama.com.au/media/impact-climate-change-public-health-recognised-federal-budget. [11]

Central Administration of the Health System, Portugal (2021), *O que é o ECO@SAÚDE?*, https://www.acss.min-saude.pt/2021/09/09/o-que-e-o-ecosaude/. [8]

Chan, K. et al. (2021), "Effects of continuity of care on health outcomes among patients with diabetes mellitus and/or hypertension: a systematic review", *BMC Family Practice*, Vol. 22/1, https://doi.org/10.1186/s12875-021-01493-x. [47]

Commonwealth of Australia (Department of Health and Aged Care) (2023), *National Health and Climate Strategy*, https://www.health.gov.au/sites/default/files/2023-12/national-health-and-climate-strategy.pdf. [14]

Danish Regions (2024), *The Danish Regions' Strategy for Sustainable Hospitals*, https://healthcaredenmark.dk/media/mmrhra21/2-pager-the-danish-regions-strategy-for-sustainable-hospitals-from-2024.pdf. [28]

Drew, J. and C. Rizan (2022), *HealthcareLCA Database [Online Database]*, https://healthcarelca.com/database (accessed on 16 January 2025). [2]

EES (2024), *Low Carbon Resilience and Environmental Sustainability Guidelines for Healthcare New Construction*, https://bcgreencare.ca/wp-content/uploads/2024/07/LCRES-Guidelines-2024-V3-FINAL-7-10-2024.pdf. [27]

Environnement-Santé Belgique (2025), *Operation Zero : première étape vers la décarbonisation des soins de santé !*, https://www.environnement-sante.be/fr/actualites/operation-zero-premiere-etape-vers-la-decarbonisation-des-soins-de-sante. [17]

Estonian Public Broadcasting (2024), *Climate minister introduces Estonia's new climate law to government*, https://news.err.ee/1609542571/climate-minister-introduces-estonia-s-new-climate-law-to-government. [30]

European Commission (2024), *Radiation Protection: European co-ordinated action on improving justification of computed tomography*, https://op.europa.eu/en/publication-detail/-/publication/dc071d95-7179-11ef-a8ba-01aa75ed71a1. [43]

Expertisecentrum Verduurzaming Zorg (2024), *Over EVZ*, https://www.expertisecentrumverduurzamingzorg.nl/over-evz/. [31]

Gao, J. et al. (2022), "The Effect of Primary Care Visits on Total Patient Care Cost: Evidence From the Veterans Health Administration", *Journal of Primary Care & Community Health*, Vol. 13, https://doi.org/10.1177/21501319221141792. [48]

Health Department, Luxembourg (2023), *Rapport du 2ème audit national de la pertinence des demandes d'examens CT et IRM [Report on the second national audit of the appropriateness of CT and MRI scan requests]*, https://sante.public.lu/fr/publications/a/audit-rapport-ct-irm.html. [45]

Healthcare Without Harm (2017), *Energy efficiency in the healthcare sector: Easy wins through behaviour change*, https://europe.noharm.org/sites/default/files/documents-files/5213/HCWHEurope_Energy_Efficiency_Factsheet-Dec_2017pdf.pdf. [4]

Hignett, K. (2024), *England's Hospitals Face 'Significant Challenges' Meeting Green Goals*, https://www.forbes.com/sites/katherinehignett/2024/06/26/englands-hospitals-face-significant-challenges-meeting-green-goals/. [32]

Houziel, C., E. Prothon and A. Trinh-Duc (2023), "Carbon footprint of general practice: Retrospective case study of GP offices in a rural department of France", *The Journal of Climate Change and Health*, Vol. 14, p. 100273, https://doi.org/10.1016/j.joclim.2023.100273. [50]

Keelara, R., E. Sutherland and M. Almyranti (2025), "Leading practices for the future of telemedicine: Implementing telemedicine post-pandemic", *OECD Health Working Papers*, No. 173, OECD Publishing, Paris, https://doi.org/10.1787/496a8ffe-en. [41]

Lee, J. et al. (2021), "Assessment of Interprofessional Collaborative Practices and Outcomes in Adults With Diabetes and Hypertension in Primary Care", *JAMA Network Open*, Vol. 4/2, p. e2036725, https://doi.org/10.1001/jamanetworkopen.2020.36725. [46]

Lichteneker, R. (2024), *The Austrian Strategy Towards a Net Zero Healthcare System*, https://www.gov.si/assets/ministrstva/MOPE/Podnebje/Samo1planet/Zdravstvo-po-zeleni-poti/03-dr.-Ruperta-Lichtenecker-The-Austrian-Strategy-Towards-a-Net-Zero-Healhcare-System.pdf. [12]

Linkov, I. (ed.) (2014), "Carbon Footprint of Telemedicine Solutions - Unexplored Opportunity for Reducing Carbon Emissions in the Health Sector", *PLoS ONE*, Vol. 9/9, p. e105040, https://doi.org/10.1371/journal.pone.0105040. [39]

McAlister, S. et al. (2024), "How many carbon emissions are saved by doing one less MRI?", *The Lancet Planetary Health*, Vol. 8/6, p. e350, https://doi.org/10.1016/s2542-5196(24)00092-5. [3]

Ministry for the Environment, New Zealand (2023), *About the Carbon Neutral Government Programme*, https://environment.govt.nz/what-government-is-doing/areas-of-work/climate-change/carbon-neutral-government-programme/about-carbon-neutral-government-programme/. [15]

Ministry of Finance, Netherlands (2025), *Voorjaarsnota 2023: Volksgezondheid, Welzijn en Sport [Public Health, Welfare and Sport]*, https://www.rijksfinancien.nl/voorjaarsnota/2023/1731978. [13]

Ministry of Health, Spain (2023), *Actuaciones para la evaluación del impacto de la huella de carbono en centros sanitarios [Actions for assessing the carbon footprint of healthcare centres]*, https://www.sanidad.gob.es/areas/sanidadAmbiental/riesgosAmbientales/saludCC/huelladeCarbono/docs/actuacionesEvImpactoHuellaCentrosSanitarios.pdf. [20]

Ministry of the Economy, Finance and Industrial Sovereignty, France/EcovaMed (2024), *Medicines carbon footprint assessment methodology*, https://www.entreprises.gouv.fr/files/files/Actualites/2024/medicines-carbon-footprint-assessment-methodology.pdf. [26]

NHS England (2025), *Greener NHS: Get Involved - Suppliers*, https://www.england.nhs.uk/greenernhs/get-involved/suppliers/. [16]

NHS England (2024), *Delivering a net zero NHS*, https://www.england.nhs.uk/greenernhs/a-net-zero-nhs/. [10]

NHS England (2024), *Sustainable Development Unit archive*, https://www.england.nhs.uk/greenernhs/whats-already-happening/sustainable-development-unit-archive/. [9]

Nicolet, J. et al. (2022), "What is the carbon footprint of primary care practices? A retrospective life-cycle analysis in Switzerland", *Environmental Health*, Vol. 21/1, https://doi.org/10.1186/s12940-021-00814-y. [49]

Nordic Centre for Sustainable Healthcare (2019), *Nordic Sustainable Healthcare*, https://norden.diva-portal.org/smash/get/diva2:1346242/FULLTEXT01.pdf. [18]

OECD (2024), *OECD Policy Survey on Climate Change and Health*. [1]

OECD (2024), *Rethinking Health System Performance Assessment: A Renewed Framework*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/107182c8-en. [35]

OECD (2023), *Health at a Glance 2023: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/7a7afb35-en. [5]

OECD (2023), *The COVID-19 Pandemic and the Future of Telemedicine*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/ac8b0a27-en. [40]

OECD (2017), *Tackling Wasteful Spending on Health*, OECD Publishing, Paris, https://doi.org/10.1787/9789264266414-en. [42]

Omrani, O. et al. (2020), "Envisioning planetary health in every medical curriculum: An international medical student organization's perspective", *Medical Teacher*, Vol. 42/10, pp. 1107-1111, https://doi.org/10.1080/0142159x.2020.1796949. [52]

Palmeiro-Silva, Y. et al. (2021), "Cambio climático y salud ambiental en carreras de salud de grado en Latinoamérica", *Revista de Saúde Pública*, Vol. 55, p. 17, https://doi.org/10.11606/s1518-8787.2021055002891. [53]

Planetary Health Alliance (2024), *Planetary Health Report Card: Medicine 2023-2024 Summary Report*, https://phreportcard.org/wp-content/uploads/2024/04/MEDICINE-PHRC-2024-Summary-Report.pdf. [54]

Purohit, A., J. Smith and A. Hibble (2021), "Does telemedicine reduce the carbon footprint of healthcare? A systematic review", *Future Healthcare Journal*, Vol. 8/1, pp. e85-e91, https://doi.org/10.7861/fhj.2020-0080. [36]

Republic of Estonia (Ministry of Climate) (2024), *Climate Resilient Economy Act will ensure preservation of nature, growth of clean energy and space for growth for industries [press release]*, https://kliimaministeerium.ee/en/news/climate-resilient-economy-act-will-ensure-preservation-nature-growth-clean-energy-and-space. [29]

Santé Luxembourg (2015), *Imagerie médicale - Plan d'action 2015*, https://sante.public.lu/fr/espace-professionnel/plans-nationaux/plan-action-imagerie-medicale.html. [44]

South-Eastern Norway Regional Health Authority (2025), *Klima og miljø: Vi skal redusere CO2-utslipp med 40 prosent innen 2030 [Climate and environment: We will reduce CO2 emissions by 40% by 2030]*, https://www.helse-sorost.no/om-oss/vart-oppdrag/hva-gjor-vi/miljo-og-samfunnsansvar/klima-og-miljo/. [24]

Steenmeijer, M. et al. (2022), *Het effect van de Nederlandse zorg op het milieu: Methode voor milieuvoetafdruk en voorbeelden voor een goede zorgomgeving [The impact of Dutch healthcare on the environment. Environmental footprint method, and examples for a healthy care environment]*, https://www.rivm.nl/publicaties/effect-van-nederlandse-zorg-op-milieu-methode-voor-milieuvoetafdruk-en-voorbeelden-voor. [21]

Sveriges Kommuner och Regioner (2023), *Miljöarbetet i regionerna: Öppna jämförelser 2023*, https://skr.se/download/18.18ef3a97188b9ffd7a69a2a9/1687847771754/Miljoarbetet-i-regionerna-Oppna-jamforelser-2023.pdf. [25]

Tennison, I. et al. (2021), “Health care’s response to climate change: a carbon footprint assessment of the NHS in England”, *The Lancet Planetary Health*, Vol. 5/2, pp. e84-e92, https://doi.org/10.1016/s2542-5196(20)30271-0. [51]

The Canadian Coalition for Green Health Care (2024), *Green Hospital Scorecard Report Presenting 2021 Data*, https://greenhealthcare.ca/wp-content/uploads/2024/08/GHS-2021-data-Report-February-29th-2024-UPDATED.pdf. [23]

van Bodegraven, M. et al. (2025), *Environmental footprint of the healthcare sector: Monitoring methodology for the Netherlands*. [22]

van der Zee, C. et al. (2024), “Assessing the Carbon Footprint of Telemedicine: A Systematic Review”, *Health Services Insights*, Vol. 17, https://doi.org/10.1177/11786329241271562. [37]

Welk, B., E. McArthur and A. Zorzi (2022), “Association of Virtual Care Expansion With Environmental Sustainability and Reduced Patient Costs During the COVID-19 Pandemic in Ontario, Canada”, *JAMA Network Open*, Vol. 5/10, p. e2237545, https://doi.org/10.1001/jamanetworkopen.2022.37545. [38]

3 Rethinking health systems supply chains, pharmaceuticals and medical products

Supply chains represent the origin of the vast majority of greenhouse gas emissions in the health system. Nearly four-fifths of the sector's emissions can be traced back to its supply chains, making reducing emissions within them a critical step towards improving the environmental impact of health systems in OECD countries. This chapter reviews the impact of pharmaceuticals, medical devices and supply chains on the emissions of health systems and explores what steps countries can take to reduce the greenhouse gas emissions of these sectors and contribute to more environmentally sustainable health systems for all.

In Brief

Transforming health system supply chains is essential to significantly reducing emissions from the health sector. **Scope 3 emissions comprised 79% of health sector emissions on average across OECD countries in 2018**, indicating that the vast majority of health systems emissions originate from supply chains. Moreover, **half of health sector emissions in OECD countries originate outside of the country of healthcare delivery**, underscoring the deeply interconnected and global nature of health sector supply chains. This means that even if countries were to successfully implement low-emissions care delivery and reduce the emissions associated with their health facilities and care, **an important share of health system emissions can only be meaningfully be reduced by tackling emissions associated with the production of pharmaceuticals and medical goods, and with health system supply chains**.

Procurement offers an important opportunity for countries to push for more environmentally sustainable alternatives. On average across OECD countries, **public sources funded nearly three-quarters (73%) of health spending in 2021**, making governments and social health insurance schemes the largest spenders on health systems in most OECD countries. Health further represents the largest share of public procurement on average across OECD countries, representing nearly one-third (31.9%) of overall government public procurement spending in 2021. While not all government spending on health relates to publicly procured goods, **there is enormous potential to harness green public procurement as a tool to mitigate health sector emissions**.

Adopting guidelines and rules to encourage using public procurement as a tool to mitigate health sector emissions is growing, but many initiatives in the health sector remain in their infancy. The development of standardised cross-country environmental rules and guidelines for public procurement would provide suppliers with the clarity they need to make long-term changes that benefit mitigation efforts.

Pharmaceuticals and medical products drive an important share of health sector emissions. **At least one-quarter of health sector emissions in OECD countries come from the use of pharmaceuticals and other medical goods**, and this value is likely an underestimate. **Substituting away from some high-emissions products is already possible** in certain cases. Researchers and clinicians have already begun to identify products that can be substituted when clinically appropriate. But few countries have translated this knowledge into policies that promote the use of lower-emitting alternatives.

Recent clinical developments mean lower-emitting alternatives for some products are coming to market. Pharmaceutical companies have invested substantial resources into developing lower-emitting alternatives for the propellants used in metered-dose inhalers. While the new products may offer significant reductions in emissions for products with high global warming potential, they may also come at a significant cost for health systems, which may be faced with deciding how much they are willing to pay for lower-emitting products.

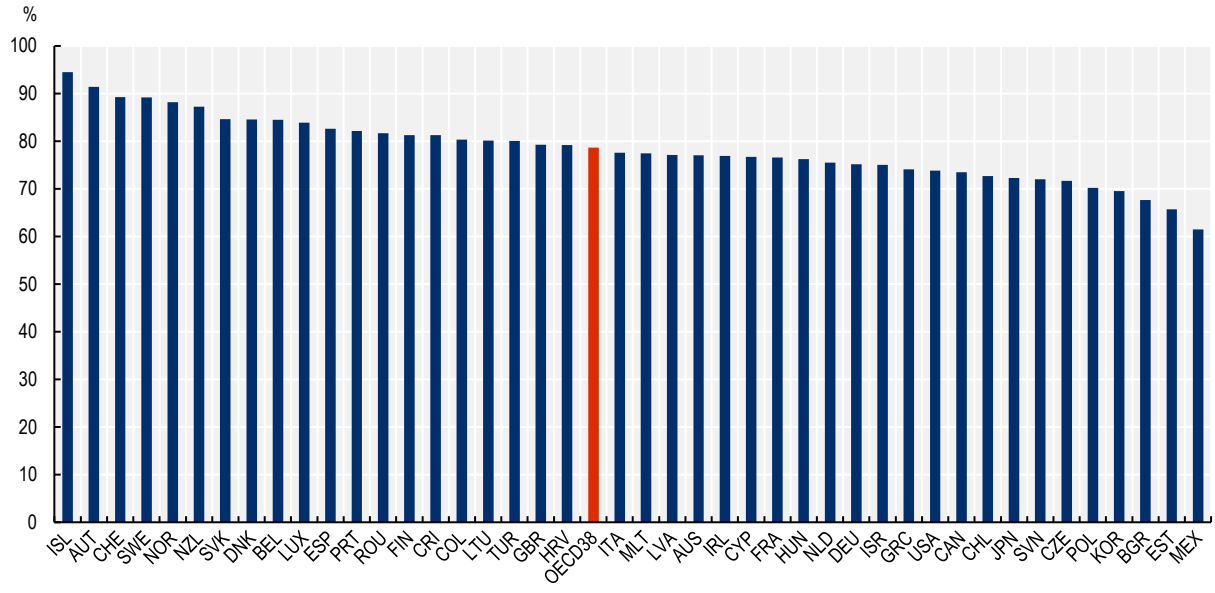
Countries have taken steps to include environmental considerations in Health Technology Assessments (HTA), but a lack of high-quality empirical data, among other factors, has hindered the systematic inclusion of environmental factors into HTA decision making.

Supply chains represent 79% of overall health system emissions

In recent years, the COVID-19 pandemic drew attention to how complex, interconnected, and global medical supply chains have become. Trade in medical goods – including pharmaceutical products, medical equipment, orthopaedic equipment, personal protective equipment, and other products – rose by 38% between 2018 and 2022, to over USD 1.58 trillion (Drevinskas, Shing and Verbeet, 2023[1]). Nearly three-fifths of the value of medical goods traded is made up of pharmaceutical products (Drevinskas, Shing and Verbeet, 2023[1]). Over the last 30 years, the global trade in pharmaceuticals has increased by more than 1 000%, representing 4% of global trade flows (OECD, 2024[2]).

New data from OECD emissions analysis indicates that supply chains make up an enormous share of overall health sector emissions. On average across OECD countries, emissions from supply chains represent 79% of overall health sector emissions.

Figure 3.1. Supply chain emissions represent 79% of overall health sector emissions



Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Emissions from health sector supply chains occur in the production and preparation of medical products, as well as in the production and transportation of the raw and intermediate materials that go into making the final products. This includes emissions associated with the extraction of raw materials, transportation-related emissions, the emissions from the actual production process (such as energy for factories), and the emissions related to delivery, storage, and consumption of the products in their country of destination.

50% of health sector emissions on average come from sources outside of the country

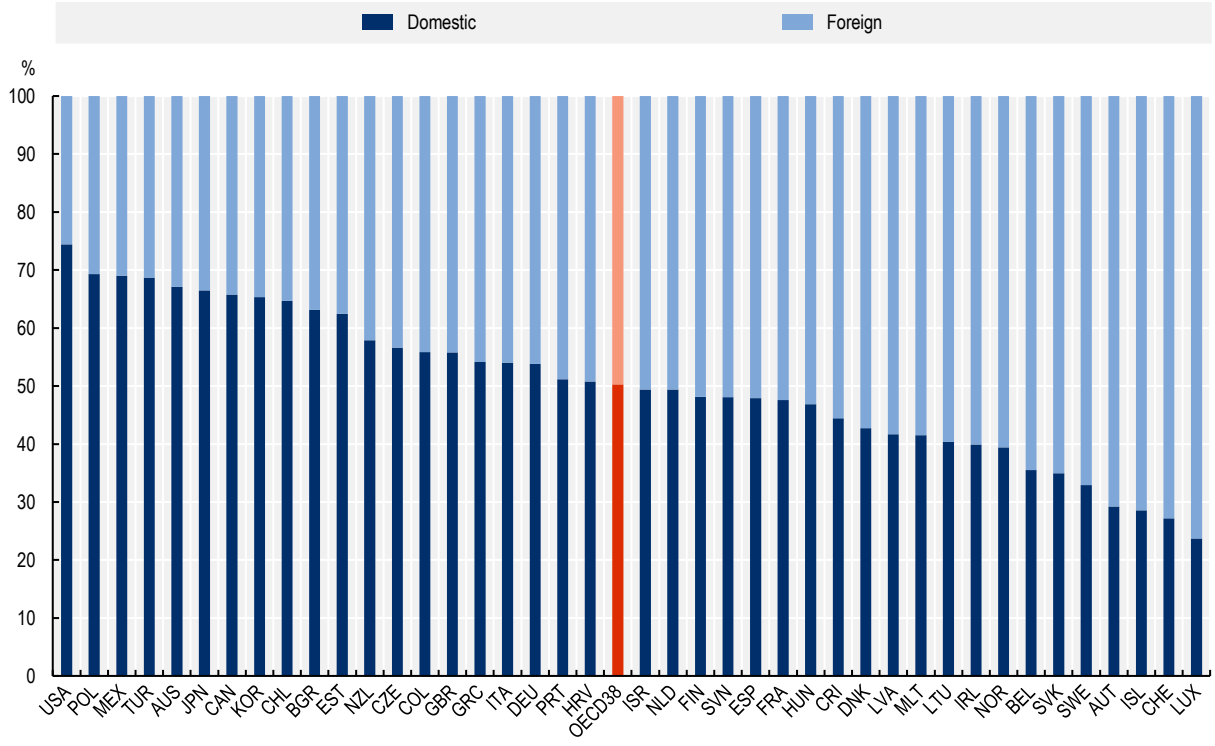
Nine of the top ten countries making up the largest exporters and importers of medical goods globally are made up of OECD countries, underscoring the central role OECD economies have in both the production and consumption of medical products (Drevinskas, Shing and Verbeet, 2023[1]). The production of medical products is extremely complex and variable, with the exact production and delivery process dependent on the medical goods being produced. Pharmaceuticals and medical devices, for example, have markedly different supply chains, with many medical device supply chains more closely resembling supply chains

from non-medical products than those of pharmaceuticals (OECD, 2024[2]). Nonetheless, supply chains across many medical products, both pharmaceutical and other, have become extremely international, with many products crossing three or more borders during the production phase before reaching their final market destination.

The globally interconnected nature of healthcare systems today is further underscored by the relatively high proportion of health systems emissions that originate from supply chains abroad. On average across OECD countries, 50% of health sector emissions stem from supply chain processes that occurred outside the country.

The international nature of the healthcare sector supply chain further emphasizes the importance of joint international efforts. In October 2024, the WHO and UNITAID convened global health organizations, including OECD and non-OECD governments, as well as other key stakeholders to discuss strategies for achieving climate-resilient and environmentally sustainable health supply chains (World Health Organization, 2024[3]). There is growing demand to address environmental and climate risks linked to health sector operations both within health systems and international agencies. Global initiatives such as the Alliance for Transformative Action on Climate and Health (ATACH) and the Global Framework on Chemicals for a planet free of harm from chemicals and waste (GFC) emphasize the need to work towards climate-resilient, low-carbon health systems, and responsible chemical management globally (World Health Organization, 2024[3]).

Figure 3.2. Half of health sector emissions stem from production and transport abroad

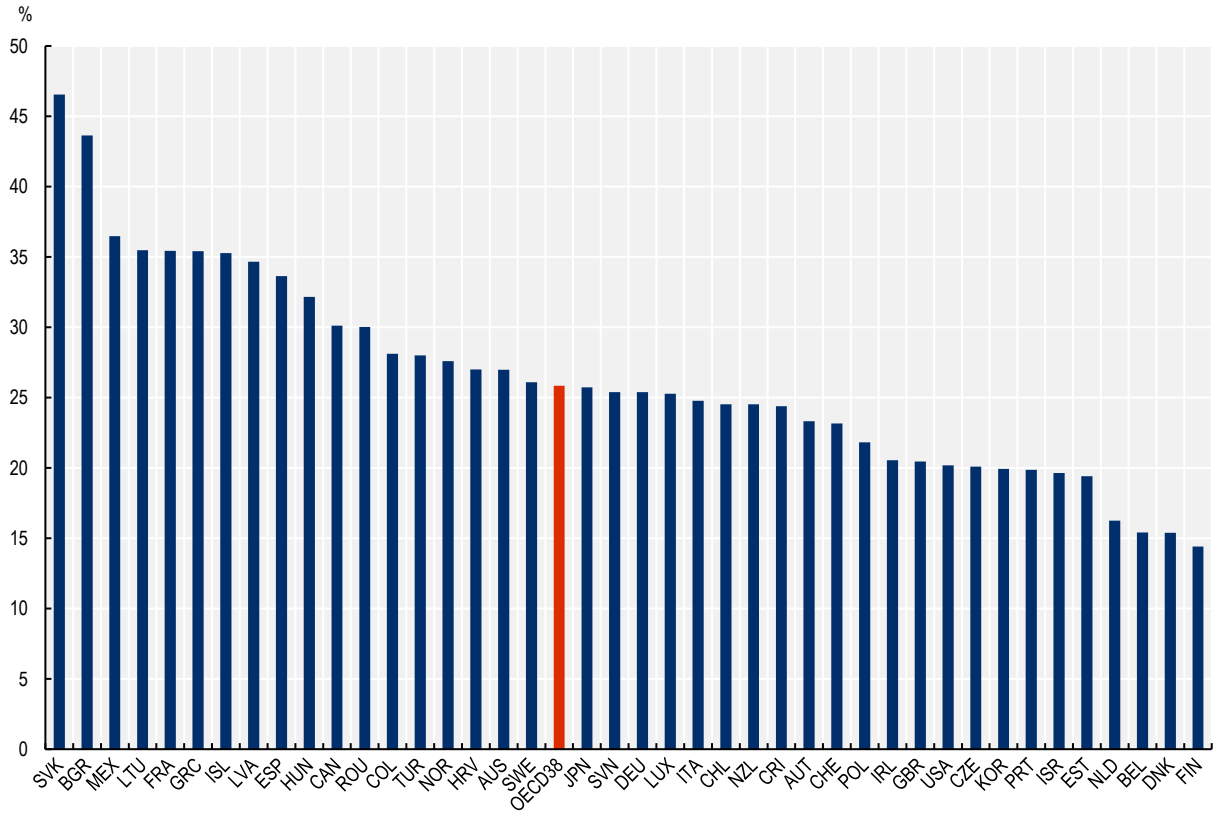


Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

Pharmaceuticals and other medical goods represent a quarter of health systems emissions

While care facilities and direct care delivery play an important role in contributing to emissions, the production and consumption of medical inputs, in the form of pharmaceuticals and other medical good, represents an important share of overall healthcare emissions. In 2018, an estimated one-quarter of overall health sector emissions related to the pharmaceuticals and other medical goods.

Figure 3.3. Pharmaceuticals and medical goods drive a quarter of health sector emissions across OECD countries



Source: OECD analysis based on data from OECD Health Statistics 2025, System of Health Accounts and ICIO data.

The significant contribution of the pharmaceutical sector to greenhouse gas emissions is large not only in the context of health systems, but of economic sectors globally. One study looking at the emissions intensity of the pharmaceutical sector exceeded that of even the automotive sector, though the exclusion of Scope 3 emissions arguably complicates drawing a conclusive picture of the comparative sizes of the sectors (Belkhir and Elmeligi, 2019[4]). The study further drew attention to the difficulty of assessing and comparing environmental performance between companies, even where public disclosures are made.

Substituting away from high-emissions products

While research on the greenhouse gas impact of specific pharmaceuticals and medical products has so far captured only a fraction of the hundreds of thousands of products that are used in healthcare,

policymakers and healthcare practitioners have identified certain types of products that can be fairly easily substituted for other widely available products, which deliver care of similar clinical value and efficacy with markedly lower greenhouse gas emissions.

Despite growing momentum and understanding around the environmental impacts of healthcare, the information available to practitioners, as well as policy action to promote products and procedures with lower environmental impact, remains limited. Where there has been attention, it has focussed – as below – on specific products for which there is a clear environmental benefit of one product over another, without patient impact. However, in far more cases, the evidence base for an environmentally-informed choice remains limited.

Anaesthetic gases: Desflurane use remains high in some countries – but policies to reduce its use have been effective

Analgesic products and anaesthetic gases have been identified as having an outsize role in the greenhouse gas emissions of the health sector, with lower-emission alternatives also identified. Anaesthetic gases and products have been estimated to represent 2% of the NHS's overall carbon footprint in the United Kingdom (England) (Watts, Moonesinghe and Foreman, 2023[5]).

Not all anaesthetic gases have similar greenhouse gas emissions, however. Among volatile anaesthetic gases, sevoflurane and isoflurane can be used with significantly lower environmental impact than desflurane, for example, with sevoflurane contributing the least to greenhouse gas emissions. Estimates suggest that the global warming potential of desflurane may be nearly 20 times higher than sevoflurane, and more than three times as high as isoflurane (Friedericy et al., 2024[6]).

In the majority of cases, desflurane can be substituted for isoflurane or sevoflurane without impacting quality of care and patient outcomes. A number of countries have taken steps towards reducing the use of – or banning entirely – the use of desflurane in hospitals and surgical centres. The **United Kingdom** (Scotland) became the first country to ban the use of desflurane in 2023, with desflurane decommissioned for general use by NHS England in 2024. In **Australia**, the state of Western Australia similarly removed desflurane from its Medicines Formulary in 2023 while across countries in the **European Union**, desflurane will be banned from general use beginning in 2026. In Western Australia, removing desflurane has been estimated to have delivered both emissions and cost reductions, reducing an estimated 1 800 tons of CO2-equivalent emissions annually, while driving down costs by AUD 750 000 (Department of Health and Aged Care, 2023[7]).

Waste from anaesthetic gases can also contribute to higher greenhouse gas emissions within the health sector, with no clinical benefit. Many hospitals, for example, use pipes to transport nitrous oxide across their buildings. Recent studies have suggested that the vast majority of nitrous oxide piped through hospitals is lost to leakage without being delivered to patients. The inefficiency of piped anaesthesia is underscored by estimates suggesting that more than three-quarters – and in some cases, close to 100% – of nitrous oxide delivered through via hospital pipelines is lost, normally due to leaks within the pipe system (Morgan et al., 2025[8]).

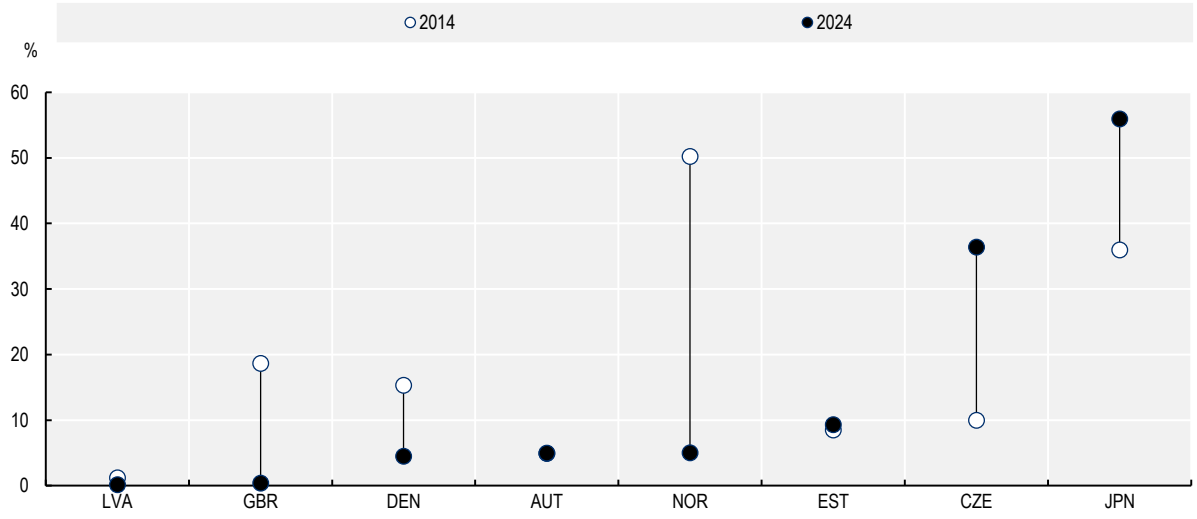
Guidelines to help clinicians move away from using high-emission anaesthetic gases in favour of lower-emission alternatives have been developed in a number of countries. In the **United Kingdom**, a report on *Green Surgery* aims to provide guidance on practices that can help reduce the environmental footprint of surgical care. The report includes recommendations on reducing the impact of anaesthesia, including recommending the decommissioning of desflurane and substituting piped nitrous oxide with cylinders (Brighton and Sussex Medical School, Centre for Sustainable Healthcare and UK Health Alliance on Climate Change, 2023[9]).

Data from a number of OECD countries indicates that there is significant scope for many countries to drive down the use of the highest emitting anaesthetic gases in favour of lower-emitting alternatives, without

clinical impacts. In the countries that have made reducing desflurane a priority in recent years, dramatic declines in the use of desflurane as a share of total anaesthetic gases has been observed, suggesting that reducing the overall use of anaesthetic gases or substituting desflurane for sevoflurane or isoflurane is possible. Countries report a wide variation in the use of desflurane, ranging from nearly three-fifths of anaesthetic gases in Japan to no or nearly no use in the United Kingdom, Norway and Latvia.

Figure 3.4. Many OECD countries have reduced their use of desflurane for anaesthesia

Desflurane as a share of overall volume of isoflurane, sevoflurane and desflurane



Note: Overall volume should not be equated with patient case share.
Source: OECD Health and Climate Data Collection on High-Emission Clinical Inputs, 2025.

Inhalers: Lower-emission alternatives are already possible for many patients, and new clinical developments may provide even more

Inhalers used as treatment to support people with respiratory conditions offer another low-cost opportunity for countries to meaningfully reduce the greenhouse gas emissions associated with their health sectors. Metered-dose inhalers, which employ a high-emissions propellant to release the medication, have a dramatically higher emissions impact and warming potential than alternatives including dry powder and soft-mist inhalers. For many patients, switching from a metered dose to a dry powder or soft mist inhaler should be relatively straightforward and cause no clinical differences in outcomes, if patients are able to use new devices correctly However, switching inhaler may not be an option for others, such as young children or very old patients, for whom existing products may be more clinically appropriate.

Previous studies have suggested countries could markedly reduce the emissions associated with inhalers at little or no cost, and potentially even reduce expenditure on inhalers. A study in the **Netherlands** estimated that pressurised metered dose inhalers deliver about half of total doses of inhaler medication, and that reducing the number of doses delivered through metered-dose inhalers by 70% could reduce greenhouse gas emissions by 63 million kg CO2-equivalent annually (ten Have et al., 2022[10]). In **Japan**, researchers have estimated that replacing 10% of prescribed pressurised metered-dose inhalers with dry powder alternatives for all patients aged 15-74 would reduce the greenhouse gas emissions associated with inhalers by 6.1%, with an increase in costs of about 0.7% (Nagasaki et al., 2023[11]).

The potential impact of switching from high-emitting metered dose inhalers to low-emission alternatives in terms of costs to the health system is less clear. Should metered dose inhalers be substituted for low-cost dry powder alternatives, multiple studies have found that health systems would experience important cost savings for prescription inhalers. In the **Netherlands**, researchers found that substituting 70% of prescribed metered dose inhalers for low-cost non-propellant alternatives would save more than EUR 49 million per year (ten Have et al., 2022[10]). In the **United Kingdom** (England), researchers have estimated that every 10% of metered dose inhalers substituted for the lowest cost equivalent dry powder inhaler would save GBP 8.2 million per year (Wilkinson et al., 2019[12]).

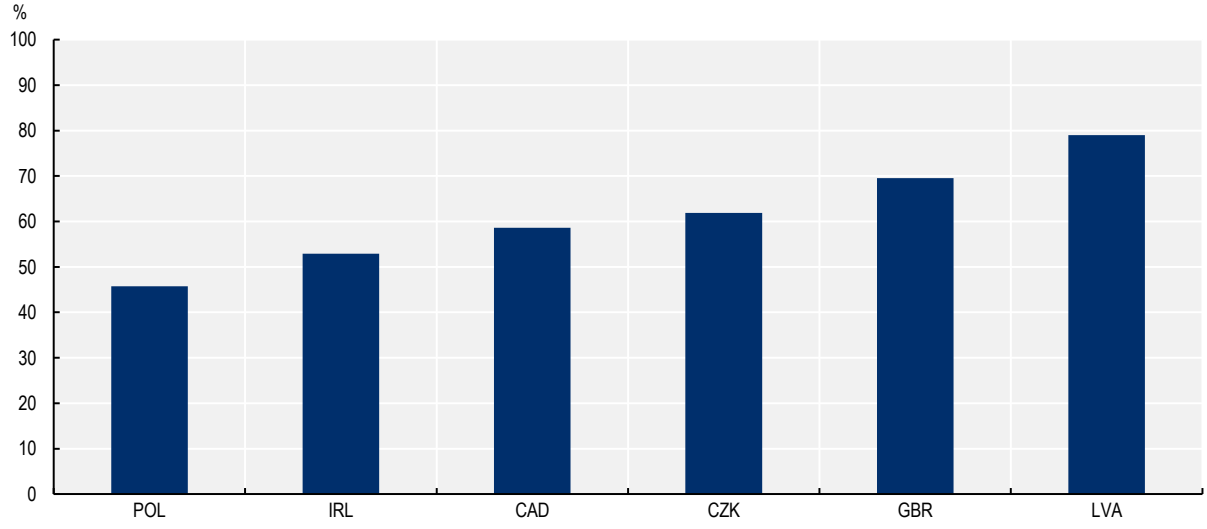
However, were metered dose inhalers to be substituted with dry powder inhalers at the average cost at the time of evaluation, researchers across multiple countries have found that the costs to the health system would increase. In the **Netherlands**, substituting 70% of metered-dose inhalers for average-cost dry powder equivalents would increase the cost of inhalers by EUR 3.7 million per year (ten Have et al., 2022[10]). With an estimated 1.4 million patients prescribed inhalers for COPD or asthma annually, this would equate to an additional cost of EUR 2.64 per patient per year. In the **United Kingdom** (England), every 10% of metered-dose inhalers substituted with dry powder inhalers according to the brand prescribing patterns of 2017, costs would increase by GBP 12.7 million each year (Wilkinson et al., 2019[12]).

Not all pressurised metered dose inhalers are the same, and new propellants being developed offer the potential to deliver propellant-based inhalers with substantially lower emissions, potentially even lower than emissions offered by current soft-powder and dry powder inhalers. Some major pharmaceutical companies who produce propellant-based inhalers have committed to developing lower-emission alternatives to use in their metered-dose inhalers, with some products approved in 2025 and further regulatory submissions expected (Wittenberg, 2024[13]).

As with anaesthetic gases, OECD countries report a wide range in the use of different types of inhalers, with the share of metered dose (high-emitting) inhalers ranging from about 40% in Japan to more than 80% in Australia, the United Kingdom and the United States.

Figure 3.5. High-emission metered-dose inhalers remain common in many OECD countries

Metered dose inhalers as a share of all prescribed inhalers, 2023



Source: OECD analysis based on data from the 2025 OECD Health and Climate Data Collection on High-Emission Clinical Inputs.

Recent clinical developments in lower-emitting propellants may make policy decisions to substitute inhalers less straightforward. The development of lower-emission propellants and the likelihood that they will come shortly to market across many OECD countries also points to the nuance needed when making policy changes based on emissions considerations, particularly when they affect care delivery. While substituting metered dose inhalers for dry powder alternatives may reduce emissions given the products currently on the market, lower-emission alternatives that do not require significant policy changes and changes to prescribing practices could also emerge in the coming years. While in most cases the majority of patients can switch to an alternative inhaler without impacting clinical outcomes, they may also become accustomed to their treatment regimes and may have a preference to maintain practices they are already familiar with. At the same time, as new formulations, the products coming onto the market may be priced substantially higher than existing inhalers, and could require policymakers to grapple with the price they are willing to pay to drive down emissions as much as possible.

Similar increases in price have been seen in previous reformulations of inhalers that were undertaken to phase out the use of chlorofluorocarbons (Wouters, Feldman and Tu, 2022[14]; Jena et al., 2015[15]). Chlorofluorocarbons (CFCs) were previously used as the propellant in metered-dose inhalers, but were ultimately banned due to their impact on ozone depletion. Researchers have found that when generic albuterol inhalers containing chlorofluorocarbons were removed from the market in the United States at the end of 2008 in favour of on-patent hydrofluoroalkane (HFA) albuterol inhalers, out-of-pocket costs nearly doubled almost immediately, while the use of inhalers also slightly declined (Jena et al., 2015[15]). Given existing financial pressures facing many health systems, it is far from clear that stakeholders will be willing to purchase significantly more expensive products which deliver clinically equivalent care with lower emissions.

Reducing intravenous administration of medicines when oral alternatives are available can reduce emissions

Many medicines administered in hospitals and other care settings have multiple delivery formats available. Most notably, clinicians often have the choice between administering patients analgesic and other medicines intravenously or orally. Recent life cycle assessments from a range of countries have found that administering medicines orally is associated with significantly lower greenhouse gas emissions and can further reduce the amount of water used during the administration of the medication. In a study of the use of acetaminophen and ketoprofen in a French university hospital, intravenous administration of the medications was found to be associated greenhouse gas emissions more than 50 to 60 times higher than administering the same drugs orally (Bouvet et al., 2024[16]). Oral administration further reduced the water consumption associated with the drug by at least 8.6 litres per administration (Bouvet et al., 2024[16]). A study of practices in hospitals in Australia, the United Kingdom and the United States similarly found that switching away from intravenous paracetamol administration in hospitals in favour of oral administration would have reduced greenhouse gas emissions across the 26 hospitals evaluated by 5.7 kilotons of CO_2e in 2019 and reduced associated costs by more than 98% (Davies et al., 2024[17]).

Improving measurement and data harmonisation for pharmaceutical and medical products

For practitioners and clinicians to be able to make informed environmentally-oriented decisions, clear information on the trade-offs between different clinical options are needed. As momentum for greater public reporting and emissions requirements in procurement has grown, a number of initiatives to improve measurement, reporting and information have developed. The global *Choosing Wisely* initiative, which has worked to reduce low-value care by providing clear and actionable recommendations for practitioners, has begun to develop resources to help clinicians make informed choices around products and procedures with lower environmental impacts which do not impact patient care.

Scaling up green healthcare procurement

The size of government procurement across OECD countries represents an important share of the overall economy. Public procurement represented 12.9% of overall GDP on average across the 38 OECD countries in 2021, and represented more than one-quarter (27.8%) of total government expenditures (OECD, 2025[18]). The important role of government spending in the economy has made public procurement an increasingly popular tool for driving policy objectives, including encouraging innovation, social outcomes, and the economic development of certain sectors.

Harnessing the influence of public procurement to shape environmental factors through "green" procurement strategies has become an increasingly important area of policy focus in recent years. As countries explore all possible avenues to foster an economy-wide transformation towards more environmentally sustainable practices, leveraging the power of public procurement has emerged as a key tool. Policymakers have recognised potential of public procurement policies to both drive demand for green products and services and to incentivise businesses to adopt more sustainable practices. This approach aims to tackle pressing environmental challenges, including mitigating greenhouse gas emissions, by encouraging sustainable development through strategic procurement choices. In this way, public procurement plays a crucial role in shaping environmental outcomes and influencing the broader market towards sustainability.

Nearly four-fifths of countries have adopted green public procurement policies, but policies are rarely health sector-focussed

OECD countries have taken a growing interest in green public procurement policies in recent years. Nearly four-fifths (78%) of responding countries reported that regulations to include environmental considerations in procurement were in place. These policies do not automatically extend across all sectors of procurement, however, with many countries initially focussing on specific sectors for action, such as construction and the procurement of wood products. About one in six countries have developed procurement guidelines or regulations specifically for the health sector itself. This indicates a limited but growing recognition of the unique environmental impacts and needs within the healthcare sector.

Broader green procurement policies developed by the government can serve as an important building block in developing procurement requirements for the health sector specifically. In the **United Kingdom (England)**, NHS England has applied and extended the environmental requirements in the government's procurement policy to develop a roadmap for suppliers – both of goods and of services – to the NHS (NHS England, n.d.[19]).

Box 3.1. The NHS Net Zero Supplier Roadmap

Building on the broader procurement strategy of the UK Government, NHS England has developed a supplier roadmap intended to help the English health system achieve its goal to reach net zero by 2030. The roadmap outlines guidance and requirements for suppliers to the NHS system to develop plans to reduce their greenhouse gas emissions and measure their carbon footprint.

In order to support suppliers in developing their capacities for measuring their environmental performance, procurement requirements are being rolled out progressively, with new rules first applicable to larger suppliers before being rolled out to cover all procurement.

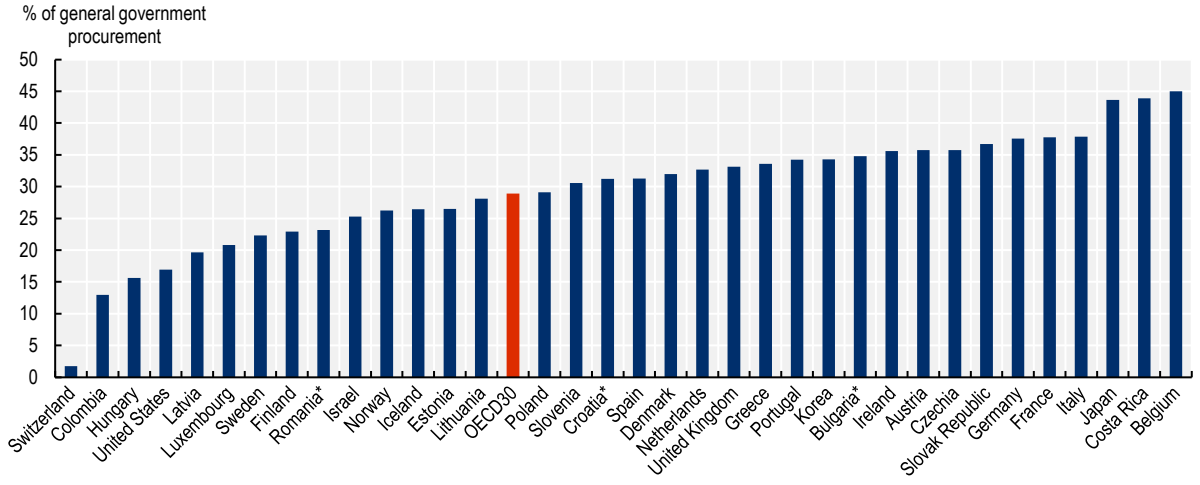
Beginning in April 2022, all procurement to NHS was required to include weighting for net zero and social value considerations. Carbon reduction plans have been required of for all suppliers of contracts worth more than GBP 5 million as of April 2023, and for all suppliers as of April 2024. Beginning in April 2027, public reporting of supplier emissions, targets, and carbon reduction plans will be required for all Scopes (1, 2 and 3) for all suppliers to the NHS, with individual product footprinting mandatory as of April 2028.

A number of countries have developed procurement processes and policies aimed at improving environmental considerations in for hospital purchasing. These policies often focus on improving environmental sustainability across a number of areas, including but not limited to greenhouse gas emissions. In **Denmark**, for example, the regional buyer responsible for the procurement of medicines in hospitals (AMGROS) has trialed public procurement tenders featuring environmental criteria including environmental considerations around the packaging and transportation of goods, return policies for devices, and the impact on antimicrobial resistance. In **Norway**, the *Sykehusinnkjøp* HF is responsible for all procurement for specialist health services and hospitals in the country. All procurement is required to meet certain standards of social responsibility, including environmental considerations. The group has also collaborated together with other Nordic countries on a set of criteria for more sustainable packaging for medical products. In the **Netherlands**, while procurement is decentralised, the government is in the process of developing an online portal for health facilities and procurement organisations that will provide them with information related to sustainable procurement, including guidelines around criteria for sustainable procurement.

The large share of government spending on health makes public procurement a powerful tool for shaping more environmentally sustainable production

Across OECD countries, a high proportion of overall government expenditure is spent on healthcare. Health expenditure as a share of GDP averaged over 9% across OECD countries in 2022, with the vast majority – 73% – coming from public sources in 2021 (OECD, 2023[20]). Previous analyses have suggested that close to three-tenths of government public procurement is related to procurements for the health system.

Figure 3.6. Health spending represented close to three-tenths of overall government procurement in 2023



Note: Countries with an asterisk* represent OECD accession countries. Data for Korea is from 2022. Data for Costa Rica is from 2021.
Source: OECD National Accounts Statistics (database), 2025.

The significant amount of public spending on healthcare underscores the potential positive impact well-developed procurement requirements could play in reducing the emissions impact of the health sector. Some of the structural characteristics of the health sector may influence how impactful procurement policy can be in shaping the environmental behaviours of its suppliers.

As countries begin to embed environmental standards into procurement regulations and purchasing agreements, ensuring rules are transparent and consistent and applicable to a large enough market share is critical for ensuring suppliers have incentives to comply with new standards. Companies may have little incentive to enter a market where the procurement rules require them to produce a product with different specifications – for example, with different packaging – than in other countries, particularly where the market is small. Moreover, in most cases, payers do not currently value or incentivise differentiation based on sustainability considerations. Developing cross-country standards and regulations is therefore important for incentivizing companies to respond to calls for tender, and for offering companies clarity in the actions they should take in both the short- and medium-term across markets.

Nordic countries have a well-established tradition of working across their markets to create certain environmental standards for medical products that apply across multiple countries. The *Nordic Criteria for More Sustainable Packaging* apply to the packaging of medical products across **Denmark**, **Finland**, **Iceland**, **Norway** and **Sweden** and were developed jointly by policymakers responsible for procurement at the hospital, regional, and national level. Building on initiatives developed at a university hospital in Denmark, the criteria provide guidance to procurement actors on developing criteria for reducing waste, promoting recyclability, and increasing the use of recycled or sustainable materials, with three levels of criteria ("basic", "advanced", and "spearhead") that can be applied to tenders (Capital Region of Denmark, Region of Southern Denmark, Central Denmark Region, North Denmark Region and Region Zealand, 2022[21]). One reason cited for the development of the joint criteria was to persuade industry players to comply with standards by increasing the market size requesting such standards (Sookne, 2022[22]).

More recently, larger countries located across the world, rather than in one region, have begun working together to develop joint procurement standards. These efforts could provide even stronger incentives to large healthcare suppliers, including pharmaceutical companies and the medical device industry, by

assuring a market size so important that companies would effectively be obligated to change their practices and supply chains globally to comply with the new guidelines set.

Countries including **Australia**, **Ireland**, **Norway** and the **United Kingdom**, have publicly committed to collaborating on decarbonising their healthcare supply chains. Initial discussions have focussed on setting joint standards for green procurement, public disclosure of greenhouse gas emissions from suppliers, and setting targets for emissions reduction among suppliers (Australian Department of Health and Aged Care, 2024[23]).

Emissions reporting by companies is growing, but not always harmonised

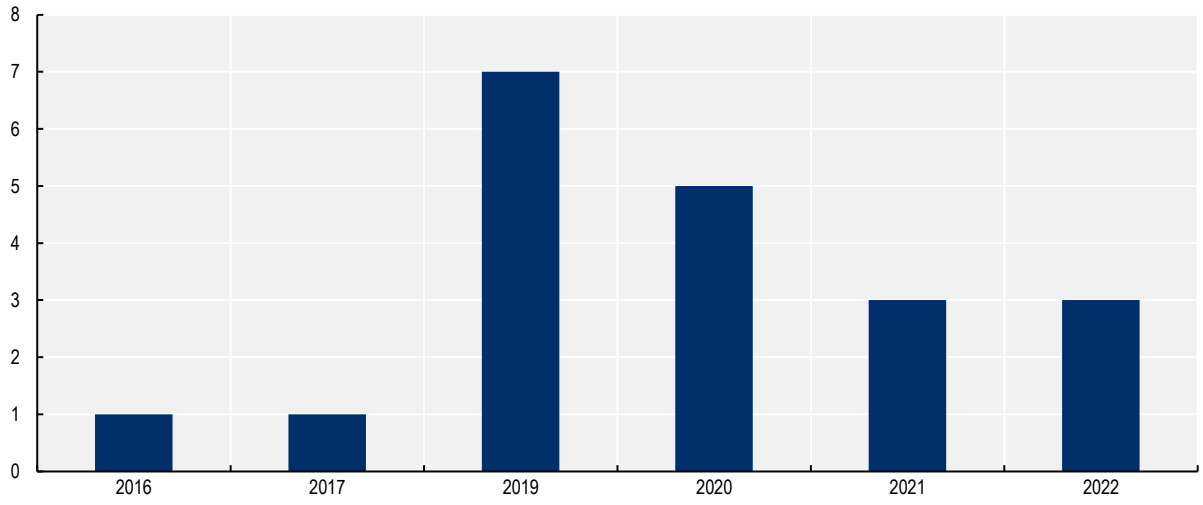
As awareness and concern about climate change and other environmental challenges has risen, many global initiatives to encourage more consistent and public reporting have been developed. Some have been developed to help guide the measurement and reporting of environmental impacts across economic sectors, while a more limited set have been developed targeting companies within the healthcare sector more specifically. These include the Greenhouse Gas Protocol and its associated Sector Guidance for Pharmaceutical Products and Medical Devices, developed by NHS England in partnership with pharmaceutical industry stakeholders in 2012, as well as various ISO standards (e.g. ISO 14 040, ISO 14 044, and ISO 14 067), a number of guidelines applicable to the chemicals sector (of which the pharmaceutical industry is a part), guidelines on measuring Scope 3 emissions in the pharmaceutical industry developed by the Pharmaceutical Supply Chain Initiative, and an approach to measuring the carbon footprint of specific medicines (ECOVAMED, 2024[24]; OECD, 2025[25]; Environmental Resources Management Ltd., 2012[26]) and to conducting environmental lifecycle assessments (PAS 2090). In addition to guidance on measurement of environmental impact, additional reporting standards provide guidance to companies who wish to publish information on their environmental, social and governance impact ("ESG" reporting) (Booth et al., 2023[27]).

Companies in the health sector have begun to make commitments and take action towards sustainability in their production and publicly reporting the environmental impacts of their production processes and products. Studies have found that the largest publicly traded companies are more likely to publicly report their greenhouse gas emissions and environmental footprint than smaller and privately held companies (Bade et al., 2023[28]). Trends toward public reporting are also relatively recent, with significant progress made in recent years.

While the development of public standards and guidelines for measuring environmental impact is intended to harmonise different approaches to evaluating such a complex issue, there remain significant differences in the ways companies measure, report and benchmark their environmental impact. In an analysis of the 20 largest medical device companies, 100% reported having Scope 1 and 2 targets, while a further 75% also included Scope 3 targets for their companies.

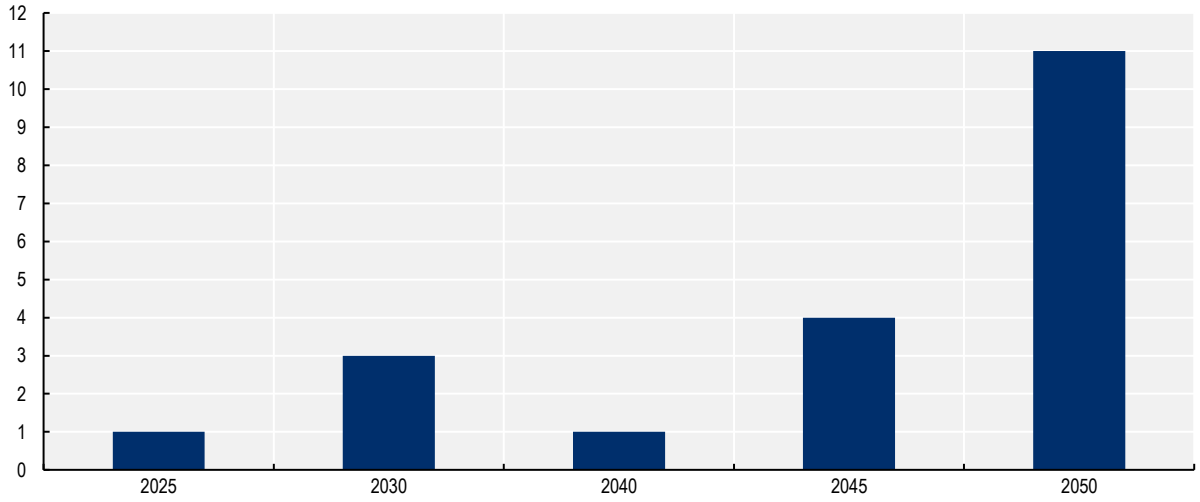
However, far fewer companies reported actual results for Scope 3 than for Scopes 1 and 2, with fewer than half (13 in 2022, 9 in 2023) reporting Scope 3 emissions estimates. Reporting approaches were also highly inconsistent, with the baseline and target years for companies inconsistent across companies.

Figure 3.7. Baseline reporting years for GHG emissions vary across medical device companies



Note: Based on top 20 largest medical device companies.
Source: OECD analysis based on public corporate reporting data.

Figure 3.8. Target years for achieving GHG emission reduction goals also vary



Note: Based on top 20 largest medical device companies.
Source: OECD analysis based on public corporate reporting data.

Pharmaceutical and healthcare companies have also become increasingly involved in efforts to improve the harmonisation of measurement related to environmental impact in the health sector. Public private initiatives, such as the Sustainable Markets Initiative and efforts through the British Standards Institute, have been launched to support companies and health systems to improve access to information about environmental impact, reduce environmental footprints and improve the harmonisation of measurement approaches.

Incorporating environmental considerations into healthcare decision making

Insufficient data and evidence hamper the inclusion of environmental criteria into health technology assessments

Health technology assessments (HTAs) serve as a critical tool for efficiently allocating limited resources to where they can have the biggest impact within health systems. By considering the clinical and economic implications of different healthcare and technologies, HTAs allow policymakers to make informed decisions on safety, efficacy and cost effectiveness when integrating new technologies, treatments and interventions into the healthcare system.

HTAs have traditionally focussed on the clinical and cost-effectiveness of new technologies, with additional considerations given to certain social or ethical considerations, such as the impact on patient quality of life and access to care. Until recently, these evaluations have not regularly considered the potential environmental impacts of the technologies being evaluated. This may be due to a combination of factors:

- Health systems remain primarily focussed on delivering high-quality care in as financially efficient a manner as possible, especially as rising demands for care occur in an era of fiscal constraint. HTAs have been designed first and foremost to address these primary health systems goals.
- HTAs depend on high-quality evidence and information. The strong evidence base upon which decisions are made is a hallmark of the HTA process. Information related to the environmental impact of healthcare technologies and interventions thus far remains extremely limited, complicating in many cases the ability for decisionmakers to make evidence-based judgements based on environmental factors (Greenwood Dufour et al., 2022[29]).
- Stakeholders participating in the HTA process may not be experts in or familiar with environmental impacts. This may complicate their abilities to make informed decisions about potential environmental effects, particularly where the evidence is limited or of poor quality (Greenwood Dufour et al., 2022[29]).
- There is not yet consensus on the best approach on how environmental considerations should be incorporated into assessments. A range of options exist with different implications for how environmental factors would be weighed. Environmental impacts could be used as an additional input of information during the deliberative process. They could alternatively or complementarily be translated into extended measures of the economic impacts or potential health impacts of a new technology. A recent review identified a range methods that have been adopted to incorporate environmental considerations into HTA, including extending cost utility and cost effectiveness analyses to account for greenhouse gas emissions, cost-benefit analyses that evaluated the willingness to pay by CO2-equivalent, and multicriteria decision analysis, but noted the lack of evidence around environmental impacts at the product or technology level complicates efforts to incorporate environmental considerations into HTA evaluations (Pinho-Gomes et al., 2022[30]).

As the evidence for the health system's environmental impact grows, a number of countries have begun to explore or express interest in considering environmental factors in health technology assessments. The number of countries that have actively moved to systematically incorporate environmental considerations into HTAs remains extremely limited. In the **United Kingdom**, a recent (2023) feasibility analysis conducted by the National Institute for Health and Care Excellence (NICE) found that the evidence around environmental impacts at the product level was not suitably advanced to incorporate environmental impacts systematically across all NICE HTA evaluations (National Institute for Health and Care Excellence, n.d.[31]).

At the same time, environmental impacts – including a product's impact on greenhouse gas emissions – have been considered ad hoc to the approval of some new technologies in the United Kingdom. A recommendation in early 2022 to use a certain product (sedaconda anaesthetic conserving device-S) as

a lower-cost alternative for inhaled anaesthetics, for example, that while there was a lack of evidence on its impact on greenhouse gas emissions, there was the "potential" that the device could help to reduce greenhouse gas emissions compared to other products (National Institute for Health and Care Excellence, 2023[32]). However, the environmental considerations were neither taken into account as evidence nor cited as a reason the product was recommended (Szawara et al., 2023[33]).

Other countries that have not formally integrated environmental considerations into HTA decision making processes have also considered other environmental impacts during at least some HTA deliberations. In **Canada**, for example, a number of dental interventions have considered environmental implications, such as the impact of water fluoridation on water and soil contamination and the environmental impact of mercury that could be released from fillings (Greenwood Dufour et al., 2022[29]). While environmental impacts are included as one of ten domains within the deliberative framework developed by Canada's Drug Agency (CDA-AMC) Health Technology Expert Review Panel, not all domains are required to undergo a full evaluation during the deliberation process (Walpole et al., 2023[34]). CDA-AMC has identified adapting its approach to more broadly consider equity, patient perspectives and environmental factors as part of its 2022-2025 Strategic Plan, including better identifying the environmental impact of health technologies as part of the health system (CDA-AMC, 2022[35]).

Other OECD countries, including **Poland**, **France**, **Sweden**, **Spain**, and the **Netherlands**, are also considering how environmental impacts can be better incorporated into health technology assessments (Bobini and Cicchetti, 2024[36]). In the Netherlands, the Dutch National Healthcare Institute (Zorginstituut Nederland) has published an advisory report at the request of the Ministry of Health titled "Healthcare personnel utilisation and environmental sustainability taken into account when deciding whether healthcare can be reimbursed". The report focuses on how the utilisation of scarce healthcare personnel and environmental impact can be taken into account when assessing whether or not to reimburse an intervention from the basic health insurance package. In May 2025 the advice was presented to the MoH in which the National Healthcare Institute sets out clear calculation methods for both subjects and advice on how to use them in the assessment and appraisal phases. It also indicates why labor input and environmental impact could, for now, not be incorporated in the criteria 'effectiveness' or 'cost-effectiveness'. The Dutch National Healthcare Institute has commenced a 3 year trial period to gain experience with the proposed methods in the report.

How might environmental considerations be factored into HTAs?

While a lack of high-quality empirical data on the environmental impact of many new health technologies creates a significant barrier to better embedding environmental considerations into the assessment of new health technologies, there are many approaches to *how* environmental factors could be considered and weighted in health technology assessments if this information were to be made more consistently available. (Toolan et al., 2023[37]) identified four potential approaches to how HTA agencies could take on board environmental impact information in their assessments (Toolan et al., 2023[37]).

- HTAs could serve as an **information conduit** for HTA agencies, using information on the environmental footprint of a technology that had been calculated elsewhere (such as by the company).
- They could further be considered via an **integrated evaluation** that would quantify health, economic and environmental considerations into one model, such as through an extended cost-benefit or cost-utility analysis.
- Alternatively, environmental impacts could be considered through a **parallel evaluation** that looked at the environmental impacts (positive or negative) of the new technology as a standalone consideration, without linking the environmental impact to health or economic factors, as in an integrated evaluation.

- Lastly, **environment-focussed evaluations** could specifically evaluate the environmental impact of an alternative technology, where the health and economic benefits of the two products would be considered largely the same, with only an important difference in the environmental footprint. This would require an extension of what HTA agencies normally assess.

Williams et al. (2024[38]) have identified multiple methods to incorporate environmental factors into health technology assessments using these four approaches and identifies potential benefits – and risks – of implementing the different approaches.

Table 3.1. Embedding environmental factors into health technology assessments: Different approaches carry different benefits – and risks

Process	Method	Risks	Benefits
Information conduit	External environmental impact data/information is published as part of HTA decision	No data validation by HTA; impact not taken into account in HTA decision	Low resource intensity Encourages transparency in environmental impact disclosure
Integrated evaluation	Extend cost effectiveness (CEA), cost utility (CUA) or cost benefit analysis (CBA) to include environmental impact (in monetary terms) Convert environmental impacts into health impact as outcome of CEA/CUA Modified willingness to pay approach that takes environmental impacts into account	Highly dependent on the accuracy of the financial conversion and may not significantly impact the incremental cost effectiveness ratio Can be very hard to translate environmental impact into marginal health impact; excludes non-health impacts of environment	Integrates environmental impact into a commonly used approach Integrates environmental impact into a commonly used approach Has been used in the past with other conditions
Parallel evaluation	Calculation of incremental carbon footprint effectiveness ratio or incremental carbon footprint ratio Incorporate environmental impact into multi-criteria decision analysis Evaluate environmental impact but present it separately from economic assessment Consider environmental impacts during the deliberation process	Unclear how decisionmakers might balance environmental vs. health/economic trade-offs No precedent; requires stakeholders to understand environmental impact Potential for lower chance of environmental impact influencing decision Requires environmental experts to be included in deliberative process	Does not requires conversion of environmental impacts into health or economic benefits Offers flexibility (e.g. ad hoc inclusion or exclusion based on perceived impact)
Environment-focussed evaluation	Looks only at environmental impacts	Does not consider health or cost impacts/benefits	Could promote development of products low environmental impact

Source: Adapted from Williams, J. et al. (2024[38]), "Methods to Include Environmental Impacts in Health Economic Evaluations and Health Technology Assessments: A Scoping Review", https://doi.org/10.1016/j.jval.2024.02.019.

One additional challenge lies in identifying what constitutes environmental impact, and how to balance potential tensions between environmental benefits and harms that can be contained within one new product or technology. Some researchers have raised concerns, for example, which focussing too narrowly on reducing greenhouse gas emissions overlooks the additional and potentially negative impacts a technology that delivers care with lower emissions may also have on the environment in other ways. The same product, for example, may simultaneously release higher levels of harmful chemicals or other toxins into the ecosystem while also lowering emissions. At the same time, the comparatively straightforward approach to measuring greenhouse gas emissions when compared to other environmental impacts, combined with its more direct impact on climate change, have led some researchers to make the case that incorporating emissions footprinting into HTAs offers a good starting point for taking into account the environmental impacts of health technologies (McAlister, Morton and Barratt, 2022[39]; Williams et al., 2024[38]).

As countries begin to consider how and whether to incorporate environmental impacts into HTA, more clearly defining the scope of environmental impacts being considered and how adopting different approaches to environmental assessment would impact current HTA processes would help countries to best weigh the risks and benefits in doing so. Incorporating environmental considerations into health technology assessments offers countries a good opportunity to take seriously their commitments to reducing the environmental footprint of the health system. At the same time, making decisions based on incomplete or insufficient data could risk complicating a well-designed practice for unclear environmental benefit, particularly where there are tensions or trade-offs between environmental impacts on different fronts.

Many of the data challenges facing health systems today will likely be reduced in the coming years. The data barriers that may currently prevent environmental factors from being more systematically considered in HTAs and other healthcare assessments will not necessarily represent the same obstacles that they do today. Even if the available information is insufficient today, countries have a good opportunity to begin proactively thinking through how environmental considerations could be more systematically included so they are ready to respond effectively once the necessary data is more widely available.

References

Australian Department of Health and Aged Care (2024), *Australia joins US and UK statement on decarbonising healthcare*, https://www.health.gov.au/ministers/the-hon-ged-kearney-mp/media/australia-joins-us-and-uk-statement-on-decarbonising-healthcare. [23]

Bade, C. et al. (2023), "Sustainability in the pharmaceutical industry—An assessment of sustainability maturity and effects of sustainability measure implementation on supply chain security", *Corporate Social Responsibility and Environmental Management*, Vol. 31/1, pp. 224-242, https://doi.org/10.1002/csr.2564. [28]

Belkhir, L. and A. Elmeligi (2019), "Carbon footprint of the global pharmaceutical industry and relative impact of its major players", *Journal of Cleaner Production*, Vol. 214, pp. 185-194, https://doi.org/10.1016/j.jclepro.2018.11.204. [4]

Bobini, M. and A. Cicchetti (2024), "Integrating environmental sustainability into health technology assessment: an international survey of HTA stakeholders", *International Journal of Technology Assessment in Health Care*, Vol. 40/1, https://doi.org/10.1017/s0266462324000631. [36]

Booth, A. et al. (2023), "Pharmaceutical Company Targets and Strategies to Address Climate Change: Content Analysis of Public Reports from 20 Pharmaceutical Companies", *International Journal of Environmental Research and Public Health*, Vol. 20/4, p. 3206, https://doi.org/10.3390/ijerph20043206. [27]

Bouvet, L. et al. (2024), "Environmental impact of intravenous versus oral administration materials for acetaminophen and ketoprofen in a French university hospital: an eco-audit study using a life cycle analysis, Impact environnemental de l'administration intraveineuse vs orale d'acétaminophène et de kétoprofène dans un CHU français : une étude d'éco-audit fondé sur une analyse de cycle de vie", *Canadian Journal of Anesthesia/Journal canadien d'anesthésie*, Vol. 71/11, pp. 1457-1465, https://doi.org/10.1007/s12630-024-02852-9. [16]

Brighton and Sussex Medical School, Centre for Sustainable Healthcare and UK Health Alliance on Climate Change (2023), *Green surgery: Reducing the environmental impact of surgical care*, https://ukhealthalliance.org/sustainable-healthcare/green-surgery-report/. [9]

Capital Region of Denmark, Region of Southern Denmark, Central Denmark Region, North Denmark Region and Region Zealand (2022), *Nordic Criteria for More Sustainable Packaging for Healthcare Products*, https://www.regioner.dk/media/21537/nordic-criteria-for-more-sustainable-packaging-in-healthcare.pdf. [21]

CDA-AMC (2022), *Ahead of the Curve: Shaping Future-Ready Health Systems - 2022-2025 Strategic Plan*, https://www.cda-amc.ca/sites/default/files/corporate/Ahead%20of%20the%20Curve_%20Shaping%20Future-Ready%20Health%20Systems%20%E2%80%94%202022-2025%20Strategic%20Plan.pdf. [35]

Davies, J. et al. (2024), "Environmental and financial impacts of perioperative paracetamol use: a multicentre international life-cycle assessment", *British Journal of Anaesthesia*, Vol. 133/6, pp. 1439-1448, https://doi.org/10.1016/j.bja.2023.11.053. [17]

Department of Health and Aged Care (2023), *National Health and Climate Strategy*, https://www.health.gov.au/sites/default/files/2023-12/national-health-and-climate-strategy.pdf. [7]

Drevinskas, E., E. Shing and T. Verbeet (2023), *Trade in medical goods stabilises after peaking during pandemic*, World Trade Organization, https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_23may23_e.htm. [1]

ECOVAMED (2024), *Medicines carbon footprint assessment methodology*, https://www.entreprises.gouv.fr/files/files/Actualites/2024/medicines-carbon-footprint-assessment-methodology.pdf. [24]

Environmental Resources Management Ltd. (2012), *Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices: Summary Document*, https://ghgprotocol.org/sites/default/files/tools/Summary-Document_Pharmaceutical-Product-and-Medical-Device-GHG-Accounting_November-2012.pdf. [26]

Friedericy, H. et al. (2024), "Greenhouse gas emissions due to inhalation anaesthetics in the Netherlands, usage data and a survey of preferences among Dutch anaesthesiologists", *European Journal of Anaesthesiology Intensive Care*, Vol. 4/1, p. e0065, https://doi.org/10.1097/ea9.0000000000000065. [6]

Greenwood Dufour, B. et al. (2022), "How We Might Further Integrate Considerations of Environmental Impact When Assessing the Value of Health Technologies", *International Journal of Environmental Research and Public Health*, Vol. 19/19, p. 12017, https://doi.org/10.3390/ijerph191912017. [29]

Jena, A. et al. (2015), "The Impact of the US Food and Drug Administration Chlorofluorocarbon Ban on Out-of-pocket Costs and Use of Albuterol Inhalers Among Individuals With Asthma", *JAMA Internal Medicine*, Vol. 175/7, p. 1171, https://doi.org/10.1001/jamainternmed.2015.1665. [15]

McAlister, S., R. Morton and A. Barratt (2022), "Incorporating carbon into health care: adding carbon emissions to health technology assessments", *The Lancet Planetary Health*, Vol. 6/12, pp. e993-e999, https://doi.org/10.1016/s2542-5196(22)00258-3. [39]

Morgan, G. et al. (2025), "Narrative review: Nitrous oxide waste and why we should abandon reticulated delivery systems", *Best Practice & Research Clinical Anaesthesiology*, https://doi.org/10.1016/j.bpa.2025.01.001. [8]

Nagasaki, K. et al. (2023), "The environmental impact of inhaler replacement: A carbon footprint and economic calculation of the National Database of Health Insurance Claims in Japan", *Journal of General and Family Medicine*, Vol. 24/4, pp. 207-214, https://doi.org/10.1002/jgf2.622. [11]

National Institute for Health and Care Excellence (2023), *Sedaconda ACD-S for sedation with volatile anaesthetics in intensive care: Medical technologies guidance*, https://www.nice.org.uk/guidance/mtg65/resources/sedaconda-acds-for-sedation-with-volatile-anaesthetics-in-intensive-care-pdf-64372178389957. [32]

National Institute for Health and Care Excellence (n.d.), *Environmental Sustainability*, https://www.nice.org.uk/about/who-we-are/sustainability. [31]

NHS England (n.d.), *Greener NHS: Take Action - Suppliers*, https://www.england.nhs.uk/greenernhs/get-involved/suppliers/ (accessed on 25 February 2025). [19]

OECD (2025), *Measuring Carbon Footprints of Agri-Food Products: Eight Building Blocks*, OECD Publishing, Paris, https://doi.org/10.1787/8eb75706-en. [25]

OECD (2025), *Public Procurement*, https://www.oecd.org/en/topics/policy-issues/public-procurement.html (accessed on 27 January 2025). [18]

OECD (2024), *Securing Medical Supply Chains in a Post-Pandemic World*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/119c59d9-en. [2]

OECD (2023), *Health at a Glance 2023: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/7a7afb35-en. [20]

Pinho-Gomes, A. et al. (2022), "Incorporating environmental and sustainability considerations into health technology assessment and clinical and public health guidelines: a scoping review", *International Journal of Technology Assessment in Health Care*, Vol. 38/1, https://doi.org/10.1017/s0266462322003282. [30]

Sookne, K. (2022), *New Nordic Sustainability Criteria Poised to Expand in Europe*, https://www.healthcarepackaging.com/sustainability/sustainability/article/22288835/new-nordic-sustainability-criteria-poised-to-expand-in-europe. [22]

Szawara, P. et al. (2023), *Environmental sustainability in HTA: Are HTA bodies applying environmental criteria in their decision-making?*, https://www.ispor.org/docs/default-source/euro2023/isporeurope23wagnerhta290poster132526-pdf.pdf?sfvrsn=fdefc172_0. [33]

ten Have, P. et al. (2022), "Turning green: the impact of changing to more eco-friendly respiratory healthcare – a carbon and cost analysis of Dutch prescription data", *BMJ Open*, Vol. 12/6, p. e055546, https://doi.org/10.1136/bmjopen-2021-055546. [10]

Toolan, M. et al. (2023), "Environmental impact assessment in health technology assessment: principles, approaches, and challenges", *International Journal of Technology Assessment in Health Care*, Vol. 39/1, https://doi.org/10.1017/s0266462323000041. [37]

Walpole, S. et al. (2023), "How can environmental impacts be incorporated in health technology assessment, and how impactful would this be?", *Expert Review of Pharmacoeconomics & Outcomes Research*, Vol. 23/9, pp. 975-980, https://doi.org/10.1080/14737167.2023.2248389. [34]

Watts, N., R. Moonesinghe and C. Foreman (2023), *Putting anaesthetic emissions to bed: commitment on desflurane*, https://www.england.nhs.uk/blog/putting-anaesthetic-emissions-to-bed. [5]

Wilkinson, A. et al. (2019), "Costs of switching to low global warming potential inhalers. An economic and carbon footprint analysis of NHS prescription data in England", *BMJ Open*, Vol. 9/10, p. e028763, https://doi.org/10.1136/bmjopen-2018-028763. [12]

Williams, J. et al. (2024), "Methods to Include Environmental Impacts in Health Economic Evaluations and Health Technology Assessments: A Scoping Review", *Value in Health*, Vol. 27/6, pp. 794-804, https://doi.org/10.1016/j.jval.2024.02.019. [38]

Wittenberg, A. (2024), *How 'green' inhalers could evade Biden's drug pricing legacy*, https://www.politico.com/news/2024/10/14/green-inhalers-biden-drug-pricing-legacy-00183576. [13]

World Health Organization (2024), *Report of Climate Resilient and Environmentally Sustainable Supply Chains in the Health Sector Expert Consultation*, https://cdn.who.int/media/docs/default-source/climate-change/cres_supply_chains.pdf?sfvrsn=3b521e6e_3&download=true. [3]

Wouters, O., W. Feldman and S. Tu (2022), "Product Hopping in the Drug Industry — Lessons from Albuterol", *New England Journal of Medicine*, Vol. 387/13, pp. 1153-1156, https://doi.org/10.1056/nejmp2208613. [14]

4 Maximising impact: The climate co-benefits of public health policies

This chapter examines the broader landscape of public health policies, making the case that many polices that promote public health also yield important climate co-benefits. It develops an evidence base of public health policies and measures that simultaneously deliver climate and health benefits. Pathways to achieve climate benefits through the reduction of greenhouse gas (GHG) emissions from public health measures across sectors include policy changes in the food, transportation, and household energy use sectors, through promoting sustainable diets, reducing air pollution, and encouraging physical activity. By highlighting the interconnectedness of public health policies across sectors and its relation to environmental benefits, this chapter underscores the importance of taking into account potential co-benefits during policy formulation and implementation.

In Brief

- Climate change and the rising and unequal burden of non-communicable disease (NCDs) share systemic drivers. NCDs account for 88% of all deaths among OECD countries. Many of the main drivers of non-communicable diseases fuelling this growing burden, including fossil fuel dependency, car-centric transportation systems, and industrialised food systems, are also driving climate change.
- Addressing demand-side solutions which influence consumer behaviours and choices yield substantial health and climate benefits. Food systems, passenger transport, and household energy use contribute substantially to climate change, and are responsible respectively for approximately a third, a quarter, and a fifth of total greenhouse gas emission among OECD countries.
- By embedding environmental considerations into public health, governments can create win-win policies that drive long-term health improvements by reinforcing health system resilience that also support decarbonisation efforts. A shift towards healthy diets that are sustainably produced, or "win-win" diets, consisting of mainly plant-based foods with little to no red and processed meats, could reduce GHG emissions by 304 MtCO2eq, equivalent to emissions of 72 million cars over one year, and 26 999 premature deaths due to cancer annually in OECD countries.
- A wide range of policy options are available to promote healthier and more sustainable choices across food, transportation, and household energy sectors, ranging from stringent regulatory approaches to behavioural science-based approaches intended to "nudge" populations towards certain practices. On average across OECD countries, policies targeting changes in the household energy were more widespread than those targeting changes to the food industry and transportation sector.
- OECD countries were more likely to have implemented regulatory policies impacting health in the transportation and energy sectors (82%) than in the food sector (53%). Financial incentives to shift towards healthier choices were similarly more common in transportation (76%) and energy (88%) than in the food and agriculture sector. The majority of responding countries reported information-based policies had been implemented across all three sectors, though these were also more frequent in the transportation and energy sectors (88%) than in the food and agriculture sector (65%).
- Across the food, transportation and energy sectors, there are opportunities for countries to adopt policies that help to prioritise the health of people and the planet. These include:
    - **Sustainable Diets**: More than three-fifths (63%) of OECD countries include environmental sustainability considerations in their dietary guidelines. Yet few provide clear guidance to consumers on how to transition diets towards lower-carbon food consumption. Policies from countries that explicitly link nutrition, sustainability, and climate considerations, including Belgium and Denmark, could serve as a model for others looking to transform the sustainability of their food systems. Other countries have worked to encourage the adoption of healthier behaviours by lowering the price of healthier foods. In Canada and Ireland, zoning legislation has helped shape healthier food environments by banning unhealthy food outlets in certain locations.

- **Sustainable Transportation**: Investments in infrastructure and financial incentives, such as the development of cycling superhighways and cycling networks in Denmark and the Netherlands, can significantly increase the uptake of active transport options. Some countries, including Germany and Luxembourg, have begun providing subsidies for public transportation utilisation to encourage people to switch away from using private vehicles for trips that could be made by public transportation.
- **Sustainable Energy Use**: Countries have also seen a strong shift towards promoting sustainable and healthy residential energy environments, including phasing out polluting energy sources for household use through regulatory and legal measures. To date, 53% of OECD countries have either complete coal phase-outs or have committed to full phase-out plans ranging from Belgium (2017) to Chile (2040). Others, including Czechia, Estonia, Poland, the Slovak Republic, Canada and Sweden have offered financial incentives to support the transition towards sustainable residential energy supplies. Countries have also adopted consultation services to help consumers better understand home energy use and methods for reducing energy consumption, including in Canada and Sweden.

- Despite the progress, OECD countries remain hindered by the absence of standardised and harmonised reporting on emissions and health outcomes, making it difficult to conduct comprehensive integrated assessments and prioritise policy action effectively within country settings. While efforts to adopt a multisector approach are underway, the lack of a unified framework for measuring and reporting health and climate co-benefits continues to stall progress, limiting the potential to scale evidence-based policy action.

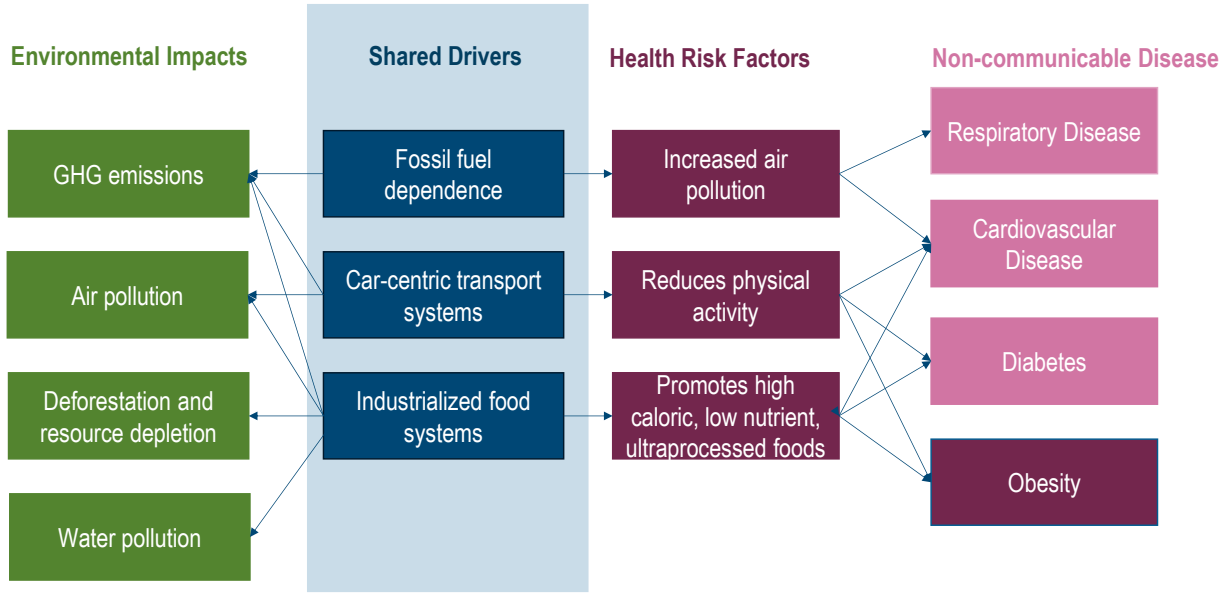
Public health: Improving health outcomes while delivering climate co-benefits

Many of the most important determinants of the rise in non-communicable diseases in OECD countries are also the key drivers of climate change. The contribution of healthcare systems to greenhouse gas emissions and climate change is profound. As previous chapters have demonstrated, substantial potential to reduce carbon emissions exists through streamlining care pathways, enhancing energy efficiency in healthcare facilities, and optimizing supply chains.

There is significant scope to address carbon emissions beyond the health sector. Public health policies, which form the bedrock of healthcare policy, also extend beyond the healthcare sector. Many health promotion initiatives leverage intersectoral actions to address the upstream determinants of health. This means that many public health interventions not only enhance health outcomes by reducing risk factors for poor health – such as increasing physical activity, lowering air pollution, and promoting healthier diets – but also yield important environmental benefits. Many public health policies that reduce greenhouse gas emissions present a “win-win” opportunity, generating important co-benefits to both the health and climate sectors.

Today, the same forces driving the rise in non-communicable diseases in OECD countries also fuel climate change. Conditions such as cardiovascular diseases, cancers, diabetes, and chronic respiratory diseases are now the leading causes of mortality and morbidity across OECD countries, with non-communicable diseases (NCDs) accounting for nearly nine in ten deaths in OECD countries in 2022. Many of the root causes fuelling the growing burden of NCD also contribute to climate change, highlighting a deeply interconnected crisis.

Figure 4.1. The main drivers of non-communicable diseases are also the forces that accelerate climate change



Source: Author's compilation of literature.

Climate change directly and indirectly exacerbates NCDs in several ways:

- Air pollution and respiratory diseases: Overreliance on fossil fuels for energy and electricity generation – by far the largest contributor to climate change – can increase exposure to air pollution and worsen air quality (concentrations of outdoor ozone and particulate matter) rates of asthma, chronic obstructive pulmonary disease (COPD), lung cancer, and cardiovascular disease. (D'Amato et al., 2014[1])
- Extreme heat and cardiovascular stress: Increased frequency, duration, and intensity of extreme heat events elevates risks for stroke and cardiovascular complications, particular among vulnerable populations with preexisting co-morbidities (Bell, Gasparrini and Benjamin, 2024[2]).
- Food system disruptions and diet-related illnesses: Climate change threatens food security leading to increased risks of malnutrition (i.e. undernutrition and obesity) and diet-related illnesses including diabetes and cardiovascular diseases (Fanzo and Downs, 2021[3]).

Given the intersecting challenges of climate change, health, and social inequalities, public health has a crucial role in shaping policies that address both health and climate impacts, particularly the consumption side. While climate mitigation efforts have traditionally focussed on supply-side interventions – such as improving energy efficiency and reducing fuel consumption in transportation – there is growing recognition of the importance of demand-side measures. Demand-side solutions are an important component of health and climate progress. The Sixth Assessment Report from the IPCC highlighted the transformative potential of demand-side solutions, including lifestyle changes and socio-cultural transitions, which could reduce global GHG emissions by 40-70% across sectors by 2050 scenarios (Calvin et al., 2023[4]).

Well-designed public health policies – particularly in food systems, transportation, and household energy use – represent a consumption-focussed approach that can improve health outcomes and reduce inequalities. Research shows that the wealthiest 0.5% of households account for 13.6% of total lifestyle-related emissions, while the world's poorest 50% contribute only 10% (Otto et al., 2019[5]). By promoting equitable access to clean energy, affordable and sustainable food, and inclusive transportation

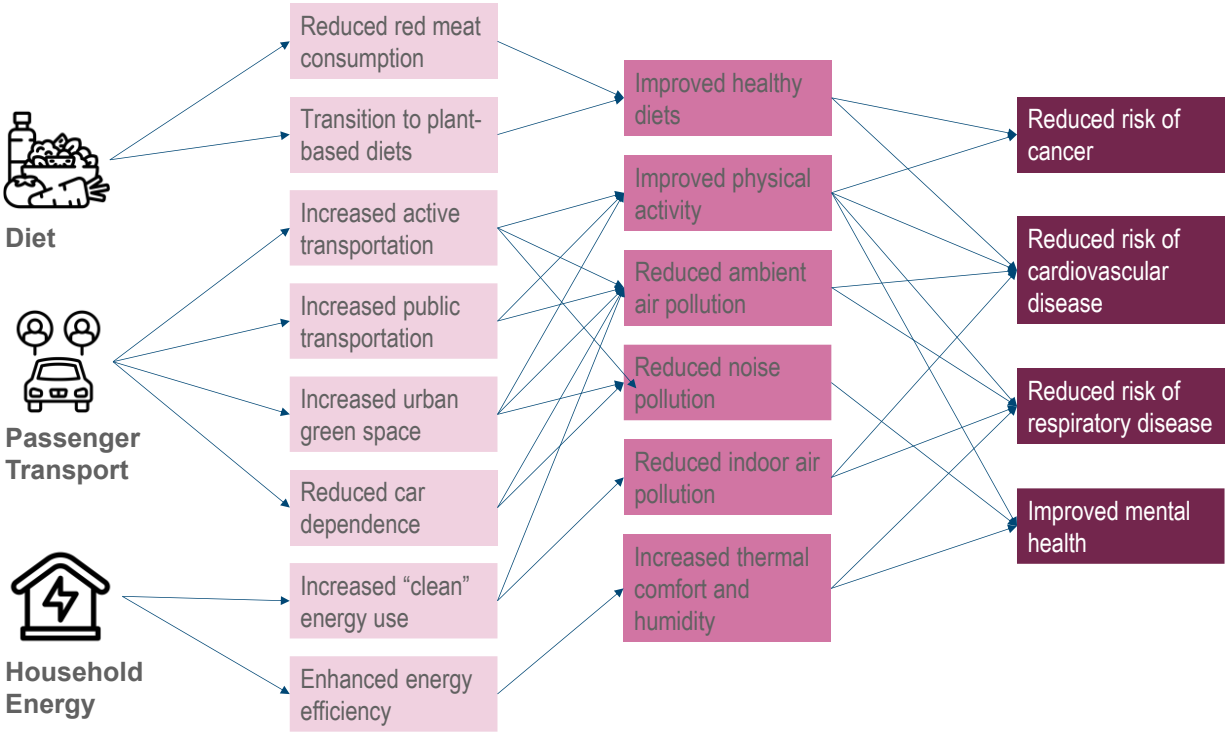
options, demand-side policies can simultaneously mitigate climate change, improve public health, and help to narrow inequalities.

Whether through health-led strategic plans, or integrated multisectoral adaptation plans, countries are increasingly embedding health considerations into climate policy frameworks. By harnessing climate co-benefits of public health policies, countries have the potential to improve health outcomes, reduce health inequity, and increase health system resilience to climate-related risks. And prioritising low-emission public health policies can do more than advance mitigation efforts: they can help to reduce health inequalities, strengthen health system resilience, and strengthen the investment case for public health in a time of extreme resource constraints.

Major environmental drivers of poor health outcomes also accelerate climate change

Public health policies can significantly improve health while also helping to reduce greenhouse gas emissions through three primary pathways policies that help reduce exposure to air pollution, that increase sustainable and health dietary intake, and that increase levels of physical activity (Figure 4.2) (Whitmee et al., 2024[6]).

Figure 4.2. Pathways to achieve positive health and climate outcomes through public health policies



Source: Adapted from Whitmee, S. et al. (2024[6]), "Pathways to a healthy net-zero future: report of the Lancet Pathfinder Commission", https://doi.org/10.1016/S0140-6736(23)02466-2 and Gao et al. (2018[7]), Public health co-benefits of greenhouse gas emissions reduction: A systematic review", https://doi.org/10.1016/j.scitotenv.2018.01.193.

For instance, transport policies that promote active transportation, such as walking and cycling, are considered as public health policies due to their multifaceted outcomes on population health beyond reducing congestion including improved cardiovascular and respiratory health, enhanced personal well-being, and better mental health. Additionally, these policies additionally reduce GHG emissions through the reduction in car-dependency as the primary form of transportation. Similarly, shifting towards plant-based diets lower risks of non-communicable diseases (NCDs) such as heart disease and diabetes while reducing agricultural emissions. These are "win-win" policies that deliver immediate health benefits while mitigating long-term climate risks (Table 4.1).

Table 4.1. Climate change mitigation-sensitive burden of illness expressed in Disability Adjusted Life Years (DALYs) and deaths among OECD countries in 2022.

Health Pathway	DALYs		Deaths	
	Number	Percentage (%)	Number	Percentage (%)
Dietary risks	29 360 710	6	13 472 010	10
Ambient air pollution	9 293 211	2	435 898	3
Low physical activity	3 401 616	0.1	150 619	1
Household air pollution	2 769 054	0	10 234	0

Source: IHPME, Global Burden of Disease Study 2022.

Dietary risks ranked as the fifth leading risk factor contributing to disease burden among OECD countries in 2021, contributing 6.4% of total DALYs

Dietary risks represented the fifth largest contributing risk factors to the disease burden in 2021 in OECD countries, contributing 6.4% of total DALYs. Within OECD countries, dietary risk factors collectively contributed to 1.3 million deaths, or 10% of all adult deaths and 30 million DALYs in 2021, with major impacts on heart disease, colon and rectal cancers, and type 2 diabetes. Dietary risk is also unevenly distributed across socio-economic strata, with populations in lower socio-economic groups at higher risk of obesity and diet-related illnesses in high-income countries (Fanzo and Davis, 2019[8]).

The aggregate dietary patterns thus have a large influence on both health outcome and climate change, representing an opportunity to develop policies that can address both health and environmental concerns simultaneously. However, addressing dietary risks also demands careful consideration of equity as access to nutrient-rich food varies significantly across socio-economic strata and geographical regions. Ensuring equitable access to healthy and sustainable foods is essential for mitigating health disparities and carbon emissions on a global scale.

Air pollution represented the leading environmental risk factor for DALYs among all environmental and occupational risks, contributing to 2.3% of total DALYs in 2021

Recognising air pollution as an important health pathway towards climate change mitigation underscores the imperative for concerted action. According to the 2021 Global Burden of Disease Study, air pollution represented the leading Level 2 risk factor in disability-adjusted life-years (DALYs) among all environmental and occupational risks (Murray et al., 2020[9]). In 2021, ambient air pollution contributed to 485 734 deaths and 10 million DALYs, representing 3.6% and 2.3% of total mortality and DALYs, respectively, among OECD countries due to a broad spectrum of acute and chronic health effects. Over the last 25 years, air pollution has emerged as a significant mortality risk factor for cardiovascular and respiratory diseases and cancer, a trend possibly attributed to factors such as ageing population, increased prevalence of non-communicable diseases, and increased exposure to outdoor air pollution (Dhimal et al., 2021[10]).

Air pollution can generally be categorised as indoor (household) and outdoor (ambient) based on the source. Exposure to indoor air pollution has been declining since the 1990s, largely due to gas and renewable energy sources started replacing biomass (wood, agricultural waste, animal dung) as fuel for household cooking and heating (Murray et al., 2020[9]). Though air pollution adversely affects the health of all population exposed, the adverse effects are unevenly distributed. Studies have shown that young children, older peoples, and persons living with co-morbidities, those exposed to concurrent and interacting pollutants, as well as those socio-economically deprived are at heightened vulnerability to the health effects of air pollution exposure (Makri and Stilianakis, 2008[11]).

Beyond these immediate health implications, air pollutants also constitute a co-pollutant to climate change as greenhouse gases are among the pollutants released. Consequently, addressing both indoor and outdoor pollution presents a unique opportunity not only to mitigate climate change but also to enhance public health outcomes.

Low physical activity

Low physical activity is strongly linked to increased risk of various non-communicable diseases such as coronary heart disease and type 2 diabetes, and breast and colon cancers, as well as premature mortality (Lee et al., 2012[12]). In 2021, it is estimated that low physical activity contributed to 150 619 deaths and 3.4 million DALYs, comprising 1% of total burden among OECD countries (Global Burden of Disease Collaborative Network, 2020[13]). The scale of this risk factor's contribution to chronic illness is similar to established risk factors of smoking and obesity (Lee et al., 2012[12]). Global costs of physical inactivity to healthcare systems, based on only five health outcomes (coronary heart disease, stroke, type 2 diabetes mellitus, breast cancer, and colon cancer), were estimated at INT$ 53.8 billion (2013), of which 58% was paid by the public sector (Santos et al., 2023[14]). Despite well-established evidence of low physical activity as a leading risk factor and its substantial cost to the healthcare system, global prevalence has remained stable between 2001 and 2016 at approximately a quarter of the adult population (Guthold et al., 2018[15]).

The effects of physical inactivity on risk of illness and the potential benefits conferred from public health intervention are not evenly distributed. Prevalence of low physical activity was more than double in high-income countries as compared with low-income countries, likely driven by transition towards sedentary occupations and increased usage of motorised vehicles, whereas in lower income countries, physical activity is more prevalent in routine daily activities including at work and transportation.

In addition to its direct impacts on health, promoting physical activity also presents an opportunity for synergistic benefits with climate change mitigation, thus resulting in co-benefits for both health and the environment. Encouraging active modes of transportation such as walking, cycling and public transportation not only increases physical activity but also reduce greenhouse gas emissions from use of motorised vehicles. Thus, policies that promote increased physical activity may simultaneously offer opportunities to mitigate climate change.

Figure 4.3. The impact of climate change mitigation policies in OECD countries by sector on health

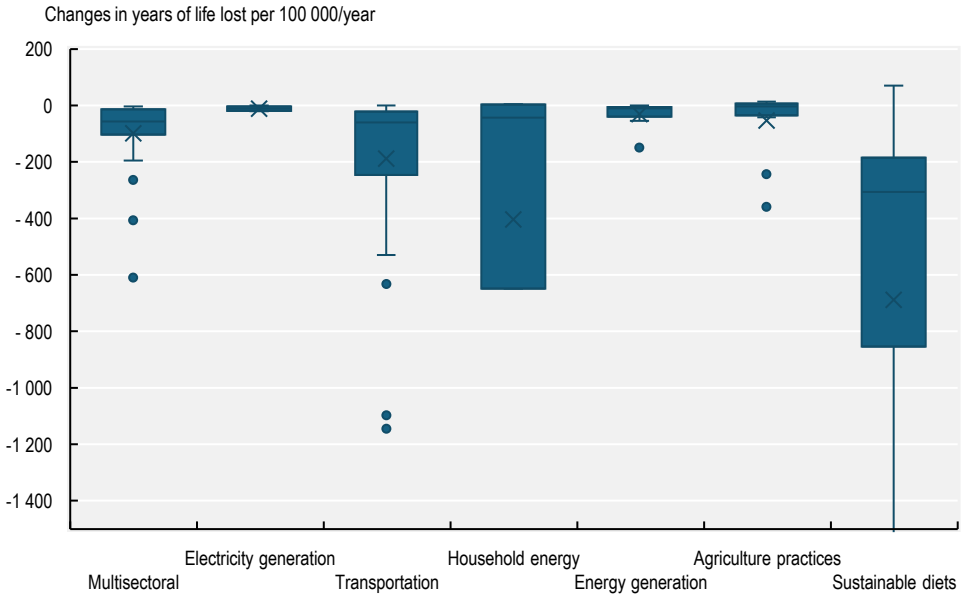
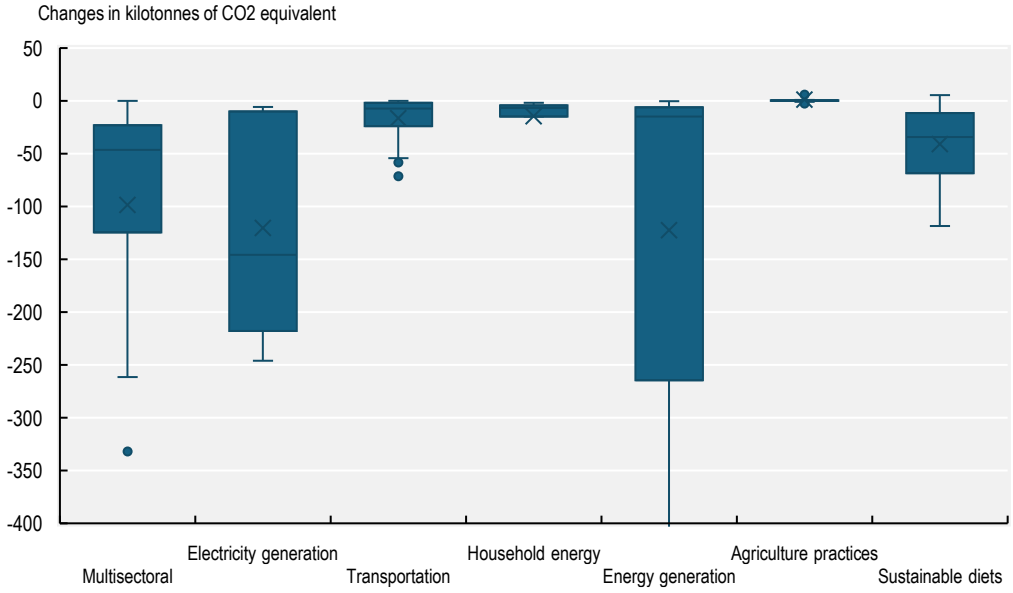


Figure 4.4. The impact of climate change mitigation policies in OECD countries by sector on greenhouse gas emissions



Note: Agricultural practices include actions that promote productive and sustainable agriculture such as changes in farming practices (e.g. fertiliser use, nutrient recycling, biodynamic farming, etc) and using technical solutions to reduce emissions (such as nitrification inhibitors). Sustainable diet interventions include strategies designed to alter individual dietary consumption patterns. Results were extracted from an umbrella review of 26 systematic reviews that provide quantitative estimates of the impacts of climate mitigation actions on greenhouse gas emissions and health outcomes, limited to OECD countries where study location data was available. Results extracted from primary studies were either modelled or implemented across a range of spatial, temporal, and measurement scales. Outliers at the tail end of 2.5% (beyond the 97.5th percentile on the upper-end and 2.5% percentile on the lower-end are removed).

Source: Whitmee, S. et al. (2024[6]), "Pathways to a healthy net-zero future: report of the Lancet Pathfinder Commission", https://doi.org/10.1016/S0140-6736(23)02466-2.

Harnessing public health to achieve health and climate benefits across domains

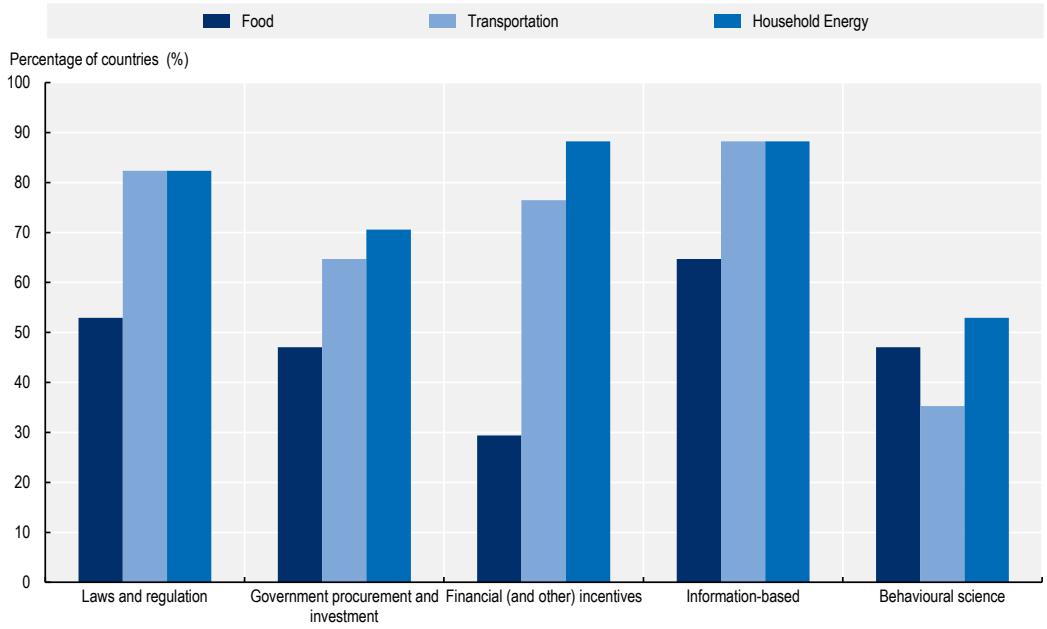
Public health policies to achieve win-wins for health and climate rely heavily on information-based approaches, followed by laws and regulation

Across public health policies in the areas of food, transportation, and household energy, information-based policies exhibit the highest adoption rates relative to other instrument types (Figure 4.5). This trend suggests that governments prioritise strategies such as awareness campaigns, labelling and consumer guidelines that aim to enhance public knowledge. While these policies can play a crucial role in shaping behaviour, their effectiveness is often limited without complementary structural interventions, such as regulatory measures or government investments, which can actively shift consumer choices by making healthier and more sustainable options more accessible and affordable.

A clear contrast emerges in the adoption of financial incentives across sectors. While household energy policies exhibit a high adoption rate (88%), driven by grants for energy efficiency improvements and renewable energy subsidies, and transportation policies follow closely behind at 76%, with incentives such as tax rebates for fuel efficient vehicles, food policies lag significantly behind, with only a 30% adoption rate. Instruments such as subsidies for healthy food or taxes on unhealthy and unsustainable food appears underutilised compared to financial levers in other sectors.

Behavioural science-based instruments remain the least utilised policy instrument across all three domains, reflecting a consistent pattern of underuse. Based on the concept that consumer choices can be guided by what and how different options are presented, these tools have been increasingly recognised for their potential to complement traditional policy approaches. The low adoption rate highlights an untapped opportunity for policymakers to integrate behavioural interventions that can enhance the effectiveness of existing policies by influencing choices in ways that promote healthier and more sustainable behaviours.

Figure 4.5. Adoption of policy instruments by domains in OECD Countries



Note:17 OECD Countries have responded to this survey.
Source: OECD Health and Climate Policy Survey.

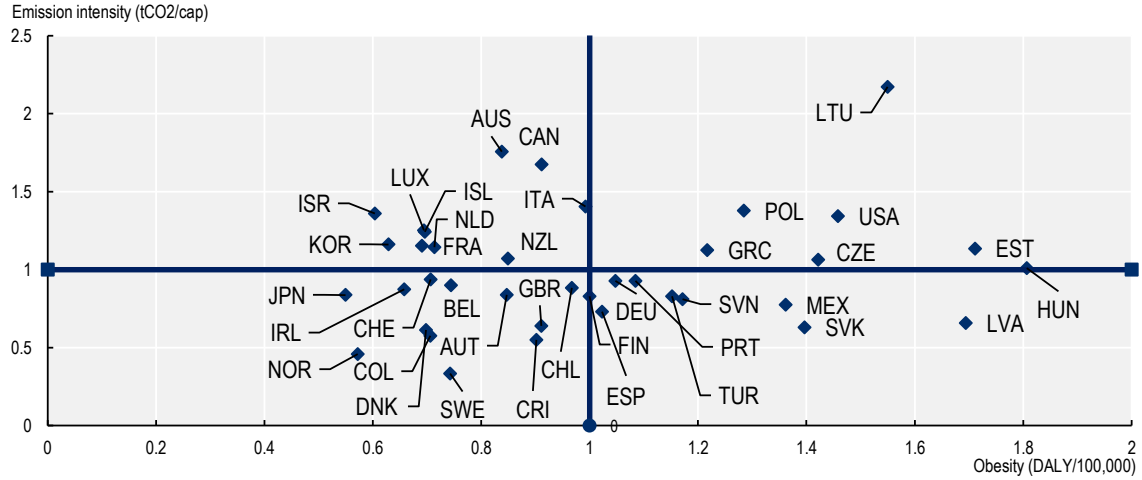
Reducing the impact of unhealthy diets on health – and the environment

Across OECD countries, there is considerable opportunity to achieve a win-win scenario for both the environmental sustainability and public health by promoting healthier and sustainable dietary consumption patterns. Strategies such as limiting overconsumption of animal-sourced foods and ultra-processed foods, reducing food waste, and encouraging seasonal eating offer multiple co-benefits.

While past efforts have primarily focussed on improving production efficiency – emphasising agricultural productivity, supply chain efficiency, and food security – to meet growing population needs, this approach alone is insufficient. It fails to address pressing challenges such as environmental footprint of food systems, high rates of food waste, and the accessibility and affordability of nutrient-rich and low carbon-emitting foods. These factors have direct public health implications and could be more effectively managed through demand-side interventions that shift consumption patterns rather than relying solely on improving supply-side efficiency.

Encouraging healthier and more sustainable food choices at the consumer level has the potential to drive systemic change across the entire food system, delivering both health and environmental benefits. Consumption of lower animal-based foods (e.g. red meat, processed meat, dairy) and higher plant-based foods (e.g. vegetables, fruits, legumes, seeds, nuts, and whole grains) benefits both environmental sustainability and health outcomes ((Aleksandrowicz et al., 2016[16]; Springmann et al., 2016[17]; Stehfest et al., 2009[18]; Nelson et al., 2016[19]) (Hallström, Carlsson-Kanyama and Börjesson, 2015[20]). Consumption-based policies provide more direct leverage to address challenges such as food waste, unhealthy dietary patterns, and limited access to sustainable food options. With obesity rates rising, policies that encourage healthier eating not only reduce diet-related diseases but also lower the carbon footprint of food systems. By shifting the focus from how food is produced to how it is consumed, governments can create more effective pathways for sustainability and public health improvements. Several countries have both a high burden of disease due to obesity and high agricultural and food system emissions (Figure 4.6).

Figure 4.6. The dual burden of food systems: Health burden and carbon emissions



Note: Obesity used as an indicator of health burden for unsustainable and unhealthy food consumption. Emission intensity represents the carbon emissions associated with "pre- and post-agricultural production processes." Carbon emissions associated include activities before the farm gate (fertilizers manufacturing, pesticides manufacturing, generation of electricity used on farm, generation of heat used on farm) and after the farm gate (food processing, food packaging, food transport, food retail, food household consumption, agrifood systems waste disposal).
Source: IHPME and FAO.

Adopting healthier diets would avert 27 000 premature deaths due to cancer annually and reduce emissions by as much as removing 72 million cars from the roads for one year

Modelled analyses of changing dietary consumption patterns in OECD countries indicate that adopting more nutritionally balanced, plant-based diets in line with national dietary guidelines across all OECD countries would reduce 27 000 premature deaths due cancer annually and would reduce greenhouse gas emissions by 304 MtCO2eq, equivalent to pulling 72 million gasoline-powered cars off the roads across OECD countries for one year (OECD, 2024[21]). Transitioning to a healthy and sustainable diet would have further beneficial impacts on a wide range of other non-communicable diseases (Box 4.1). Aligning dietary patterns to this reference healthy diet could not only provide substantial health benefits in terms of reductions in premature mortality, but also lead to a more sustainable food system (Springmann et al., 2018[22]).

Box 4.1. Impact of a scientifically derived healthy reference diet on health and sustainability

The EAT-Lancet Commission constructed a reference healthy diet based on an integrated environment and food framework (Willett et al., 2019[23]). The reference healthy diet includes broad food groups with intake ranges that allows for different dietary preferences globally. Four different energy-balanced, low-meat diets defined within the framework of the EAT-Lancet Commission meeting public health objectives are outlined (Willett et al., 2019[23]).

Table 4.2. Healthy reference diets derived from EAT-Lancet Commission on healthy diets from sustainable food systems.

Flexitarian	No processed meat, small amounts of red meat (one serving per week), moderate amounts of other animal-source foods (poultry, fish, and dairy), and generous amounts of plant-based foods (fruits, vegetables, legumes, and nuts).
Pescatarian	Replaces meat with two-thirds fish and seafood and a third fruits and vegetables.
Vegetarian	Replaces meat with two-thirds legumes and a third fruits and vegetables
Vegan	Replaces all animal-source foods with two-thirds legumes and a third fruits and vegetables

Note: Diets are energy-balanced varieties of flexitarian, pescatarian, vegetarian, and vegan dietary patterns defined by the EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems.
Source: Willett et al. (2019[23]),), "Food in the Anthropocene: the EAT – Lancet Commission on healthy diets from sustainable food systems", https://doi.org/10.1016/s0140-6736(18)31788-4; Springmann et al. (2018[22]), "Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail", https://doi.org/10.1016/s2542-5196(18)30206-7.

Researchers have shown on average a 20% reduction in premature mortality across all four diets, specifically – a 19% reduction in premature mortality for flexitarian diet across regions, 20% for pescatarian, 20% for vegetarian, and 22% for vegan (Springmann et al., 2018[24]). The changes in premature mortality were generally evenly distributed across regions (e.g. ranging from 19 to 24% for flexitarian diet), though the greatest reduction was observed in upper-middle-income countries where there exist higher levels of nutritionally imbalanced diets (Willett, et al., 2019). In high-income countries, the biggest drop in premature deaths from the dietary change – compared to keeping current diets – was seen in cancer, followed by heart disease, diabetes, and stroke (Table 4.3).

Table 4.3. Health and environmental impact of four balanced diets as compared to baseline scenario in high income countries

	Health, number of averted premature mortality (% of averted premature mortality)					Emissions (% change)
	Cancer	CHD	Diabetes	Stroke	All	GHG kgCO2/kg
Business as Usual	Ref	Ref	Ref	Ref	Ref	Ref
Flexitarian	174 (22)	121 (48)	38 (71)	29 (30)	442 (21)	-853.89 (-74)
Pescatarian	182 (23)	133 (53)	38 (72)	32 (33)	466 (22)	-946.70 (-82)
Vegetarian	181 (23)	114 (45)	38 (72)	34 (35)	447 (21)	-945.14 (-82)
Vegan	198 (25)	131 (52)	38 (72)	39 (40)	485 (23)	-1 025.92 (-89)

Note: High income countries include OECD countries apart from Chile, Colombia, and Costa Rica. Business as Usual: based on current and projected levels of food consumption and weight distributions. In the main analysis, year 2010 was used for analysing nutrient adequacy and year 2030 for the mortality and environmental analyses to allow for transition time for dietary and technological changes. Food consumption was estimated based on food demand projections from the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) and adjusted for food waste at the household level.
Health impact was defined by premature death averted, which is avoided deaths attributable to dietary and weight-related risk by calculating population impact fractions representing the proportion of disease cases avoided when the risk exposure changes from the baseline; environmental impact was defined by GHG emission, cropland use, freshwater use, nitrogen application, and phosphorous. GHG emission with agriculture included methane and nitrous oxide emissions, but they exclude carbon dioxide emissions which, following the methods of the IPCC, are allocated to the energy sector or others.
Source: Springmann et al. (2018[22]), "Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail", https://doi.org/10.1016/s2542-5196(18)30206-7.

Promoting healthier choices

Food labelling

Food labelling can be an important policy instrument to shape consumer awareness and demand for healthy and sustainable food options by providing consumers with detailed food product information listing the nutritional information (typically listed in the back of food packaging) as well as a summary label indicating the nutritional quality and/or environmental impact (typically listed in the front of food packaging) thus enabling informed food choices among consumers. To motivate change in behaviour among consumers, food labels must be clear, accessible, and trustworthy (Brown et al., 2020[25]).

Under the European Commission's Farm to Fork strategy, a harmonised, mandatory EU-wide front-of-package nutrition labelling system (FoPL) is being developed to help consumers make healthier food choices. Several OECD countries already use FoPLs, including Nutri-Score, introduced in France, and the Health Star Rating, introduced in Australia and New Zealand. Both voluntary labels grade nutritional quality on a five-level scale and help consumers identify higher-rated food products, but their impact on purchasing decisions and actual consumption is limited (Ikonen et al., 2019[26]; Feteira-Santos et al., 2019[27]).

Some concerns have been raised about their misuse by industry as marketing tools. For example, one study found the Health Star Rating displayed on 74% of ultra-processed foods finds, potentially misrepresenting their healthiness (Dickie, Woods and Lawrence, 2018[28]). The Nordic Keyhole logo, widely recognised in Nordic countries, highlights healthier options within food groups but should not be misinterpreted as a license for overconsumption (Wanselius et al., 2022[29]). In Chile, mandatory Nutrient Warning Labels, introduced in 2016 alongside marketing restrictions and school bans on unhealthy products, have significantly reduced purchases of low-nutritional-quality foods and improved consumers' ability to identify healthier options (Reyes et al., 2020[30]; Correa et al., 2019[31]).

Table 4.4. Front of package nutrition-based food labels implemented in OECD countries

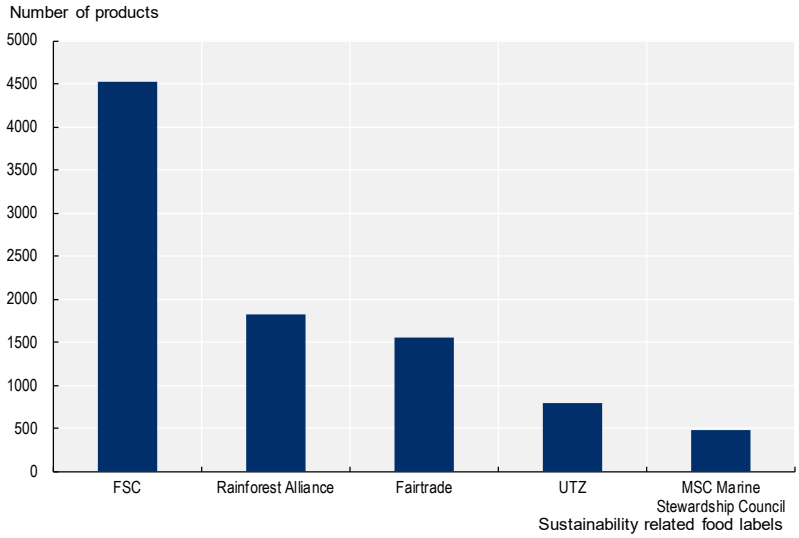
Name	Description	Policy	Implemented countries
Nutri-Score	A nutrition label that indicates the nutritional quality of the food product using a five-colour nutritional scale associated with letters.	Introduced in France in 2017 on a voluntary basis with wide adoption across EU countries.	Belgium, France, Germany Luxembourg, the Netherlands, Spain and Switzerland.
Health Star Rating	A nutrition label for packaged foods that assigns 0.5 to 5 stars based on the foods nutritional profile	Implemented in 2014 in Australia and New Zealand on a voluntary basis. Uptake of the HSR was at 41% in 2019; however, vast majority of products with HSR 2.0 which are not recommended by the Australian Dietary Guidelines yet highly consumed do not display HSR voluntarily (Shahid, Neal and Jones, 2020[32]).	Australia and New Zealand.
Nordic Keyhole	A nutrition label that indicates products that meets one or more of the following criteria: Less and healthier fat Less sugar Less salt More dietary fibres and whole grain	Introduced in Nordic European countries in 1989, this is the earliest FOP nutrition label implemented on a voluntary basis. It is a positive endorsement logo, indicating when a food product is a healthier product compared to others in the same category.	Sweden, Denmark, Norway, Iceland, Lithuania and North Macedonia.
Nutritional Warning Labels	A stop-sign shaped label that warn when a food product exceeds a consumer's daily recommended value of any nutrient of concern – sugar, salt, or saturated fats	First introduced in Chile in 2016 as a mandatory label with laws preventing sale of products with warning labels to children.	Canada (2026), Israel, Mexico, Ecuador, Chile, Peru, Uruguay, Argentina and Colombia

Source: Kanter, Vanderlee and Vandevijvere (2018[33]), "Front-of-package nutrition labelling policy: global progress and future directions", https://www.doi.org/10.1017/s1368980018000010.

Environmental sustainability labelling is also increasingly used on food products to encourage healthy and sustainable food choices by fostering a more transparent food environment and strengthening food system resilience through the sustainability transition. Such labels are typically used to indicate compliance with standards set by governments, private firms, NGOs, or multi-stakeholder initiatives, requiring products to meet specific environmental criteria related to attributes or production and processing methods.

Within EU countries, the use of voluntary sustainability standards and labelling schemes has steadily increased in recent years. By 2021, 20% of new food product launches in countries like the Netherlands, Germany, Belgium, Austria, Ireland, Denmark and Sweden featured sustainability labels (Sanye Mangual et al., 2024[34]). Among sustainability-related labels, the top five schemes accounted for 81% of uptake in 2021, though the labels vary significantly in stringency and focus across different evaluation dimensions (Figure 4.7).

Figure 4.7. Top five market share of sustainability-related food labels for new product launches in the EU in 2021



Note: Total product launches in 2021= 74 420.
Source: Sanye Mangual et al. (2024[34]), *Sustainability labelling in the EU food sector: Current status and coverage of sustainability aspect*, https://data.europa.eu/doi/10.2760/90191.

Further quantitative evidence on the environmental impacts of food labelling schemes is essential to develop harmonised, reliable, comparable, and verifiable labelling systems that avoid greenwashing and reduce consumer confusion while nudging sustainable dietary choices (Bunge et al., 2021[35]). Although experimental evidence suggests that sustainability labels positively influence shopping behaviour (Potter et al., 2021[36]) and indicate a higher willingness to pay for sustainably produced products (Lusk, 2018[37]), these findings do not consistently translate into actual market demand for labelled products (Deconinck and Hobeika, 2022[38]). This gap between stated intentions and consumption behaviour may stem from social desirability bias in survey responses. Research also highlights that price, taste, and perceived health benefits often dominate consumer decision making among food products (Lusk, 2018[37]). However, design improvements, such as simplified formats (e.g. traffic light labelling) and the use of emotive communication, could enhance the effectiveness of sustainability labels (Onwezen et al., 2021[39]).

National dietary guidelines

Food-based dietary guidelines aim to promote health, prevent chronic disease and ensure a nutritionally balanced diet required for health. These guidelines often inform food procurement policies in government setting such as schools, prisons, and government workplaces. In the United States for example, "Dietary Guidelines for Americans" is renewed every 5 years and forms the foundation of nutrition policy – guiding more than USD 80 billion in federal spending, shapes decision making in the food industry, and informs consumer education on healthy diets (Blackstone et al., 2018[40]).

Evidence suggests that dietary guidelines remain predominantly health-focussed with limited mention of environmental sustainability. Among OECD countries that have in place government-endorsed dietary guidelines, 63% of the dietary guidelines integrated environmental sustainability dimension. In a study evaluating the breadth and depth of sustainability integration in national dietary guidelines, researchers found guidelines published by Belgium to cover the most comprehensive breadth of health and environmental impacts of different types of diets (James-Martin et al., 2022[41]). Additionally, authors found that while the "what" (i.e. specific food products that are healthy and sustainable) was often addressed,

the why (i.e. the negative impact on health and environment) was addressed to a lesser extent, and the how *(*i.e. practical advice on how to change your diet in ways that are accessible and appealing) was rarely addressed. As dietary guidelines are reviewed and periodically updated, there are opportunities for countries to integrate environmental sustainability dimensions as evidence continues to accumulate.

National dietary guidelines also have the potential to inform wider changes and raise the ambition to increase health and environmental impacts, but there remains large discrepancies between impacts of national dietary guideline adoption and global health and environment targets (i.e. Action Agenda on Non-Communicable Diseases, and the Paris Climate Agreement) (Springmann et al., 2020[42]). With approximately a third of the national dietary guidelines incompatible with the agenda on reducing non-communicable diseases and three-quarters incompatible with meeting the objectives of the Paris Climate Agreement, national guidelines could stand to be healthier and more sustainable. The largest health benefits can be derived from increasing the intake of healthy foods (e.g. whole grains, fruits and vegetables, nuts and seeds, and legumes) and reducing the intake of red and processed meat; while the largest environmental benefits will be derived from limiting the consumption of animal-sourced foods (Springmann et al., 2020[42]).

Reducing harmful behaviours

Food pricing policies can significantly shift consumer behaviour towards healthier and more sustainable options, even more so than food labelling policies (Hoek et al., 2017[43]). Affordability is a key determinant influencing food choice, particularly among lower-income households. In the context of meeting the dual objectives of increased sustainability and health outcomes, food pricing is a key policy to consider as the price of a healthy and sustainable food basket is notably higher compared to a standard food basket. In Australia for example, researchers have found that the healthy and sustainable food basket are up to 30% more expensive compared to a typical food basket in the most disadvantaged neighbourhood with household in the lowest quintile living in middle-income neighbourhoods spending up to 48% of their weekly income (Barosh et al., 2014[44])

Evidence from systematic reviews indicate that taxes and subsidies ranging between 10 to 20% are effective in changing food consumption behaviour towards healthier alternatives, with the greatest effects observed when both tax and subsidies are implemented in conjunction (Thow, Downs and Jan, 2014[45]; Afshin et al., 2017[46]). A study modelling the effect of optimal taxing on meat consumption, accounting for health costs associated with diet-attributable ill health from red and processed meat consumption, found reduced consumption would decrease the number of deaths attributable to red and processed meat consumption by 9% and attributable health costs by 14% globally, with the greatest reductions observed in middle- and high-income countries (Springmann et al., 2018[24]). However, implementing taxes on unhealthy food products must be approached cautiously, as they may disproportionately burden lower-income households, leading to regressive effects that could outweigh the long-term health benefits of these policies. Several OECD countries including Germany, Poland, Finland and Portugal prioritise tax reductions on healthy and sustainable foods (e.g. fruits, vegetables, and legumes). (Pineda et al., 2022[47]).

Shaping the choice environment: Changing default options

Policies that promote the availability and accessibility of healthy and sustainable food options may accelerate the adoption of such diets. Zoning regulations, for example, can restrict the density and location of quick service restaurants that primarily sell unhealthy and unsustainable foods, particularly in underserved or low-income areas where access to healthier options may limited. In Ireland, zoning legislation for “no fry zones” prohibits placement of unhealthy food outlets within 400 metres of primary and secondary schools. Similarly, in Canada, zoning bylaws have been adopted in several municipalities banning fast food restaurants and drive-through facilities to create healthier food environments (Nykiforuk et al., 2018[48]).

In retail environments, guidelines can encourage grocery stores and food service establishments to prioritise the placement and presentation of healthier and more sustainable food options, such as fruits and vegetables over less nutritious choices. Policies that incentivise businesses to increase the availability and visibility of sustainable food items on menus and in prominent store locations can further drive healthier consumer behaviours (Filimonau et al., 2017[49]). For instance, in Chile, a law restricting child-directed marketing was implemented that banned sale or promotion of unhealthy and unsustainable food products in schools and nurseries. Similarly, a ban on fast food advertisement targeted towards children has demonstrated a significant reduction in its consumption in Quebec (Dhar and Baylis, 2011[50]). Collectively, these strategies help shape healthier food environments, reduce carbon footprints, and improve public health outcomes, particularly in communities that have traditionally had limited access to nutritious and affordable food options.

Public food procurement is increasingly recognised as a strategic entry point to advance sustainable and healthy food environments. It has the possibility to determine (i) **what** food is purchased (e.g. local, nutritious, healthy, and culturally appropriate); (ii) from **whom** (e.g. local and/or family farming producers, small and medium food enterprises, historically disadvantaged groups); (iii) from **which** type of production practices (e.g. from agricultural practices that prioritises environmental sustainability principles) (Swensson and Tartanac, 2020[51]). When designed well, public food procurement has the potential to address different components of the food system, from shifting food consumption patterns to influencing food production to deliver on multiple environmental, health, economic, and social benefits (Swensson and Tartanac, 2020[51]).

Ensuring that healthy and sustainable food choices are available and encouraged in government-funded settings such as schools, hospitals, prisons, universities, and cafeterias in public buildings as well as other public social programmes may be achieved through a well-designed public food procurement that embeds both health and sustainability criteria. Though sustainable production of meat and dairy products may indeed be more expensive, research has shown that the same budget can be maintained throughout menu modifications if meat products were reduced and replaced with plant-rich foods, cooking from scratch and reducing food waste (ICLEI - Local Governments for Sustainability, 2021[52]). Other levers also include providing longer contract terms to support long-term partnership and security better terms on pricing, switching to on-site kitchens, shortening supply chains by supporting local farms.

Among OECD countries, several have included environmental and climate-related requirements in public food procurement processes (OECD, 2024[53]).

- In Austria, there is a mandatory sustainability criterion implemented at the federal level for food and catering services including increase in share of organically produced food purchased, high animal welfare standards and GMO-free feed for procurement of animal foods, reusable systems for packaging and transport systems, original labelling for meat, eggs, and milk, fish from regional waters or sustainable aquaculture, and climate plate including at least one vegetarian or vegan main course every day that is seasonal and regional and contains at least one organic ingredient.
- In Canada, environmental considerations are consistently incorporated in public procurement decisions to ensure that environmentally preferable food and beverages are procured.
- In Hungary, there are mandatory requirements in place for public catering which includes nutritional requirements (wholegrain, vegetables, fruits, etc), short supply chains and local food products, shorter delivery period between food preparation and dishing, organic farming practices, and a customer feedback system.
- In Norway, the Norwegian Agency for Public and Financial Management launched a new Action Plan to increase the proportion of green public procurement and green innovation for the period 2021 -2030 (The Norwegian Agency for Public and Financial Management, 2021[54]). This follows from a new public procurement act which came into force in 2017 that places obligations on central government, municipality and county authorities to consider environmental impact and encourage

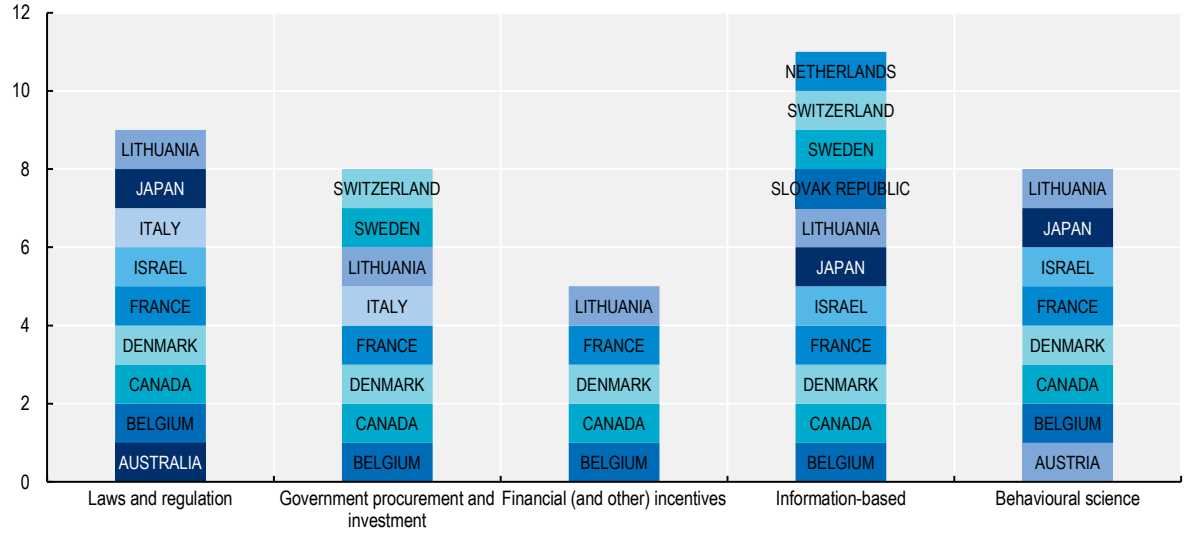
climate friendly solutions – where food and catering services is among priority categories. For public institutions including health and care services, Armed Forces, preschools/kindergartens, schools and work canteens, food procurement will aim to reduce adverse climate impact through reducing food waste (objective to reduce food waste by 50% by 2030) and choosing a climate-smart menu (i.e. food with a lower environmental footprint).

- In Sweden, the National Agency for Public Procurement establishes different sustainability criteria for different food groups (e.g. milk, egg, fish, fruit, vegetables, coffee, meat) and meal services with the criteria tailored to the food group and connected to information on verification and follow up.
- In Denmark, a joint government food policy has come to effect since 2021 requiring all governmental canteens to have a minimum organic share of 60%, measure food waste, and offer meal options that consider health and climate.

Policy options to shape consumer choices lean on information-based approaches

Governments have relied heavily on information-based policies, such as health education campaigns and food labelling, which place the responsibility on individuals to make informed dietary choices (Figure 4.8). However, these downstream interventions often lack the structural support needed for widespread behaviour change. To enhance the shift in sustainable consumption, there is an opportunity to increase the use of financial incentives. Financial incentives such as subsidies for healthier foods, taxes on unhealthy products, and behavioural science-based interventions, could prove more effective in fostering an environment where healthy and sustainable choices become the default. By expanding the policy mix to include financial and behavioural science informed instruments, governments can create a more comprehensive and enabling environment for individuals to adopt sustainable and healthy dietary patterns.

Figure 4.8. Public health policy instruments implemented by countries to guide consumption of healthy and sustainable foods



Note: Results reflect responding countries (N=14); non-responding countries may also have policies in place.
Source: OECD Health and Climate Change Policy Survey.

While government utilise a range of policy instruments, their effectiveness in shaping consumption patterns depends on how they are applied in specific policy domains. These domains categorise policy options

based on their primary mechanism for influencing food consumption behaviour (Table 4.5.) These include policies that **influence food choices** such as food labelling and national food guidelines, **changing food prices** to tax unhealthy and unsustainable food options while providing subsidies for healthy and sustainable options, **broadening choices** through procurement of sustainable food options in public settings and zoning schemes to attract healthier and sustainable food, and **restricting choices** by banning marketing non-optimal food options to minors.

Table 4.5. Policy options to shape consumer sustainable and healthy dietary choices

	Policy Option	Policy Instrument	Description and illustrative example	Potential synergies and trade-offs
Influencing Choices	Food labelling	Information-based	Front-of-pack nutrition and environmental **label**: Consumer-oriented labelling on food packaging and restaurant menu to enable consumers in making informed food choices.	Synergy: Incentivises the reformulation of sustainable and healthy reformulation of food products by industry Trade-off: May increase prices of final food products
	National Food Guidelines	Information-based	Food-based **dietary guidelines** aim to promote health, prevent chronic disease and ensure a nutritionally balanced diet required for health.	Synergy: Promotes health and prevents chronic diseases by encouraging a balanced diet. Trade-offs: Implementation may lead to food waste if supply and demand are not matched May increase costs of healthier and more sustainable food options, making it more difficult for low-income groups to follow the recommendations
Changing Prices	Food prices	Financial incentive	Aligning **food pricing** policies (e.g. taxes and subsidies) with health and sustainability outcomes by making desirable food choices easier and more affordable **Taxes** on less healthy, less sustainable foods **Subsidies** for healthier and more sustainable foods Food-related **income support** programmes (e.g. vouchers) to increase accessibility for low-income and vulnerable groups	Trade-off: May increase purchases of beverages harmful for health (incl. alcoholic beverages) not subject to food pricing strategies May increase cross-border shopping thus increasing carbon emissions without reducing consumption of target food product Trade-off: Subsidies and vouchers may increase food waste if not designed properly
Broadening choices	Food procurement	Government procurement and investment	Ensuring that food **procurement** in government-funded settings (incl. schools) offer and encourage healthy and sustainable food choices	Synergy: Incentivises the reformulation of sustainable and healthy reformulation of food products by industry Trade-off: May increase food waste due to reduced shelf life of fresh produce if not designed properly
	Food retail	Laws and regulations	Increase the availabilities of healthy and sustainable food options in communities through zoning laws. Zoning schemes to attract grocers or markets with healthier and more sustainable food options in historically underserved, low-income areas **Zoning schemes**, regulations, and policies to limit density or location of quick-service restaurants selling mainly less healthy and less sustainable foods Policies to **prioritise placement** and prominence of healthier and more sustainable foods in formal (e.g. food stores and supermarkets) and informal food sectors (e.g. food trucks and street vendors)	Synergy: Support local and sustainable food suppliers can strengthen local economics and reduce carbon emissions from transportation Trade-offs: May increase cost of foods available in low-income neighbourhoods May increase food waste if supply chain and consumer demand are not well matched to prevent spoilage

	Policy Option	Policy Instrument	Description and illustrative example	Potential synergies and trade-offs
Restricting choices	Food Marketing	Laws and regulations	Marketing policies that support the availability of healthy and sustainable food options and limit the availability of unhealthy and unsustainable food options. **Marketing restrictions** of less healthy and less sustainable foods to children across all media outlets **Marketing restrictions** on less healthy and less sustainable foods in retail outlets: restrictions on product placements in prominent in-store positions (e.g. checkouts, end-of-aisle displays), price discounts, and sales targeting children and parents/caregivers.	Trade-offs: May reduce revenue for retailers, especially small businesses that rely on higher-margin processed or packaged foods

Note: Policy actions are examples and do not aim to represent all option that could be implemented by countries.
Source: FOOD-EPI (2014[55]), "Towards global benchmarking of food environments and policies to reduce obesity and diet-related non-communicable diseases: design and methods for nation-wide surveys", https://www.doi.org/10.1136/bmjopen-2014-005339; Bonnet and Coinon (2024[56]), "Environmental co-benefits of health policies to reduce meat consumption: A narrative review", https://www.doi.org/10.1016/j.healthpol.2024.105017 and Burgaz et al. (2024[57]), "Which government policies to create sustainable food systems have the potential to simultaneously address undernutrition, obesity and environmental sustainability?", https://www.doi.org/10.1186/s12992-024-01060-w.

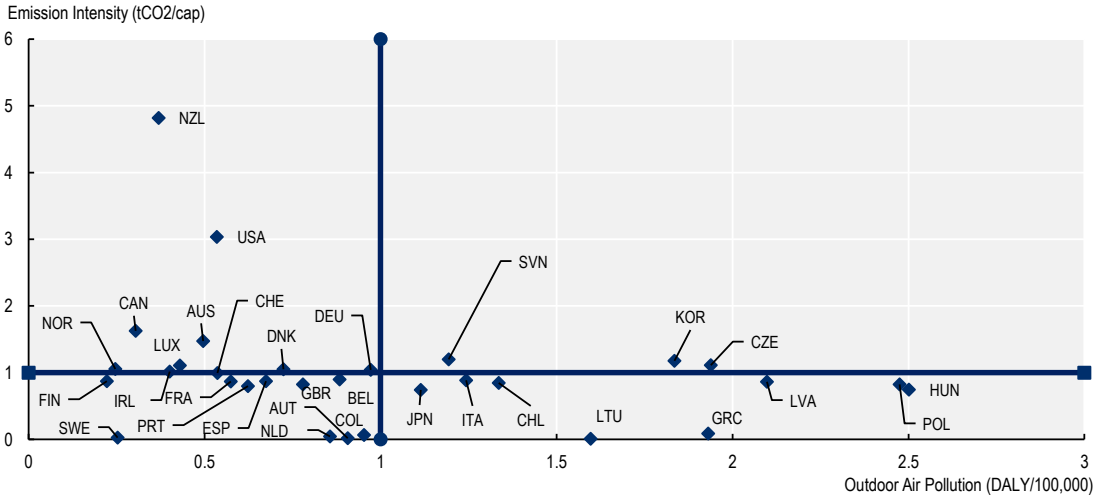
Promoting active transportation

Transportation is the fastest-growing source of greenhouse gas (GHG) emissions in OECD countries, with significant and wide-ranging impacts on public health. In 2019, the sector accounted for roughly one-quarter of global emissions, and projections from the International Transport Forum (ITF) suggest this share could rise to 40% by 2030 if current trends continue. Passenger transport alone contributes approximately 40% of total transportation emissions, with private vehicle use, which has a higher GHG emission intensity than public transport options such as rail or buses, remaining dominant across OECD countries. While some regions have seen a decline in vehicles per capita, countries such as Australia, Canada, Mexico, Türkiye, Eastern European countries and the United States continue to have high levels of private vehicle ownership (Mattioli et al., 2020[58]; OECD, 2022[59]).

The growing dependence on private cars not only intensifies GHG emissions but also presents serious public health risks. Car-centric urban planning is closely linked to sedentary lifestyles, low physical activity levels, increased air and noise pollution, and a higher incidence of road traffic accidents. Outdoor air pollution, one of the most pressing health risks associated with transport emissions, continues to impact populations disproportionately across OECD countries (Figure 4.9).

With consumers often locked into car-dependent mobility patterns and global transport emissions continuing to rise due to urban expansion and growing travel demand, promoting strategies such as active transportation (walking, cycling), improving public transit infrastructure, and accelerating the shift to zero-emission vehicles offer a dual benefit: they enhance public health outcomes while also helping reduce environmental harm.

Figure 4.9. The dual burden of transportation: health burdens and carbon emissions



Note: Outdoor air pollution used as an indicator of health burden for passenger transportation. Emission intensity represents the carbon emissions associated with passenger transportation. Values are standardised towards the OECD average.
Source: IHPME and IEA End-Use Efficiency Indicators.

Policy options to shape consumer choices towards sustainable and healthy modes of transportation

Policies and strategies that concurrently address the negative environmental and health impacts of existing car dependent transportation systems fall under the categories **reducing harmful behaviours** through disincentivizing use of private vehicles, including through vehicle restriction schemes and congestion tolls, **promoting healthier choices** to facilitate the use of active and public transportation through investments in infrastructure and financial incentives, and **shaping the default environment** by improving the fuel efficiency of existing vehicles through green procurement, vehicle emission standards, and feebates (Table 4.6).

Table 4.6. Policy mechanisms to reduce negative environmental and health impacts of passenger transportation sector

	Air pollution	Noise Pollution	Physical Activity	Road Traffic Crashes
Reducing harmful behaviours: Disincentivising car dependence or use				
Vehicle restriction scheme (Urban)*	X	X		X
Congestion pricing and tolls	X	X		X
Promoting healthier choices: Building sustainable transportation (active transportation and public transportation)				
Cycling infrastructure	X	X	X	X
Public transport infrastructure (Urban)	X			X
Public transport incentives (Urban)	X			X
Urban environment design	X	X	X	X
Shaping the default environment: Improve fuel efficiency				
Green procurement	X	X		
Vehicle emission standards*	X	X		
Feebates	X	X		

Source: ITF Transport Climate Action Directory and OECD Health and Climate Policy Survey.

Promoting healthier choices: Building sustainable modes of transportation

The benefits of active modes of transportation including walking and cycling on health and the environment are well-documented and achieve the largest benefits across both domains compared to disincentivizing car dependence and improving fuel efficiency (Mizdrak et al., 2023[60]; Whitmee et al., 2024[6]). Existing literature indicates that car trips shorter than 5km are often considered "switchable" to cycling for most users. More affordable, frequent, and extensive public transport networks have been listed as the most important improvements that could encourage regular car users to drive less (OECD, 2023[61]). Among policies to encourage increased sustainable transportation use, the importance of infrastructure provision and spatial planning has been consistently emphasised as a high priority across setting with attractive public transport and pricing instrument following behind (with certain differences between geographies) (Thaller et al., 2021[62]; Chakrabarti and Shin, 2017[63]).

Innovation in different types of bicycles, particularly the growing popularity of e-bikes, is also contributing to the promotion of active transportation. By reducing physical barriers such as long distances, hilly terrain, and physical limitations, e-bikes offer the opportunity to make cycling accessible to a broader segment of the population. This development can facilitate not only longer commutes by bicycle, but also attracts new user groups who might otherwise depend on private cars, thereby reinforcing the transition toward sustainable and active mobility.

Providing well connected, safe, and high-quality cycling infrastructure plays a significant role in enabling a shift to cycling (Panter et al., 2016[64]). Extensive experience from cities in the Netherlands and Denmark on transforming cities away from highly car-centric in the mid-1970s due to the increasing evidenced environmental, energy, and safety harms of increased car use provides some lessons (Pucher and Buehler, 2008[65]).

- Extensive and well-integrated systems of separate cycling lanes both on-road and off-road are found in cities with high cycling rates, often including priority traffic signals and advance cyclist waiting positions at intersections to increase usability and convenience. Most local neighbourhoods have traffic calming features with speed limits of up to 30 km per hour and speed bumps, curved designs, dead-ends for motor vehicles to deliberately slow down or discourage through traffic (Pucher and Buehler, 2008[65]).
- "Cycling superhighways" first pioneered in the Netherlands and Denmark and now found in cities across Northern and Western Europe facilitate higher speed and safety of long-distance commutes by running parallel to major roads with minimal road crossings combined with synchronised traffic signals at intersections timed for through passing (Cabral Dias and Gomes Ribeiro, 2020[66]).
- To increase adoption for longer commutes and enable multimodality transport options, bike parking facilities and integration with public transport including bike rentals or bike shares at train and suburban stations or policies to allow bicycles onto public transport is widely prevalent in many Dutch and Danish train stations (Pucher and Buehler, 2008[65]).

Improving public transport infrastructure also enables shifts away from car dependency. Subways, metros, and buses are more efficient, equitable, and less polluting than private car use and is the most widely used modes of non-car transport among nine OECD countries (ranging from 71% in Switzerland to 28% in the United States) (OECD, 2023[61]). Among frequent car users, an average of 54% indicated improved public transport services including more frequent and extensive public transport networks such as express networks for buses and wider coverage would encourage them to use their car less.

Providing financial incentives to increase affordability of public transport is also a key lever in increasing ridership. Across 9 OECD countries, affordability was rated as a very important determinant of public transportation utilisation by 42% of respondents who are frequent car users, with the highest share in Belgium and the Netherlands at 49% and 50% respectively (OECD, 2023[61]). A range of financial incentives have been implemented across cities in OECD countries.

- In Spain, the introduction of public transport subsidies in Madrid, which reduced the costs per trip for frequent users by approximately 35.5% through a travel pass, led to increased ridership among regular public transportation users (Cadena et al., 2016[67]). An increase in passenger numbers could help to reduce traffic congestion, lower greenhouse gas emissions and improve urban air quality, helping to support overall sustainability and mobility goals. Public transport usage has since increased by around 33% across Spain (Government of Spain, 2025[68]).In Luxembourg, public transportation is free starting from 2020 when second-class fares were eliminated to attract increased ridership. Although an overall increase in public transport as the main mode of transportation was modelled, a resultant increase in travel time particularly for cross-border workers created resistance to modal shift (Bigi, Schwemmle and Viti, 2023[69]).
- In Germany, reductions in public transportation fare to 9 Euros a month nation-wide (representing a large reduction of up to 90% in some states such as Berlin) during a pilot policy introduced between June and August of 2022 was casually linked to not only increased public transport ridership but also decreases in air pollution levels indicating car users' substitution (Gohl and Schrauth, 2024[70])).

Improving the walkability of cities is a key strategy in promoting health in city centre while concurrently reducing carbon emissions. By prioritizing pedestrian-friendly infrastructure, cities can encourage active transportation such as walking and cycling which have a direct impact on physical and mental health. Elements within the built environment that increases walkability include the following (Baobeid, Koç and Al-Ghamdi, 2021[71]).

- Improved urban connectivity: The ability to walk continuously to different amenities and destinations is among the most important aspect of walkability. Features like well-maintained sidewalks, vehicle speed limits, and traffic control systems are key to ensuring safety and accessibility. Additionally, increased density of intersections creating smaller blocks allows for more efficient walking routes, reducing travel distances and making urban areas more navigable.
- Mixed land use: A walkable city includes mixed land use, where residential, commercial, and recreational spaces are integrated within close proximity. This allows residents to meet daily needs such as shopping, dining, working, and accessing community services without relying on cars. Not only does this increase physical activity, but also fosters vibrant and engaged neighbourhoods by promoting local business and creating public spaces where people can interact, further enhancing the social and economic fabric of the area. This is the core concept behind "15 minute cities," a human-centric urban design concepts where the daily needs of a resident can be met within a 15 minute journey by ensuring cities are designed to be multifunctional and compact (Moreno et al., 2021[72]).
- Improved pedestrian safety: Ensuring pedestrian safety is essential for promoting walkability. This may include traffic calming features on roads such as speed bumps, reduced speed zones, and the strategic placement of crosswalks, which help protect pedestrian from vehicle crashes. Additionally, separating walking paths from vehicular traffic through the use of buffers, such as green spaces or bike lanes enhances pedestrian safety.
- Increased thermal comfort: Thermal comfort plays an increasingly critical role in walkability, especially as cities experiences rising temperatures due to climate change. Shaded streets, through tree-lined sidewalks, canopies, green roofs all provide relief from heat, making walking home more comfortable and relaxing.

Reducing harmful behaviours: Disincentivising car dependence and use

While a range of policy tools exist to disincentivise car use, it is important to ensure public transportation coverage, investing in cycling infrastructure and pedestrianisation, and subsidies to ensure lower-income and car-dependent communities would not be disproportionately overburdened. Policies to discourage car

use includes price-based policies such as tolls, taxes, and congestion pricing and regulatory-based policies such as vehicle restriction schemes (Table 4.6). However, any effort to discourage car dependence or use must recognise the diverse mobility needs of different populations. Well-designed policies would help to accommodate individuals with disabilities, families with young children, and residents in rural or remote areas, where public transportation infrastructure may be sparse.

Vehicle restriction schemes have become increasingly popular in urban areas where sections, typically in the city centre, are protected from motor vehicle and may apply during peak traffic periods and or specific days during a week. Many cities have recognised the detrimental impact of personal motor vehicles and implemented plans for car-free city centres (see Box 4.2). Beyond the proximate impacts of improved air quality and reduced noise pollution, restricting car use has implications on land use, providing opportunities to increase the share of green space and green networks in cities which substantially improves the liveability of neighbourhoods (Nieuwenhuijsen et al., 2016[73]). However, it is important to consider potential unintended consequences and balance carbon reduction objectives with overall well-being objectives. As an example, "green gentrification" or "climate gentrification" is a phenomenon whereby the creation of green spaces or infrastructure has resulted in increased property values and housing prices, leading to displacement of local residents (Anguelovski et al., 2022[74]). Although more commonly seen across North American cities, it is also increasingly observed in European cities such as Copenhagen, Nantes and Barcelona (Anguelovski et al., 2022[74]).

Box 4.2. The Car-free Liveability Programme in Oslo

The Car-free Liveability Programme was implemented in 2017 by the Oslo municipality as one of many transformative urban projects to support the climate and energy strategy. The strategy had two objectives – to reduce Oslo's direct greenhouse gas emissions by 50% by 2030 and to become fossil fuel free by 2050.

In 2021, the municipality of Oslo had a population of 693 491 with a projected increase of 140 000 by 2030. With transport sector accounting for the largest emission share, mainly due to passenger transport emissions, the city aimed to decouple population growth from GHG emissions by implementing more sustainable transport measures. The Programme intended on "handing the urban spaces back to the people," and thus had conducted lengthy public consultations with residents.

Based on the feedback received, Oslo launched the programme in 2017 with an emphasis on improving connections to and from the city centre, activating hidden urban spaces, and increasing interaction between destination points. It further established a longer-term goal to a comprehensive approach based on zoning laws that focussed on people (pedestrians, cyclists, children, adolescents, and seniors) instead of private cars.

Specific developments from the Car-free Liveability Programme include:

- Enhancing vibrancy of city life at the expense of parking space: The city removed approximately 750 parking spaces, with the reclaimed parking spaces used by delivery trucks, tradespeople working in the city, and others dependent on driving in the city centre.
- Exploratory urban development projects: Introduced "parklets" or miniparks that consist of a platform furnished with seating spaces and plants but leaving users with flexibility to do with the space as they wish – as a resting space, mobile charging space, space to pump bicycle tires etc. Additionally, "stroll-bus" which catered to the mobility needs of seniors and children makes it easier for residents living in the suburbs to get into the city centre.

- New pedestrian streets and pedestrian-friendly urban spaces: Turned existing vehicular passages to pedestrian-only zones or create new pedestrian areas which prioritises people and city life to be interconnected and expand.
- The success of the programme has been attributed to public engagement, continuous impact measurement, and taking a holistic approach. Engaging residents of Oslo in decision making throughout the design, implementation, and evaluation of the programme ensures the project's sustainability as it creates trust and buy-in from users of the space. Continuous monitoring at different stages of the project through engagement with residents, business owners, people with disabilities, pedestrians, and cyclists provide practical feedback loops to support longer-term implementation. And lastly, ensuring that a comprehensive approach is taken to support urban redevelopment including mobility, biodiversity, public transport, social integration, and citizen health ensures that several objectives may be integrated and achieved deriving co-benefits for several sectors.

Source: Minja (2021[75]), *The Car-free Livability Programme,* https://doi.org/10.1002/9781119821670.ch6.

In addition to vehicle restriction schemes, pricing policies to reduce vehicle utilisation and encourage the use of cleaner vehicles including pollution charges and congestion pricing. **Congestion pricing policies** are often used to change driving behaviour and shift traffic towards less congested roads, off-peak travel periods, other transportation modes, or to discourage travel altogether (Singichetti et al., 2021[76]). They have been implemented in cities including London, Stockholm and Milan, with widely varying structures including toll-based policies for specific road sections or zones, and non-toll-based policies (Singichetti et al., 2021[76]).

- In Stockholm, a charge was imposed between the 6:30 to 18:30 weekdays in the city centre of Stockholm with price differentials between peak and off-peak hours (Eliasson, 2009[77]). Following the charge implementation, a 3.6% reduction in road traffic crashes (Eliasson, 2009[77]).
- In Milan, following the implementation of a road pricing measure where car drivers passing through a restricted traffic zone must pay a congestion charge and access is limited during peak travel times has seen a 28% decrease in road congestion, 24% reduction in road casualties between 2011 and 2012 (Comune di Milano, n.d.[78]).
- London's congestion charging scheme imposes a daily charge of GBP 15 when driving within the Congestion Charge Zone between 7:00 to 18:00 on weekdays and 12:00 to 18:00 on Saturday, Sundays, and bank holidays. Emissions from motor vehicle exhaust was reduced by 16% within the congestion charging zone and by 1% for all of London following implementation (Santos and Fraser, 2006[79]).

These financial instruments not only contribute to reducing emissions but also promote a shift towards more sustainable transportation options, including public transit and non-motorised modes of transport, thereby yielding multiple environmental and social co-benefits.

The ultimate success of encouraging a modal transition from private car use to public transportation depends on the accessibility of public and alternative transportation infrastructure. Enhancing public transport coverage, ensuring integration of public transport services (including bike-sharing for example) to facilitate multimodality trips, and subsidising the use of public transit modes can ensure that low-income, car-dependent communities do not become disproportionately burdened by road pricing schemes.

Shaping the choice environment: Improving fuel efficiency

Vehicle emission standards have been a cornerstone in the efforts to reduce the environmental impact of cars in many OECD countries. These standards set limits on the amount of pollutants that vehicles can

emit, driving automakers to innovate and produce cleaner, more fuel-efficient vehicles. For example, the European Union has implemented progressively stricter Euro emission standards, which have been effective in reducing nitrogen oxides (NOx) and particulate matter (PM) from vehicles. These policies not only contribute to lowering greenhouse gas emissions but also improve air quality, leading to public health benefits such as reduced respiratory diseases.

Green procurement policies, where public authorities prioritise environmental efficiency and the pollutant levels of vehicles during tendering processes, have not only yielded direct benefits on GHG emissions and improved air quality but have also played a crucial role in stimulating the initial demand needed for automakers to increase the availability of higher efficiency and low- or zero-emission vehicles. OECD countries have implemented ambitious targets for their public transport fleets, aiming for a significant portion to be composed of low- or zero-emission vehicles. For example, Poland has set targets requiring 30% of its public transport fleets to be electric by 2030, while Lithuania aimed to purchase 200 public transportation vehicles that are low- or zero-emission by 2030. In Norway, electric transport and other zero emissions solutions are key to cut emissions in the transport sector, with the government announcing its plan to ensure zero emissions for public procurement in various vehicles between 2022 and 2025. These policies not only reduce the environmental impact of public transportation but also drive broader market shifts towards cleaner vehicle technologies, paving the way for more widespread adoption across all sectors.

Feebate (or "bonus-malus") systems effectively promote the purchase of fuel-efficient vehicles by imposing taxes on less efficient models and offering subsidies for more efficient alternatives at the point of sale. These programmes are designed to be revenue-neutral, with the funds collected through taxes typically covering the costs of the rebates, ensuring no net cost to the government. By providing immediate financial incentives or penalties at the time of purchase, feebates encourage consumers to opt for more environmentally friendly vehicles. Unlike vehicle efficiency standards, which mandate minimum requirements for manufacturers, feebates motivate both consumers and manufacturers to exceed these standards. For example, France's feebate scheme has significantly increased the market share of low-emission vehicles, while Norway's CO_2-differentiated vehicle registration system has been a key driver in making electric vehicles the majority of new car sales (Yan and Eskeland, 2018[80]; D'Haultfœuille, Durrmeyer and Février, 2016[81]).

Information-based and regulatory approaches are the most common methods to promote active transportation, but financial incentives and investments are also widely used

Similar to trends seen in policies adopted in the food sector, **information-based policies** are the most widely adopted policy instruments to address climate change and health in the transportation sector, ahead of financial incentives (Figure 4.10). Policies aim to reduce exposure to air pollution while lowering carbon emissions, with some also promoting active mobility.

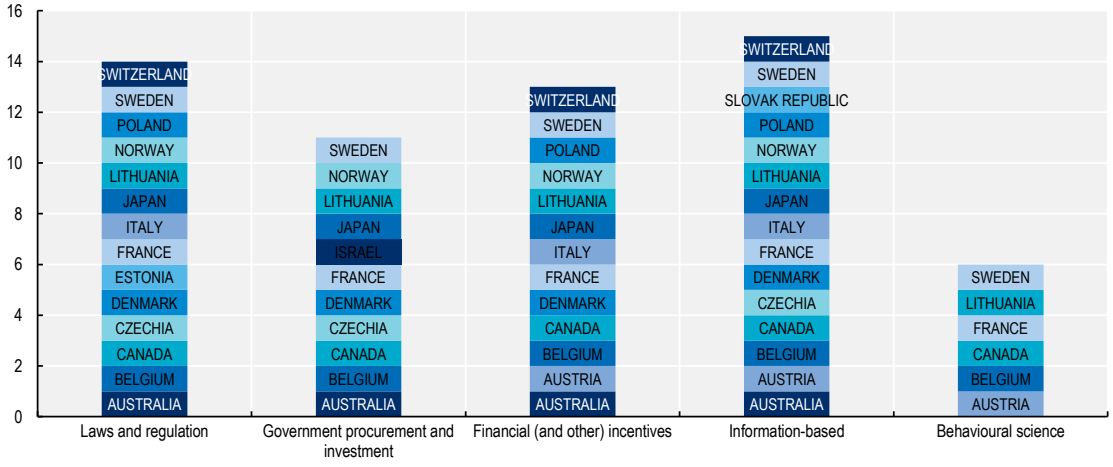
Many countries have adopted information-based strategies, such as public awareness campaigns on the benefits of active mobility and carpooling initiatives. France established a network of "Maisons Sport-Santé" (Sport-Health Centres) in partnership with the French Ministry of Sport to promote physical activity and active transport. Similarly, Denmark launched a public information campaign in 2023 to promote carpooling and car sharing, while Poland has supported shared transportation initiatives to encourage environmentally friendly behaviour among drivers and passenger.

Alongside these measures, many countries have also adopted regulatory measures, including vehicle emissions standards, low-emission zones, and urban mobility laws to curb transport related pollution. In parallel, public investment has been directed toward public transit, cycling infrastructure, and zero-emission vehicle (ZEV) charging networks, with countries like Canada, France, Japan and Poland prioritizing these strategies. Financial incentives, such as subsidies for electric vehicles, carbon pricing, and tax benefits for green transport are also widely used to encourage low-emission mobility, particularly

in France, Canada and Poland. Meanwhile, behavioural science approaches, which focus on nudging people towards active mobility choices like cycling and walking, remain underutilised.

There is an opportunity to increase behavioural science-based interventions to increase the use of active transportation. Given their potential to encourage behavioural shifts towards active transportation, expanding the use of behavioural insights, could drive sustainable mobility and maximised health benefits.

Figure 4.10. Public health policy instruments implemented by countries to guide low-emission transport use

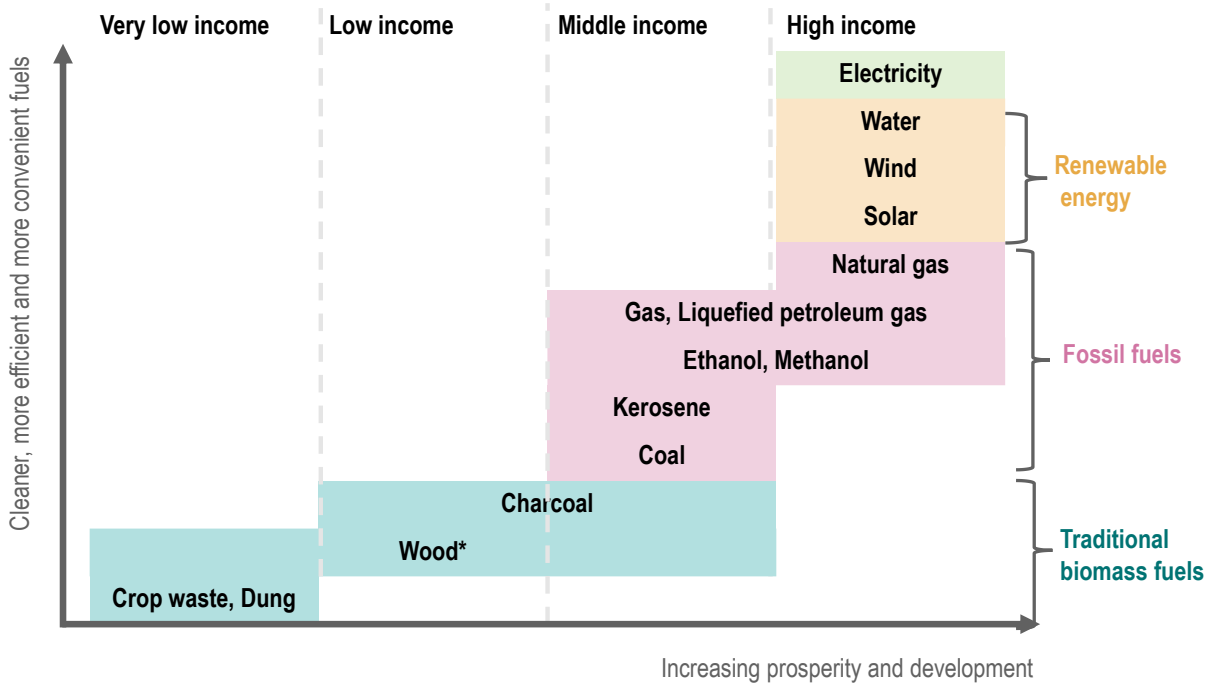


Note: Results reflect responding countries (N=17); non-responding countries may also have policies in place.
Source: OECD Health and Climate Change Policy Survey.

Promoting cleaner energy use in residential settings

Energy consumption in the residential sector has substantial environmental and health consequences (Li et al., 2024[82]). The energy sources used in residential settings vary widely in their environmental impact and are strongly correlated with a country's level of economic development (Figure 4.11).

Figure 4.11. Energy ladder in different developmental contexts

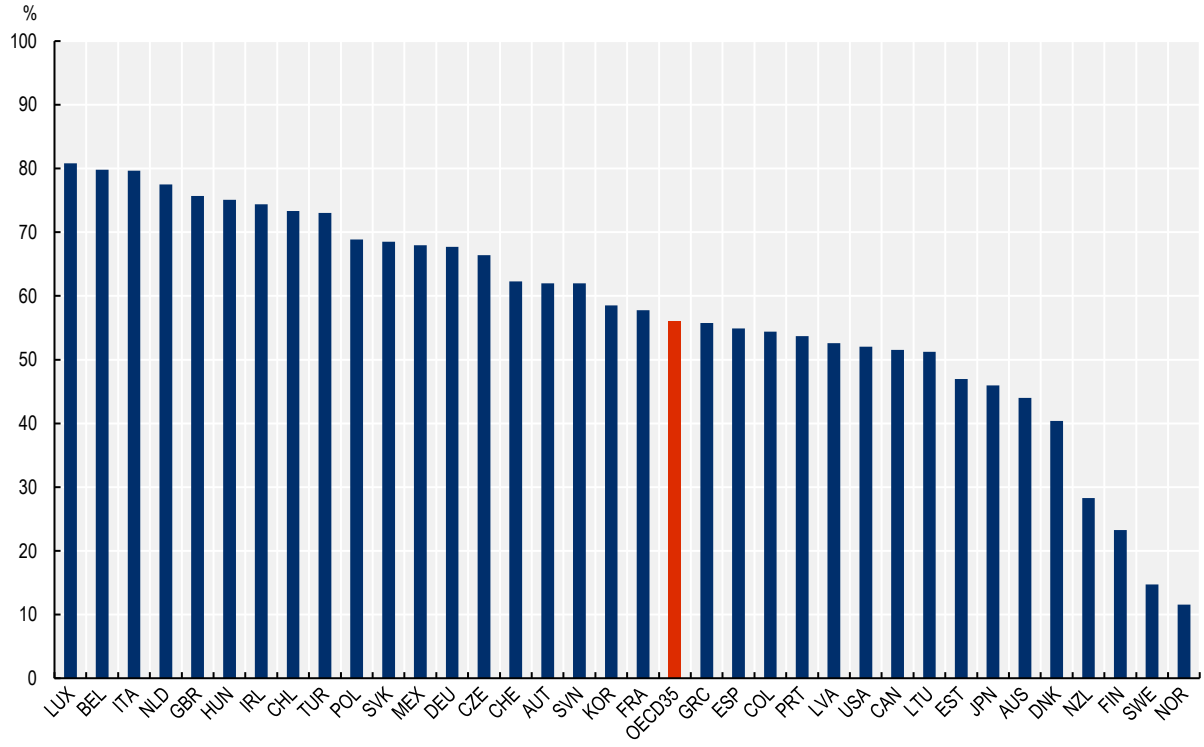


Note: *Wood is classified as renewable energy under EU law.
Source: Our world in data, "The 'Energy Ladder': What energy sources do people on different incomes rely on?", https://ourworldindata.org/energy-ladder; WHO Clean Household Energy Solutions toolkit, "Defining clean fuels and technologies", https://www.who.int/tools/clean-household-energy-solutions-toolkit/module-7-defining-clean.

High-income countries have made significant progress in adopting renewable energy sources for electricity generation. However, despite these advancements, residential homes remain heavily dependent on oil and natural gas – both major sources of pollution – particularly for heating systems (Figure 4.12). In 2021, OECD countries continued to use polluting energy sources, including biofuels, coal gas, and oil, to varying degrees. In some nations, such as Norway, Sweden and Finland, these sources accounted for less than 25% of residential energy consumption. In contrast, other countries exhibited significantly higher reliance, with Hungary, the United Kingdom, Netherlands, Italy, Belgium and Luxembourg, all exceeding 75%.

Figure 4.12. OECD countries reliant on pollution sources of energy in residential homes in 2021

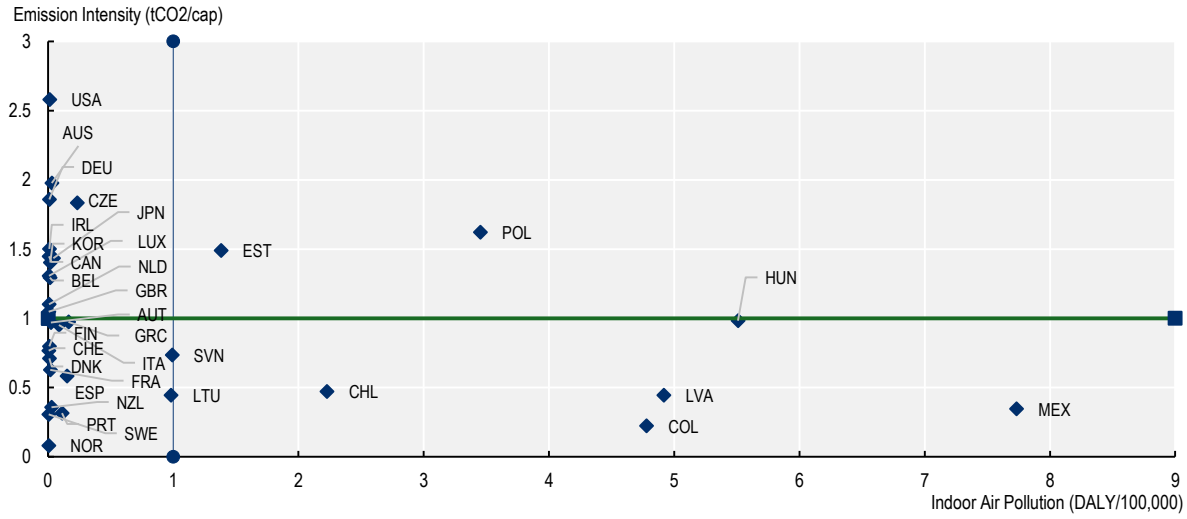
Percentage of polluting energy consumption across OECD countries



Note: Polluting energy sources defined as consumption of "biofuels and waste", "coal and coal products", "Gas", and "Oil and oil products".
Source: IEA, Energy end-uses and efficiency indicators (2022).

Reliance on polluting energy sources not only contributes to carbon emissions but also imposes a significant burden on public health across OECD countries. Indoor air pollution, a key indicator of health risks associated with residential energy use, continues to impact populations to varying degrees. While 82% of OECD countries have a disease burden from indoor air pollution exposure below the OECD average, several countries remain above this threshold. Notably, Poland, Estonia and Hungary exhibit both a high burden of disease and high emission intensity within the residential energy sector, highlighting a dual challenge of environmental and health impacts (Figure 4.13).

Figure 4.13. The dual burden of household energy: Health risks and carbon emissions



Note: DALYs resulting from indoor air pollution used as an indicator of health burdens for polluting household energy use. Emission intensity represents the carbon emissions associated with residential energy use. Values are standardised towards the OECD average.
Source: IHPME and IEA End-Use Efficiency Indicators.

Energy poverty disproportionately affects vulnerable populations within OECD countries

Access to affordable, reliable, and clean energy remains a major challenge globally. While this issue is most acute in low- and middle-income countries, where indoor air pollution from solid fuels like wood, charcoal, and coal contributes to millions of premature deaths annually (see Box 3 on the Clean Cooking agenda), energy poverty is also a significant concern within high-income countries. In OECD countries, most households have transitioned away from solid fuels, yet a subset of the population continues to struggle to afford or access clean and efficient energy for daily needs.

Box 4.3. Clean cooking: An important pathway to health, climate, and economic sustainability

Access to clean fuels and technologies is a key target under Sustainable Development Goal (SDG) 7 with substantial implications for several other SDGs such as good health, gender equality and climate action. Clean cooking relies on non-polluting energy sources such as liquified petroleum gas (LPG), natural gas, electricity, biogas, and ethanol in alignment with standards defined by the World Bank's Multi-Tier Framework for Clean Cooking and the International Energy Agency (Bhatia and Angelou, 2015[83]). Despite global efforts, 2.1 billion people (approximately 26% of the world's population) still lack access to clean energy for cooking, primarily relying on polluting fuels, disproportionately affecting women and children through exposures to harmful air pollutants, labour-intensive fuel-collection, and time-consuming fire tending (IEA, 2023[84]).

The economic case for scaling up clean cooking policy actions is clear. A WHO analysis demonstrates a net benefit of USD 1.4 trillion accrued between 2020 and 2050 across 120 low- and middle-income countries due to health benefits from avoided morbidity and mortality through air pollution, time savings from reduced time spent cooking and collecting fuel, and environmental benefits from reduced fuel harvesting and GHG emissions. Although consistent progress is seen in Central and Southern Asia, led by high population density countries such as India (42%), China (28%) and Indonesia (10%), challenges remain, particularly in Sub-Saharan Africa, where population growth outpaces access to clean cooking solutions. Beyond regional differences, rural areas face greater access deficits than urban areas, highlighting the need for equitable solutions that bridge the rural-urban divide.

National policies and international support are crucial to advance clean cooking and ensure health protection in residential settings. Only 40% of countries without universal access to clean cooking have set targets aligned with SDG7 on universal access to clean energy by 2030, and less than 20% of those without access have adequately funded and resourced organisations to implement these targets (IEA, 2024[85]). At the national level, incorporating clean cooking in Nationally Determined Contributions under the Paris Agreement strengthens political commitment and provides a structured pathway for implementation. Specifying clear targets, along with implementation plans that outline roles and responsibilities can operationalise these pathways by effectively allocating resources and leveraging climate finance mechanisms to meet the targets. Establishing clear regulatory oversight can support measurement of uptake to track progress and ensure minimum quality standards are met.

Ensuring health benefits are integrated alongside environmental and climate mitigation concerns in the clean cooking agenda is crucial. The initial focus on improving fuel efficiency, financial empowerment, and emissions reductions has shifted to integrating health benefits in the clean cooking agenda as epidemiological evidence directly linking indoor air exposure to a range of significant health risks emerged. Recent initiatives from donor agencies such as USAID and NORAD for instance emphasise the substantial health benefits offered through LPG-powered stoves as a clean alternative.

As national governments and international development communities continue to advance on clean cooking in the context of differing national priorities for health and climate mitigation, an integrated approach that maximises health, economic, and environmental co-benefits, provides a robust path forward for a sustainable, healthy, and inclusive energy transition.

Note: Access deficit refers to the indicator number of population exposed to detrimental health and socio-economic effects of polluting fuels and technologies due to lack of access (IEA, 2024[85]).
Source: IEA (2024[85]), *Tracking SDG 7: The Energy Progress Report 2024,* https://www.iea.org/reports/tracking-sdg7-the-energy-progress-report-2024; IEA (2023[84]), *A Vision for Clean Cooking Access for All, International Energy Agency*, https://www.iea.org/reports/a-vision-for-clean-cooking-access-for-all.

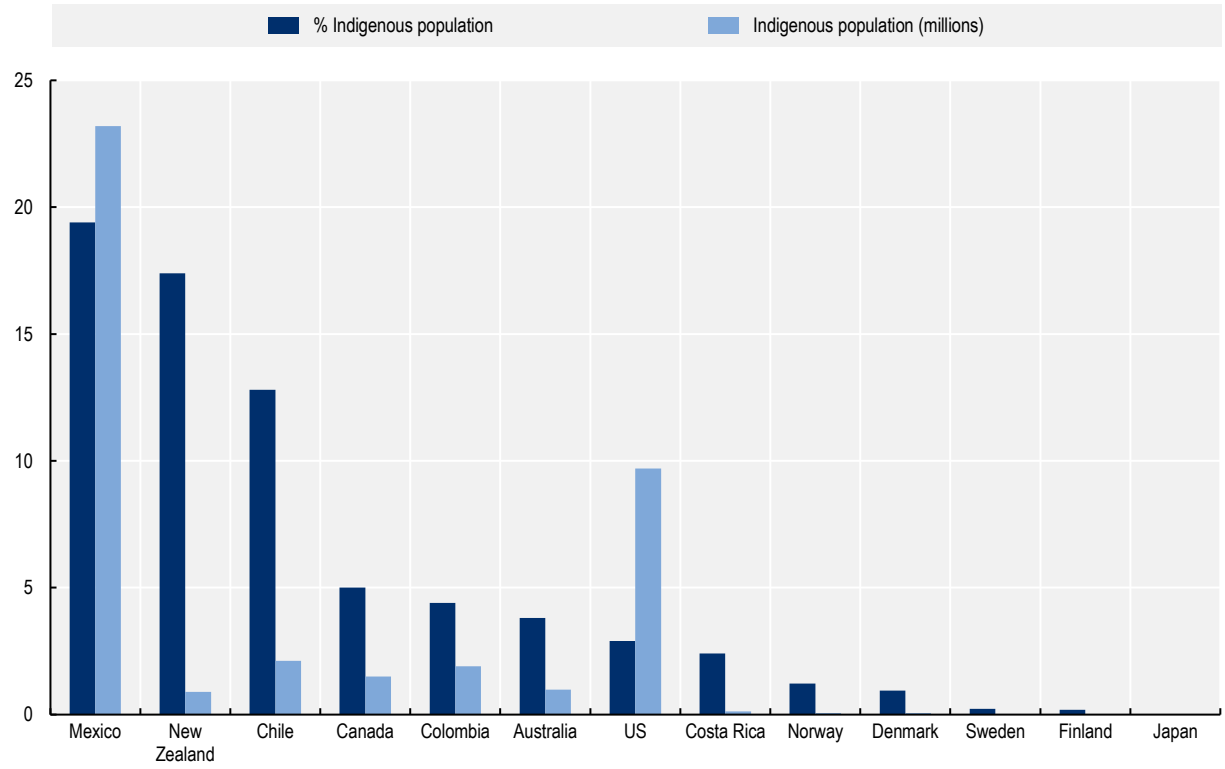
A growing body of research links inadequate access to clean energy with a wide range of negative health outcomes. These include poorer general health and mental health, increased incidence and severity of respiratory conditions, greater complexity of chronic diseases, higher mortality, and increased use of healthcare services with substantially worse outcomes for already disadvantaged groups (Ballesteros-Arjona et al., 2022[86]; Bentley et al., 2023[87]).

Within OECD countries, Indigenous populations are among those most disproportionately affected by energy poverty (Riley et al., 2023[88]; Guzmán-Rosas, 2022[89]). Structural inequalities, including underinvestment in infrastructure and geographic isolation, have contributed to persistent energy access disparities. In Canada, for example, about 28% of Indigenous communities reside in rural and remote areas that are not connected to the main power grid. As a result, many of these communities rely on expensive and environmentally damaging diesel-powered generators to meet their basic energy (Riva et al., 2021[90]). In Australia, Indigenous residents in remote communities frequently experience energy insecurity, with many facing involuntary energy self-disconnection from electricity services due to affordability constraints (Riley et al., 2023[88]). Similar disparities are observed in Latin America. In Chile, Indigenous communities experience significantly higher levels of multidimensional energy poverty compared to non-Indigenous populations (Villalobos, Chávez and Uribe, 2021[91]). And in Mexico, Indigenous groups are disproportionately affected by energy deprivation, limiting their access to safe and efficient household energy (Guzmán-Rosas, 2022[89]).

Despite growing recognition of these disparities, comprehensive data on Indigenous energy insecurity remains limited. National energy statistics across OECD countries rarely disaggregate data by Indigenous status, making it difficult to fully assess the extent of energy deprivation and design evidence-based interventions that address their specific needs. Nevertheless, Indigenous communities represent a significant and frequently underserved portion of the population, underscoring the urgency of targeted data collection and policy intervention. (Figure 4.13)

Figure 4.14. Indigenous communities represent a significant yet often overlooked population across OECD Countries

Distribution of indigenous population across OECD countries



Source: Mexico (2020) National Institute of Statistics and Geography. New Zealand (2018) Stats NZ. Chile (2017) National Statistics Institute of Chile. Canada (2021) Statistics Canada. Colombia (2018) National Administrative Department of Statistics. Australia (2021) Australian Bureau of Statistics. United States (2017-2021) the United States Census Bureau. Costa Rica (2010) National Institute of Statistics and Census. Norway (up to date estimates as of 2024, there is no official census on Sami populations) Indigenous Navigator Norway. Denmark (2022) Statistics Greenland. Sweden (up to date estimates as of 2024, there is no official census on Sami populations) Official Website of Sweden. Finland (up to date estimates as of 2024, there is no official census on Sami populations) Indigenous Navigator Finland. Japan (2011) Statistics Bureau Japan.

There is wide recognition that integrated policies on clean energy transition in the residential sector may yield substantial benefits for both reducing greenhouse gas emissions and improving health outcomes by reducing indoor air pollution among other health benefits. At the core of these policies is promoting healthier choices by **encouraging sustainable energy use**, reducing harmful behaviours by **phasing out polluting energy sources** for household use through regulatory and legal measures, and shaping the decision environment to enable **improved uptake of energy efficient choices**.

Table 4.7. Policy mechanisms to reduce negative environmental and health impacts of residential energy use

	Regulatory policies	Financial incentives and investments	Information provision and behavioural science
Promoting healthier choices	Mandated energy performance standards for appliances and/ or new homes	Rebates or tax credits for adopting clean household energy technologies (e.g. electric heat pumps, induction stoves, rooftop solar)	Personalised guidance on low-emission lifestyle changes Campaigns highlighting indoor air quality and efficient energy use
Discouraging harmful behaviours	Fossil fuel ban for residential heating systems	Carbon pricing on residential heating fuels	Educational campaigns on health impacts of fossil fuels and benefits of clean heating
Shaping the decision environment	Energy labels and certification schemes		Smart metre for energy conservation

Source: OECD Health and Climate Policy Survey, IEA.

Promoting healthier choices: Encouraging sustainable and clean energy use

Policies that encourage households to adopt clean energy technologies, improve insulation, and reduce consumption of polluting energy sources can lower energy bills while enhancing comfort, air quality, and health outcomes. Engaging the public through demand-side policy-levers can support meaningful behaviour change and reduce overall energy consumption. Small behavioural adjustments, such as turning off unused lights or selecting energy-efficient options, can reduce demand-side energy use. In OECD countries, information-based policies have been used to drive these changes by informing consumers on how their energy choices impact emissions and concrete steps they can take to reduce emission.

- **Targeted Awareness Initiatives:** In Sweden, municipal climate advisory services provide advice on reducing energy needs for heating in homes, while France's multi-channel campaign informs consumers on ways to decrease gas and electricity use. In Canada, energy advisors registered with Natural Resources Canada provide free assessment of homes to promote energy efficient homes.
- **Educational outreach:** In Germany and Spain, educational campaigns have been deployed to raise awareness on energy efficiency and transition towards renewable energies, with the aim to create broader acceptance for transformation towards a climate neutral society.
- **Providing feedback on energy consumption:** Smart metres[1] allows consumers to have timely access to their energy consumption data. As of 2021, 54% of households in the EU have an electricity smart metre while in 13 EU countries, smart metre uptake was over 80% at the end of 2022. Evidence suggests that the smart metres can achieve an average energy saving of 2-10% (Alaton and Tounquet, 2020[92]).

Reducing Harmful Behaviours: Phasing out polluting energy use

Reducing reliance on fossil fuels and decarbonising electricity through clean energy sources such as solar, wind, and hydroelectric power can drastically cut GHG emissions and improve air quality with substantial benefits for health outcomes. These transitions offer a sustainable solution to climate change while yielding substantial health benefits. Phasing out coal, the most carbon-intensive fossil fuel, has become a policy priority globally, with evidence suggesting it would yield the largest health benefits in the energy sector (Markandya and Wilkinson, 2007[93]; Friedlingstein et al., 2019[94]). OECD countries like Austria, Belgium and Sweden have completed coal phase-outs, while Canada, France, Germany, Korea, Italy and the United Kingdom have committed to full coal phase-out plans (IEA, 2021[95]). Given the potential job losses and local economic disruptions from coal transitions (Diluiso et al., 2021[96]), there is a need to include job

creation within the clean energy sector to ensure decisions on energy transition policies centred on people's health and economic well-being.

Many OECD countries have taken legislative steps to accelerate the shift away from polluting energy sources. For example, Norway, began phasing out oil- and paraffin-based heating systems in 2016, fully banning them in all new and renovated residential buildings by 2020. Similar restrictions on fossil fuel-based heating systems for both new and renovation of existing residential buildings have been introduced in Demark, Germany, Ireland and Belgium (EPHA, 2024[97]). Austria's Federal Act on Renewable Heat Supply in New Buildings (EWG), effective as of 2024, is another example which prohibits fossil-fuel based heating systems in all new buildings.

Sweden, Denmark, Norway and Finland are leaders in applying carbon taxes to fossil fuels for residential heating, having introduced these measures early. In Sweden, carbon tax was introduced in the early 1990s, applying heating fuels in the residential sector and has reduced emissions by almost a third in residential building emissions since 1990 (Martinsson et al., 2024[98]). Denmark and Finland also tax fossil fuels used for heating, incentivizing a shift toward bioenergy and other low-carbon solutions.

Although natural gas combustion emits fewer air quality pollutants, methane leaks during distribution and incomplete combustion is linked to increased risks for asthma among children (Gruenwald et al., 2022[99]). Natural gas remains prevalent in OECD countries, representing 37% of residential energy use, primarily for cooking. Transitioning to stoves powered by renewably generated electricity is a healthier and more sustainable alternative to mitigate these health risks.

Shaping the choice environment: Improving energy efficiency in homes and appliances

While some policies aim to directly promote healthier behaviours or reduce harmful practices, energy efficiency interventions are best understood as shaping the environment in which choices are made by altering the default options and improving the physical or regulatory context. The health benefits of improving energy efficiency in residential settings are increasingly evident. These extend beyond reduced air pollution, including indirect health benefits through improved living comfort, and alleviating energy poverty. Among the OECD, four countries – Spain, Ireland, Poland and Latvia – explicitly elaborate on the health benefits of energy efficiency in policymaking considerations as indicated in the latest National Energy and climate plans 2021-2030, underscoring the growing recognition of health considerations in energy efficiency policies.

The EU's Energy performance of Buildings Directive (EPBD), updated in 2024 provides a comprehensive regulatory framework, including policies on Long-Term Building Renovation Strategies (LTRS),[2] Nearly-Zero Energy Buildings (NZEB), and Energy Performance Certificates (EPC). Under LTRS, many countries have explicitly incorporated health benefits of residential building renovation (i.e. thermal comfort, improved air quality, improved lighting) in the National Long-term renovation strategies (European Commission, 2020[100]). In Estonia, for example, health objectives are explicitly specified – such as decreasing the number of premature deaths due to environmental impact of energy economy and decrease disease burden resulting from environmental impact of energy management (Ministry of Economic Affairs and Communications, 2017[101]). Implemented in 2021, all new buildings in the EU must meet nearly-zero energy standards. Although NZEB definitions vary by country, these buildings typically achieve high energy efficiency, reducing energy consumption and promoting health of residents by providing more stable indoor temperature and better air quality. The EPC scheme rates building energy performance, suggesting cost-effective renovations to improve energy efficiency and comfort. Despite inconsistencies and challenges in energy performance across countries, EPCs offer a pathway to making informed improvements in residential buildings (Gonzalez-Torres et al., 2023[102]).

Beyond the EU, countries like Australia and Canada are also advancing energy efficiency standards in residential building. In Australia, the National Construction Code, to be updated in 2025 will introduce

requirements for air quality and thermal comfort, reflecting the health needs of residents. In Canada, the National Building Code (last updated in 2020) similarly addresses energy efficiency and health objectives, targeting health risks such as indoor air quality, thermal comfort, moisture control, noise protection, hygiene and sanitation to support resident's well-being.

Residential home upgrades and retrofits

Improving energy efficiency in residential homes through retrofits like thermal insulation of outer walls, window glazing, and ventilation upgrades can reduce exposure to cold, present overheating, and enhance ventilation, which improves respiratory health and overall living comfort. Inadequate energy access, or energy poverty, is a significant barrier and is recognised as an important determinant of health. Energy poverty can lead to harmful indoor environments that exacerbate respiratory and cardiovascular conditions, stress, and mental health issues. It disproportionately affects low-income and vulnerable populations, leading to preventable health disparities.

OECD countries have implemented several policies, including financial incentives, to encourage a transition towards sustainable and healthy residential buildings. Financial incentives are essential for ensuring an equitable and just transition, as they can provide lower-income households with resources to offset the upfront costs for residential energy retrofits. For instance, Australia's 2023-2024 Budget includes an AUD 1.7 billion Energy Savings Package to help households and businesses access energy upgrades. Czechia, Estonia, Poland and the Slovak Republic all have national and regional financial support programmes for renovating residential buildings to improve energy efficiency and indoor climate. In Canada and Sweden, tax credits and rebates are offered to encourage energy efficiency and renewable energy use in residential buildings. Particular attention is given to vulnerable populations. In Canada, the "Clean Energy for Rural and Remote Communities" programme provides targeted funding for renewable energy projects, capacity building initiatives, and energy efficiency measures in Indigenous, rural and remote communities. In Latvia, a communications campaign "Let's live warmer" was developed to inform the public about funding for housing insulation. Increases in applications for home renovation applications between 2009 and 2022 by over four-fold (Ministry of Economics Republic of Latvia, 2020[103])).

Government investments

Governments are investing in clean energy infrastructure and initiatives that consider health benefits. In Australia, for example, the National Health and Climate Strategy includes a partnership with First Nations communities to enhance access to renewable energy and improve housing and health infrastructure. These investments aim to modernise power grids, demonstrate innovative clean energy technologies, and improve the energy efficiency of homes and communities.

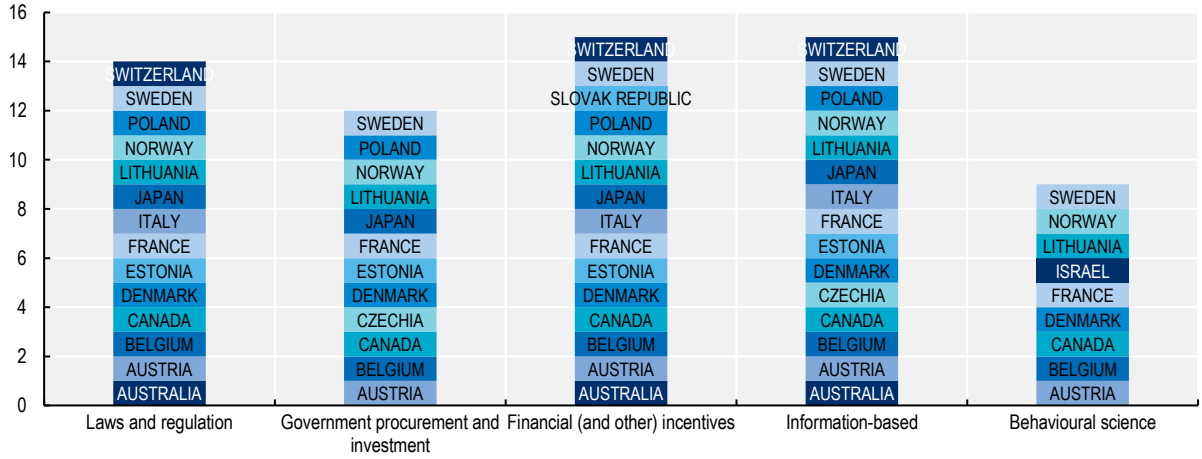
Energy-efficient appliances and technologies

Energy-efficient appliances and heating systems are critical to achieving residential energy savings while supporting public health. Heat pumps and energy efficient residential solar powered heating systems have been shown to raise thermal comfort-levels while reducing GHG emissions as well as aggravating respiratory and cardiovascular illnesses through indoor air pollution (Lysenko et al., 2024[104]). Existing evidence from various geographies have investigated the health impacts of these technologies, including projections in avoidance of 10 000 premature deaths by 2030 in China from widespread deployment of solar photovoltaic panels (Yang et al., 2018[105]) and potential health benefits in Ireland amounting to 100 million Euros per annum from switching from solid and liquid fuels to energy efficient heat pumps (Kelly, Fu and Clinch, 2016[106]).The EU's Ecodesign and Energy Labelling policies harmonise energy efficiency scales for household appliance across EU countries. These standards further promote the purchase of energy-efficient appliances, allowing consumers to choose options that lower both emissions and household energy costs.

Information-based, regulatory approaches and financial incentives are the most common methods to lower household energy emissions, but government procurement and investments are also widely used

Austria, Belgium, Canada, Denmark, France, Lithuania, Norway and Sweden have all adopted comprehensive strategies across multiple policy instrument categories while others have exhibited varying levels of adoption. Financial incentives and information-based policies have had the highest level of adoption with laws and regulations and government procurement closely following. There are opportunities to increase the uptake of behavioural science-based approaches.

Figure 4.15. Public health policy instruments implemented by countries to guide clean household energy use



Note: Results reflect responding countries (N=17); non-responding countries may also have policies in place.
Source: OECD Health and Climate Survey.

References

Adams, J. (ed.) (2017), "The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis", *PLOS ONE*, Vol. 12/3, p. e0172277, https://doi.org/10.1371/journal.pone.0172277. [46]

Alaton, C. and F. Tounquet (2020), *Benchmarking smart metering deployment in the EU-28*, European Commission, Directorate-General for Energy. [92]

Anguelovski, I. et al. (2022), "Green gentrification in European and North American cities", *Nature Communications*, Vol. 13/1, https://doi.org/10.1038/s41467-022-31572-1. [74]

Arias, P. et al. (eds.) (2023), *IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.*, Intergovernmental Panel on Climate Change (IPCC), https://doi.org/10.59327/ipcc/ar6-9789291691647. [4]

Ballesteros-Arjona, V. et al. (2022), "What are the effects of energy poverty and interventions to ameliorate it on people's health and well-being?: A scoping review with an equity lens", *Energy Research & Social Science*, Vol. 87, p. 102456, https://doi.org/10.1016/j.erss.2021.102456. [86]

Baobeid, A., M. Koç and S. Al-Ghamdi (2021), "Walkability and Its Relationships With Health, Sustainability, and Livability: Elements of Physical Environment and Evaluation Frameworks", *Frontiers in Built Environment*, Vol. 7, https://doi.org/10.3389/fbuil.2021.721218. [71]

Barosh, L. et al. (2014), "The cost of a healthy and sustainable diet – who can afford it?", *Australian and New Zealand Journal of Public Health*, Vol. 38/1, pp. 7-12, https://doi.org/10.1111/1753-6405.12158. [44]

Bentley, R. et al. (2023), "The effect of energy poverty on mental health, cardiovascular disease and respiratory health: a longitudinal analysis", *The Lancet Regional Health - Western Pacific*, Vol. 35, p. 100734, https://doi.org/10.1016/j.lanwpc.2023.100734. [87]

Bhatia, M. and N. Angelou (2015), *Beyond Connections Energy Access Redefined*, The International Bank for Reconstruction and Development (The World Bank Group), Washington, DC. [83]

Bigi, F., N. Schwemmle and F. Viti (2023), *Evaluating the impact of Free Public Transport using agent-based modeling: the case-study of Luxembourg*, Aurich. [69]

Blackstone, N. et al. (2018), "Linking sustainability to the healthy eating patterns of the Dietary Guidelines for Americans: a modelling study", *The Lancet Planetary Health*, Vol. 2/8, pp. e344-e352, https://doi.org/10.1016/s2542-5196(18)30167-0. [40]

Bonnet, C. and M. Coinon (2024), "Environmental co-benefits of health policies to reduce meat consumption: A narrative review", *Health Policy*, Vol. 143, p. 105017, https://doi.org/10.1016/j.healthpol.2024.105017. [56]

Brown, K. et al. (2020), "The future of environmental sustainability labelling on food products", *The Lancet Planetary Health*, Vol. 4/4, pp. e137-e138, https://doi.org/10.1016/s2542-5196(20)30074-7. [25]

Brunekreef, B. and S. Holgate (2002), "Air pollution and health", *The Lancet*, Vol. 360/9341, pp. 1233-1242, https://doi.org/10.1016/s0140-6736(02)11274-8. [107]

Bunge, A. et al. (2021), "Sustainable food profiling models to inform the development of food labels that account for nutrition and the environment: a systematic review", *The Lancet Planetary Health*, Vol. 5/11, pp. e818-e826, https://doi.org/10.1016/S2542-5196(21)00231-X. [35]

Burgaz, C. et al. (2024), "Which government policies to create sustainable food systems have the potential to simultaneously address undernutrition, obesity and environmental sustainability?", *Globalization and Health*, Vol. 20/1, https://doi.org/10.1186/s12992-024-01060-w. [57]

Cabral Dias, G. and P. Gomes Ribeiro (2020), "Cycle Highways: a new concept of infrastructure", *European Planning Studies*, Vol. 29/6, pp. 1003-1020, https://doi.org/10.1080/09654313.2020.1752154. [66]

Cadena, P. et al. (2016), "Social and Distributional Effects of Public Transport Fares and Subsidy Policies: Case of Madrid, Spain", *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2544/1, pp. 47-54, https://doi.org/10.3141/2544-06. [67]

Chakrabarti, S. and E. Shin (2017), "Automobile dependence and physical inactivity: Insights from the California Household Travel Survey", *Journal of Transport & Health*, Vol. 6, pp. 262-271, https://doi.org/10.1016/j.jth.2017.05.002. [63]

Comune di Milano (n.d.), *Milan's Area C reduces traffic pollution and transforms the city center*, 2012. [78]

Correa, T. et al. (2019), ""Responses to the Chilean law of food labeling and advertising: exploring knowledge, perceptions and behaviors of mothers of young children"", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 16/1, https://doi.org/10.1186/s12966-019-0781-x. [31]

D'Amato, G. et al. (2014), "Climate change and respiratory diseases", *European Respiratory Review*, Vol. 23/132, pp. 161-169, https://doi.org/10.1183/09059180.00001714. [1]

D'Haultfœuille, X., I. Durrmeyer and P. Février (2016), "Disentangling sources of vehicle emissions reduction in France: 2003–2008", *International Journal of Industrial Organization*, Vol. 47, pp. 186-229, https://doi.org/10.1016/j.ijindorg.2016.05.002. [81]

Deconinck, K. and M. Hobeika (2022), "Improving environmental outcomes along food supply chains: A review of initiatives and their effectiveness", *OECD Food, Agriculture and Fisheries Papers*, No. 186, OECD Publishing, Paris, https://doi.org/10.1787/d549eb43-en. [38]

Dhar, T. and K. Baylis (2011), "Fast-Food Consumption and the Ban on Advertising Targeting Children: The Quebec Experience", *Journal of Marketing Research*, Vol. 48/5, pp. 799-813, https://doi.org/10.1509/jmkr.48.5.799. [50]

Dhimal, M. et al. (2021), "Impact of Air Pollution on Global Burden of Disease in 2019", *Processes*, Vol. 9/10, p. 1719, https://doi.org/10.3390/pr9101719. [10]

Dickie, S., J. Woods and M. Lawrence (2018), "Analysing the use of the Australian Health Star Rating system by level of food processing", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 15/1, https://doi.org/10.1186/s12966-018-0760-7. [28]

Diluiso, F. et al. (2021), "Coal transitions—part 1: a systematic map and review of case study learnings from regional, national, and local coal phase-out experiences", *Environmental Research Letters*, Vol. 16/11, p. 113003, https://doi.org/10.1088/1748-9326/ac1b58. [96]

Eliasson, J. (2009), "A cost–benefit analysis of the Stockholm congestion charging system", *Transportation Research Part A: Policy and Practice*, Vol. 43/4, pp. 468-480, https://doi.org/10.1016/j.tra.2008.11.014. [77]

EPHA (2024), *Update: Which countries are scrapping fossil fuel heaters?*, https://www.ehpa.org/news-and-resources/news/update-which-countries-are-scrapping-fossil-fuel-heaters/ (accessed on 26 October 2024). [97]

European Commission (2020), *Long-term renovation strategies*, https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/long-term-renovation-strategies_en#national-long-term-renovation-strategies-2020. [100]

Fanzo, J. and C. Davis (2019), "Can Diets Be Healthy, Sustainable, and Equitable?", *Current Obesity Reports*, Vol. 8/4, pp. 495-503, https://doi.org/10.1007/s13679-019-00362-0. [8]

Fanzo, J. and S. Downs (2021), "Climate change and nutrition-associated diseases", *Nature Reviews Disease Primers*, Vol. 7/1, https://doi.org/10.1038/s41572-021-00329-3. [3]

Feteira-Santos, R. et al. (2019), "Effectiveness of interpretive front-of-pack nutritional labelling schemes on the promotion of healthier food choices: a systematic review", *International Journal of Evidence-Based Healthcare*, Vol. 18/1, pp. 24-37, https://doi.org/10.1097/xeb.0000000000000214. [27]

Filimonau, V. et al. (2017), "'Nudging' as an architect of more responsible consumer choice in food service provision: The role of restaurant menu design", *Journal of Cleaner Production*, Vol. 144, pp. 161-170, https://doi.org/10.1016/j.jclepro.2017.01.010. [49]

for the International Network for Food and Obesity/non-communicable diseases (NCDs) Research, Monitoring and Action Support (INFORMAS) (2014), "Towards global benchmarking of food environments and policies to reduce obesity and diet-related non-communicable diseases: design and methods for nation-wide surveys", *BMJ Open*, Vol. 4/5, p. e005339, https://doi.org/10.1136/bmjopen-2014-005339. [55]

Friedlingstein, P. et al. (2019), "Global Carbon Budget 2019", *Earth System Science Data*, Vol. 11/4, pp. 1783-1838, https://doi.org/10.5194/essd-11-1783-2019. [94]

Gao, J. et al. (2018), "Public health co-benefits of greenhouse gas emissions reduction: A systematic review", *Science of The Total Environment*, Vol. 627, pp. 388-402, https://doi.org/10.1016/j.scitotenv.2018.01.193. [7]

Giglio, S. (ed.) (2024), "The Effect of Carbon Pricing on Firm Emissions: Evidence from the Swedish CO2 Tax", *The Review of Financial Studies*, Vol. 37/6, pp. 1848-1886, https://doi.org/10.1093/rfs/hhad097. [98]

Global Burden of Disease Collaborative Network (2020), *Global Burden of Disease Study 2019 (GBD 2019)*, Institute for Health Metrics and Evaluation (IHME), Seattle, United States. [13]

Gohl, N. and P. Schrauth (2024), "JUE insight: Ticket to paradise? The effect of a public transport subsidy on air quality", *Journal of Urban Economics*, Vol. 142, p. 103643, https://doi.org/10.1016/j.jue.2024.103643. [70]

Gonzalez-Torres, M. et al. (2023), "Review of EU product energy efficiency policies: What have we achieved in 40 years?", *Journal of Cleaner Production*, Vol. 421, p. 138442, https://doi.org/10.1016/j.jclepro.2023.138442. [102]

Government of Spain (2025), *El uso del transporte público sube un 33% en toda España con los descuentos impulsados por el Gobierno desde 2022*, https://www.lamoncloa.gob.es/serviciosdeprensa/notasprensa/transportes-movilidad-sostenible/paginas/2025/240125-uso-transporte-publico-descuentos.aspx. [68]

Gruenwald, T. et al. (2022), "Population Attributable Fraction of Gas Stoves and Childhood Asthma in the United States", *International Journal of Environmental Research and Public Health*, Vol. 20/1, p. 75, https://doi.org/10.3390/ijerph20010075. [99]

Guthold, R. et al. (2018), "Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants", *The Lancet Global Health*, Vol. 6/10, pp. e1077-e1086, https://doi.org/10.1016/s2214-109x(18)30357-7. [15]

Guzmán-Rosas, S. (2022), "Ethnicity as a social determinant of energy poverty: the case of Mexican indigenous population", *Local Environment*, Vol. 27/9, pp. 1075-1101, https://doi.org/10.1080/13549839.2022.2100879. [89]

Hagenaars, L., T. Fazzino and J. Mackenbach (2024), "Giving fruits and vegetables a tax break: lessons from a Dutch attempt", *Public Health Nutrition*, Vol. 27/1, https://doi.org/10.1017/s1368980024000442. [108]

Hallström, E., A. Carlsson-Kanyama and P. Börjesson (2015), "Environmental impact of dietary change: a systematic review", *Journal of Cleaner Production*, Vol. 91, pp. 1-11, https://doi.org/10.1016/j.jclepro.2014.12.008. [20]

Hoek, A. et al. (2017), "Healthy and environmentally sustainable food choices: Consumer responses to point-of-purchase actions", *Food Quality and Preference*, Vol. 58, pp. 94-106, https://doi.org/10.1016/j.foodqual.2016.12.008. [43]

ICLEI - Local Governments for Sustainability, I. (2021), *Sustainable Public Procurement of Food: A goal within reach*. [52]

IEA (2024), *Tracking SDG 7: The Energy Progress Report, 2024*, IEA, IRENA, UNSD, World Bank, WHO, Washington DC. © World Bank, https://www.iea.org/reports/tracking-sdg7-the-energy-progress-report-2024. [85]

IEA (2023), *A Vision for Clean Cooking Access for All*, International Energy Agency, https://www.iea.org/reports/a-vision-for-clean-cooking-access-for-all (accessed on 25 October 2024). [84]

IEA (2021), *Phasing Out Unabated Coal: Current status and three case studies*, OECD Publishing, Paris, https://doi.org/10.1787/d6c4a08d-en. [95]

Ikonen, I. et al. (2019), "Consumer effects of front-of-package nutrition labeling: an interdisciplinary meta-analysis", *Journal of the Academy of Marketing Science*, Vol. 48/3, pp. 360-383, https://doi.org/10.1007/s11747-019-00663-9. [26]

James-Martin, G. et al. (2022), "Environmental sustainability in national food-based dietary guidelines: a global review", *The Lancet Planetary Health*, Vol. 6/12, pp. e977-e986, https://doi.org/10.1016/s2542-5196(22)00246-7. [41]

Kanter, R., L. Vanderlee and S. Vandevijvere (2018), "Front-of-package nutrition labelling policy: global progress and future directions", *Public Health Nutrition*, Vol. 21/8, pp. 1399-1408, https://doi.org/10.1017/s1368980018000010. [33]

Kelly, J., M. Fu and J. Clinch (2016), "Residential home heating: The potential for air source heat pump technologies as an alternative to solid and liquid fuels", *Energy Policy*, Vol. 98, pp. 431-442, https://doi.org/10.1016/j.enpol.2016.09.016. [106]

Lee, I. et al. (2012), "Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy", *The Lancet*, Vol. 380/9838, pp. 219-229, https://doi.org/10.1016/s0140-6736(12)61031-9. [12]

Li, H. et al. (2024), "Interaction between household energy consumption and health: A systematic review", *Renewable and Sustainable Energy Reviews*, Vol. 189, p. 113859, https://doi.org/10.1016/j.rser.2023.113859. [82]

Lusk, J. (2018), "Separating Myth from Reality: An Analysis of Socially Acceptable Credence Attributes", *Annual Review of Resource Economics*, Vol. 10/1, pp. 65-82, https://doi.org/10.1146/annurev-resource-100517-023153. [37]

Lysenko, O. et al. (2024), "Positive climate and health impacts from upscaled use of heat pumps and solar panels in technology packages in EU-27 by 2050", *Sustainable Production and Consumption*, Vol. 44, pp. 221-233, https://doi.org/10.1016/j.spc.2023.12.007. [104]

Makri, A. and N. Stilianakis (2008), "Vulnerability to air pollution health effects", *International Journal of Hygiene and Environmental Health*, Vol. 211/3-4, pp. 326-336, https://doi.org/10.1016/j.ijheh.2007.06.005. [11]

Markandya, A. and P. Wilkinson (2007), "Electricity generation and health", *The Lancet*, Vol. 370/9591, pp. 979-990, https://doi.org/10.1016/s0140-6736(07)61253-7. [93]

Mattioli, G. et al. (2020), "The political economy of car dependence: A systems of provision approach", *Energy Research & Social Science*, Vol. 66, p. 101486, https://doi.org/10.1016/j.erss.2020.101486. [58]

Ministry of Economic Affairs and Communications, E. (2017), *Energiamajanduse arengukava aastani 2030 [Energy Sector Development Plan 2030]*, https://www.mkm.ee/en/energy-sector-and-mineral-resources/energy-economy/energy-sector-development-plan. [101]

Ministry of Economics Republic of Latvia (2020), *Let's live warmer*. [103]

Minja, M. (2021), *The Car-free Livability Programme, Oslo*, Wiley, https://doi.org/10.1002/9781119821670.ch6. [75]

Mizdrak, A. et al. (2023), "Assessing the health impacts of changes in active transport: An updated systematic review", *Journal of Transport & Health*, Vol. 33, p. 101702, https://doi.org/10.1016/j.jth.2023.101702. [60]

Moreno, C. et al. (2021), "Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities", *Smart Cities*, Vol. 4/1, pp. 93-111, https://doi.org/10.3390/smartcities4010006. [72]

Murray, C. et al. (2020), "Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019", *The Lancet*, Vol. 396/10258, pp. 1223-1249, https://doi.org/10.1016/s0140-6736(20)30752-2. [9]

Nelson, M. et al. (2016), "Alignment of Healthy Dietary Patterns and Environmental Sustainability: A Systematic Review", *Advances in Nutrition*, Vol. 7/6, pp. 1005-1025, https://doi.org/10.3945/an.116.012567. [19]

Nieuwenhuijsen, M. et al. (2016), "Transport And Health: A Marriage Of Convenience Or An Absolute Necessity", *Environment International*, Vol. 88, pp. 150-152, https://doi.org/10.1016/j.envint.2015.12.030. [73]

Nykiforuk, C. et al. (2018), "Adoption and diffusion of zoning bylaws banning fast food drive-through services across Canadian municipalities", *BMC Public Health*, Vol. 18/1, https://doi.org/10.1186/s12889-018-5061-1. [48]

OECD (2024), *Harnessing Public Procurement for the Green Transition: Good Practices in OECD Countries*, OECD Public Governance Reviews, OECD Publishing, Paris, https://doi.org/10.1787/e551f448-en. [53]

OECD (2024), *Tackling the Impact of Cancer on Health, the Economy and Society*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/85e7c3ba-en. [21]

OECD (2023), *How Green is Household Behaviour?: Sustainable Choices in a Time of Interlocking Crises*, OECD Studies on Environmental Policy and Household Behaviour, OECD Publishing, Paris, https://doi.org/10.1787/2bbbb663-en. [61]

OECD (2022), *OECD Regions and Cities at a Glance 2022*, OECD Publishing, Paris, https://doi.org/10.1787/14108660-en. [59]

Onwezen, M. et al. (2021), *Conditions for the effectiveness of labelling: a systematic literature review*, Wageningen University & Research, Wageningen. [39]

Otto, I. et al. (2019), "Shift the focus from the super-poor to the super-rich", *Nature Climate Change*, Vol. 9/2, pp. 82-84, https://doi.org/10.1038/s41558-019-0402-3. [5]

Panter, J. et al. (2016), "Impact of New Transport Infrastructure on Walking, Cycling, and Physical Activity", *American Journal of Preventive Medicine*, Vol. 50/2, pp. e45-e53, https://doi.org/10.1016/j.amepre.2015.09.021. [64]

Pineda, E. et al. (2022), "Policy implementation and priorities to create healthy food environments using the Healthy Food Environment Policy Index (Food-EPI): A pooled level analysis across eleven European countries", *The Lancet Regional Health - Europe*, Vol. 23, p. 100522, https://doi.org/10.1016/j.lanepe.2022.100522. [47]

Potter, C. et al. (2021), "The Effects of Environmental Sustainability Labels on Selection, Purchase, and Consumption of Food and Drink Products: A Systematic Review", *Environment and Behavior*, Vol. 53/8, pp. 891-925, https://doi.org/10.1177/0013916521995473. [36]

Pucher, J. and R. Buehler (2008), "Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany", *Transport Reviews*, Vol. 28/4, pp. 495-528, https://doi.org/10.1080/01441640701806612. [65]

Riley, B. et al. (2023), "Disconnected during disruption: Energy insecurity of Indigenous Australian prepay customers during the COVID-19 pandemic", *Energy Research & Social Science*, Vol. 99, p. 103049, https://doi.org/10.1016/j.erss.2023.103049. [88]

Riva, G., C. Malighetti and S. Serino (2021), "Virtual reality in the treatment of eating disorders", *Clinical Psychology & Psychotherapy*, Vol. 28/3, pp. 477-488, https://doi.org/10.1002/cpp.2622. [109]

Riva, M. et al. (2021), "Energy poverty in Canada: Prevalence, social and spatial distribution, and implications for research and policy", *Energy Research & Social Science*, Vol. 81, p. 102237, https://doi.org/10.1016/j.erss.2021.102237. [90]

Santos, A. et al. (2023), "The cost of inaction on physical inactivity to public health-care systems: a population-attributable fraction analysis", *The Lancet Global Health*, Vol. 11/1, pp. e32-e39, https://doi.org/10.1016/s2214-109x(22)00464-8. [14]

Santos, G. and G. Fraser (2006), "Road pricing: lessons from London", *Economic Policy*, Vol. 21/46, pp. 264-310, https://doi.org/10.1111/j.1468-0327.2006.00159.x. [79]

Sanye Mangual, E. et al. (2024), *Sustainability labelling in the EU food sector: Current status and coverage of sustainability aspect*, European Commission, Joint Research Centre, https://data.europa.eu/doi/10.2760/90191 (accessed on 13 January 2025). [34]

Shahid, M., B. Neal and A. Jones (2020), "Uptake of Australia's Health Star Rating System 2014–2019", *Nutrients*, Vol. 12/6, p. 1791, https://doi.org/10.3390/nu12061791. [32]

Shankar, B. (ed.) (2018), "Health-motivated taxes on red and processed meat: A modelling study on optimal tax levels and associated health impacts", *PLOS ONE*, Vol. 13/11, p. e0204139, https://doi.org/10.1371/journal.pone.0204139. [24]

Singichetti, B. et al. (2021), "Congestion Pricing Policies and Safety Implications: a Scoping Review", *Journal of Urban Health*, Vol. 98/6, pp. 754-771, https://doi.org/10.1007/s11524-021-00578-3. [76]

Solomon, C. and R. Salas (eds.) (2024), "Climate Change, Extreme Heat, and Health", *New England Journal of Medicine*, Vol. 390/19, pp. 1793-1801, https://doi.org/10.1056/nejmra2210769. [2]

Springmann, M. et al. (2016), "Analysis and valuation of the health and climate change cobenefits of dietary change", *Proceedings of the National Academy of Sciences*, Vol. 113/15, pp. 4146-4151, https://doi.org/10.1073/pnas.1523119113. [17]

Springmann, M. et al. (2020), "The healthiness and sustainability of national and global food based dietary guidelines: modelling study", *BMJ*, p. m2322, https://doi.org/10.1136/bmj.m2322. [42]

Springmann, M. et al. (2018), "Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail", *The Lancet Planetary Health*, Vol. 2/10, pp. e451-e461, https://doi.org/10.1016/s2542-5196(18)30206-7. [22]

Stehfest, E. et al. (2009), "Climate benefits of changing diet", *Climatic Change*, Vol. 95/1-2, pp. 83-102, https://doi.org/10.1007/s10584-008-9534-6. [18]

Swensson, L. and F. Tartanac (2020), "Public food procurement for sustainable diets and food systems: The role of the regulatory framework", *Global Food Security*, Vol. 25, p. 100366, https://doi.org/10.1016/j.gfs.2020.100366. [51]

Thaller, A. et al. (2021), "How to design policy packages for sustainable transport: Balancing disruptiveness and implementability", *Transportation Research Part D: Transport and Environment*, Vol. 91, p. 102714, https://doi.org/10.1016/j.trd.2021.102714. [62]

The Norwegian Agency for Public and Financial Management (2021), *Action plan to increase the proportion of green public procurements and green innovation*. [54]

Thow, A., S. Downs and S. Jan (2014), "A systematic review of the effectiveness of food taxes and subsidies to improve diets: Understanding the recent evidence", *Nutrition Reviews*, Vol. 72/9, pp. 551-565, https://doi.org/10.1111/nure.12123. [45]

Villalobos, C., C. Chávez and A. Uribe (2021), "Energy poverty measures and the identification of the energy poor: A comparison between the utilitarian and capability-based approaches in Chile", *Energy Policy*, Vol. 152, p. 112146, https://doi.org/10.1016/j.enpol.2021.112146. [91]

Wanselius, J. et al. (2022), "Consumption of foods with the Keyhole front-of-pack nutrition label: potential impact on energy and nutrient intakes of Swedish adolescents", *Public Health Nutrition*, Vol. 25/12, pp. 3279-3290, https://doi.org/10.1017/s1368980022002178. [29]

Wareham, N. (ed.) (2020), "Changes in the amount of nutrient of packaged foods and beverages after the initial implementation of the Chilean Law of Food Labelling and Advertising: A nonexperimental prospective study", *PLOS Medicine*, Vol. 17/7, p. e1003220, https://doi.org/10.1371/journal.pmed.1003220. [30]

Whitmee, S. et al. (2024), "Pathways to a healthy net-zero future: report of the Lancet Pathfinder Commission", *The Lancet*, Vol. 403/10421, pp. 67-110, https://doi.org/10.1016/S0140-6736(23)02466-2. [6]

Wiley, A. (ed.) (2016), "The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review", *PLOS ONE*, Vol. 11/11, p. e0165797, https://doi.org/10.1371/journal.pone.0165797. [16]

Willett, W. et al. (2019), "Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems", *The Lancet*, Vol. 393/10170, pp. 447-492, https://doi.org/10.1016/s0140-6736(18)31788-4. [23]

Yang, J. et al. (2018), "Climate, air quality and human health benefits of various solar photovoltaic deployment scenarios in China in 2030", *Environmental Research Letters*, Vol. 13/6, p. 064002, https://doi.org/10.1088/1748-9326/aabe99. [105]

Yan, S. and G. Eskeland (2018), "Greening the vehicle fleet: Norway's CO2-Differentiated registration tax", *Journal of Environmental Economics and Management*, Vol. 91, pp. 247-262, https://doi.org/10.1016/j.jeem.2018.08.018. [80]

Notes

[1] Smart metre is an electronic device that measures how much gas and electricity is used and send these readings automatically to the energy supplier. They typically come with an in-home display screen to help monitor and reduce energy use.

[2] Long-Term Building Renovation Strategies are regular reporting among EU countries that outline long-term strategies to renovate national building stock into a highly energy efficient and decarbonised building stock by 2050, containing an estimated energy savings expected.

OECD Health Policy Studies

Decarbonising Health Systems Across OECD Countries

Health systems account for over 4% of total greenhouse gas emissions in OECD countries, making them a significant contributor to the carbon footprint. As populations age and demand for healthcare rises, the sector's environmental footprint is likely to grow without policies to address the issue. At the same time, governments face increasing pressure to deliver care efficiently within tight health budgets. This report examines how OECD countries are addressing this challenge, discussing policies that both deliver high-quality health services and improve health outcomes, and reduce the carbon footprint. While awareness of the health sector's environmental impact is increasing, targeted, health system-specific policies are still at an early stage in many countries. The report highlights how policies that reduce waste and low-value care can both improve health systems' efficiency and population health outcomes while also lowering emissions. It further suggests that progress towards reducing health systems' environmental impact remains impaired by limited data on healthcare-related emissions and the sector's broader environmental effects.

PRINT ISBN 978-92-64-66867-6
PDF ISBN 978-92-64-89270-5