Decarbonizing the healthcare supply chain
strategic actions for health systems

NHS

ATACH
Alliance for Transformative Action on Climate and Health
WHO-hosted network

World Health Organization

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Abbreviations

API	active pharmaceutical ingredient
ATACH	Alliance for Transformative Action on Climate and Health
CO_2e	carbon dioxide equivalent
GHG	greenhouse gas
GHG Protocol	Greenhouse Gas Protocol
HSE	Health Service Executive, Ireland
LCA	lifecycle analysis
NHS	National Health Service
SBTi	Science Based Targets Initiative
TLD	tenofovir, lamivudine and dolutegravir
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Glossary

carbon dioxide equivalent	The mass of carbon dioxide that would produce the same global warming effect as one unit mass of a given greenhouse gas.
carbon footprint, greenhouse gas footprint or greenhouse gas emissions	The total mass of greenhouse gases emitted, – directly and indirectly – by an individual, organization, product or process, expressed as carbon dioxide equivalent (CO_2e) *(1)*.
circular economy model	A model that keeps products and materials in use for as long as possible through processes such as reuse, remanufacture, refurbishment and recycling.
decarbonization	The process by which countries, individuals or other entities aim to achieve zero fossil carbon existence *(2)*. In this report, the term refers more broadly to the process by which countries, individuals or other entities aim to reduce or eliminate greenhouse gas emissions.
direct emissions	Emissions from sources owned or controlled by the reporting entity *(3)*.
emission or carbon hotspot	A specific location, process or activity responsible for a disproportionately high amount of greenhouse gas emissions.
emission reduction targets	Goals set by an organization to reduce direct or indirect emissions by a specified amount *(4)*.
greenhouse gases	Gaseous constituents of the atmosphere – natural and anthropogenic – that absorb and emit radiation at specific wavelengths, contributing to the greenhouse effect *(2)*.
greenhouse gas emissions reduction plan	A structured, strategic document that outlines how an organization will assess, track and monitor its greenhouse gas emissions and that sets out an approach for implementation of interventions to reduce emissions.

health system	All the activities whose primary purpose is to promote, restore and/or maintain health; the individuals, institutions and resources arranged together in accordance with established policies to improve the health of the population they serve, while responding to people's legitimate expectations and protecting them against the cost of ill health through a variety of activities whose primary intent is to improve health *(5)*.
indirect emissions	Emissions that are a consequence of the operations of the reporting company but that occur at sources owned or controlled by another company *(3)*.
lifecycle assessment	Assessment of the sum of a product's environmental impact and effects (e.g. greenhouse gas emissions) at each step in the product's lifecycle, including resource extraction, production, use and waste disposal *(3)*.
low carbon	Causing or resulting in a small net release of greenhouse gas emissions into the atmosphere, as compared with other relevant alternatives.
net-zero emissions or net zero	A state in which the greenhouse gases going into the atmosphere are balanced by removal from the atmosphere *(2)*.
net-zero target	A target date by which an entity aims to achieve net-zero emissions.
offsetting	Purchasing carbon credits from activities outside a company value chain as a substitute for abating emissions within its value chain *(4)*.
proportionate	As applied to procurement criteria, a principle that ensures the requirements and criteria set for the procurement process are appropriate to the type, nature, market conditions, complexity, risk, value or objective of what is being procured *(6)*.
reprocessing	A process carried out on a used device or piece of equipment to allow its safe reuse *(7)*.
science-based targets	Corporate targets to mitigate greenhouse gas emissions that are in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement – to pursue efforts to limit warming to 1.5°C *(4)*.
Scope 1 emissions	Direct emissions from owned or controlled sources, such as emissions from combustion in owned or controlled boilers, furnaces, vehicles, as well as emissions from chemical production in owned or controlled process equipment *(3)*.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the entity *(3)*.

Scope 3 emissions	All indirect emissions not included in Scope 2 that occur in a value or supply chain, including both upstream and downstream emissions. Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company *(3)*.
supply chain	The entire system of processes and resources required to produce and sell a product from start to finish, typically starting with raw materials and ending with the customer in possession of the product.
sustainable procurement	Procurement is the process that includes all activities from identifying needs, sourcing, soliciting offers, evaluating, contracting and managing contracts to the final delivery of goods, services or works. Sustainable procurement means purchasing goods and services in a manner that takes account of environmental and social outcomes in addition to traditional cost and quality criteria. This report is focused on decarbonization and supply, and therefore sustainable procurement in this case refers only to the impact of climate change.
verification	An independent assessment of the reliability (considering completeness and accuracy) of a greenhouse gas inventory *(3)*.

The Science Based Targets Initiative (SBTi) Glossary *(4)* and the GHG Protocol Glossary *(8)* provide many further definitions relevant to healthcare supply chain decarbonization. Annex 1 lists other resources to support implementation of the recommendations in this report.

References

1 Möller V, van Diemen R, Matthews JBR, Méndez C, Semenov S, Fuglestvedt JS, et al. Annex II: glossary. In: Climate change 2022: impacts, adaptation and vulnerability. Contribution of working group II to the sixth assessment report of the intergovernmental panel on climate change. Cambridge and New York: Cambridge University Press; 2022 (https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Annex-II.pdf, accessed 15 October 2025).

2 Matthews JBR. Annex I: glossary. In: Global warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Cambridge and New York: Cambridge University Press; 2018 (https://www.ipcc.ch/sr15/chapter/glossary/, accessed 15 October 2025).

3 Greenhouse gas protocol: a corporate accounting and reporting standard. Geneva and Washington, DC: World Business Council for Sustainable Development and World Resources Institute; 2004 (https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf, accessed 15 October 2025).

4 SBTi glossary. London: Science Based Targets Initiative; 2023 (https://files.sciencebasedtargets.org/production/files/SBTi-Glossary.pdf, accessed 29 September 2025).

5 Operational framework for building climate resilient and low carbon health systems. Geneva: World Health Organization; 2023 (https://www.who.int/publications/i/item/9789240081888, accessed 29 September 2025).

6 Procurement in investment project financing. Washington, DC: World Bank; 2016 (https://thedocs.worldbank.org/en/doc/415861533066041404-0290022016/original/ProcurementRegulations2016.pdf?utm_source=chatgpt.com, accessed 24 October 2025).

7 Reprocessing of devices. Brussels: European Commission (https://health.ec.europa.eu/medical-devices-topics-interest/reprocessing-devices_en?utm_source=chatgpt.com, accessed 24 October 2025).

8 Glossary. In: Greenhouse gas protocol: a corporate accounting and reporting standard. Geneva and Washington, DC: World Business Council for Sustainable Development and World Resources Institute; 2004 (https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf).

Executive Summary

The health and well-being of people across the globe are increasingly affected by climate change, with evidence indicating impacts are likely to intensify *(1)*. With increasing extreme weather events and humanitarian crises, climate change is also impacting the ability of health systems to deliver care *(2)*. Health systems themselves contribute to climate change, with the healthcare sector responsible for roughly 5% of global greenhouse gas (GHG) emissions *(3)*. To deliver their mission to protect the health of populations, health systems must adapt to this changing environment and ensure they are prepared for escalating climate impacts, while actively reducing their contribution to global GHG emissions.

Of the emissions associated with healthcare, 60–80% are generated by the healthcare supply chain through the goods and services supplied to health systems *(4–6)*. Initiatives to tackle supply chain emissions are therefore a high priority in health system decarbonization. At the same time, such initiatives offer an opportunity to improve supply chain resilience, which is increasingly threatened by adverse climate events, and also by global crises, manufacturing challenges, trade barriers and shifting demand patterns *(7–9)*.

Suppliers are already taking action to reduce emissions and improve supply chain resilience. Health systems can support and accelerate this transformation, which also presents opportunities to improve quality, safety and affordability of supplies.

This report aims to:

- provide guidance to health systems on decarbonizing their supply chains through changing the way they select, procure and use goods and services, building an approach that fits their systems, priorities and resources;
- support greater alignment in sustainable procurement practices across health systems, to amplify decarbonization efforts and accelerate collective actions.

The report forms part of a suite of materials being developed by the Alliance for Transformative Action on Climate and Health (ATACH) to support member countries to build climate resilient and low carbon health systems. It was developed by the Alignment of Procurement Standards Task Team and is complemented by forthcoming resources developed by the Task Team on procurement standards among international agencies with considerable purchasing power and for nutritious and sustainable food in health settings, and the work of other ATACH task teams.

The report gives detailed guidance on two complementary approaches for health systems to decarbonize their supply chain:

- accelerating supplier action to decarbonize their products, services and operations through procurement levers – this approach relies on the use of decarbonization criteria to be embedded in procurement processes;
- optimizing demand and usage through clinically and operationally led actions to promote efficient use of products and services and to support the adoption of environmentally sustainable and low carbon substitutions when available.

The report suggests approaches health system leaders and policy-makers can take to decarbonize supply chains, including practical procurement levers and operational and clinical low regret actions. These are contextualized with implementation examples to support practical application.

The focus of the report is on actions driven by health system leaders, but the suggested approaches rely on collaborative work with broader stakeholders, such as government departments beyond healthcare, suppliers, trade associations, regulators, standard bodies and health system users.

The report suggests ways to prioritize action to maximize impact – for example, by targeting known emission hotspots – so that health systems can tailor their approaches to their context, capabilities and priorities.

This report builds on the WHO *Operational framework for building climate resilient and low carbon health systems*, which recognizes that the pathways to climate resilience and decarbonization will differ, depending on the performance and the level of GHG emissions *(10)*.

It is recommended that health systems with low emissions, typically associated with low or medium health system performance, initially focus on building climate resilience, while introducing low carbon sustainability where possible. These health systems may be focused primarily on strengthening healthcare delivery and may face constraints in supply chain interventions, such as limited access to essential supplies, frequent disruptions, reduced negotiating power or constrained manufacturing capacity. These systems can benefit from initiating supplier engagement – or including climate change considerations in their existing engagement – and considering the opportunity to adopt low regret interventions that optimize resource use and maximize broader benefits across health, access and supply chain resilience. Further work is required, however, to develop specific actions tailored for these health systems.

It is recommended that health systems with medium performance and medium emissions give a balanced focus to climate resilience and low carbon sustainability. These health systems can work towards leveraging their purchasing power to support and accelerate emission reduction in their supply chains. They can consider starting to address systemic levers to optimize demand and use of supplies.

It is recommended that health systems with high performance focus on low carbon sustainability while strengthening climate resilience. These health systems should aim to implement decarbonization criteria in procurement and to optimize their use of supplies as soon as possible to decarbonize their supply chains and positively influence progress in other regions.

References

1 Summary for policymakers. In: Lee H, Romero J, editors. 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. Geneva: Intergovernmental Panel on Climate Change; 2023 (https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf, accessed 15 October 2025).

2 Gkouliaveras V, Kalogiannidis S, Kalfas D, Kontsas S. Effects of climate change on health and health systems: a systematic review of preparedness, resilience, and challenges. Int J Environment Res Public Health. 2025;22(2):232. https://doi.org/10.3390/ijerph22020232.

3 Health care's climate footprint: how the health sector contributes to the global climate crisis and opportunities for action. Reston, VA: Health Care Without Harm and ARUP; 2019 (https://global.noharm.org/focus/climate/health-care-climate-footprint-report, accessed 15 October 2025).

4 NHS England. Delivering a "net zero" national health service. London: NHS England; 2020 (https://www.england.nhs.uk/greenernhs/publication/delivering-a-net-zero-national-health-service/, accessed 15 October 2025).

5 Eckelman MJ, Huang K, Lagasse R, Senay E, Dubrow R, Sherman JD. Health care pollution and public health damage in the United States: an update. Health Aff (Millwood). 2020;39(12):2071–2079. https://doi.org/10.1377/hlthaff.2020.01247.

6 Decarbonising healthcare supply chains: recommendations on how to drive emissions reductions across healthcare supply chains. Sustainable Markets Initiative Health Systems Task Force; 2022 (https://a.storyblok.com/f/109506/x/c8d17852a1/smi-hstf-supply-chains-whitepaper.pdf, accessed 15 October 2025).

7 World Health Organization. Medicines shortages: global approaches to addressing shortages of essential medicines in health systems. WHO Drug Information. 2016;30(2):180–185 (https://iris.who.int/handle/10665/331028, accessed 15 October 2025).

8 Miller FA, Young SB, Dobrow M, Shojania KG. Vulnerability of the medical product supply chain: the wake-up call of COVID-19. BMJ Qual Saf. 2021;30(4):331–335. https://doi.org/10.1136/bmjqs-2020-012133.

9 Kaplan WA, Hamer DH, Shioda K. The potential impact of climate change on medication access and quality deserves far more attention. One Health. 2025;20:100957. https://doi.org/10.1016/j.onehlt.2024.100957.

10 Operational framework for building climate resilient and low carbon health systems. Geneva: World Health Organization; 2023 (https://www.who.int/publications/i/item/9789240081888, accessed 29 September 2025).

1 Introduction

1.1 Purpose and scope of this report

1.2 Development of this report

1.3 The healthcare supply chain

1.4 Current context for supply chain decarbonization

1.5 Delivering broader benefits to health

1.6 Approaches to decarbonizing the healthcare supply chain

1.7 Pathways for decarbonizing the healthcare supply chain: how to navigate this report

The latest Intergovernmental Panel on Climate Change report is clear: climate change is harming human health globally, and the impacts are likely to worsen with further warming. The effects of climate change are wide-ranging, from the spread of vector-borne diseases to rising rates of respiratory and cardiovascular conditions, malnutrition and mental health challenges *(1)*. At the same time, climate change is disrupting the delivery of healthcare itself, introducing new stressors and forcing health systems to operate under mounting constraints *(2)*.

Health systems also play a role in climate change, with the healthcare sector estimated to contribute about 5% of global greenhouse gas (GHG) emissions *(3)*. To protect the health of populations, health systems have the dual responsibility of adapting to increase their climate resilience while reducing their contribution to global GHG emissions.

The emissions associated with the medicines, medical equipment and other goods and services supplied to health systems, embedded across complex supply chains, account for 60–80% of health-sector emissions *(4–6)*. Shortages and disruptions are also a growing issue in healthcare supply chains, which are directly affected by adverse climate events and a range of factors such as global crises, manufacturing, trade and political challenges, and shifting demand patterns *(7–9)*.

Tackling supply chain emissions and strengthening supply chain resilience is therefore essential for health systems.

Many suppliers are already taking action to reduce emissions and improve supply chain resilience. Health systems can support and accelerate this change. This transformation also presents opportunities to deliver more environmentally sustainable, climate resilient healthcare, while continuing to uphold – and, where possible, enhance – the quality, safety and affordability of supplies. By embedding climate resilience and environmental sustainability into procurement and supply chain strategies, health systems can drive innovation that supports both environmental and clinical outcomes.

1.1 Purpose and scope of this report

This report aims to:

- provide guidance to health systems on decarbonizing their supply chains through changing the way they select, procure and use goods and services, building an approach that fits their systems, priorities and resources;
- support greater alignment in sustainable procurement practices across health systems, to amplify decarbonization efforts and accelerate collective actions.

This report is designed for:

- ministries of health and national health agencies setting direction and developing and implementing sustainability policies;
- sustainability teams, procurement teams and procurement agencies responsible for developing and implementing sustainable procurement policies and practices;
- regional and local health systems seeking to decarbonize their supply chains in line with national and international approaches;
- clinical and operational teams and professional bodies looking for ways to support healthcare supply chain decarbonization efforts;
- suppliers to the healthcare sector looking for ways to align with country commitments to build climate resilient and low carbon health systems;
- civil society and the general public advocating for sustainable supply chains in healthcare.

The report is limited to approaches health systems can take to reduce their supply chain emissions, while maintaining or improving quality, affordability and supply chain resilience. For other aspects of a decarbonization programme, the World Health Organization (WHO) *Operational framework for building climate resilient and low carbon health systems* outlines 10 components to help health systems increase their climate resilience and reduce GHG emissions *(10)*. Broader work led by the Alliance for Transformative Action on Climate and Health (ATACH) and WHO towards healthier populations, including prevention, early detection and self-care, supports a reduced need for healthcare and therefore reduction of emissions in the supply chain *(11, 12)*, but this is beyond the scope of this report.

1.2 Development of this report

The report builds on ATACH work on climate resilient and environmentally sustainable supply chains in the health sector *(13)* and responds to the demand from the ATACH community to develop a document that can support ATACH members in decarbonizing their supply chains and foster greater alignment in practice.

The report was developed by the ATACH Health Systems sub-task team, within the task team on Alignment of Procurement Standards.

ATACH task teams

ATACH is a WHO-hosted platform leveraging the collective power of member countries and areas and non-state actors to support the implementation of climate resilient and low carbon sustainable health systems and promote healthy climate action in key health-determining sectors. ATACH task teams are established based on identified country needs and bring together ATACH members to develop specific technical products that support country-level implementation of climate change and health priorities. See the ATACH community of practice website for more information (https://www.atachcommunity.com/).

The task team was convened through an open call for expressions of interest from ATACH members, including representatives from ministries of health, nongovernmental organizations and industrial bodies. All interested members were invited to the task team workshops and invited to provide feedback on the proposed approach for this report.

The process for developing this document included:

- reviews of grey literature on decarbonization of healthcare supply chains;
- reviews of existing policies or actions implemented by countries and health systems to identify aligned approaches;
- building on previous technical guidance developed by the WHO with expert input, such as the *Operational framework for building climate resilient and low carbon health systems (10)* and feedback received through previous consultations on building climate resilient and environmentally sustainable healthcare supply chains *(13)*;
- consultation with and technical input from experts supporting healthcare supply chain decarbonization from public administration, United Nations agencies, nongovernmental organizations, standards bodies, academia and industry, all with a proven track record of developing or implementing action to decarbonize healthcare supply chains;
- a call for case studies through the ATACH task team and broader contributors, and selection of implementation examples based on scalability and relevance at the health system level;
- iterative drafting and review by the core team and expert advisers. Contributions from ATACH task team members and experts were collected through meetings, implementation examples and a feedback survey.

The report is complemented by the work of other ATACH task teams developing material to support climate resilient, low carbon health systems. This includes the other Alignment of Procurement Standards sub-task teams focused on:

- procurement among global health initiatives, nongovernmental organizations and United Nations agencies with considerable purchasing power, led by the United Nations Development Programme;
- procurement standards for nutritious and sustainable food in health settings, led by the Initiative on Climate Action and Nutrition.

The ATACH Measuring Greenhouse Gas Emissions of National Health Systems Task Team has published first-of-its-kind guidance enabling the adaptation of GHG accounting reporting standards into the realities of healthcare delivery *(14)*.

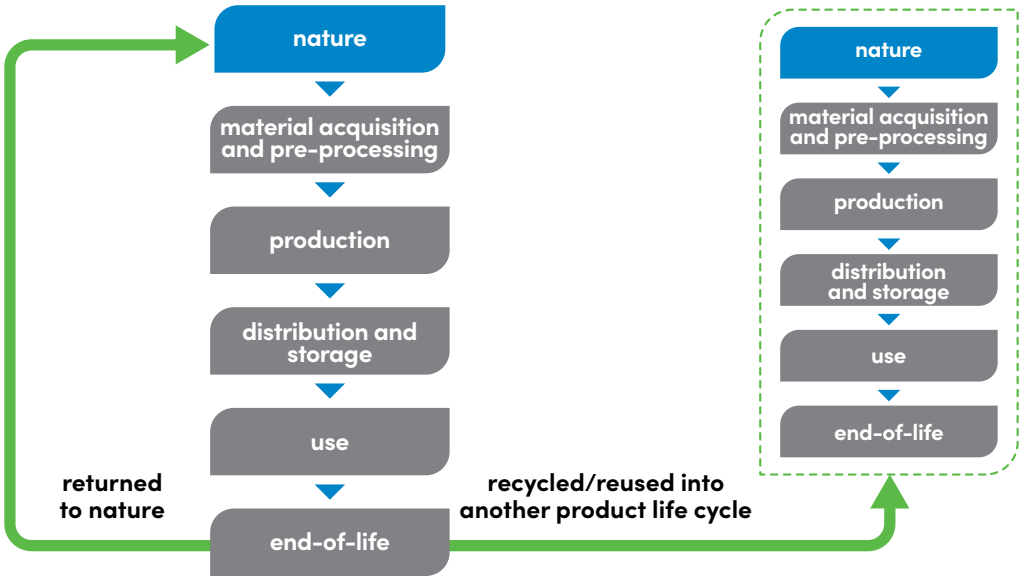
Practical case studies of high-impact decarbonization actions, including those highlighted in this report, are available on the ATACH community of practice website *(15)*.

1.3 The healthcare supply chain

Healthcare supply chains include direct suppliers and also everything that contributes to getting a product or service to the point of care. Examples of supply chain emissions include emissions related to the packaging of healthcare goods, fuel used by manufacturers, upstream electricity used by their suppliers, business-to-business transport emissions, and farming-related emissions, such as nitrous oxide from fertilizers used to grow ingredients for medicines or food products.

Measuring supply chain and/or Scope 3 emissions is complex. For products, multiple stages of the product lifecycle must be considered because emissions can be generated at all stages of the lifecycle, from material extraction to use and disposal (Fig.1).

Fig. 1. Five stages of a product lifecycle



Source: Greenhouse Gas Protocol: product life cycle accounting and reporting standard. Washington, DC: World Resources Institute and World Business Council for Sustainable Development; 2011.

There are also variations in the profile of emissions or hotpots for individual products across the different stages outlined in Figure 1. For example, some medicines or vaccines may result in high emissions during manufacturing but require storage at normal temperatures. Other products may generate fewer emissions in the manufacturing stage but require refrigeration, leading to higher energy consumption during transportation and storage.

The stages and processes outlined in Figure 1 typically operate across multiple regulatory environments and involve numerous stakeholders, including staff at multiple locations, and suppliers varying from global manufacturers to local distributors. For example, Novo Nordisk, a global pharmaceutical supplier, estimated that its supply chain includes 450 first-tier suppliers across 30 countries that directly support the manufacturing and assembling of its products and 60 000 first-tier indirect suppliers that support its business activities *(16)*.

Work to decarbonize supply chains needs to consider this complexity, ensuring appropriate buy-in at all levels of the system, while considering the most effective levers for implementation and impact *(17)*. Although health systems do not directly control the different stages and stakeholders of their supply chain, they can use their purchasing power and the way they select and use goods and services to drive action. Strategies should be considerate of and tailored to the local context, including health system performance and current emissions, as outlined in the WHO *Operational framework for building climate resilient and low carbon health systems (10)*.

Identification of emission hotspots across the different stages of a product lifecycle, but also within the range of supplies purchased and used by a health system is vital to prioritize decarbonization activities. This report provides guidance to health systems to prioritize action for maximizing impact, taking account of the local context.

1.4 Current context for supply chain decarbonization

International policy developments such as the European Union Corporate Sustainability Reporting Directive *(18)*, global initiatives such as the One Planet Sustainable Public Procurement Programme *(19)*, and the G7 commitment to incorporate sustainable procurement into its targets *(20)* are setting new standards for transparency and accountability in supply chain emissions. Similarly, the United Nations Development Programme Sustainable Health in Procurement Project aims to reduce the environmental impacts of medical products *(21)*. Although not all specific to healthcare, these initiatives and regulations are increasingly influencing the health sector.

International collaboration on tackling healthcare supply chain emissions is essential to drive momentum and accelerate progress. Due to the global nature of healthcare suppliers, as health systems work with their suppliers to reduce their own GHG emissions, policies in one place will affect suppliers in other health systems. Aligned strategies that support efficient use of resources and increased demand for lower-emission products also act as market signals to influence future production, and avoid regulatory misalignment and unnecessary supplier burden. This report highlights specific areas where cross-country alignment and collaboration can accelerate decarbonization efforts.

1.5 Delivering broader benefits to health

Reducing emissions in the healthcare supply chain provides the opportunity for health systems to deliver further important benefits such as improved health outcomes, long-term cost-savings and greater supply chain resilience.

Closer collaboration with suppliers and increased transparency can directly support supply continuity and resilience. Emissions reduction policies that optimize and streamline the use of resources, such as reducing reliance on single-use items, can deliver cost-savings and also support resilience against disruption. By discouraging overuse of medicines, such policies also support efforts to reduce drug resistance – a current challenge for diseases such as malaria and tuberculosis.

Social benefits can also be achieved. For example, phasing out the use of fossil fuels in production will reduce air pollution, in turn leading to health benefits to workers in the supply chain.

1.6 Approaches to decarbonizing the healthcare supply chain

Decarbonizing the healthcare supply chain requires suppliers to take action in how they design, manufacture and deliver their products and services. Suppliers alone, however, cannot achieve a net-zero supply chain. Support from health systems is essential – particularly through a clear demand signal for low carbon products and processes and the integration of environmentally sustainable practices within healthcare settings.

This report is structured in two main sections, with detailed guidance on two complementary approaches for health systems to decarbonize their supply chains:

Section 2: accelerating supplier decarbonization through procurement focuses on procurement-led actions in health systems and includes key decarbonization criteria to embed in procurement processes.

Section 3: optimizing demand and usage of supplies focuses on clinically and operationally led actions in health systems and includes both high-priority low regret actions and broader levers for change.

Each section outlines practical actions and real-world examples of how these actions have been implemented in practice. It also offers suggestions for prioritizing actions based on local context. Annex 1 lists resources supporting implementation of the actions outlined in this report.

1.7 Pathways for decarbonizing the healthcare supply chain: how to navigate this report

This report should be read and applied in accordance with the local context within a health system. The WHO *Operational framework for building climate resilient and low carbon health systems* provides practical guidance to navigate this complexity and prioritize action accordingly *(10)*. This framework recognizes that the pathways to climate resilience and decarbonization will differ, depending on the performance (defined by the WHO universal health coverage service coverage index) and the level of GHG emissions (defined by the health-sector per capita GHG emissions) of a health system (Table 1).

Table 1. Pathways for strengthening climate resilience and low carbon sustainability of health systems

Area	Health system performance[a,b]	Health-sector GHG emissions[c]	Climate resilience and low carbon pathways
1	**Low**	**Low**	Focus on climate resilience while adopting sustainable low carbon technologies
2	**Medium**	**Low**	Strengthen climate resilience while introducing sustainable low carbon interventions
3	**Medium**	**Medium**	Strengthen both climate resilience and low carbon sustainability
4	**High**	**Medium**	Strengthen low carbon sustainability while promoting climate resilient health systems
5	**High**	**High**	Focus on achieving net-zero emissions while continuing to promote climate resilience
Target	**High**	**Low**	Net-zero emissions and climate resilience by 2050

[a] For health system performance, **high** is preferable.

[b] Health system performance is represented by the universal health coverage service coverage index.

[c] For health-sector GHG emissions, **low** is preferable.

Source: Operational framework for building climate resilient and low carbon health systems. Geneva: World Health Organization; 2023.

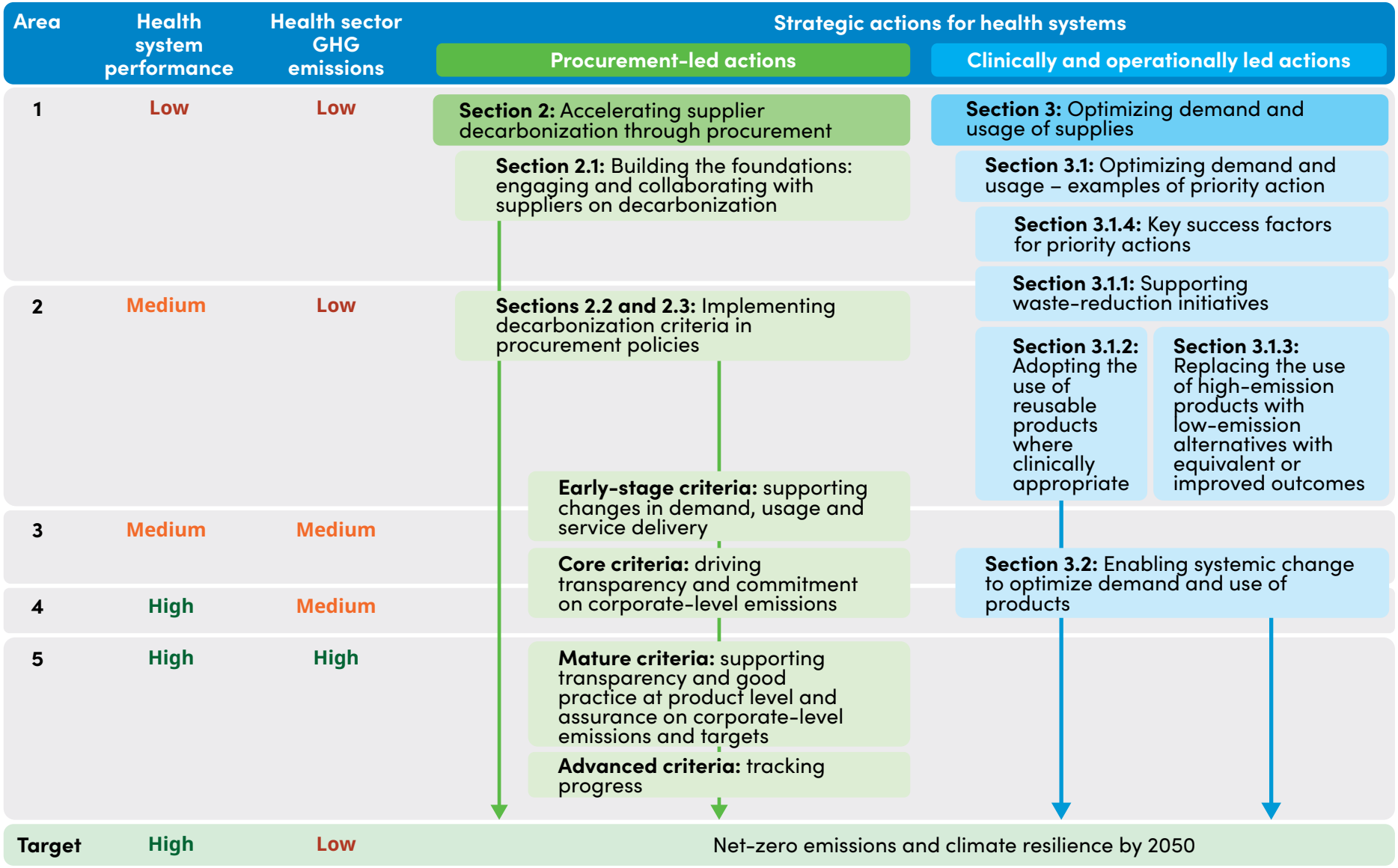
Figure 2 is provided as a navigation tool for this report, outlining how different parts of the report might be useful to health systems at different levels of performance and GHG emissions.

- Health systems with low emissions (Areas 1 and 2 in Table 1), typically associated with low or medium health system performance, may be focused primarily on strengthening healthcare delivery and may face constraints in supply chain interventions, such as limited access to essential supplies, frequent disruptions, reduced negotiating power or constrained manufacturing capacity. These systems can benefit from initiating supplier engagement (as discussed in Section 2.1) – or

including climate change considerations in their existing engagement – and considering the opportunity to adopt low regret interventions (as discussed in Section 3.1) that optimize resource use and maximize broader benefits across health, access and supply chain resilience. Further work is required, however, to develop specific actions tailored for health systems in these areas.

- Health systems with medium emissions and medium performance (Area 3 in Table 1) can build on these foundational actions and work towards leveraging their purchasing power to support and accelerate emission reduction in their supply chains (embedding the early stage and, in time, core procurement criteria in Section 2.2, building on the approach outlined in Section 2.3). They can consider starting to address systemic levers to optimize demand and use of supplies (Section 3.2).
- High-performing health systems (Areas 4 and 5 in Table 1) should aim to decarbonize their supply chains as soon as possible and positively influence progress in other regions, by implementing decarbonization criteria in procurement (the core and, in time, mature criteria in Section 2.2, building on the approach outlined in Section 2.3) and implementing systemic changes in the use of supplies (Section 3.2). These health systems can also start to explore and shape future interventions to accelerate progress (the advanced criteria in Section 2.2), in collaboration with procurement teams, suppliers and broader stakeholders.

Fig. 2. Decarbonizing the healthcare supply chain: strategic action for health systems mapped to the WHO Operational Framework for Building Climate Resilient and Low Carbon Health Systems



2 Accelerating supplier decarbonization through procurement

2.1 Building the foundations: engaging and collaborating with suppliers on decarbonization

2.2 Embedding climate change mitigation in procurement processes: defining decarbonization criteria

2.3 Implementing decarbonization criteria in procurement policies

This section is most relevant for:

- ministries of health and national health agencies setting direction and developing and implementing sustainability policies;
- sustainability teams, procurement teams and procurement agencies responsible for developing and implementing sustainable procurement policies and practices;
- regional and local health systems seeking to decarbonize their supply chains in line with national and international approaches;
- suppliers to the healthcare sector looking for ways to align with country commitments to build climate resilient and low carbon health systems.

Health systems buy a wide range of goods, works and services from a broad range of suppliers. For example, the National Health Service (NHS) in England procures more than 600 000 products from more than 80 000 suppliers *(22)*. These suppliers often rely on a chain of other suppliers, all contributing to the emissions associated with health systems. The NHS in England and other health systems do not control these emissions directly, but they can use their considerable purchasing power to influence change.

This section focuses on how health systems can use procurement mechanisms to support and incentivize suppliers to decarbonize their products and operations. It is organized into three parts:

The opening section highlights the critical first step in any sustainable procurement journey – meaningful engagement and collaboration with suppliers. Through practical examples, this section showcases how health systems can partner with stakeholders across the healthcare value chain to begin to reduce supply chain emissions.

The second section presents key climate change related criteria that health systems can integrate into their procurement processes to accelerate supplier action. The criteria are organized into three maturity levels so that health systems can consider actions best suited to progressing towards the sustainability pathways outlined in Table 1 and Figure 2 and the specific constraints of their supply chains but also set a direction for future action.

The final section outlines the essential steps for implementing these criteria into impactful procurement policies. Guidance is provided on how to define, develop and implement the criteria effectively, ensuring they are actionable and impactful within real-world procurement settings.

2.1 Building the foundations: engaging and collaborating with suppliers on decarbonization

Tackling emissions across the healthcare supply chain is not possible without the active participation and transformation of suppliers across the value chain. It is critical to engage suppliers early on in the sustainability journey. This helps to improve understanding of supply chain emissions, actions already being taken by suppliers, and how best to drive further supplier action, while ensuring access and supply chain resilience. Simultaneously, this engagement enables a shared ambition between health systems and suppliers. Suppliers often welcome this opportunity to share their progress and to get input from health systems to inform future plans.

Health systems can engage directly with their supply chains to foster innovation, showcase leadership and tackle specific carbon-intensive hotspots. This can be achieved by partnering with trade associations and by supporting cross-sector initiatives that drive both broad and targeted actions to decarbonize healthcare supply chains. Such collaborations enable technical knowledge-sharing, mutual learning and coordinated efforts, thus accelerating progress and helping to overcome systemic challenges.

For health systems with low performance, including climate change considerations in existing supplier engagements and promoting collaboration can be enough to start driving a reduction in supply chain emissions. For example, when undertaking major construction or adaptation projects to enhance performance and climate resilience, or when aiming to improve access to specific medicines, direct collaboration with suppliers and broader stakeholders such as non-profit-making organizations and third-party buyers offers a practical and impactful way to address key emission hotspots while delivering broader benefits. Implementation examples 1 and 2 demonstrate how direct collaboration can drive progress.

Implementation example 1

UNICEF: piloting sustainable vaccine shipments by sea

Background

In 2023, the United Nations Children's Fund (UNICEF) published its first comprehensive Scope 3 GHG emissions baseline, identifying air freight as a contributor – responsible for 48 000 tonnes of carbon dioxide equivalent (CO_2e) in 2019, or approximately 1.2% of the organization's total 3.9 million tonnes CO_2e.

Of these air freight emissions, 32 000 tonnes CO_2e were attributed to vaccine shipments. Vaccine transportation presents unique challenges because of the need to maintain cold-chain integrity, but UNICEF identified opportunities to shift some routine (non-emergency) vaccine deliveries to sea freight. In alignment with organizational sustainability targets, UNICEF launched a pilot initiative to assess the feasibility, safety and impact of transitioning vaccine shipments from air to sea.

Action

UNICEF adopted a multistakeholder approach to ensure feasibility and safety. The pilot project focused on routine vaccines with a long shelf-life and stable cold-chain requirements (2–8 °C), excluding emergency orders and landlocked destinations. Key steps included:

- selection of eligible countries (e.g. Côte d'Ivoire) and suppliers with sea freight capacity (e.g. GSK, Pfizer, Sanofi);
- engagement with freight forwarders and carriers offering specific reefer grade containers;
- development of standard operating procedures for temperature monitoring, container inspection and incident response;
- use of real-time temperature monitoring via carrier-embedded loggers and passive data loggers;
- adjustment of Incoterms to maintain accountability, streamline customs clearance and clarify accountability.

Results

In July 2025, UNICEF completed its first vaccine delivery by sea, transporting more than 500 000 doses of pneumococcal 13-valent conjugate vaccines to Côte d'Ivoire. Initial results from the pilot show carbon dioxide emissions were reduced by up to 78%, and freight costs were reduced by approximately 30–50%. The pilot project eliminated the need for single-use passive shippers, reduced packaging waste, and improved cold-chain control. Shipment consolidation enhanced operational efficiency by reducing split deliveries. UNICEF mapped customs processes and trained stakeholders to ensure readiness.

Full-scale implementation is pending, but early analysis indicates that at least 20% of UNICEF routine vaccine shipments could transition to sea freight, with potential annual savings of US$ 10–16 million. The pilot project has strengthened supplier engagement and informed future procurement strategies.

Lessons learned

Success hinged on strong analysis, early stakeholder engagement, supplier experience and robust standard operating procedures. Key enablers included:

- robust Scope 3 emissions data;
- selecting experienced suppliers, forwarders and carriers;
- real-time monitoring related to the requirements set by suppliers and insurance safeguards;
- clear roles and responsibilities across the supply chain.

Challenges included longer transit times, regulatory gaps (no WHO sea-shipment guidelines) and country-specific customs delays. These were mitigated through delivered duty paid terms, process mapping and targeted training.

Recommendations for other health systems include starting with routine orders, leveraging supplier expertise, prioritizing direct shipping lanes, and implementing a phased rollout with strong monitoring and feedback mechanisms.

Implementation example 2

Unitaid: building the case to decarbonize HIV treatment manufacturing in low- and middle-income countries

Background

Tenofovir, lamivudine and dolutegravir (TLD) is a lifesaving HIV treatment used by nearly 24 million adults in low- and middle-income countries. TLD production generates around 1.6 million tonnes of carbon dioxide annually, and this is expected to rise to 2.3 million tonnes by 2030 *(23)*.

Access to TLD depends on generic manufacturing, primarily in India, where 10 of the 12 global suppliers are based. These suppliers account for up to 91% of generic supply to key procurers, such as the Global Fund to Fight AIDS, Tuberculosis and Malaria *(23)*.

Action

Building on previous studies, Unitaid developed actionable pathways to reduce emissions from TLD production. Technical and market analyses clarified market volumes, established a data-driven emissions baseline, identified emission hotspots, and prioritized decarbonization levers. These were assessed for feasibility, cost, regulatory impact and timelines.

The lifecycle analysis (LCA) assessed the finished pharmaceutical product across the entire value chain but focused on the active pharmaceutical ingredient (API), which is the primary driver of emissions. Input from more than 20 manufacturers provided insights into current practices, opportunities and barriers.

Findings informed a market-shaping framework to drive system-wide change. This framework includes potential levers such as providing technical assistance to manufacturers, developing market-level incentives to drive demand for low carbon products, engaging procurers to incentivize manufacturers, and creating industry-level indicators. This initiative aims to be a global first – using TLD decarbonization to build a blueprint for sustainable generic medicine manufacturing.

Results

Analysis showed that more than 95% of emissions across the TLD value chain come from API manufacturing (50% of the emissions in India, more than 40% in China). The baseline is around 6 kg CO_2e per bottle of 30 tablets.

Up to 85% of emissions could be addressed through feasible interventions, as identified in the framework, with around US$ 270 million initial investment and US$ 120 million annual costs. These investments could be co-financed by multiple stakeholders over time, including climate financiers, development banks, grant-makers and manufacturers. Reductions in emissions of around 31% are achievable over 10 years at no net cost to patients by reinvesting efficiency gains *(24)*.

Manufacturers expressed strong interest in low-cost, high-impact solutions, with potential to engage the five largest API producers. Several interventions, such as implementation of green chemistry practices and improving energy efficiency, can result in long-term cost-savings for manufacturers.

The initiative has raised awareness of the carbon footprint of the pharmaceutical sector and the need to align climate and health goals.

Lessons learned

Early engagement with manufacturers was essential. Codifying emissions data and developing costed abatement models strengthened the investment case. Effective engagement must account for supply chain complexity, particularly the distinction between finished product and API manufacturers. Market analysis should prioritize Scope 3 emissions while considering critical-tier suppliers.

A key lesson learned is the need to align the technical aspects of decarbonization with market dynamics, including demand drivers and pricing pressures, to shape viable and scalable interventions.

Product-level emissions mapping remains technically challenging, but this analysis highlights its value in identifying emissions hotspots and tailoring decarbonization levers to specific markets.

Other challenges include limited manufacturing incentives for decarbonization in price-sensitive markets and the risk associated with additional procurement criteria in health systems in low- and middle-income countries with constrained access. Decarbonization may also require process innovations that existing regulatory pathways are not yet equipped to accommodate, raising questions about approval timelines and market access. Proactive collaboration with regulators will be essential to shape an enabling environment.

Unitaid is now planning investments in low-cost interventions that do not require regulatory approvals to build demand and demonstrate feasibility, laying the groundwork for broader decarbonization across essential medicines.

2.2 Embedding climate change mitigation in procurement processes: defining decarbonization criteria

The criteria that health systems use to determine which goods, works and services to procure, and the requirements they embed within contracts, are powerful levers for driving supplier action.

This section introduces key criteria that health systems can consider embedding in their procurement processes. These criteria are designed to encourage and support suppliers to take ownership of their climate impact and take some critical steps on the decarbonization journey. Steps include understanding the carbon footprints of their organizations and their products, identifying their carbon hotspots, setting emissions reduction targets, and designing and implementing plans to reduce emissions.

Access to this information is also valuable for health systems to better understand their supply chain emissions, potential hotspots and how best to support suppliers' decarbonization efforts. This can inform further engagement and collaboration plans with suppliers to accelerate progress.

These criteria can also be formalized within contracts to ensure accountability and sustained impact.

2.2.1 The importance of international alignment

Many healthcare suppliers operate across global markets, supplying multiple health systems at the same time. By aligning the procurement criteria they apply, health systems can send a consistent signal to suppliers, strengthening the demand for sustainable products and practice, and amplifying collective impact. This can help to reduce the risk of suppliers exiting the market, thus strengthening supply chain resilience. Such alignment also enables more effective supplier action by allowing suppliers to concentrate on decarbonization efforts, rather than navigating and adapting to varied reporting requirements across different buyers. This report and the broader work of ATACH aim to support and accelerate this alignment effort.

Several of the criteria outlined below have already been adopted or proposed for adoption by a range of national health systems. They also align with the supplier survey published by the National Academy of Medicine Climate Collaborative *(25)*. The references included in the table and the implementation examples illustrate how the criteria can be used in practice, the types of contract they apply to, how they are assessed, and their timeframes for adoption. Criteria not in use yet are intended to set a strategic direction and require further collaboration across health systems and suppliers to be implemented.

2.2.2 Selecting the right levers for each context

The proposed criteria have been informed by the authors' experiences, including consultation with suppliers, tests and implementation of the criteria in practice. These criteria may not be suitable for all contexts. Health systems should consider the best levers for their supply chains, based on initial supplier engagement and understanding of the market. In some cases, the criteria can be narrowed in scope – for example, to focus on areas of high spend and high emissions, and where markets are stable and competitive. This is a way to maximize impact while minimizing burden and the risk of

supply disruption. Further work is needed to assess the feasibility and effectiveness of such levers in health systems where immediate aims include maximizing health system performance before reducing emissions, as outlined in the WHO *Operational framework for building climate resilient and low carbon health systems (10)*.

2.2.3 Key considerations when implementing decarbonization criteria in procurement

When selecting and implementing sustainability criteria in procurement, health systems should consider the following:

Scope: to which procurements and contracts will the criteria be applied?

Health systems should clearly define the types of procurement and contract to which the criteria will apply, in order to maximize impact and keep administrative burden minimal. In many cases, a small number of suppliers or contracts may account for the majority of spending and GHG emissions. In such situations, it may make sense to prioritize these contracts when applying decarbonization criteria.

For example, criteria could be applied only to higher-value contracts or to areas of spending known to have a significant environmental footprint. Criteria could also be linked to specific procurement mechanisms, such as pre-approved supplier lists, panels or catalogues, where suppliers are likely to receive multiple orders over time.

Importantly, health systems should ensure any criteria used are proportionate to the value and complexity of the contract. This helps to avoid placing unnecessary burdens on smaller suppliers and supports a fair and inclusive procurement process.

Reporting format: which data will be collected, in what format and for what purpose?

When using procurement criteria to gather decarbonization information from suppliers, health systems should consider the format in which suppliers are expected to respond and report the information. The format should aim to minimize burden both for the suppliers completing the information and for the procurement professionals assessing the information. The format should support the health system to analyse and make use of the data effectively.

If the criteria align with existing requirements (e.g. from other health systems or broader government policies), then aligning with existing collection templates can avoid unnecessary duplication of efforts for suppliers. See, for example, the collection template recommended by the National Academy of Medicine in its supplier survey *(25)* and the carbon reduction plan template used by the NHS in England *(26)*.

Using recognized international standards can provide greater confidence in the technical relevance and consistency of supplier responses. Where applicable, see the standards listed in Table 2.

For most of the criteria discussed below, public disclosure of the information is recommended. This is essential for scrutiny and accountability, and enables wide access to the information. Public commitments are also associated with enhanced action: in a study by the MIT Sustainable Supply Chain Lab and the Council of Supply Chain Management Professionals, companies with public goals were 74% more likely

to invest in high-impact initiatives and embed sustainability in routine decision-making processes *(27)*. Health systems should give enough notice to suppliers when requiring public reporting, because organizations often require sufficient time to make information publicly available, depending on their internal approval processes. Public availability of the information also enables artificial intelligence (AI)-led data collection and analysis techniques. Public disclosure can be done via publication on the supplier website (with inclusion of a link in the response to the tender) or via third-party organizations and verifiers, if applicable. Costs associated with third-party disclosure should always be considered.

Assessment: when and how will the responses be assessed in the procurement process?

Criteria can be embedded and assessed in different ways, depending on local practices and regulations, the maturity of the suppliers on their decarbonization journey, and the ability of procurement staff to evaluate answers. For example, criteria can be applied as a qualifying requirement for suppliers to be able to bid for contracts (using a pass/fail approach, in which suppliers are not compared with each other); can be scored as part of the tendering process; or can be embedded as a contract requirement with a set timeframe for compliance.

The evaluation method should be standardized and communicated clearly in advance, ensuring responses are evaluated in a fair and consistent way. Health systems should consider the capacity and skills required by procurement teams to conduct the assessment and should aim to make the process as simple as possible. The examples in Table 2 illustrate different approaches. For broader examples of implementing scored environmental criteria beyond climate change in a standardized and harmonized way, see the Norwegian Hospital Procurement Trust *Experience report (28)*.

Qualifying criteria are usually the most effective in driving quick adoption, as illustrated by the almost 100% pass rate measured in England across NHS Supply Chain frameworks and NHS England medicines' tenders on the Carbon Reduction Plan requirements *(22)*. If a health system faces supply chain resilience issues, however, a phased approach to implementation could be useful. For example, health systems could start with contract requirements or scored criteria before making them qualifying. Existing research looking at the impact of implementing environmental criteria in procurement beyond decarbonization can support health systems to select the best assessment methods for their objectives *(29)*, but further work tailored to decarbonization criteria is still required.

Exceptions: under which circumstances may suppliers be exempted?

Healthcare supply chains are often extremely diverse. It is important to plan for legitimate exceptions where suppliers could be exempted from complying with the criteria. The circumstances could be related to the need of the health system (e.g. urgent procurement), the constraints of specific markets (e.g. avoiding shortages and supply chain resilience issues), or the ability of suppliers to gather the required data. Health systems should consider how these exceptions will be assessed and implemented in practice.

Practical examples of scope, reporting formats, assessment methods and exceptions in various health systems can be found in the references included in the table and the implementation examples in Section 2.2.4.

2.2.4 Decarbonization criteria

Key criteria to embed decarbonization into procurement are presented in Table 2, along with the following information:

- The criteria are grouped into four indicative maturity levels to support health systems to choose which criteria to use, depending on their performance, their emission profiles (see Table 1 and Fig. 2), and the maturity of their suppliers around decarbonization.
- The table indicates whether the criteria refer to the specific purchased product or service, to the contract, or to the entity that supplies them:
  - Criteria tailored to specific contracts, markets or products can support interventions targeted at high-emission products or markets or identified hotspots in the supply chain. The specific impact of the introduction of these criteria in procurement is often easier to identify and measure than for criteria targeted at the supplying organization as a whole.
  - Organization-wide criteria targeting the supplier itself are referred to as corporate-level criteria, in line with the Greenhouse Gas Protocol (GHG Protocol) terminology *(30)*. These criteria are generally easier to define and implement, because they can be applied consistently across diverse markets and supplier types, with minimal need for customization. Although their specific impact is more difficult to isolate and measure, they promote broad, organization-wide transformation across products and operations, at every stage of the manufacturing and distribution process.
- The purpose of the criteria and the benefits health systems can expect from applying them are outlined.
- Key considerations for health systems when defining and implementing the criteria are suggested, including relevant standards and good practice, potential constraints for suppliers, and options for phased implementations.
- Examples of health systems where these criteria have been adopted or proposed for adoption are provided.

Although these criteria are intended for suppliers, they represent good practice for any organization committed to reaching net zero. For more information on how health systems can measure their GHG emissions, see the ATACH guidance on measuring GHG emissions of national health systems *(14)*.

Table 2. Healthcare procurement criteria supporting supplier decarbonization

Criteria	Purpose of criteria	Key considerations	Health system examples
Early-stage criteria: supporting changes in demand, usage and service delivery			
Targeted product and service specifications, e.g. recycled paper, reusable equipment	Support the adoption of low carbon, environmentally sustainable, climate resilient approaches and products that deliver comparable or enhanced benefits with reduced environmental impact. Drive innovation in sustainable product design and service delivery.	Due to their tailored nature, these requirements are most effective for contracts and product categories where good practice or suitable alternatives have been identified. Standard questions and clear guidance on response expectations and assessment are critical to support the fair and effective implementation of these criteria. See Section 3.1 for examples of low carbon products.	France *(31)* Health Service Executive (HSE), Ireland *(32)* NHS, England *(33)* Norway (see Implementation example 10 in Section 3.1)
Core criteria: driving transparency and commitment on corporate-level GHG emissions			
Public reporting of corporate emissions	Improve the understanding of health system emissions. Support the identification of hotspots where emissions reduction is a priority. Foster transparency and collaboration across the supply chain.	Alignment with international standards such as the GHG Protocol supports standardized accounting and a simplified reporting landscape for suppliers *(30)*. It is recommended that suppliers clearly outline their methodology to drive transparency and update their reporting on a yearly basis to ensure it is relevant and current. Criteria could start by focusing on Scope 1 and 2 emissions only, but with a plan to expand to Scope 3 emissions, because these often form the largest part of an organization's emissions.	NHS, England *(34)* Norway *(35)*

Criteria	Purpose of criteria	Key considerations	Health system examples
Public commitment to corporate emissions reduction targets (near-term and net-zero targets)	Ensure suppliers are committed to reducing emissions at the whole-of-organization level, in line with the objectives of the health system. Near-term targets are usually within a timeframe of 5–10 years and ensure near-term action. Net-zero targets demonstrate long-term vision and commitment.	When disclosing emissions reduction targets, suppliers should include key parameters of the target, including the target year, the emissions scopes covered and the targeted percentage of emissions reduction. Best practice also suggests net-zero targets should be absolute (total emissions) rather than intensity targets (emissions per unit, such as per product, per dollar of revenue or per employee) whenever possible, should maximize actual emission reductions over offsetting and clearly state the associated percentage of reduction in emissions being aimed for *(36)*. Requiring both near- and long-term targets is best practice, but requiring only one could be a helpful first step.	HSE, Ireland *(32)* NHS, England *(34)* Norway *(35)*
Publicly available corporate GHG emissions reduction plan	Ensure suppliers are setting out appropriate action plans to support the achievement of their emission reduction targets.	The content, format and level of detail in emission reduction plans vary significantly. Mature suppliers may have a highly robust plan with a clear journey to net zero, but suppliers at the start of the journey might focus on easier goals and further building their plans in the future. It is essential that expectations account for this diversity in the supply chain and are proportionate to the intended purpose and use of the information. Consideration should be given to how procurement teams will be able to assess this requirement in a fair and replicable way. The existence of a publicly available plan in line with the reported target can be an acceptable first step.	NHS, England *(34)* Norway *(35)*

Criteria	Purpose of criteria	Key considerations	Health system examples
Mature criteria: supporting transparency and good practice at the product level and assurance on corporate-level emissions and targets			
Targeted product carbon footprinting	Better understand the specific impact of the procured products on climate change. Improve the availability of data on the carbon footprint of products and better understand drivers of emissions, particularly for carbon hotspots within the healthcare supply chain. Support low-emission design and manufacturing practices.	These criteria enable the collection of emissions data at the product level. Depending on the intended use, product-level footprint information may take various forms, such as a single or multi-impact LCA, or a set of specific questions addressing known drivers of emissions. Such criteria are particularly relevant for products that have been identified as significant contributors to healthcare supply chain emissions, such as pharmaceutical products and medical devices *(37)*. To maximize the usability of the information, health systems should be specific on key parameters, such as boundaries, units to be used and data sources. Suppliers should clearly state when assumptions are made. When appropriate, health systems should aim to align with existing international standards, such as the GHG Protocol Product Standard *(38)*, the ISO 14044 standard for LCA *(39)* and PAS 2050 *(40)*. Standards specific to the health sector are currently in development. For example, BSI PAS 2090 will define the product category rules to undertake an LCA for pharmaceutical products *(41)*. Product-level emissions can also be verified by accredited third parties, when relevant and proportionate. Undertaking LCAs for complex products can be resource-intensive, and health systems should ensure the requirement is useful and proportionate.	France *(42)* HSE, Ireland *(32)* NHS, England *(43)* Norway *(35)*

Criteria	Purpose of criteria	Key considerations	Health system examples
Third-party validation of corporate targets and plans	Ensure supplier targets are aligned with climate science and demonstrate credible commitments.	Validation of targets through specialist third-party organisations is best practice – for example, the Science Based Targets Initiative (SBTi) provides validation services for corporate organizations, financial institutions, and small and medium-sized enterprises *(44)*. Before introducing such criteria, consideration should be given to specific circumstances (e.g. public-sector or non-profit-making suppliers that cannot currently obtain validation through SBTi), the cost and resource implications for suppliers, the capacity of third parties to perform the required validation, and the likely lead time. Target validation may be most suitable for strategic suppliers and categories associated with a significant proportion of emissions.	HSE, Ireland *(32)* Norway *(35)*
Corporate emissions verification	Ensure emissions reported are accurate, credible and aligned with international standards.	Although emissions verification is considered best practice, it has potential cost and resource implications. Before adopting these criteria, health systems should engage with suppliers to ensure they balance the additional benefits against supplier maturity and burden. A tiered or phased approach – for example, focusing on strategic and high-value contracts – could help to ensure fairness and proportionality.	

Criteria	Purpose of criteria	Key considerations	Health system examples
Advanced criteria: tracking progress			
Progress report against emissions reduction targets	To promote accountability of progress made against plans and targets and enable collaborative and continuous learning across supply chains.	A variety of factors can affect how progress is assessed and emission reductions are measured. For example, emissions can increase with improved measurement and calculation methods, and trends may shift when suppliers restructure their operations, such as through the acquisition or sale of business units. This should be accounted for when considering how to embed and assess these criteria. Further work is needed in this area to determine the most appropriate approaches.	

Implementation example 3

NHS England: the NHS Net Zero Supplier Roadmap

Background

The NHS has committed to reaching net zero by 2045 for the emissions it influences through the goods and services it buys from its partners and suppliers *(4)*. To help meet this goal, in 2021 NHS England published the *NHS net zero supplier roadmap* to help suppliers align with the net-zero ambitions *(43)*.

Action

The first three milestones of the Roadmap have been implemented:

- Since April 2022, all NHS tenders must include a minimum 10% weighting for net zero and social value *(33)*.
- Since April 2023, for all new contracts above £5 million per annum, the NHS requires suppliers to publish a carbon reduction plan for their United Kingdom Scope 1 and 2 emissions and a subset of Scope 3 emissions as a minimum. Carbon reduction plan guidance has been published to support suppliers to understand the requirement and how it is put into practice *(34)*.
- Since April 2024, the NHS has proportionately extended this requirement to all procurements *(34)*. This is achieved via a two-tier approach, with a full carbon reduction plan required for all new contracts over £5 million per annum and for all new frameworks (pre-approved suppliers for specific products and services, with predefined terms and conditions), and a net-zero commitment required for new lower-value contracts.

Results

As a result, more than 90% of the money spent by the NHS (excluding staffing budgets) is in scope of carbon reduction plan or net-zero commitment requirements, with an almost 100% pass rate for carbon reduction plan requirements across NHS Supply Chain frameworks and NHS England medicines' tenders *(22)*.

Lessons learned

Early engagement with suppliers and procurement teams was essential for implementation of the policy.

The NHS strongly encourages all suppliers to prepare for the roadmap milestones, but it accounts for the specific barriers that some suppliers may face. Specific support is available for small and medium-sized enterprises and voluntary, community and social enterprises at each stage of the roadmap.

Resources such as a carbon reduction plan checking service for suppliers and training webinars for both internal staff and suppliers have been instrumental *(45)*.

The NHS continues to work closely with regulators, suppliers and industry bodies to shape its approach and give all suppliers the opportunity to align with the net-zero ambition. To inform the implementation of the next milestone of the roadmap in 2027, a detailed market sounding was undertaken in mid-2025.

The full case study is available on the ATACH website *(46)*.

Implementation example 4

Norwegian Hospital Procurement Trust: establishing a supplier roadmap to net zero for national healthcare services in Norway

Background

Since 2022, Norway has been building capacity, increasing knowledge and strengthening collaboration to develop a national net-zero supplier roadmap for health services. Dialogue with suppliers has been central to this effort.

The aim is to align closely with NHS England to build on existing work, ensure consistency, and reduce supply chain emissions from the Norwegian health system.

Action

Norway engaged extensively with NHS England and the Health Service Executive (HSE) in Ireland, sharing experiences and insights before and during the development of the Norwegian supplier roadmap.

The draft supplier roadmap was shared in May 2025 through a formal written consultation *(35)*. Communication and engagement, including collaboration with industry associations through webinars, consultations and ongoing market dialogue, were highly valuable and continue to inform the process.

The final roadmap is expected to be published by the end of 2025. Additional webinars are planned to maintain dialogue with associations and individual suppliers both before and after final publication.

Results and lessons learned

Although the policy has not been implemented yet, supplier relationships have been strengthened and mutual understanding of challenges has deepened.

Leveraging the experiences of more advanced international partners was essential. Collaboration and alignment across borders have been well received by the majority of suppliers and are likely to accelerate impact.

Building internal capacity and knowledge within procurement teams before launching external communications ensured a more informed and mature engagement process. Work is ongoing to continue to strengthen internal expertise in this area.

A dialogue-based approach has proven highly valuable. Norway is committed to sharing its experiences to support broader progress in sustainable procurement.

See the Norwegian Hospital Procurement Trust website for more details *(35)*.

Implementation example 5

France: tool for simplified carbon footprint assessment

Background

The national climate and resilience plan of France mandates the integration of environmental criteria in all public tenders by 2026. To support this, public buyers and healthcare professionals needed a reliable tool to objectively compare the carbon footprints of medicines.

Implementation

In 2023, France began development of a simplified carbon footprint assessment matrix for medicines, in collaboration with health authorities, manufacturers, healthcare professionals and environmental experts.

The methodology focuses on key emission sources across the lifecycle – particularly API production and formulation, which are the main drivers of the carbon footprint of medicines *(42)*. This method provides a consistent approach to estimating emissions across the lifecycle of a medicine, from production to use.

The tool includes emission factors for all materials and calculates uncertainty at each step, favouring manufacturers that supply primary data. The aim is to ensure results are comparable, verifiable and supportive of greener procurement decisions.

Results

The methodology is starting to be implemented in public tenders in France. Implementation is still in its first steps. Currently, suppliers that deliver a score are recognized in tenders. Successful suppliers must carry out a precise calculation during the final stages. Broader application is planned across public tenders, with potential future use in diverse aspects of medicines market access or healthcare usage.

Results will be monitored to assess the impact of the tool on market transformation and supplier practices.

Lessons learned

The tool was designed to practically recognize efforts of manufacturers to reduce emissions, while avoiding unnecessary burden. It is simple, consistent, and designed to reward transparency and investment in sustainable processes.

Cross-sector engagement was essential in ensuring both feasibility and adoption of the final tool.

France is preparing for two key next steps:

- All data will be verified by a third party to ensure the reliability of results used to compare offers. The national accreditation body, COFRAC, will award accreditation. Mutual recognition allowing international organizations to verify results is also being explored.
- A shared platform will simplify data submission, verification and access. Manufacturers and suppliers will be able to upload data, enabling automatic calculations. Authorized organizations will access results for procurement and supplier comparison.

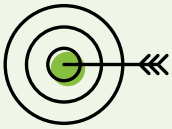
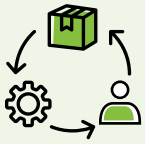
This approach supports informed purchasing decisions and encourages supply chain decarbonization.

See the full methodology for more details *(42)*.

2.3 Implementing decarbonization criteria in procurement policies

Annex 1 lists several resources available to support health systems in developing sustainable procurement policies. This section focuses on the critical steps required to ensure the implementation of decarbonization procurement criteria by health systems is impactful and fair and does not lead to unintended consequences on supply (Table 3).

Table 3. Critical steps for the implementation of decarbonization criteria in procurement by health systems

Policy development steps	Key activities
 **1 Establish a clear strategic direction**	Define the overarching purpose and priorities of the policy, aligning with broader health priorities Secure early buy-in from key internal and external stakeholders
 **2 Engage and understand the supply chain**	Map the supply landscape and assess readiness and capabilities to identify where to focus effort to maximize impact and minimize risks Involve suppliers early to build shared understanding and foster collaboration Identify relevant public policies, regulations and standards
3 Define and communicate high-level criteria	Set out and communicate high-level expectations, scope and timeline, in line with the objectives, and share with key stakeholders Identify potential implementation risks and plan for appropriate mitigations
4 Design an implementation approach	Define the operational details of how the criteria will be embedded in procurement processes to ensure they maximize impact, while minimizing risk and burden for buyers and suppliers
5 Implement the policy	Develop supporting and training resources for key stakeholders and identify best communication routes to maximize awareness, before rolling out the requirements through procurement processes
6 Monitor progress and risks and plan for next steps	Track outcomes, gather feedback, manage risks and use insights to refine the approach, strengthen impact and inform future policy cycles Monitor global policy and standards changes to mitigate potential impact

The steps in Table 3 can guide policy development at the national and local levels within health systems. In contexts where procurement policies are defined at the state or regional level, national teams can still play a key role by leading on Steps 1–3, while actively involving local system teams from the outset. Steps 4 and 5 can then be locally owned, with national teams supporting implementation through joint efforts such as supplier engagement, training and knowledge-sharing to foster consistency and maximize impact. Step 6 can be led nationally, with local support in the collection of data and feedback, to help maintain national consistency.

Implementation example 6

Australian Government Department of Health, Disability and Ageing: developing Australian health system guidelines for green procurement and sustainable resource use in a federated system

Background

In 2023, the Australian Government published the National Health and Climate Strategy to address the health impacts of climate change and build a climate resilient, net-zero health system *(47)*. The Australian health system accounts for around 5.4% of total national GHG emissions. Scope 3 (indirect) emissions, which arise primarily from purchased goods and services, account for 68% of Australian health system emissions *(48)*.

The federated system in Australia means health procurement responsibilities are shared across Commonwealth, state, territory and local health organizations, making coordinated action essential.

Action

To support sustainable procurement, the Department of Health, Disability and Ageing is working with state and territory health departments and procurement bodies to develop national guidelines for green procurement and sustainable resource use *(48)*. This process is in its early stages, with the aim to launch the guideline in late 2026.

The co-design process aims to align the guidelines with existing policies and regulations across jurisdictions and with the *NHS net zero supplier roadmap (43)*. The Department conducted a comprehensive review of existing sustainability measures in procurement policies to identify gaps, shared principles and examples of strong practice. It also met with each jurisdiction to identify alignment opportunities, resource needs and implementation challenges.

Perspectives of local and national suppliers and private and aged care providers will be incorporated to ensure the guidelines are practical and support supply chain decarbonization. This may include tools and resources to support suppliers and health services through implementation.

Results and lessons learned

The guidelines are still in development, but the planned inclusive approach is laying the groundwork for long-term benefits, including improved efficiency, transparency and collaboration across the health supply chain.

Key lessons have emerged:

- Building a strong case for change using robust data – such as Scope 3 emissions analysis – is essential *(49)*.
- Navigating Australia's complex federated procurement system, where policies vary across states, has been challenging. This is being addressed through a co-design approach involving state and territory representatives and alignment with established sustainable procurement policies.

2.3.1 Establishing a clear strategic direction

When establishing new procurement levers to support decarbonization, it is essential to start by agreeing on the intended aim and objectives and ensure they align with organizational priorities. This will help secure buy-in at all levels of the organization and allow teams to dedicate the required time to developing and implementing the policy. Clearly defined objectives provide a strong foundation for later stages of policy development, helping to guide decisions and trade-offs to maximize impact, while avoiding unnecessary complexity or burden.

As part of this step, health systems should consider the following:

- identify organizational priorities and goals with which the policy could directly align (e.g. net-zero commitments, supply chain resilience, efficient use of resources, cost-saving efforts, broader social value) and broader health priorities that the policy could deliver (e.g. improved outcome for patients);
- define specific primary and secondary objectives of the policy (e.g. maximizing the proportion of the supply chain footprint covered by a net-zero commitment, or decarbonizing a specific identified hotspot);
- secure early support from senior decision-makers on this strategic direction, including procurement, clinical and operational leads.

2.3.2 Engaging and understanding the supply chain

Gaining insight into where suppliers currently stand on their sustainability journeys, and the existing requirements and regulations they must follow, helps to shape requirements that are both ambitious and achievable. It informs the definition of the scope of the criteria (see Section 3.2) to focus efforts on areas of greatest impact. This initial information-gathering phase also offers a valuable opportunity to begin engaging key partners and suppliers early in the policy development process, ensuring they understand the intent of the policy and can start preparing accordingly.

As part of this step, health systems should consider the following:

- Identify and engage relevant procurement organizations leading or supporting healthcare procurement to gather their insights and collaborate on further steps.
- Engage with suppliers and their representative organizations. Health systems should share the goals and expected benefits of the policy and seek to understand suppliers' current commitment to emissions reduction, the maturity of their climate action plans, and the common barriers and enablers they face. This process should identify significant differences between suppliers – such as variations in ambition, capacity or pace – and explore the regulatory, market-based or internal factors driving these differences.
- Understand climate change and procurement policies, regulations and standards within the country and across international systems to consider whether the policy could align with those, reduce unnecessary burden and avoid confusion. Table 2 and the implementation examples in this report highlight criteria already adopted by health systems, and relevant standards, offering a practical, well-established position to align with.

2.3.3 Defining and communicating high-level criteria

It is essential to articulate and communicate high-level expectations early. This should include which markets, contracts or procurement categories will be in scope, and when the criteria will take effect. Providing early visibility to key stakeholders across the supply chain fosters ongoing engagement and input into the policy development process. It ensures affected organizations have time to prepare, and it allows for the development of appropriate support mechanisms and a tailored implementation strategy.

As part of this step, health systems should consider the following:

- Conduct a supplier segmentation exercise or market analysis to help define the scope of application of the criteria in alignment with the policy objectives. See Section 3.2 for key considerations regarding scope definition and potential exceptions.
- Identify existing legal, contractual and operational levers that the requirements can be embedded into or align with – for example, model terms and conditions for contracts with suppliers – to strengthen their enforceability and impact.
- Engage with internal procurement, clinical and operational teams, suppliers and wider external stakeholders to ensure the plans are practical, achievable and broadly supported. This early engagement helps to reveal potential challenges before finalizing the policy and fosters shared ownership of its successful implementation.
- Identify and mitigate potential risks associated with the introduction of new procurement criteria, such as price increases and supply disruptions. For example, replicating criteria already adopted by other health systems, focusing on strategic categories and competitive markets, and planning for appropriate exceptions can minimize these risks.
- Define and communicate high-level expectations, scope and timeline, building on the findings of the previous step and leaving enough time for stakeholders to prepare.

2.3.4 Designing an implementation approach

Once high-level expectations are established, it is critical to implement the policy in a way that maximizes impact while mitigating risk and avoiding unnecessary burden. Procurement criteria should be applied in a manner that is relevant, fair and proportionate, driving meaningful action while avoiding undue complexity or cost for both suppliers and procurement teams. See Section 2.2.3 for practical considerations on implementing the proposed criteria.

As part of this step, health systems should consider the following:

- Identify the most effective channels to support implementation, such as communication pathways, levers of influence, and support or training resources required for both internal and external stakeholders;
- Plan resource needs to ensure sufficient capacity and skills for successful delivery.

2.3.5 Implementing the policy

Once the policy is finalized and publicly released, the primary focus should shift to building awareness and preparing suppliers and procurement teams for implementation. Comprehensive support should be in place in the lead-up to the criteria taking effect to ensure consistent implementation and drive meaningful progress.

As part of this step, health systems should consider the following:

- Develop and execute a robust communications and engagement strategy to raise awareness internally and externally. This should build on collaboration with key partners such as supplier representative bodies and local procurement forums.
- Leverage existing resources for support and training, including from other sectors, creating tailored content only where gaps exist. For example, organizations such as the GHG Protocol and SBTi and industry groups such as the Pharmaceutical Supply Chain Initiative offer webinars and materials on emissions accounting, target-setting and climate action planning. See Annex 1 for further examples.
- Address the unique support need of small and medium-sized enterprises, voluntary and non-profit-making organizations, and suppliers with limited capacity.
- Equip procurement teams with appropriate training. This includes ensuring they are familiar with the policy aims and objectives, action plans and supporting resources, to ensure the criteria are applied consistently, fairly and with meaningful impact.
- Plan for a comprehensive support offer for stakeholders before, during and after implementation, including clear signposting to resources such as frequently asked questions, technical guidance and help channels.

2.3.6 Monitoring progress and risks, and planning for next steps

To ensure the policy achieves its intended impact, implementation must be actively monitored. This not only supports continuous improvement and future development but also informs the introduction of new or enhanced requirements over time.

As part of this step, health systems should consider the following:

- Analyse supplier achievements and compliance with the criteria to identify which suppliers are and are not meeting expectations. This provides insight into sustainability maturity across different supplier categories, highlights potential risk areas, and informs targeted support to drive meaningful action.
- Review the engagement, support and training approach alongside compliance information, to allow for continuous improvement. This could include feedback from support resource users and support resource usage tracking.
- Evaluate the impact of the policy against defined objectives, anticipated broader benefits and potential risks to pinpoint opportunities for improvement or areas where progress can be accelerated. This could inform future plans to embed higher-maturity criteria into procurement processes.
- Monitor changes in market conditions and broader health system challenges to ensure the criteria remain relevant and do not lead to unintended consequences.
- Monitor global trends, emerging best practices, and local and international policy developments to ensure requirements and plans stay relevant and aligned with global standards.

Implementation example 7

HSE Ireland: Green Procurement Strategic Framework

Background

Sustainable procurement is identified as a priority area under the HSE Climate Action Strategy 2023–2050 *(50)* and is key to delivering the other frameworks adopted under the Strategy, including greener models of healthcare, mobility and transport, green space and water conservation. Collecting relevant data from supply chain partners and building adaptation capacity into contracts are also vital to ensure operational resilience in a changing climate.

Action

The HSE Green Procurement Strategic Framework was launched in September 2025 *(32)*. The purpose of the Framework is to set clear minimum requirements to address the main environmental and social impacts of HSE contracts with suppliers and service providers. It also provides a framework for identifying staff training and resource requirements, setting targets, monitoring and reporting on progress.

Results

Suppliers are increasingly being evaluated not only on price and quality but also on their environmental performance, fostering a systemic shift towards sustainability in the supply chain. Continued supplier engagement will inform the development of criteria for health-sector-specific categories of goods and services.

Service providers can be consulted in advance of the tender if any doubt exists about the ability of the market to meet the identified sustainability criteria, or there are concerns about impacts on cost, competition, or other aspects of performance or delivery.

The Framework focuses efforts to decarbonize procurement activities across multiple high-impact categories such as food services, cleaning and equipment.

The HSE works closely with the Office of Government Procurement, which leads national efforts on green procurement. Engagement with the marketplace continues through supplier forums and “meet the buyer” events. A multistakeholder approach is fostering innovation and consistency across sectors, ensuring sustainability is embedded across the Framework.

Participation in multilateral engagement with other countries is essential to support the harmonization of requirements for suppliers.

Lessons learned

Success in green public procurement requires ongoing dialogue and partnership with suppliers, trade bodies and policy-makers to build capacity and share knowledge. Leadership commitment is key, and green public procurement training will be fundamental to progress the green agenda.

Embedding green public procurement across the organization requires a cultural change at all levels of the organization. Collaboration across public-sector bodies and industries creates economies of scale and drives demand for greener products and services.

See the full case study on the HSE website for more information *(51)*.

3 Optimizing demand and usage of supplies

3.1 Optimizing demand and usage: examples of priority actions

3.2 Enabling systemic change to optimize demand and use of products

Health systems can reduce supply chain emissions not only by encouraging suppliers to decarbonize their own processes and products but also by changing how goods and services are selected and used by the system itself. This requires clinical and operational professionals throughout the system rethinking what they buy and prescribe, and how products are used over the course of their lifespan, which in turn sends meaningful signals to the relevant markets. In all instances, these decisions are to be made with the objective of delivering high-quality care; often, these decisions result in improvements to healthcare delivery and performance.

The breadth of products and services procured by health systems makes large-scale transformation complex and resource-intensive. To drive effective decarbonization, health systems should concentrate their efforts in two key areas:

- Prioritize low regret interventions on products or categories where viable and effective decarbonization strategies have already been identified and implementation pathways are clear, and that demand relatively limited resources. These should serve as immediate targets for action.
- Facilitate broader systemic change by removing critical barriers and reinforcing key enablers to accelerate progress at scale.

This section illustrates these complementary approaches. The first part showcases specific examples of priority actions undertaken by health systems. The second parts overviews key barriers and enablers that health systems may need to optimize to accelerate systemic change.

The approaches recommended in this section are only examples and are not necessarily applicable across all health contexts. Given the diversity of the structure of health systems, healthcare settings and care delivery, it is essential for decision-makers to evaluate the relevance and feasibility of these approaches within their own operational context and adapt them appropriately. The success factors outlined in Section 3.1.4 can be a useful starting point when tailoring or translating the examples into different contexts.

3.1 Optimizing demand and usage: examples of priority actions

This section is most relevant for:

- ministries of health and national health agencies setting direction and developing and implementing sustainability policies;
- regional and local health systems seeking to decarbonize their supply chains in line with national and international approaches;
- sustainability teams embedded in these organizations;
- clinical and operational teams and professional bodies looking for ways to support healthcare supply chain decarbonization efforts.

A comprehensive emissions profile is not necessary to start addressing supply chain hotspots. Useful starting points include published literature, case studies from other health systems, and manufacturer data – all of which can help to identify high-emission products or categories and actionable levers for change. The aim of this section is not to pinpoint the most carbon-intensive products but to showcase areas with substantial emissions where effective decarbonization actions are readily available, can deliver notable broader benefits, and can be implemented without delay in the appropriate context. The resources listed in Annex 1 can help to identify further areas of action.

This section presents three types of priority action that have been or are being implemented by health systems:

- tackling waste or unnecessary use of resources, which results in lower emissions, lower costs and better supply chain resilience;
- enabling the reuse of products where clinically available and appropriate;
- partially or totally substituting the use of high-emission products with low-emission alternatives, while delivering similar or improved outcomes.

These actions are predominantly clinically or operationally led, but they often require support and buy-in from procurement, waste and infrastructure teams.

The evidence supporting these example actions is clear, but additional work is needed at the international level to better understand other high-emitting products. Tools such as LCAs and whole-life costing of products can be useful in supporting health systems to prioritize products for action. For example, a resource database for public use to cover information on emissions-intensive products could focus on undertaking LCAs for the most used products globally for which LCAs currently do not exist, and indicate alternative, lower-carbon, more circular switches where clinically appropriate.

Some of the actions suggested in this section build on the five-step waste hierarchy outlined in the European Commission Waste Framework Directive *(52)*. Preventing or reducing waste should always be the preferred option, after which reuse and then recycling can be explored. The Ellen MacArthur Foundation circular economy diagram outlines additional steps that systems may consider when reducing waste *(53)*. These principles are not explored in this report, but the systematic changes needed to enable them are considered in Section 3.2.

Across most high-priority actions, assessing and monitoring impact and the expected broader benefits is essential to ensure the intended outcomes are achieved. This process also generates valuable insights that support continuous improvement, inform future developments and guide other high-priority actions. The lessons learned from these high-priority actions can support a better understanding of broader barriers and enablers and how to address them. Many of these actions are driven at the health facility level, but system-level intervention is essential to provide the leadership, infrastructure and incentives to drive action.

A summary of key success factors learned from the example priority actions is provided at the end of the section to help inform broader action.

3.1.1 Supporting waste-reduction initiatives

When seeking interventions that deliver both emissions reductions and cost-savings, tackling waste and the unnecessary use of resources is a clear low regret priority.

Health systems should consider targeting products where emissions, volume or expenditure are high, such as medicines, medical devices, food or equipment composed of non-renewable materials such as plastics and some metals. Interventions typically involve reducing the unnecessary use of equipment or overprescribing; optimizing demand forecasting, ordering systems and inventory management to prevent waste through expired or unused supplies; and improving supplier relationship management to best adapt supply to demand.

It is useful to begin by measuring baseline levels of consumption or waste, because this helps in tracking impact and building initial stakeholder support. Emphasis should shift, however, to implementing corrective actions without delay.

The examples and case studies in this section illustrate practical areas where health systems have been able to significantly reduce waste of specific products, unlocking environmental and financial benefits and in some cases broader health benefits. Other initiatives, such as the work undertaken by Aravind in India to measure and reduce waste associated with cataract surgery via phacoemulsification, demonstrate that waste can also be considered across care pathways to identify useful levers for waste reduction *(54)*.

Reducing waste and unnecessary use of medicines

Many health systems have focused efforts on reducing overprescribing, unnecessary use and waste of medicines to improve health outcomes, reduce GHG emissions and save costs. Interventions often have the greatest impact with appropriate engagement and coordination of stakeholders across key specialties and professions, such as prescribers, pharmacy teams, estates teams and portering teams. Several initiatives focus on reducing overall waste of medicines by improving demand forecasting, improving stock management, and streamlining prescribing and delivery systems. Health systems are also working to improve clinical practice by addressing overprescribing and polypharmacy – both of which have been shown to negatively impact patient outcomes *(55–57)*. These efforts not only support better health but also contribute to lower emissions and reduced costs. For more details on these actions, see the case study from NHS Scotland on implementing polypharmacy reviews *(58)* and the Dutch Green Deal roadmap to combat medicines waste *(59)*.

Such approaches are also aligned with the global need to take action on the increase of drug resistance due to the overuse and misuse of antibiotics, which is particularly affecting treatment of malaria and tuberculosis *(60)*.

Other initiatives focus on a specific medicine or group of medicines, improving delivery systems across hospital settings, such as with nitrous oxide, where medical gas pipeline systems often suffer from significant leakage and are frequently oversized relative to actual clinical demand. For practical examples and guidance, see the case study demonstrating how NHS Scotland has tackled nitrous oxide waste *(61)*, the Australian Government practical guide for detecting and reducing nitrous oxide leaks *(62)*, the statement from the American Society of Anesthesiologists on deactivating central piped nitrous oxide *(63)*, and the dedicated toolkit developed to support English hospitals to address nitrous oxide waste *(64)*.

Reducing waste and unnecessary use of single-use items

Health systems have targeted waste of single-use items, often made from plastics or metals, which are derived from non-renewable resources and associated with high GHG emissions. This includes both medical and non-medical items. When targeting medical items, it is critical to work with clinical teams – in particular, infection prevention and control teams – and to support the change in practice with robust evidence. Implementation example 8 illustrates an approach to the reduction in use of non-sterile gloves.

Implementation example 8

Médecins Sans Frontières Wear with Care campaign: reducing unnecessary use of non-sterile gloves

Background

From June 2023 to February 2024, Médecins Sans Frontières implemented the Wear with Care pilot campaign in primary healthcare facilities in Arsal and Hermel, Lebanon.

The initiative targeted the overuse of non-sterile examination gloves – a significant contributor to GHG emissions, medical waste, financial costs, and increased risk of health-care-associated infections. The campaign aimed to rationalize glove use, improve compliance with standard precautions, and improve patient and staff safety, while reducing environmental impact. It also provided education on the important role of proper hand hygiene – including using soap and water and waterless alcohol-based hand rubs – during care to reduce the transmission of hospital-acquired infections. A key objective was to develop a replicable methodology.

Action

The Wear with Care campaign adopted a behaviour change approach. It prioritized understanding of local practices and barriers – including habitual glove use, fear of infection, and mistrust in standard operating procedures – which were assessed at the beginning, midpoint and end of the campaign.

Key steps included the following:

- A campaign manager with expertise in infection prevention and control led implementation.
- Baseline surveys and regular audits provided insights into staff knowledge and adherence to procedures. Informal feedback and a “champions” network complemented data collection.
- Two waves of communication materials (primarily posters) focused on risk assessment, environmental harm, cross-contamination and disinfection. Patient-facing materials clarified rationale of glove use.

- Training and refresher sessions on hand hygiene, glove use, disinfection and waste management were led by the campaign manager.
- Glove consumption was monitored monthly via pharmacy records and compared against patient admissions.

Results

The campaign achieved a 40% reduction in glove use per consultation, saving approximately 45 000 gloves, reducing waste by 270 kg, and preventing 1170 kg CO_2e. Staff demonstrated improved understanding of contamination risks and increased compliance with hand hygiene protocols. These outcomes contributed to enhanced care quality and reduced the risk of hospital-acquired infections.

Recommendations include replicating the Wear with Care campaign across Médecins Sans Frontières missions, using the developed methodology.

Lessons learned

Understanding context-specific behavioural drivers was critical to success. A multifaceted approach driven by dedicated personnel – combining tailored messaging, training and continuous feedback – proved effective. The presence of dedicated infection prevention and control personnel was essential for sustained change. Tailored messaging based on local assessments was key.

Data collection challenges were mitigated through anonymous surveys and open communication.

Regular follow-up training, refreshers and monitoring through dedicated personnel will be essential to sustain change.

Reducing food waste

For many health systems, addressing food waste within healthcare facilities presents a valuable opportunity to reduce both emissions and costs linked to food services. As with other waste reduction efforts, impactful interventions include improving demand forecasting, aligning supply with actual demand, optimizing ordering and delivery processes, and improving stock management. In the context of food, there are also more specific actions, such as optimizing portion sizes, minimizing preparation waste, and enhancing menu planning. Measuring waste can be a powerful tool to help teams recognize the scale of the issue and support the identification and implementation of effective actions. For practical examples and guidance, see the GreenHealthCare case study from Ireland *(65)* and targeted resources from the Waste and Resources Action Programme *(66)*.

3.1.2 Adopting the use of reusable products where clinically appropriate

As per the waste hierarchy *(52)* and circular economy diagram *(53)* introduced in Section 3.1, opportunities to reuse products should be explored to reduce emissions and waste.

By adopting reusable products where it is clinically appropriate and safe to do so, and where the decontamination infrastructure is in place, medical supply chains are becoming more circular. Many health systems are taking action on the reuse of non-sterile products such as mobility aids, and other health systems are focusing on products that need to be decontaminated or sterilized. System-level leadership is often required to enable the uptake of these circular approaches, because regulatory changes and infrastructure capacity may need to be considered at the national level to facilitate widespread adoption.

Implementation example 9

Health Innovation North West Coast in England: gown-switching process map

Background

According to the most recent data, the United Kingdom Government spends more than £20 billion on medical goods every year *(67)*, producing approximately 156 000 tonnes of clinical waste annually *(68)*. Single-use products make up a significant proportion of this expenditure and waste generation, but they also create supply chain vulnerabilities and have been found to be responsible for 68% of emissions in the five most common operations *(69)*. Single-use isolation gowns are a high-volume, carbon-intensive example. Several NHS trusts transitioned to using reusable alternatives due to surges in demand and shortages during the COVID-19 pandemic.

Action

To support NHS organizations to realize the benefits of a safe transition to using reuseable surgical and isolation gowns, Health Innovation North West Coast published a gown-switching process map *(70)*. This outlines core activities, hints and tips to consider when transitioning to reusable gowns, including:

- securing internal support through advocacy and engagement;
- establishing a baseline of single-use gown use, and calculating expected benefits;
- setting out a clear standard operating procedure to ensure staff and patient safety;
- implementing an inventory control and audit model;
- tracking cost and carbon benefits.

Results

Single-use gowns, identified as one of the most carbon-intensive personal protective equipment items *(71)*, present considerable opportunity to realize carbon and financial savings through increased uptake of reusables. Health Innovation North West Coast described 3 NHS case studies where such cost and carbon benefits are realized.

One hospital site, with 35 operating theatres and more than 1000 beds, was modelled to annually save:

- 100 tonnes CO_2e;
- 20 tonnes of waste;
- 500 m^3 of water;
- £100 000 in procurement and clinical waste costs.

If each trust in England were to replicate these savings, it would deliver emissions reductions of more than 20 000 tonnes CO_2e and cost savings of more than £20 million nationally.

See the full case study published by Health Innovation North West Coast for more information *(70)*.

3.1.3 Replacing high-emission products with low-emission alternatives with equivalent or improved outcomes

For some products supplied to health systems, low- or lower-emission alternatives exist. Before undertaking a change, health systems should ensure the alternatives deliver at least the same level of quality and safety and consider the impact on cost and supply chain resilience. Depending on the product, adopting the alternatives can be simple and involve minimal change for users, such as the use of recycled paper *(72)*, or be more complex and require a change in clinical practice.

This section focuses on two clinical examples that are well-evidenced emission hotspots in health systems where they are used – metered-dose inhalers used for respiratory conditions, and the anaesthetic gas desflurane *(3, 49, 73)*. These examples illustrate how encouraging the use of low carbon alternatives can bring opportunities to reduce costs and improve patient outcomes. Interventions at the health system level in partnership with local procurement and clinical staff can accelerate meaningful progress in these high-emitting areas.

See Annex 1 for further examples.

Reducing the use of metered-dose inhalers

The propellants used in most pressurized metered-dose inhalers are powerful GHGs, with a global warming potential that is 1300–3350 times higher than carbon dioxide *(74)*. Although metered-dose inhalers are indicated in some specific cases, dry-powder inhalers, soft-mist inhalers and nebulizers have a significantly lower carbon footprint and can be offered safely to many people *(74)*. Even within the range of metered-dose inhalers, for the same active ingredient, there are sometimes significant differences between brands, resulting in significantly different carbon footprints *(75)*.

Evidence shows that inhalers are often not used correctly, either due to poor technique or over- or underuse *(76)*. This can lead to worse health outcomes for people with

respiratory conditions, causing them to rely even more on their inhalers. Recognizing the opportunity to improve patient outcomes and reduce environmental impact, primary care and respiratory doctors across many health systems have taken the lead in changing clinical practice to implement the latest evidence and optimize the choice and use of inhalers.

By developing national best practice guidelines and supporting resources in partnership with patients, professional bodies, regulators and national policy-makers, and ensuring best practice is adopted, health systems can ensure high-quality low carbon care is delivered, where inhaler choice improves disease management and reduces the environmental impact of inhalers *(74, 77, 78)*.

The Norwegian Hospital Procurement Trust has taken a different approach. It is supporting clinically phasing out the use of metered-dose inhalers by introducing national procurement levers, which exclude high global warming potential inhalers from hospital tenders *(28)*.

Implementation example 10

Norwegian Hospital Procurement Trust: phasing out use of GHG inhalers in hospitals

Background

Norwegian hospitals have committed to reducing GHG emissions by 40% by 2030. In 2022, inhalers and anaesthetic gases contributed approximately 6 million kg CO_2, with inhalers accounting for 100 000 kg – 60 000 kg from propellants used in salbutamol inhalers alone *(28)*.

To address this, the Norwegian national procurement steering group agreed to phase out desflurane and metered-dose inhalers containing propellants with high global warming potential. The decision to phase out metered-dose inhalers with high global warming potential was made in 2023 and implemented in hospital tenders from 2025.

Action

Before the decision, the procurement team assessed the clinical and operational impact of excluding high-impact metered-dose inhalers from tenders. The team identified that most people in hospitals used facility-administered inhalers only temporarily, and then they were typically discarded.

Clinician input confirmed that nebulizers were widely available and often preferred. Switching to nebulizers would also reduce costs, because hospitals could dispense single-dose units rather than paying for multidose inhaler devices.

The recommendation was to prioritize nebulizers, with dry-powder inhalers as an alternative for capable patients with specific indications. Metered-dose inhalers remained available for exceptional medical cases but were excluded from tender contracts.

A tender was published in 2025 requiring inhalers to be free from GHGs. The results and rationale were shared with all hospitals. Exceptional provision for people who require metered-dose inhalers is still possible through wholesale purchasing channels.

Results and lessons learned

Full-year data are required to measure actual impact. Although the total direct emissions reduction within hospitals is likely to be modest, the broader potential impact of similar actions outside hospital settings is significant.

Early feedback from clinicians included both strong support and the identification of practical challenges. These concerns are largely based on individual patient preferences and familiarity rather than clinical necessity.

Industry has responded positively, accelerating development of alternative propellants with lower global warming potential and other delivery systems.

Salbutamol for nebulizers is supplied by only one provider in Norway. To ensure continued access, supply chain resilience is actively monitored.

Hospital pharmacists required support to communicate the move to more sustainable healthcare to clinical staff. Training and background materials were essential.

Both of these actions send a clear signal to the market about future supply and demand and can be particularly effective for countries with high usage of metered-dose inhalers.

Phasing out the use of desflurane

Desflurane is an anaesthetic gas commonly used in some health systems in surgery. It has a much higher global warming potential than readily available, clinically safe and cost-effective alternatives, such as other general anaesthetic gases, and alternative anaesthetic techniques, including total intravenous anaesthesia and regional anaesthesia. Recognizing this environmental impact, anaesthetists across many health systems have taken the lead in changing clinical practice to eliminate the use of desflurane. Building on this momentum, policy-makers in England and Scotland have supported system-wide decommissioning of desflurane *(79, 80)*. The European Union will prohibit the use of desflurane from January 2026 *(81)*. In Australia, the Council of Australian Therapeutic Advisory Groups has released a statement recommending health service organizations and medicines and therapeutic committees consider not listing desflurane on hospital- or state-based formularies *(82)*. For more details on how to use national levers to phase out the use of desflurane, see the ATACH technical case study on reducing pollution from inhalational anaesthetic *(83)* and guidance published by the NHS in England in collaboration with national professional bodies *(79)*.

In health systems where volatile agents such as desflurane are not commonly used for anaesthesia, particularly due to cost constraints, further work is required to implement viable alternatives to current practices, particularly in settings where the use of nitrous oxide is heavily relied on *(84)*.

3.1.4 Key success factors for priority actions

Although many of the initiatives in this section are currently implemented at the health facility level, several common success factors have emerged where action has successfully been scaled to the health system level. Health systems should consider the following when undertaking similar initiatives:

- **Setting priorities:** clearly identifying and communicating high-priority areas helps local teams to focus their efforts where impact is greatest.
- **Clinical leadership:** clinicians should be engaged early and lead change at the local and system levels. This ensures patient safety is maintained and maximizes opportunities to improve patient outcomes, while reducing emissions and costs. Clinician endorsement is critical to monitoring safety, building trust, and driving adoption by peers and patients.
- **Engagement of key partners:** expertise from key trusted partners such as patient advocacy groups and professional organizations (e.g. colleges, societies, associations) is essential for building momentum and buy-in, developing tailored resources, and identifying the most effective channels to reach patients and clinicians. Regulators can also play a key role in enabling national changes in clinical practice.
- **Evidence-based interventions:** adopting clear, evidence-based guidance at the system level helps to build confidence and supports informed decision-making.
- **Cross-professional collaboration:** effective implementation requires coordination across professional specialties and roles. Clinical staff, procurement teams, sustainability leads, estates teams, patients and their representatives all play vital roles in driving change. Collecting and disseminating examples of successful initiatives – for example, through webinars, reports or peer networks – can inspire action and foster collaboration between teams.
- **Supporting resources:** clinical and non-clinical teams and patients should have access to appropriate decision-support tools, educational materials, guidance and training to facilitate the transition.
- **Appropriate policy levers:** strategic policy mechanisms can accelerate adoption. For example, the NHS in England has successfully used financial incentives for primary care organizations to support the rollout of inhaler policies *(85)*.

3.2 Enabling systemic change to optimize demand and use of products

This section is most relevant for:

- ministries of health and national health agencies setting direction and developing and implementing sustainability policies;
- regional and local health systems seeking to decarbonize their supply chains in line with national and international approaches;
- sustainability teams embedded in these organizations.

The actions outlined in Section 3.1 offer valuable low regret opportunities for immediate implementation. Alongside this, health systems should aim to move beyond isolated, product-level interventions and begin to tackle broader systemic barriers and enablers. This shift is critical to driving large-scale, rapid transformation in demand patterns and resource utilization. Coordination across governmental programmes in countries should be considered to drive action at scale at the country level. Alignment and collaboration internationally, such as through ATACH, are also key in sending market signals to improve availability of desired products globally. Table 4 summarizes the key strategic levers. Actions should be prioritized in line with local context, as described in the WHO *Operational framework for building climate resilient and low carbon health systems (10)*.

Table 4. Key systemic levers of change for optimizing demand and use of products

Lever of change	Overview
Prioritize strategic objective alignment	Ensure alignment with wider system and national priorities to maximize benefits, such as improved health outcomes, supply chain resilience and cost-savings; strengthen stakeholder buy-in; and enable coordinated use of resources and efforts
Advance research and innovation	Address knowledge and evidence gaps and foster innovation, in collaboration with key partners Ensure research findings are translated into practice
Identify and align relevant official frameworks	Promote consistency across national and international frameworks to support the use of lower-carbon products and send clear signals to suppliers

Lever of change	Overview
Review procurement processes and engage suppliers	Adapt procurement processes to incentivize low carbon products and services Ensure ongoing dialogue with suppliers to inform these changes and ensure availability of products
Enable access to technical and technological infrastructure	Assess current and future needs for infrastructure and develop implementation plans to support adoption at the facility level
Support change and large-scale adoption	Support and learn from champions and early adopters Facilitate widespread adoption, in collaboration with key partners
Monitor progress and impact	Establish and track key performance indicators to track progress and inform decision-making

3.2.1 Prioritizing strategic objective alignment

Changing buying and prescribing practices and optimizing the use of resources offer opportunities to deliver substantial benefits beyond reducing supply chain emissions. A sustainability and quality improvement approach is useful to consider how an intervention affects the "triple bottom line", encompassing health benefits for patients, costs and sustainability *(86)*. Early identification of these opportunities, particularly when aligned with broader health system and national priorities, is vital. Pursuit of these complementary objectives serves as a critical lever for generating momentum, securing stakeholder buy-in, and maximizing the overall impact of decarbonization efforts.

To mobilize this lever, health systems should consider the following:

- Identify opportunities to better align care and use of medicines and medical products with best practice to improve patient outcomes, improve efficiency and reduce waste.
- Prioritize decarbonization measures that also deliver financial savings. Although some interventions may require upfront investment, they often lead to long-term cost reductions. Collaboration with suppliers is essential to ensure low carbon products are competitively priced or cost-neutral over time.
- Align with broader national priorities, such as boosting local manufacturing, advancing research and innovation, increasing social value generation, reducing modern slavery risk and supporting economic resilience.
- Align with wider government policies and programmes focused on areas such as decarbonization or circular economy.
- Identify opportunities to strengthen supply chain resilience. Decarbonizing the healthcare supply chain – including interventions such as adopting circular consumption over single-use models – reduces dependency on continuous resupply and enhances system robustness.

3.2.2 Advancing research and innovation

Although some high-priority actions have been identified and are well documented, a lot of research and innovation is still needed to enable the identification and adoption of more circular, lower-emission products. Research and innovation are important levers to drive large-scale impactful change and should be done in partnership across health systems.

To mobilize this lever, health systems should consider the following:

- Partner with academic institutions and subject-matter experts to test assumptions and generate robust evidence. Healthcare has unique considerations, but insights from other sectors – particularly those experienced in circular economy practices – can offer valuable perspectives and transferable solutions.
- Identify and address critical knowledge gaps that hinder progress. For example, a more detailed understanding of supply chain emissions can help to pinpoint high-impact areas; comparative LCAs can inform buying and prescribing decisions; and systematic reviews on the safety of reusable or reprocessed products can help to mitigate clinical concerns and build confidence.
- Collaborate with innovation hubs and industry networks to accelerate the development of sustainable product design, circular models and resource-efficient solutions. Particular attention should be given to areas where the absence of viable low carbon alternatives is currently limiting progress.
- Translate evidence into actionable guidance. To support practical implementation, research findings should be synthesized into clear, accessible principles that inform procurement, prescribing and product design decisions across the system.

3.2.3 Identifying and aligning relevant official frameworks

Health system supply chains are shaped by a complex web of local, national and international frameworks, which many suppliers are already accustomed to navigating. These include clinical guidelines, procurement and healthcare policies, environmental criteria and regulations, and technical standards. Aligning to or influencing these frameworks to support the adoption of lower-emission products can be a powerful catalyst for change.

To mobilize this lever, health systems should consider the following:

- Map and assess relevant guidelines, policies, standards and regulations that influence sustainable practices within health systems and the broader public and private sectors. Key areas include environmental policies, medical device and pharmaceutical regulations, and infection prevention and control policies, which play a critical role in enabling more circular and environmentally sustainable health supply models.
- Foster collaboration across stakeholders – including policy-makers, clinical and non-clinical professional bodies, regulators, standards bodies, suppliers, subject-matter experts and peer health systems – to share insights, harmonize approaches, and update or expand existing references to better support sustainable practices.

3.2.4 Reviewing procurement processes and engaging suppliers

Current procurement processes in healthcare have often been set up to maximize quality and availability and minimize immediate costs. Reducing emissions in the supply chain often aligns with these objectives but requires a change in processes to account for longer-term health impact, environmental impacts and cost-savings. Engagement with suppliers is critical to understand these procurement barriers and ensure availability of more sustainable products.

To mobilize this lever, health systems should consider the following:

- Update product specifications to include sustainability criteria, while maintaining access, quality and safety standards (see early-stage criteria in Section 2.2). This can be informed by the principles developed through research or more in-depth analysis of high-emitting products.
- Revise procurement processes to account for longer-term impacts on health, costs and environment, rather than only at the point of purchase. For example, although reusable equipment is often more expensive to purchase, it can prove cheaper after a number of uses compared with single-use alternatives.
- Collaborate with trade associations to identify commercial barriers, signal upcoming changes, and ensure increased availability of more sustainable products.

3.2.5 Enabling access to technical and technological infrastructure

Achieving more efficient resource use and advancing circular practices within health systems often depends on the availability of targeted technical and technological solutions. These may include ordering and prescribing platforms, inventory management systems, storage infrastructure, and facilities for decontamination and laundry services.

To mobilize this lever, health systems should consider the following:

- Identify existing barriers and gaps where specific infrastructure solutions are needed. This includes evaluating current demand and forecasting future requirements *(87)*.
- Assess the current capacity and capability of the health system to deliver these solutions internally, while also exploring opportunities in external markets for potential outsourcing.
- Pilot solutions to test feasibility, measure impact and determine the potential for broader implementation.
- Develop a strategic plan to ensure access to the necessary infrastructure, aligned with the rollout of optimization initiatives and circular supply practices.

3.2.6 Supporting change and large-scale adoption

Achieving behavioural change at scale requires strong stakeholder engagement, effective change management strategies, and deliberate planning for widespread implementation.

To mobilize this lever, health systems should consider the following:

- Establish mechanisms to identify and amplify successful initiatives, early adopters and local champions, while capturing lessons learned and developing case studies to inform broader efforts. Local pilot projects can play a key role in demonstrating return on investment, helping to justify and overcome the challenge of upfront funding requirements.
- Analyse recurring barriers and enabling factors to inform system-level responses. This insight can help refine known levers or reveal new opportunities for intervention.
- Collaborate with professional bodies to co-develop tailored training materials and support resources, aligned with the needs of specific services, specialties, care pathways or professional groups.
- Engage patient representatives and advocacy groups to shape evolving practices and foster wider acceptance and adoption across the system.
- Create and sustain peer networks to facilitate knowledge exchange, reduce duplication of effort and build momentum for change.
- Explore options to allocate dedicated time for sustainability champions – clinical and non-clinical – to lead by example, influence peers and drive local implementation.
- Design and launch targeted awareness campaigns focused on high-emission products, product categories or priority initiatives, aimed at staff and patients to build understanding and support.
- Some waste reduction and reuse activities require upfront investment, which often delivers long-term savings. System-level funding can help to overcome local budget constraints. Alternatively, equipping teams with simple tools to demonstrate potential return on investment can strengthen local business cases.

3.2.7 Monitoring progress and impact

Given the scale and complexity of the transformation required, it is essential to continuously monitor changes in practice, adoption and outcomes to inform dissemination strategies and guide policy priorities.

To mobilize this lever, health systems should consider the following:

- Define key performance indicators to track progress across targeted initiatives and broader system-level changes. These should include metrics for process (e.g. percentage of reuse, organizational engagement) and outcomes (e.g. emissions reductions, cost-savings, patient outcomes). Where data are not available yet, it is critical to invest in the necessary infrastructure – such as data flows and collection systems – to enable effective measurement. For further guidance, see the ATACH guidance on measuring GHG emissions of national health systems *(14)*.
- Use insights from pilot initiatives to model projected impact and support prioritization of future actions.
- Ensure ongoing collaboration with industry to better understand how Scope 3 and product-level emission footprinting is evolving to improve health system measurement and modelling.
- Regularly review the effectiveness of utilized levers, assessing whether they are delivering the intended outcomes and refining approaches accordingly.

4 Conclusion

WHO commissioned this report, recognizing that reducing emissions in the healthcare supply chain is critical to achieving low carbon, climate resilient healthcare. Achieving this requires long-term change, driven by clear policy direction that aligns with market realities and is underpinned by robust engagement.

Taking action to reduce supply chain emissions can make a positive impact beyond climate change. By aligning priorities, making more efficient use of resources, considering broader environmental sustainability and supporting the implementation of best practice, decarbonization efforts can deliver cost-savings, enhance supply chain resilience and improve health outcomes. Contributors to this document have highlighted these broader benefits and want to provide a clear aligned landscape for suppliers to collaborate with health systems on their pathways to climate resilience and low carbon sustainability.

An increasing number of healthcare suppliers are already tackling the GHG emissions associated with their products and operations and have highlighted the importance of a joint and coordinated effort.

Health systems should integrate the impact of climate change into procurement decisions as a core priority to ensure resilience and long-term value for money. Using this report, health systems can identify their next steps in designing and implementing policies that accelerate supplier decarbonization at the corporate and product levels. Collecting GHG emission information through procurement can also support a better understanding of the carbon footprint of a health system, as recommended in the ATACH guidance on measuring GHG emissions of national health systems *(14)*. The examples in this report highlight how health systems are already applying these approaches in practice.

Although supplier action is critical in decarbonizing the healthcare supply chain, health systems also have a part to play in the way they demand and use goods and services. Health systems should focus on both immediate low regret actions and longer-term, greater-effort systemic changes to enable effective and durable emission reduction.

The ATACH Alignment of Procurement Standards Task Team will continue to gather best practice examples and recommendations to support health system action on supply chains. The Task Team will also consider further work on the implementation and impact of the recommended procurement criteria to help support their adoption, and on practical strategies to support a more circular healthcare supply chain.

Significant opportunity lies in wider health system improvement and transformation efforts. By championing planetary and preventive healthcare, reduction in healthcare demand will follow, contributing to sustained reductions in emissions. Actions that promote prevention or early detection therefore also support significant reduction in supply chain emissions, while improving health and well-being.

Actions to reduce supply chain emissions should be taken not in isolation but as a broader action to implement climate mitigation and adaptation measures to develop climate resilient health systems. This report considers different actions to suit different levels of health system performance and GHG emissions. The WHO *Operational framework for building climate resilient and low carbon health systems* provides a guide for navigating these differences and should be considered when implementing the recommendations in this report *(10)*.

Collaboration and partnership working will be increasingly essential. Through streamlining and aligning the policy landscape, health systems send a strong signal to suppliers and support their decarbonization efforts. Work through ATACH and broader collaboration initiatives should continue to support this alignment effort.

Looking ahead, continued cross-country collaboration will be vital to set sector-wide goals and standards, increase transparency and information-sharing, enhance research and innovation, and accelerate progress towards low carbon and climate resilient healthcare. This report supports health systems to take immediate and impactful action, in a coordinated way, to protect the health of populations now and in the future.

References

1 Pörtner H-O, Roberts DC, Tignor M, et al. Climate change 2022: impacts, adaptation and vulnerability working group II contribution to the sixth assessment report of the Intergovernmental Panel on Climate Change. Geneva: Intergovernmental Panel on Climate Change; 2022 (https://www.ipcc.ch/report/ar6/wg2/, accessed 3 November 2025).

2 Gkouliaveras V, Kalogiannidis S, Kalfas D, Kontsas S. Effects of climate change on health and health systems: a systematic review of preparedness, resilience, and challenges. Int J Environment Res Public Health. 2025;22(2):232. https://doi.org/10.3390/ijerph22020232.

3 Health care's climate footprint: how the health sector contributes to the global climate crisis and opportunities for action. Reston, VA: Health Care Without Harm and ARUP; 2019 (https://global.noharm.org/focus/climate/health-care-climate-footprint-report, accessed 15 October 2025).

4 NHS England. Delivering a "net zero" national health service. London: NHS England; 2020 (https://www.england.nhs.uk/greenernhs/publication/delivering-a-net-zero-national-health-service/, accessed 15 October 2025).

5 Eckelman MJ, Huang K, Lagasse R, Senay E, Dubrow R, Sherman JD. Health care pollution and public health damage in the United States: an update. Health Aff (Millwood). 2020;39(12):2071–2079. https://doi.org/10.1377/hlthaff.2020.01247.

6. Decarbonising healthcare supply chains: recommendations on how to drive emissions reductions across healthcare supply chains. Sustainable Markets Initiative Health Systems Task Force; 2022 (https://a.storyblok.com/f/109506/x/c8d17852a1/smi-hstf-supply-chains-whitepaper.pdf, accessed 15 October 2025).

7 World Health Organization. Medicines shortages: global approaches to addressing shortages of essential medicines in health systems. WHO Drug Information. 2016;30(2):180–185 (https://iris.who.int/handle/10665/331028, accessed 15 October 2025).

8 Miller FA, Young SB, Dobrow M, Shojania KG. Vulnerability of the medical product supply chain: the wake-up call of COVID-19. BMJ Qual Saf. 2021;30(4):331–335. https://doi.org/10.1136/bmjqs-2020–012133.

9 Kaplan WA, Hamer DH, Shioda K. The potential impact of climate change on medication access and quality deserves far more attention. One Health. 2025;20:100957. https://doi.org/10.1016/j.onehlt.2024.100957.

10 Operational framework for building climate resilient and low carbon health systems. Geneva: World Health Organization; 2023 (https://www.who.int/publications/i/item/9789240081888, accessed 29 September 2025).

11 WHO guideline on self-care interventions for health and well-being, 2022 revision. Geneva: World Health Organization; 2022 (https://iris.who.int/server/api/core/bitstreams/ebbf577b-d3ff-4a81-b0d9-bdf3b1e9f2ac/content, accessed 15 October 2025).

12 Healthier populations. Geneva: World Health Organization (https://www.who.int/our-work/healthier-populations, accessed 13 October 2025).

13 Alliance for Transformative Action on Climate and Health, World Health Organization, Unitaid. Report of climate resilient and environmentally sustainable supply chains in the health sector expert consultation. Geneva: World Health Organization; 2025 (https://www.who.int/publications/m/item/report-of-climate-resilient-and-environmentally-sustainable-supply-chains-in-the-health-sector-expert-consultation, accessed 15 October 2025).

14 ATACH Measuring greenhouse gas emissions of in national health systems Task Team. Alliance for Transformative Action on Climate and Health; (https://www.atachcommunity.com/resources/resource-repository/measuring-greenhouse-gas-emissions-in-health-systems/, accessed 10 November 2025).

15 First wins library. Alliance for Transformative Action on Climate and Health (https://www.atachcommunity.com/resources/first-wins-library/, accessed 29 September 2025).

16 Novo Nordisk modern slavery statement 2024. Bagsvaerd: Novo Nordisk; 2024 (https://www.novonordisk.com/content/dam/nncorp/global/en/sustainable-business/pdfs/esg-portal/novo-nordisk-modern-slavery-statement-2024.pdf, accessed 15 October 2025).

17 Unitaid, World Health Organization, Alliance for Transformative Action on Climate and Health. Building climate-resilient, environmentally sustainable and low-carbon health supply chains: key priorities for collective action. Geneva: Unitaid; 2025 (https://unitaid.org/uploads/Building-climate-resilient-sustainable-low-carbon-health-supply-chains.pdf, accessed 29 September 2025).

18 European Parliament, Council of the European Union. Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting (text with EEA relevance). Strasbourg and Brussels: European Parliament and Council of the European Union; 2022 (https://eur-lex.europa.eu/eli/dir/2022/2464/oj/eng, accessed 15 October 2025).

19 Sustainable Public Procurement Programme. Paris: One Planet Network (https://www.oneplanetnetwork.org/programmes/sustainable-public-procurement, accessed 9 November 2025).

20 G7 clean energy economy action plan. Brussels: European Council; 2023 (https://www.consilium.europa.eu/en/press/press-releases/2023/05/20/g7-clean-energy-economy-action-plan/, accessed 15 October 2025).

21 Sustainable health in procurement project. New York: United Nations Development Programme (https://savinglivesustainably.org/shipp/shipp.html, accessed 15 October 2025).

22 Five years of a greener NHS: progress and forward look. London: NHS England; 2025 (https://www.england.nhs.uk/long-read/five-years-greener-nhs-progress-forward-look/, accessed 29 September 2025).

23 The untold story of dolutegravir: when climate impact goes hand-in-hand with access to better treatments. Geneva: Unitaid; 2024 (https://unitaid.org/uploads/The-untold-story-of-dolutegravir-When-climate-impact-goes-hand-in-hand-with-access-to-better-treatments.pdf, accessed 29 September 2025).

24 From milligrams to megatons: a climate and nature assessment of ten key health products. Geneva: Unitaid; 2023 (https://unitaid.org/uploads/Report_From-milligrams-to-megatons_A-climate-and-nature-assessment-of-ten-key-health-products.pdf, accessed 29 September 2025).

25 Health sector climate action survey. Washington, DC: National Academy of Medicine (https://nam.edu/product/health-sector-climate-action-survey/, accessed 24 October 2025).

26 Carbon reduction plan template. London: Cabinet Office of the Government of the United Kingdom; 2022 (https://www.gov.uk/government/publications/ppn-006-taking-account-of-carbon-reduction-plans-in-the-procurement-of-major-government-contracts/ppn-006-taking-account-of-carbon-reduction-plans-html#carbon-reduction-plan-template, accessed 24 October 2025).

27 Velázquez Martínez JC, Rajagopalan S, Arnold V, Mora Quinones CA. State of supply chain sustainability 2025. Cambridge, MA: MIT Center for Transportation and Logistics and Council of Supply Chain Management Professionals; 2025 (https://sustainable.mit.edu/sscs-report/, accessed 24 October 2025).

28 Experience report: environmental requirements for pharmaceutical procurements 2022–2023. Vadsø: Norwegian Hospital Procurement Trust; 2024 (https://www.sykehusinnkjop.no/4937c6/siteassets/bilder/nyheter/2024/miljokrav-legemidler-rapport/erfaringsrapport-miljo-2023_engelsk-versjon.pdf, accessed 29 September 2025).

29 Jahre M, van Oorschot K, Årdal C, Sverrisson E, Pettersen MS, Wangen A. Sustainable pharmaceutical procurement: environmental tendering criteria for better or worse? J Purchasing Supply Management. 2025:101081. https://doi.org//10.1016/j.pursup.2025.101081.

30 Greenhouse gas protocol: a corporate accounting and reporting standard. Geneva and Washington, DC: World Business Council for Sustainable Development and World Resources Institute; 2004 (https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf, accessed 15 October 2025).

31 Planification écologique du système de santé [in French]. Paris: Government of France; 2023 (https://sante.gouv.fr/IMG/pdf/dp_pess.pdf, accessed 15 October 2025).

32 HSE green procurement strategic framework. Dublin: Health Service Executive (https://www.hse.ie/eng/about/who/climate-and-health/hse-climate-strategic-framework-green-procurement.pdf, accessed 15 October 2025).

33 NHS social value playbook. London: NHS England; 2025 (https://www.england.nhs.uk/long-read/nhs-social-value-playbook/, accessed 15 October 2025).

34 Carbon reduction plan and net zero commitment requirements for the procurement of NHS goods, services and works. London: NHS England; 2025 (https://www.england.nhs.uk/long-read/carbon-reduction-plan-requirements-for-the-procurement-of-nhs-goods-services-and-works/, accessed 15 October 2025).

35 The net zero supplier roadmap. Vadsø: Norwegian Hospital Procurement Trust (https://www.sykehusinnkjop.no/nyheter/nyheter-2025/status-for-veikart-for-netto-null/#the-net-zero-supplier-roadmap-in-english-text-version, accessed 24 October 2025).

36 SBTi corporate net-zero standard. London: Science Based Targets Initiative (https://files.sciencebasedtargets.org/production/files/Net-Zero-Standard.pdf?dm=1757950109&_gl=1*1o65cdb*_gcl_au*NDM4Nzk3NDU2LjE3NTk2NjYzMTg.*_ga*MTYwOTMyMDQwMC4xNzQ4MzYwMDU1*_ga_22VNHNTFT3*czE3NjEyNTMxMjYkbzE0JGcwJHQxNzYxMjUzMTI2JGo2MCRsMCRoMTg1Njc3ODUyMw, accessed 24 October 2025).

37 Rodríguez-Jiménez L, Romero-Martín M, Spruell T, Steley Z, Gómez-Salgado J. The carbon footprint of healthcare settings: a systematic review. J Adv Nurs. 2023;79(8):2830–2844. https://doi.org//10.1111/jan.15671.

38 Greenhouse Gas Protocol: product life cycle accounting and reporting standard. Washington, DC: World Resources Institute and World Business Council for Sustainable Development; 2011 (https://ghgprotocol.org/sites/default/files/standards/Product-Life-Cycle-Accounting-Reporting-Standard_041613.pdf, accessed 15 October 2025).

39 Environmental management: life cycle assessment – requirements and guidelines. Geneva: International Organization for Standardization; 2006 (https://www.iso.org/standard/38498.html, accessed 15 October 2025).

40 PAS 2050:2011 specification for the assessment of the life cycle greenhouse gas emissions of goods and services. London: British Standards Institution; 2011 (https://knowledge.bsigroup.com/products/specification-for-the-assessment-of-the-life-cycle-greenhouse-gas-emissions-of-goods-and-services, accessed 15 October 2025).

41 PAS 2090 pharmaceutical products: product category rules for environmental lifecycle assessments – specification. London: British Standards Institution (https://standardsdevelopment.bsigroup.com/projects/9025–12045, accessed 15 October 2025).

42 Methodology for assessing the carbon footprint of medicines. Paris: Ministry of the Economy, Finance, and Industrial and Digital Sovereignty of France; 2025 (https://www.entreprises.gouv.fr/la-dge/publications/methodologie-devaluation-de-lempreinte-carbone-des-medicaments, accessed 29 September 2025).

43 Suppliers. London: NHS England (https://www.england.nhs.uk/greenernhs/get-involved/suppliers/, accessed 15 October 2025).

44 Validation services. London: Science Based Targets Initiative (https://sciencebasedtargets.org/validation-services, accessed 15 October 2025).

45 Net Zero and Sustainable Procurement Team webinar programme. London: NHS England (https://www.events.england.nhs.uk/net-zero-and-sustainable-procurement-team-webinar-programme, accessed 15 October 2025).

46 Reducing supplier driven emissions in the healthcare supply chain: technical case study from the NHS England. Alliance for Transformative Action on Climate and Health (https://www.atachcommunity.com/resources/first-wins-library/reducing-supplier-driven-emissions-in-the-healthcare-supply-chain/, accessed 29 September 2025).

47 National health and climate strategy. Canberra: Australian Government Department of Health, Disability and Ageing; 2023 (https://www.health.gov.au/resources/publications/national-health-and-climate-strategy?language=en, accessed 15 October 2025).

48 Estimates of Australian health system greenhouse gas emissions 2021–22. Canberra: Australian Government Department of Health, Disability and Ageing; 2025 (https://www.health.gov.au/resources/publications/estimates-of-australian-health-system-greenhouse-gas-emissions-2021–22?language=en, accessed 29 September 2025).

49 Tennison I, Roschnik S, Ashby B, Boyd R, Hamilton I, Oreszczyn T, et al. Health care's response to climate change: a carbon footprint assessment of the NHS in England. Lancet Planet Health. 2021;5(2):e84–e92. https://doi.org/10.1016/S2542–5196(20)30271–0.

50 HSE climate action strategy 2023–2050. Dublin: Health Service Executive; 2023 (https://www.hse.ie/eng/about/who/climate-and-health/hse-climate-action-strategy-2023–50.pdf, accessed 15 October 2025).

51 HSE procurement: case study – HSE Green Procurement Strategic Framework. Dublin: Health Service Executive (https://www.hse.ie/eng/about/who/finance/nationalfinance/procurement/hse-green-procurement-strategic-framework.pdf, accessed 15 October 2025).

52 Waste Framework Directive. Brussels: European Commission (https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en#ref-2023-amendment-to-the-waste-framework-directive, accessed 9 October 2025).

53 The butterfly diagram: visualising the circular economy. Ellen MacArthur Foundation (https://www.ellenmacarthurfoundation.org/circular-economy-diagram, accessed 15 October 2025).

54 Thiel CL, Schehlein E, Ravilla T, Ravindran RD, Robin AL, Saeedi OJ, et al. Cataract surgery and environmental sustainability: waste and lifecycle assessment of phacoemulsification at a private healthcare facility. J Cataract Refract Surg. 2017;43(11):1391–1398. https://doi.org/10.1016/j.jcrs.2017.08.017.

55 Promoting rational use of medicines. Geneva: World Health Organization (https://www.who.int/activities/promoting-rational-use-of-medicines/, accessed 15 October 2025).

56 Medication without harm: policy brief. Geneva: World Health Organization; 2024 (https://www.who.int/publications/i/item/9789240062764, accessed 15 October 2025).

57 National overprescribing review report. London: United Kingdom Department of Health and Social Care; 2021 (https://www.gov.uk/government/publications/national-overprescribing-review-report, accessed 15 October 2025).

58 Polypharmacy reviews to improve patient outcomes and healthcare sustainability: technical case study from NHS Scotland. Alliance for Transformative Action on Climate and Health (https://www.atachcommunity.com/resources/first-wins-library/polypharmacy-reviews-to-improve-patient-outcomes-and-healthcare-sustainability-1/, accessed 29 September 2025).

59 From ambition to action: sustainable use of medicines in healthcare. Dutch Green Deal; 2025 (https://www.greendealduurzamezorg.nl/service/nieuws/routekaart-duurzaam-geneesmiddelgebruik/, accessed 15 October 2025).

60 Otaigbe II, Elikwu CJ. Drivers of inappropriate antibiotic use in low- and middle-income countries. JAC Antimicrob Resist. 2023;5(3):dlad062. https://doi.org/10.1093/jacamr/dlad062.

61 Reducing nitrous oxide emissions and waste. technical case study from NHS Scotland. Alliance for Transformative Action on Climate and Health (https://www.atachcommunity.com/resources/first-wins-library/reducing-nitrous-oxide-emissions-and-waste/, accessed 29 September 2025).

62 E Kayak, F McGain, H Burch, Dunne B, Gu Y, Davies J, et al. Detecting and reducing leaks from nitrous oxide in healthcare facilities: a practical guide. Canberra: Interim Australian Centre for Disease Control and Department of Health and Aged Care; 2024 (https://www.health.gov.au/resources/publications/detecting-and-reducing-leaks-from-nitrous-oxide-in-healthcare-facilities-a-practical-guide?language=en, accessed 29 September 2025).

63 Statement on deactivating central piped nitrous oxide to mitigate avoidable health care pollution. Washington, DC: American Society of Anesthesiologists; 2024 (https://www.asahq.org/standards-and-practice-parameters/statement-on-deactivating-central-piped-nitrous-oxide-to-mitigate-avoidable-health-care-pollution, accessed 15 October 2025).

64 UCLPartners, NHS England. Nitrous oxide toolkit: reducing waste in NHS trusts. London: UCLPartners (https://uclpartners.com/project/nitrous-oxide-toolkit-reducing-waste-in-nhs-trusts/, accessed 29 September 2025).

65 Case study: using best practice technology to reduce healthcare food waste. Dublin: GreenHealthCare; 2025 (https://greenhealthcare.ie/wp-content/uploads/2025/07/AI-Food-Waste-CS-A4–4.pdf, accessed 29 September 2025).

66 Preventing waste in the healthcare sector. Banbury, United Kingdom: Waste and Resources Action Programme; 2021 (https://www.wrap.ngo/resources/report/preventing-waste-healthcare-sector, accessed 29 September 2025).

67 Healthcare expenditure, UK health accounts: 2023 and 2024. London: Office for National Statistics; 2025 (https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthcaresystem/bulletins/ukhealthaccounts/2023and2024#provisional-estimates-of-healthcare-expenditure-in-2024, accessed 15 October 2025).

68 NHS clinical waste strategy. London: NHS England; 2023 (https://www.england.nhs.uk/estates/nhs-clinical-waste-strategy/, accessed 15 October 2025).

69 Rizan C, Lillywhite R, Reed M, Bhutta MF. The carbon footprint of products used in five common surgical operations: identifying contributing products and processes. J Roy Soc Med. 2023;116(6):199–213. https://doi.org/10.1177/01410768231166135.

70 Health Innovation North West Coast, NHS England. A health innovation North West Coast report for the NHS England Net Zero and Sustainable Procurement Team: understanding the benefits of a switch from single-use to reusable surgical and isolation gowns. Daresbury, United Kingdom: Health Innovation North West Coast; 2020 (https://www.healthinnovationnwc.nhs.uk/media/News/2024/REUSABLE%20SURGICAL%20GOWNS%20REPORT%20Jan%2024.pdf, accessed 15 October 2025).

71 Rizan C, Reed M, Bhutta MF. Environmental impact of personal protective equipment distributed for use by health and social care services in England in the first six months of the COVID-19 pandemic. J R Soc Med. 2021;114(5):250–263. https://doi.org/10.1177/01410768211001583.

72 Tomberlin KE, Venditti R, Yao Y. Life cycle carbon footprint analysis of pulp and paper grades in the United States using production-line-based data and integration. Bioresources. 2020;15(2):3899–3914. https://doi.org/10.15376/biores.15.2.3899–3914.

73 Let's decarbonize the economy! The Shift Project. (https://theshiftproject.org/en/, accessed 15 October 2025).

74 British Thoracic Society, National Institute for Health and Care Excellence, Healthcare Improvement Scotland. Asthma inhalers and climate change: patient decision aid. Manchester: National Institute for Health and Care Excellence; 2024 (https://www.nice.org.uk/guidance/ng245/resources/patient-decision-aid-on-asthma-inhalers-and-climate-change-bts-nice-sign-pdf-13558151917, accessed 15 October 2025).

75 Bulletin 295: inhaler carbon footprint. Leeds: PrescQIPP https://www.prescqipp.info/our-resources/bulletins/bulletin-295-inhaler-carbon-footprint/, accessed 15 October 2025).

76 Inhaler technique for people with asthma or COPD. Melbourne: National Asthma Council Australia; 2016 (https://extranet.who.int/ncdccs/Data/AUS_D1_Inhaler_Technique_Infopaper-FULL-UPDATED-11–1.pdf, accessed 15 October 2025).

77 NICE guideline NG244: asthma pathway. Manchester: National Institute for Health and Care Excellence; 2024 (https://www.nice.org.uk/guidance/ng244/chapter/Managing-chronic-asthma, accessed 15 October 2025).

78 Global strategy for asthma management and prevention. Fontana, WI: Global Initiative for Asthma; 2024 (https://ginasthma.org/wp-content/uploads/2024/05/GINA-2024-Strategy-Report-24_05_22_WMS.pdf, accessed 15 October 2025).

79 Guidance: desflurane decommissioning and clinical use. London: NHS England; 2024 (https://www.england.nhs.uk/long-read/guidance-desflurane-decommissioning-and-clinical-use/, accessed 29 September 2025).

80 Centre for Sustainable Delivery, NHS Scotland. NHS Scotland first in world to “clean up” anaesthetic gases. Clydebank, United Kingdom: NHS Centre for Sustainable Delivery; 2023 (https://www.nhscfsd.co.uk/news/nhs-scotland-first-in-world-to-clean-up-anaesthetic-gases/, accessed 29 September 2025).

81 Consolidated text: Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024 on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014 (Text with EEA relevance). Brussels: European Union; 2024 (https://eur-lex.europa.eu/eli/reg/2024/573/2024-02-20, accessed 3 November 2025).

82 Formulary listing of desflurane. Council of Australian Therapeutic Advisor Groups (https://catag.org.au/resource/desflurane/, accessed 24 October 2025).

83 Devlin-Hegedus JA, McGain F, Harris RD, Sherman JD. Reducing pollution from inhalational anesthetics: technical case study. Alliance for Transformative Action on Climate and Health (https://www.atachcommunity.com/resources/first-wins-library/reducing-pollution-from-inhalational-anesthetics/#c5656, accessed 29 September 2025).

84 Sharma A, Puri GD, Chauhan R, Luthra A, Khurana G, Hazarika A, et al. Nitrous oxide splurge in a tertiary health care center and its environmental impact: no more laughing stock. J Dent Anesth Pain Med. 2024;24(1):67–73. https://doi.org/10.17245/jdapm.2024.24.1.67.

85 Promoting high quality, low carbon respiratory care by optimizing the use of inhalers: technical case study from NHS England. Alliance for Transformative Action on Climate and Health (https://www.atachcommunity.com/resources/first-wins-library/promoting-high-quality-low-carbon-respiratory-care-by-optimizing-the-use-of-inhalers/, accessed 29 September 2025).

86 About SusQI. Oxford: Centre for Sustainable Healthcare (https://www.susqi.org/, accessed 15 October 2025).

87 Physical and digital infrastructure. In: Design for Life roadmap. United Kingdom Department of Health and Social Care; 2025 (https://www.gov.uk/government/publications/design-for-life-roadmap/design-for-life-roadmap--4#physical-and-digital-infrastructure-2, accessed 15 October).

Annex 1. Key resources

General resources to support decarbonizing the healthcare supply chain

- Resource repository. Alliance for Transformative Action on Climate and Health.
- Country documents repository. Alliance for Transformative Action on Climate and Health.
- First wins library. Alliance for Transformative Action on Climate and Health.
- ATACH guidance for GHG measurement. Alliance for Transformative Action on Climate and Health; forthcoming.
- Procurement resources. Reston, VA: Healthcare Without Harm.
- SBTi glossary version 1.2. London: Science Based Targets Initiative.
- Glossary. In: Greenhouse gas protocol: a corporate accounting and reporting standard. Geneva and Washington, DC: World Business Council for Sustainable Development and World Resources Institute; 2004.

Accelerating supplier decarbonization through procurement

Standards, technical guidance and supporting resources

- GHG Protocol corporate accounting and reporting standard. Geneva and Washington, DC: World Business Council for Sustainable Development and World Resources Institute; 2004.
- GHG Protocol corporate value chain (Scope 3) standard. Geneva and Washington, DC: World Business Council for Sustainable Development and World Resources Institute.
- The corporate net-zero standard. London: Science Based Targets Initiative; 2025.
- Resource library. London: Science Based Targets Initiative.
- Greenhouse Gas Protocol: product life cycle accounting and reporting standard. Washington, DC: World Resources Institute and World Business Council for Sustainable Development; 2011.
- ISO 14044:2006. Environmental management: life cycle assessment – requirements and guidelines. Geneva: International Organization for Standardization; 2006.
- PAS 2050:2011. Specification for the assessment of the life cycle greenhouse gas emissions of goods and services. London: British Standards Institution; 2011.

- PAS 2090. Pharmaceutical products: product category rules for environmental lifecycle assessments – specification. London: British Standards Institution; in development.
- Resources. London: Pharmaceutical Supply Chain Initiative.
- Decarbonising healthcare: how a competitive medical technology industry can contribute. Brussels: MedTech Europe; 2025.
- Climate journey map: supplier pathway. Washington, DC: National Academy of Medicine.
- Health sector climate action survey. Washington, DC: National Academy of Medicine.
- Start your journey to net zero. SME Climate Hub.
- Greenhouse gas (GHG) emissions sectoral guidance. Nyon, Switzerland: Global Self-Care Federation.

Country-specific sustainable procurement policies, guidance and supporting resources

- Achats durables. In: Planification écologique du système de santé [in French]. Paris: Government of France; 2023.
- Carbon footprint of medicines: assessment methodology. Paris: Government of France; 2023.
- HSE green procurement strategic framework. Dublin: Health Service Executive.
- HSE procurement: case study – HSE Green Procurement Strategic Framework. Dublin: Health Service Executive.
- NHS net zero supplier roadmap. London: NHS England; 2023.
- Reducing supplier driven emissions in the healthcare supply chain: technical case study from the NHS England. Alliance for Transformative Action on Climate and Health.
- NHS social value playbook. London: NHS England.
- Carbon reduction plan and net zero commitment requirements for the procurement of NHS goods, services and works. London: NHS England; 2025.
- Net zero and sustainable procurement team webinar programme. London: NHS England.
- Procurement of goods and services. In: Roadmap for sustainable, low-emission and climate-adapted health and care services. Oslo: Norwegian Directorate of Health.
- Bærekraft – Sykehusinnkjøp HF [in Norwegian]. Vadsø: Norwegian Hospital Procurement Trust.
- The net zero supplier roadmap. Vadsø: Norwegian Hospital Procurement Trust.
- Experience report: environmental requirements for pharmaceutical procurements 2022–2023. Vadsø: Norwegian Hospital Procurement Trust; 2024.
- Sustainability criteria for public procurement: medical devices. Helsinki: Kriteeripankki.
- Find sustainability criteria. Solna: Sweden: National Agency for Public Procurement.
- Sustainable procurement. Hamilton, ON: Canadian Coalition for Green Healthcare.

Sustainable procurement in healthcare

- Sustainable health procurement guidance note. New York: United Nations Development Programme; 2020.
- Procuring for greener pharma. Brussels: Healthcare Without Harm.
- Broader sustainable procurement resources
- Green public procurement toolkit. Brussels: European Commission.
- Harnessing public procurement for the green transition. Paris: Organisation for Economic Co-operation and Development; 2024.
- BS ISO 20400:2017. Sustainable procurement guidance. London: British Standards Institution; 2017.

Optimizing demand and usage of supplies

Identifying high-emission products or categories and actionable levers for change

- A database of healthcare's environmental impacts. Healthcare LCA.
- From milligrams to megatons: a climate and nature assessment of ten key health products. Geneva: Unitaid; 2023.
- Green surgery report: products used in surgical care. London: UK Health Alliance on Climate Change.

Reducing waste and increasing circularity

- Polypharmacy reviews to improve patient outcomes and healthcare sustainability: technical case study from NHS Scotland. Alliance for Transformative Action on Climate and Health.
- From ambition to action: sustainable use of medicines in healthcare. Dutch Green Deal; 2025.
- Reducing nitrous oxide emissions and waste. technical case study from NHS Scotland. Alliance for Transformative Action on Climate and Health.
- E Kayak, F McGain, H Burch, Dunne B, Gu Y, Davies J, et al. Detecting and reducing leaks from nitrous oxide in healthcare facilities: a practical guide. Canberra: Interim Australian Centre for Disease Control and Department of Health and Aged Care; 2024.
- Statement on deactivating central piped nitrous oxide to mitigate avoidable healthcare pollution. Washington, DC: American Society of Anesthesiologists; 2024.
- UCLPartners, NHS England. Nitrous oxide toolkit: reducing waste in NHS trusts. London: UCLPartners.
- Case study: using best practice technology to reduce healthcare food waste. Dublin: GreenHealthCare; 2025.
- Preventing waste in the healthcare sector. Banbury, United Kingdom: Waste and Resources Action Programme; 2021.
- Waste Framework Directive. Brussels: European Commission.

- The butterfly diagram: visualising the circular economy. Ellen MacArthur Foundation.
- Circular healthcare resources. Healthcare Without Harm.
- HSE procurement case study: clinical waste initiative. Dublin: Health Service Executive.
- Health Innovation North West Coast, NHS England. A health innovation North West Coast report for the NHS England Net Zero and Sustainable Procurement Team: understanding the benefits of a switch from single-use to reusable surgical and isolation gowns. Daresbury, United Kingdom: Health Innovation North West Coast; 2020.
- Reducing single-use materials in medicine and healthcare. Ghent: Ghent University for the Federal Public Service for Health, Food Chain Safety and Environment, the Directorate-General for the Environment; 2023.

Replacing use of high-emission products with low-emission alternatives with equivalent or improved outcomes

- British Thoracic Society, National Institute for Health and Care Excellence, Healthcare Improvement Scotland. Asthma inhalers and climate change: patient decision aid. Manchester: National Institute for Health and Care Excellence; 2024.
- NICE guideline NG244: asthma pathway. Manchester: National Institute for Health and Care Excellence; 2024.
- Global strategy for asthma management and prevention. Fontana, WI: Global Initiative for Asthma; 2024.
- Centre for Sustainable Delivery, NHS Scotland. NHS Scotland first in world to "clean up" anaesthetic gases. Clydebank, United Kingdom: NHS Centre for Sustainable Delivery; 2023.
- Guidance: desflurane decommissioning and clinical use. London: NHS England; 2024.

Enabling systemic change to optimize demand and use of products

- Design for Life roadmap. United Kingdom Department of Health and Social Care; 2025.
- Policy brief: reducing the environmental impact of medical devices adopted for use in the NHS. Brighton: Brighton and Sussex Medical School, University of Sussex; 2024.
- Van Straten B, Bruno B, Horeman TU. Transitioning towards a circular (healthcare) economy: circular economy principles, leadership, policy and decision-making. Delft, Netherlands: TU Delft Open Books; 2025.

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