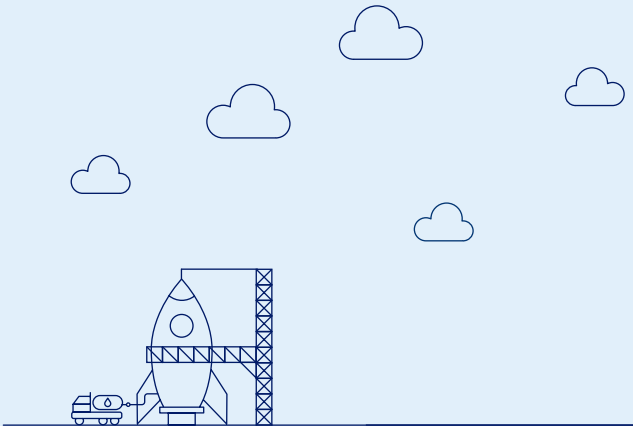
Valuing the environment:

Global progress towards recognising the environmental impact of healthcare technologies



Contents:

Executive Summary

With the healthcare sector contributing ~4–5% of global greenhouse gas emissions (1), there is an urgent need to identify and accelerate strategies that support population and environmental health. The recognition of the environmental value of healthcare technologies and processes, and the incorporation of this into decision-making, represents a critical step forward. Novo Nordisk produced this white paper to shed light on current environmental considerations for healthcare systems globally, as well as best practice examples and recommendations to sustain momentum and drive sustainability in healthcare.

To do this, we assessed progress regarding the recognition of the environmental value of healthcare technologies and processes across 13 countries. The research looked at the inclusion of environmental and sustainability criteria in healthcare decision-making including health technology assessment (HTA) processes, during procurement, in treatment guidelines, and at the point of prescribing decisions, identifying multiple promising avenues for change and advancement.

The review also illustrated the importance of working towards a care pathway approach for environmentally sustainable healthcare. This holistic approach goes beyond focusing on single technologies, and instead quantifies the environmental impact of the entire care pathway. By considering not only the carbon footprint of the technology itself, but at key touchpoints throughout the pathway across all care settings, sustainable care pathways can be identified, implemented, and upscaled. Additionally, this approach empowers patients and healthcare providers to make informed decisions about sustainable and effective treatment options.

In light of these findings, this whitepaper outlines recommendations for how to minimise the environmental footprint of healthcare. Notably, by encouraging the pharmaceutical industry to leverage the scale and international reach of their organisations to drive cross-sector collaboration (for instance with payers, regulators, public authorities, healthcare professionals, academic institutions), amplifying examples of best practice, and inspiring healthcare systems to adopt or scale environmentally responsible approaches.

Recognising this cannot be done alone, Novo Nordisk is actively engaging in industry-wide initiatives and cross-sector collaboration to accelerate collective progress. Sustaining this momentum is essential, not only for the future of healthcare, but for the health of populations and the planet alike.

Introduction

A healthier future depends on recognising that environmental stewardship is integral to advancing human health

Though the environment is relevant to all sectors of industry, it is especially relevant to healthcare. Human health and patient outcomes are heavily affected by the environment; for example, the World Health Organization estimates that nearly a quarter of global deaths are caused by environmental pollution or risks (2). Healthcare itself also has an impact on the environment, contributing ~4–5% of global greenhouse gas emissions, which is on par with or greater than emissions from all flights (~2–5%) (1). Given the high and rising prevalence of chronic diseases, reducing the environmental footprint of patient care pathways could have a substantial effect on the broader environmental impact of healthcare.

One example of how health and the environment interact in a vicious cycle is the relationship between asthma and greenhouse gas emissions. The effects of climate change (e.g. greater air pollution) increase the number and severity of asthma attacks, and in rare cases, trigger asthma-like symptoms in people without diagnosed asthma (3-5). Many asthma inhalers release greenhouse gases either when used or if not disposed of properly, and so asthma treatments often contribute further to climate change. This can then cause poor asthma control and increased asthma incidence, resulting in the need for more inhalers (Figure 1) (6-8). With over 200 million people living with asthma globally, the health impact specific to climate change is likely to be vast, and could be a major concern (9, 10). Asthma is just one example of how health and climate change influence one another, and the health impact will be felt across numerous other diseases beyond asthma (11-16). To break the cycle, strategies that concurrently support population and environmental health are critical.

Figure 1: Climate and asthma – A vicious cycle

Increasing air pollution and more frequent storms leading to 'thunderstorm asthma'

= Worsening asthma severity and increasing asthma incidence

Hydrofluorocarbon gases used in inhalers are potent GHGs. Some 120-dose inhalers† are equivalent to a 115-mile petrol car journey

= Increasing GHGs and global temperature

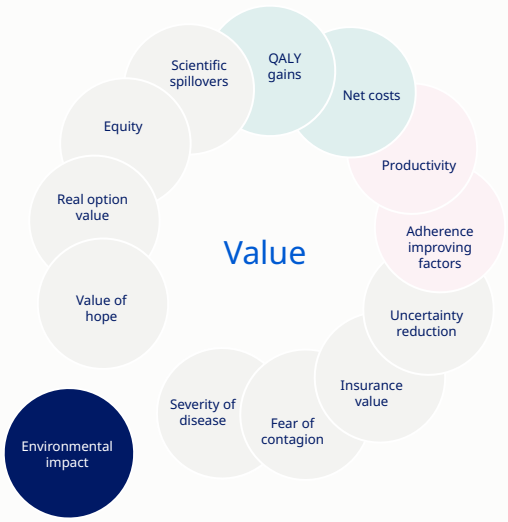
Abbreviations: GHG, greenhouse gas.
† 120-dose Flutiform® or Symbicort® metered dose inhalers emit (~35 kg CO_2e).
Source: Cecchi et al (2010) (3); D'Amato et al (2015) (4); NICE, BTS, and SIGN (2024) (7); Thien et al (2018) (5); and Woodcock et al (2022) (6). Koch et al (2021) (14); GBD collaborators (2025) (17); IPCC (2022) (18).

To establish long-term improvements in the environmental footprint of patient care pathways, environmental considerations need to be incorporated into value assessments and healthcare decision-making. This approach may help break reinforcing feedback loops – such as the one illustrated in Figure 1 – by simultaneously prioritising health outcomes and environmental sustainability.

Historically, the focus of value assessments has been on factors such as safety, efficacy, and cost, with limited analysis of any aspects of broader societal value, including the environment (19). Considering a wide range of values, such as those in the Professional Society for Health Economics and Outcomes Research (ISPOR) value flower (Figure 2), ensures that healthcare value goes beyond simply costs and benefits, recognising the role that healthcare activities and value assessments play in contributing to improved patient outcomes and population health. In the past, environmental factors have often been underrepresented in value frameworks, even when societal elements are considered. Yet their influence on the sustainability of healthcare systems – and their wider role in supporting human life and development – makes a compelling case for their formal inclusion.

Broadening value assessments to include the environment means a step change in how the whole field of healthcare perceives the value of technologies and care processes, but this is likely to be readily accepted by wider society if health outcomes are not compromised. By recognising the environment as a distinct and essential dimension, value assessments would be aligned with long-term system resilience and environmental responsibility.

Figure 2: Environmental impact – A new petal on the ISPOR value flower?



Abbreviations: ISPOR, Professional Society for Health Economics and Outcomes Research; QALY, quality-adjusted life year.
Green petals: core elements of value; pink petals: common but inconsistently applied elements of value; white petals: other potential elements of value; dark blue petal: new element proposed.
Adapted from Lakdawalla et al (2018) (19).

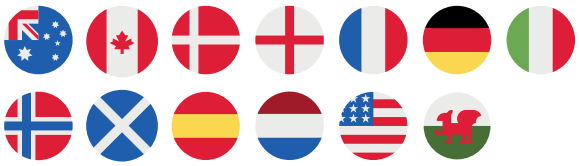
In addition to individual value assessments which may focus more on assessing the carbon footprint attributable to a specific health care technology, we must also consider the environmental impact of healthcare technologies on the whole patient care pathway. The care pathway approach advocates for the importance of minimising emissions associated with patient care across the entire treatment journey, as well as considering how product efficacy and healthcare efficiency can support patient carbon footprint reductions. For example, a simple comparison between two medicines might identify the option with the lowest greenhouse gas emissions during production, but if the use of this medicine results in additional admissions or procedures that require the use of anaesthetic greenhouse gases, the 'low emissions' option could ultimately have the largest footprint. This gold-standard approach of looking at the whole patient care pathway allows environmental impact to be assessed at each stage, with changes and innovation applied where greatest reductions in the environmental footprint of healthcare can be made.

Balancing the need to reduce the environmental impact of medicines with that of delivering effective, life-saving medicines to vulnerable people is essential, and as such is a priority for Novo Nordisk. To quantify the environmental impact of healthcare technologies and processes, an evaluation of global progress on environmental impact assessment (EIA) was conducted, with a focus on the inclusion of environmental criteria in HTA processes, during procurement, in treatment guidelines and healthcare decision-making, and across care pathways.

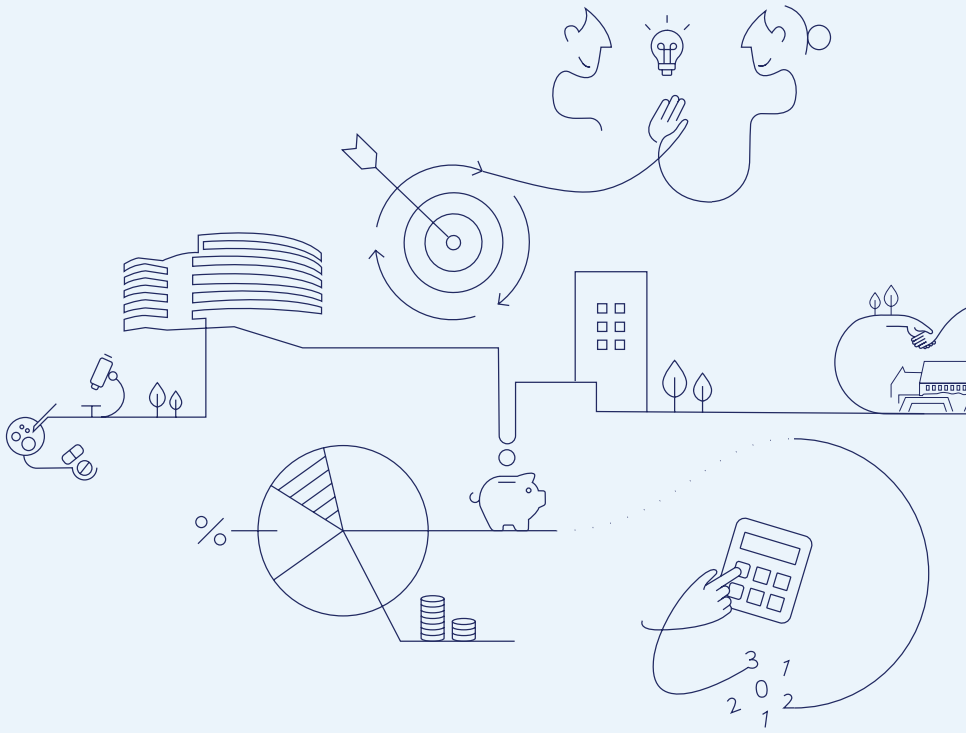
To minimise the environmental footprint of healthcare more broadly, Novo Nordisk is committed to encouraging innovative thinking and the advancement of sustainable practices. As such, this white paper highlights current initiatives and examples of best practice to enable patients and healthcare providers to make informed decisions about effective and sustainable treatment options, bolster momentum on these critical issues, and drive sustainability in healthcare.

Methodology

13 countries (Australia, Canada, Denmark, England, France, Germany, Italy, Norway, Scotland, Spain, the Netherlands, US, and Wales) were selected for evaluation based on their position as developed nations that are known to be global leaders in healthcare and/or environmental sustainability.



A targeted search of national HTA agencies or government bodies was conducted to identify policies, position statements, or guidelines addressing environmental impact or sustainability issues. A glossary of each HTA body is presented in the Appendix. The analysis focused on progress towards the incorporation of environmental sustainability criteria in HTA methodologies, but approaches taken towards sustainable procurement, treatment guidelines, and care pathways were also noted. A review of proposed health economic methodologies for including environmental evidence in health technology appraisals was also conducted.



Global progress

Despite broad consensus to act on key environmental issues, global healthcare systems have variations in their approaches and strategies

In 2015, global governments made a legally binding commitment to address global warming as part of the Paris Climate Agreement (20). As the healthcare sector contributes almost 5% of net global climate emissions, this sector has a responsibility to make changes that combat climate change (21). In 2021, the 26th United Nations Climate Change Conference of the Parties (COP26) Health Programme aimed to encourage this transformation, with nations making a commitment to achieve climate-resilient low carbon or net zero healthcare systems (22). The Alliance for Transformative Action on Climate and Health (ATACH) was established to harmonise activity across World Health Organization member states and ensure progress against the commitments set at COP26 (23).

Additionally, environmental commitments are being embedded into healthcare systems' legislative structures. For example, the UK National Health Service (NHS) was the first national health system to commit to becoming net zero by 2045 (24, 25). Such commitments have enabled the NHS in England and Scotland to be the only known healthcare systems globally to have successfully reduced their carbon footprint from baseline (26).
To evaluate global progress towards recognising environmental criteria in healthcare decision-making since the adoption of the Paris Climate Agreement and COP26 Health Programme commitments, environmental and sustainable approaches were assessed against four key domains (see Figure 3):

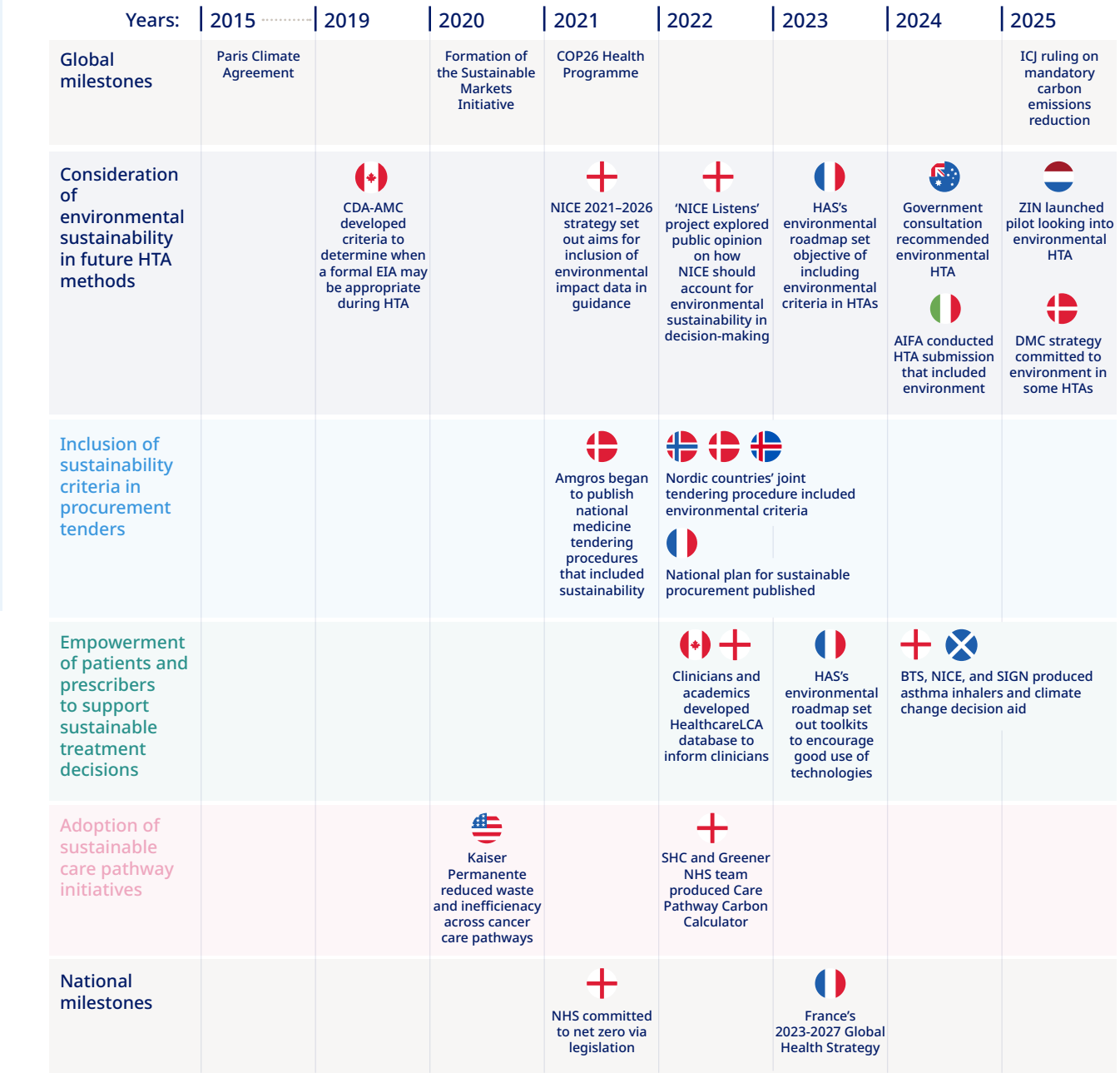
1. Consideration of environmental sustainability in future HTA methods
2. Inclusion of sustainability criteria in procurement tenders
3. Empowerment of patients and prescribers to support sustainable treatment decisions
4. Adoption of sustainable care pathway initiatives

Many initiatives commenced in the last 2 years, which shows that momentum is building. The inclusion of environmental criteria in HTA is one of the more prominent approaches to improving healthcare system sustainability by measuring the environmental value of technologies and care processes. However, it is not the only approach, highlighting that a multifaceted strategy considering the journey from procurement to prescribing is necessary to accelerate progress.

It is Novo Nordisk's aim to showcase these best practice examples to encourage broader adoption and advance the integration of sustainability considerations in healthcare decision-making.

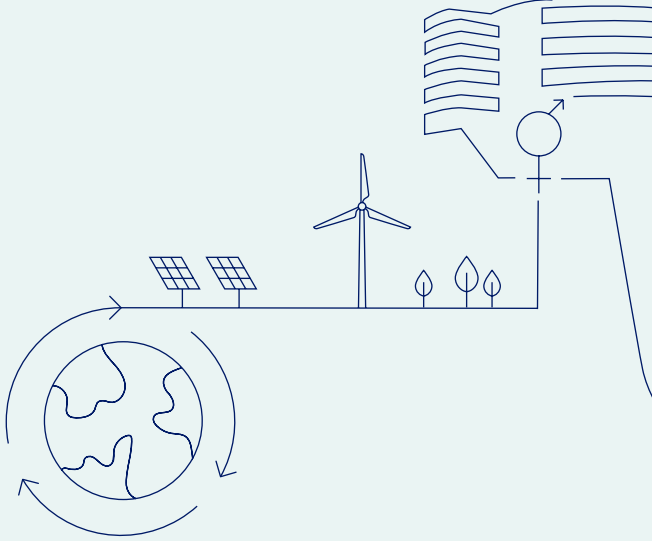
Figure 3:

Summary of healthcare environmental sustainability progress over time across countries



Abbreviations: AIFA, Agenzia Italiana del Farmaco; BTS, British Thoracic Society; CDA-AMC, Canada's Drug Agency; COP, Conference of the Parties; DMC, Danish Medicines Council; EIA, environmental impact assessment; HAS, Haute Autorité de Santé; HTA, health technology assessment; ICJ, International Court of Justice; NHA, National Health Service; NICE, National Institute for Health and Care Excellence; SIGN, Scottish Intercollegiate Guidelines Network; ZIN, Zorginstituut Nederland.

Consideration of environmental sustainability in future HTA methods



The inclusion of environmental sustainability criteria in HTA methods is being explored by HTA bodies in Australia, Canada, Denmark, England, France, Italy, and the Netherlands, each with varying progress towards creating and implementing new HTA frameworks.

In England, the National Institute for Health and Care Excellence (NICE)'s HTA Lab is exploring the feasibility of assessing the environmental impact of competing technologies, to enable more sustainable options to be favoured when the costs and benefits are comparable (27).

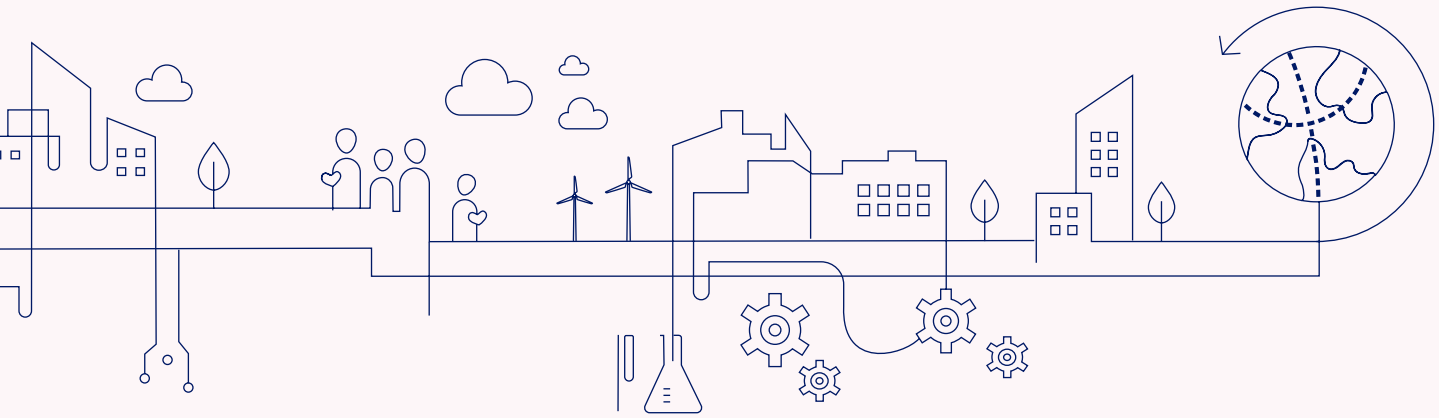
In Canada, Canada's Drug Agency (CDA-AMC) is developing criteria to determine when a formal EIA may be appropriate during the assessment of new drugs. Environmental sustainability will not be a value or decision driver for all new technologies due to the need to balance environmental factors against clinical benefits, safety, and affordability (28). However, having a framework to determine when an EIA is appropriate, and to then integrate environmental criteria into the HTA, is necessary to ensure the environmental value of new technologies is reliably considered going forward.

Another notable example is in the Netherlands, where Zorginstituut Nederland (ZIN) is taking strides to formally pilot new HTA methods. The 3-year pilot aims to consider environmental criteria as a decision driver alongside economic and clinical aspects in reimbursement decisions, with the aim to develop a consistent method that enables efficacy to be balanced against climate impact (29).

In the 3-year pilot, the following environmental parameters will be factored into reimbursement decisions through a deliberative process:

Incremental climate effect:	The difference in greenhouse gas emissions (in carbon dioxide [CO_2] equivalents) required per patient to implement the technology compared with the standard of care (SOC), or the difference in greenhouse gas emissions required to achieve 1 quality-adjusted life year (QALY) gain.
Total climate impact:	The difference in greenhouse gas emissions in CO_2 equivalents needed to treat all patients eligible for the new technology compared with SOC. To highlight the urgency of the climate crisis, ZIN also proposes contextualising the environmental impact of the new technology within the remaining carbon budget of the healthcare sector, and expressing the total climate impact of the technology as a fraction of greenhouse gases of the entire sector.

Overall, HTA methods are evolving to ensure that healthcare systems identify opportunities to reduce the environmental impact of new healthcare technologies and care pathways, where appropriate.



Inclusion of environmental criteria in procurement tenders

HTA alone cannot operationalise the inclusion of environmental criteria for new medical technologies. As such, this approach should be complemented by actionable levers, such as sustainable procurement frameworks, which directly support the adoption and upscaling of greener innovations.

Amgros, Denmark's national procurement agency, prides itself on its ambitious climate goals, and aspires to apply environmental criteria in 40% of European Union (EU) tendering procedures from 2026, increasing to 75% of procedures by 2030 (30, 31). This will mainly apply to technologies already in widespread use in Denmark, rather than new technologies. However, from 2025, Amgros will collaborate with the Danish Medicines Council to develop models for environmental criteria in tenders based on new HTA recommendations.

The inclusion of environmental criteria in tenders has been highly successful in Denmark. In some instances, suppliers have won contracts based on responses to environmental criteria rather than price (32). Amgros also collaborates with other Nordic countries via the Nordic Pharmaceutical Forum in joint tendering procedures that apply environmental criteria (32). Similarly, the Norwegian Hospital Procurement Trust integrated environmental criteria into its hospital procurement procedures (33). Although sustainable procurement practices are yet to progress outside of the Nordic countries, it is evident that upscaling this is a best practice approach. In France, the National Plan for Sustainable Procurement aims to ensure that all hospital contracts awarded have at least one environmental consideration by 2025 (34).

Empowerment of patients and prescribers to support sustainable decisions

Quantifying the environmental impact of healthcare technologies and processes is the necessary first step towards reducing it, yet the meaningful change comes from empowering patients and prescribers to opt for more sustainable treatment options without detriment to health outcomes. This can be achieved by publishing treatment guidelines that address sustainability considerations where key environmental concerns exist, as well as increasing knowledge sharing regarding the environmental impact of medicines and healthcare processes.

For example, in England and Scotland, the new collaborative guideline for asthma (NG245), developed jointly by the British Thoracic Society (BTS), NICE, and the Scottish Intercollegiate Guidelines Network (SIGN), outlines the environmental impact of different inhalers, thereby enabling patients to make informed treatment decisions (7, 8). The NHS also encourages shared decision-making between patients and prescribers to consider using lower carbon inhalers. Patients are increasingly receptive to considering the environmental impact of their treatment choices, and new incentives are being established to reduce reliance on metered-dose inhalers, which have a higher environmental impact than other options (35, 36).

In France, HAS' 2023–2024 environmental roadmap promotes sustainable care by reducing overuse of medicines, devices, and tests by preventing over-prescribing as well as inappropriate prescribing. HAS will support this with good practice guides inspired by NICE's tools (7) and plans to integrate environmental considerations into future clinical guidelines where relevant (37).

Another initiative established by clinicians and academics in Canada and England is the development of the HealthcareLCA database. The publicly accessible database contains all published data/studies on the environmental impact of healthcare treatments and services, with the aim to foster knowledge sharing and equip clinicians with the insights needed to understand and reduce the potential environmental impact of their practice (38).

Around the world, millions of people with chronic diseases depend on medical devices. Once used, many of these devices end up in landfills or are incinerated, wasting tonnes of valuable materials that could be recycled. As part of Novo Nordisk's ambition to achieve net-zero emissions across our entire value chain by 2045, we are working to find new ways to avoid waste by turning it into useful resources again. The ReMed™ program (known as PenCycle in the UK) enables pen users to return their used pens, enabling the high-quality plastic from the pen to be re-used and repurposed rather than sent to landfill or incinerated, and enabling patients to contribute to sustainable healthcare processes (39, 40)

Adoption of sustainable care pathway initiatives

To fully understand the environmental implications of healthcare technologies, it is essential to look beyond isolated interventions. The care pathway approach does just that – it evaluates a technology's environmental impact across the entire clinical journey, including diagnosis, monitoring, management, and admissions. This approach spans all care settings, including hospitals, emergency care, and general practice. The strength of this approach is that it considers the environmental benefit of the technology as a whole in preventing progression and long-term complications (41).

Examples of this approach are illustrated in the Sustainable Healthcare Coalition's report 'Building environmental considerations into the evaluation of health interventions: Taking a care pathway approach'. One example illustrated in the report from the US was Kaiser Permanente's transformation into the first carbon neutral healthcare system in the US. An aspect that contributed to this achievement was assessing how healthcare pathways aligned with carbon neutrality goals, with reducing inefficient care and encouraging telemedicine use noted as examples of strategies deployed (42).

Harnessing data to analyse the environmental impact of care pathways is critical for identifying opportunities for change. The carbon footprint of care pathways in the UK NHS in chronic kidney disease (CKD), respiratory syncytial virus (RSV), surgery, and anaesthesiology were evaluated to help identify optimal and actionable strategies to reduce the carbon impact of care (41). The Patient Care Pathway Carbon Calculator, developed by the Sustainable Healthcare Coalition (SHC), was designed to help healthcare service providers estimate the overall carbon footprint for specific pathways and patient populations, providing insights into areas for improvement (43).

Innovations in economic evaluation methods and the importance of the care pathway approach

Including the environment as a domain in HTA is methodologically challenging, yet potential approaches have been explored

Of all the potential ways for healthcare systems to improve environmental sustainability, its inclusion in HTA is among the most complex, requiring new methods. Additionally, other questions beyond the best methods would also need to be considered. How would HTA best incorporate the environment as a core domain, given the lack of societal perspective in the past? As inclusion would probably mean additional expertise and evidence for each HTA, it could be reserved for cases with the greatest societal benefit, such as widespread chronic diseases with multiple treatment options; or environmental benefit versus a comparator otherwise similar in efficacy, safety, and cost; or technologies with intrinsic characteristics that impact the environment (44). This would potentially help more sustainable medicines reach patients and drive innovation in sustainability. Though multiple environmental factors could be considered, it may be pragmatic to limit the assessment to factors with the best available data (often greenhouse gas emissions, but could include plastic waste and environmental toxicity). EIA, if incorporated into decision making frameworks, could ultimately inform coverage, reimbursement, pricing and uptake decisions for health technologies, and potentially lead to scenarios where technologies with high environmental value are prioritised and technologies with lower environmental value or that contribute to environmental harms could be disinvested in (44).

There are a variety of methods to incorporate environmental aspects into HTA, such as lifecycle assessment (LCA), cost-benefit analysis, enriched cost-utility analysis, and multi-criteria decision analysis (MCDA), some of which (e.g. process-based LCA) can be used alongside others (45, 46). At present, it may be more important to consider how these are used rather than which are used. As well as harmonised approaches, transparency will be crucial, both from manufacturers in providing accurate data, and from decision-makers on the weighting attributed to environmental value.

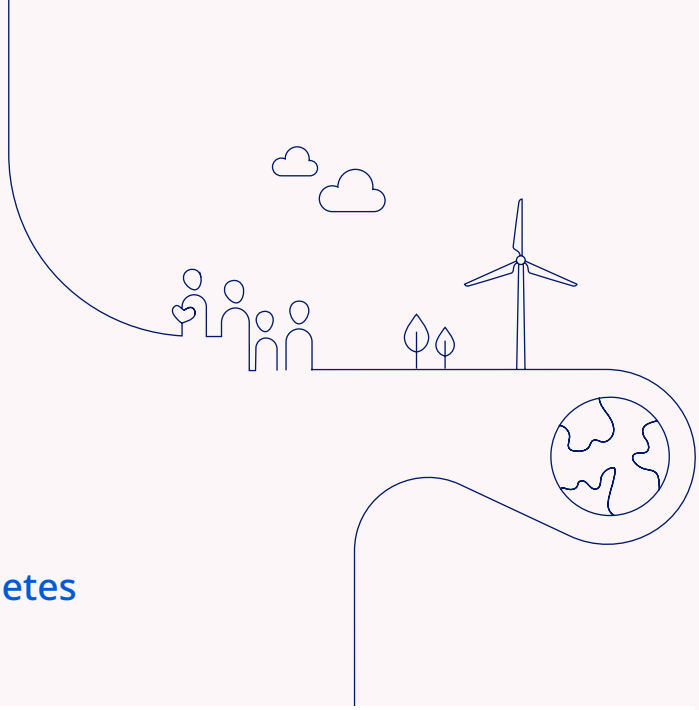
Two approaches exist for including environmental impact in HTA: parallel evaluation, where the EIA is conducted separately from other aspects of the appraisal, or fully integrated approach, where environmental metrics are directly incorporated alongside clinical and economic evaluation. Of the two, the fully integrated approach is more resource intensive, and requires careful judgement about how the relative importance of the environment compares to other aspects, such as efficacy; however, this provides a holistic evaluation. Parallel evaluations are more flexible and could theoretically permit future updates if environmental impact changes, e.g. via improved waste disposal.

Momentum and consensus are gathering in key areas, such as the care pathway approach

The benefit of the care pathway approach to considering the environmental impact of healthcare technologies is that it captures both the environmental footprint of the technology itself and of the technology's clinical outcomes. Care pathway redesign with sustainability in mind can simultaneously improve patient outcomes and reduce the environmental impact of a treatment across disease areas and care settings. This holistic approach is vital for identifying and implementing changes to address environmental impact (47). For HTAs, where cost inputs for a technology and all relevant comparators are included, there is scope to adopt a similar approach with carbon emissions where possible, covering the whole care pathway. However, a potential limitation is the ability to evaluate existing products, which is essential to understand care pathway impact.

Public–private partnership initiatives that aim to develop harmonised methodologies for adoption are also critical to improve sustainability in healthcare. A key example is the net zero-focussed Sustainable Markets Initiative (SMI) Health Systems Task Force launched at COP26 by His Majesty King Charles III, in his former role as The Prince of Wales, and chaired by AstraZeneca CEO Pascal Soriot, with CEO-level partnership with members from across the healthcare industry (including Novo Nordisk, GSK, NHS England, Roche, Sanofi, and the World Health Organization, among others).

If it is possible to analyse the full care pathway in future HTAs, a key question is whether formally including environmental sustainability criteria in HTA is the most impactful approach to sustainable healthcare. Given the complexities of including environmental impact within HTAs, it is anticipated that there will be many cases where HTA is unsuitable for this purpose. However, where HTA can produce meaningful analysis of environmental impact, this will have two substantial benefits. Firstly, it would provide financial incentives for manufacturers, including those otherwise reluctant to prioritise the environment. Secondly, it would enable dissemination of the current evidence and findings of in-depth health economic analysis to clinicians and patients, empowering them to make informed decisions. Given these benefits, HTA may be one tool to support sustainable healthcare, which should be used alongside other initiatives such as sustainable procurement and treatment guidelines.



Examples and opportunities

Three examples of EIA in type 2 diabetes show how progress can occur

Italian HTA submission for insulin icodec (Awiqli®)

The HTA submission report for once weekly insulin icodec (Awiqli®) is a pioneering example of how environmental considerations can be included in HTA assessments. This effort was driven by strong communication between Novo Nordisk and stakeholders such as payers and public health authorities. The environmental assessment within the HTA focused on two key domains: 1) The reduction in CO_2 emissions associated with reduced travel to appointments as a result of Awiqli® treatment; 2) The reduction in CO_2 emissions based on the carbon footprint of the needle used for administration following a switch from daily to weekly administration (48).

Environmental impact was assessed via patient association surveys, CO_2 emissions associated with needles and cartridges, and the CO_2 footprint of FlexTouch® devices. The analysis estimated that in Italy, every 100,000 patients switched from a daily insulin regimen to a weekly regimen could result in a yearly saving of 740 tonnes of CO_2 (equivalent to the annual electricity consumption of 100 families). After 5 years, the total reduction in CO_2 emissions would be approximately 865,047 kg versus non-icodec (48). The relative simplicity of the analysis highlights that this approach to quantifying the environmental impact could be easily scaled across future HTAs.

Cost-utility analyses of insulin icodec versus insulin degludec in England

A different analysis was conducted to compare two basal insulins produced by Novo Nordisk – once-weekly icodec and once-daily degludec – using two methods to assess their long-term environmental impact in HTAs (49, 50).

To account for environmental impact, a cost-utility analysis (CUA) was modified using the PRIME type 2 diabetes (T2D) model to include CO_2 equivalent emissions. The assessment focused on the long-term effects of icodec compared with degludec, a once-daily basal insulin that employs a similar pen-injector to icodec. The model examined patients with T2D, both insulin-naïve and those switching from a daily to a weekly insulin (insulin switch), based on evidence from clinical trials, over 60-years from the perspective of UK payers (49, 50).

The first method highlighted the environmental advantages of icodec through an integrated CUA, integrating CO_2 equivalent emissions by monetising them and incorporating these costs alongside traditional cost metrics. This adaptation resulted in a new measure called the green incremental cost-effectiveness ratio (gICER), expressed in £ (GBP) per QALY gained.

The second method adopted a parallel approach, emphasising environmental metrics measured as carbon footprint expressed in $kgCO_2eq$ and introduced two metricsderived from existing literature: the incremental carbon footprint effectiveness ratio (ICFER) expressed in $kgCO_2eq$ per QALY gained, and the incremental carbon footprint cost ratio (ICFCR) expressed in $kgCO_2e$ per £ (GBP) spent. (49, 50).

Both initiating and switching to icodec showed greater environmental benefits compared with degludec. The integrated approach improved cost-effectiveness, resulting in a gICER that is 4.1% lower for the insulin-naïve population and 7.8% lower for the insulin-switch population, compared to the baseline traditional CUA. Furthermore, the parallel approach indicated that initiating icodec resulted in an ICFER of –533.48 $kgCO_2e$ per QALY gained. This reduction is comparable to the CO_2 emissions from a round-trip economy-class flight from Copenhagen to Barcelona per QALY gained. Additionally, with an ICFCR of 0.4 $kgCO_2e$ per £ spent compared with degludec, icodec demonstrated a lower carbon footprint per unit of spending, indicating greater environmental efficiency over degludec (49, 50).

This study highlighted that both integrated and parallel approaches can effectively evaluate environmental impact in HTA.

Reducing Plastic Usage and Carbon Dioxide Emissions Through the Rollout of DuraTouch® in the Daily Insulin Patient Population

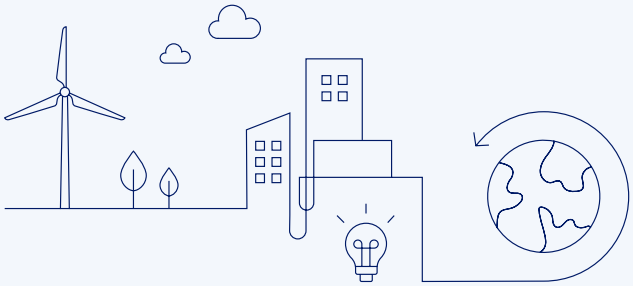
Daily insulins are often delivered via disposable plastic pen injectors, which, along with their packaging, contribute significantly to the global plastic waste crisis.
Novo Nordisk's Circular for Zero environmental strategy aims to shift consumer preferences from disposable to reusable devices, minimise end-of-life product waste, and ensure access to reusable injection devices.

DuraTouch® is an easy-to-use reusable insulin pen developed as part of this strategy (51). Novo Nordisk plans to roll out durable injection devices like DuraTouch® to shift patients from single-use plastic devices to reusable ones within the daily insulin space.

A Carbon Footprint report† assessed the plastic use and carbon emissions associated with one year of treatment. The report shows that switching 10 patients from FlexTouch® (Tresiba®, Ryzodeg®, Fiasp®) to DuraTouch® can save up to 8 kg of plastic waste annually – equivalent to about 1,000 half-litre water bottles – and reduce carbon emissions by an amount comparable to driving approximately 350 km by car (49-51).

DuraTouch® retains the same convenience, and comfort as FlexTouch® while significantly reducing plastic waste and carbon dioxide emissions from manufacturing and delivering injection devices to Novo Nordisk patients worldwide.

† The Carbon Footprint Report comes from an internally-produced LCA report that is not publicly available. These reports are for internal use only and may NOT be distributed externally. Novo Nordisk's LCAs follow the ISO14040/44 standard, as well as a product carbon footprint sector guidance document (52), co-developed by Novo Nordisk and other organisations within pharmaceuticals and healthcare. Novo Nordisk use the LCA methodology to measure and assess the environmental impacts – including carbon footprint – across the entire product lifecycle of our drugs and devices.



Summary and recommendations

Cross-sectoral collaboration and standardisation are critical to progress in this vital area

Achieving environmentally sustainable healthcare requires urgent action. Recognising the environmental value of healthcare technologies and integrating this into decision-making offers a promising path forward. While HTA provides a structured and influential platform, its application is inconsistent across markets and often limited to new innovations.

This research identifies additional opportunities to accelerate progress, including embedding sustainability into procurement, and empowering clinicians and patients to make environmentally informed treatment choices. Importantly, strategies must consider the full clinical pathway's environmental impact.

Global momentum is emerging, yet challenges remain – particularly around when and how to include environmental criteria in key decision-making stages. Using a care pathway approach to identify inefficiencies in care delivery processes is key. Taking this approach across therapy areas and care settings can deliver insights at each stakeholder level to address the bottlenecks and advance sustainable care practices in the healthcare system.

Novo Nordisk is committed to advancing progress in this domain by encouraging knowledge sharing and building a community of practice through cross-sector collaboration. To continue advancing the field in support of the ultimate goal of environmentally sustainable healthcare, the following are proposed:

Environmental sustainability should be assessed across an entire care pathway – rather than simplistic analysis of a single technology – to ensure improvements are meaningful. This should be accelerated through multidisciplinary collaboration and embedded in decision-making beyond medicine reimbursement

Efforts should be taken to measure environmental impact in value assessments via standardised, harmonious methodological approaches to optimise payer decision-making in procurement decisions and HTA

Information should be provided to support and empower healthcare systems, practitioners, and patients to make informed decisions around effective and sustainable treatment options. For instance, through supporting updates to treatment and prescribing guidelines, engaging with sustainable procurement processes, and supporting public awareness and education

It is our hope that the considerations outlined in this white paper may stimulate an open and aligned discussion among a broad list of stakeholders in the industry to advance the goals of reducing the environmental footprint of healthcare and rewarding innovation in this domain, as well as building environmental literacy across the healthcare community to enable informed care choices for patients.

Appendix

Glossary of HTA bodies within the scope of this report

Country	HTA body	Abbreviation	Remit and responsibilities
Australia	Pharmaceutical Benefits Advisory Committee	PBAC	Evaluates medicines for listing on the Pharmaceutical Benefits Scheme. Assesses clinical effectiveness, safety, and cost effectiveness of medicines
Canada	Canada's Drug Agency	CDA-AMC	Provides evidence-based assessments to inform healthcare decision-making across most provinces and territories (except Quebec). Conducts HTAs on drugs, medical devices, diagnostics, and procedures, and offers reimbursement recommendations to public drug plans
	Institut national d'excellence en santé et en services sociaux (The National Institute of Excellence in Health and Social Services)	INESSS	Evaluates health technologies and clinical practices for Quebec's healthcare system
Denmark	Medicinrådet (Danish Medicines Council)	DMC	Conducts comparative clinical assessments and cost-effectiveness analyses, and issues recommendations on whether new medicines should be used in Danish hospitals
England	National Institute for Health and Care Excellence	NICE	Provides national guidance and advice to improve health and social care. This includes technology appraisals for new and existing medicines and treatments, and development of clinical guidelines and quality standards
France	Haute Autorité de Santé (French National Authority for Health)	HAS	Ensures quality, safety, and efficiency of healthcare in France. Assesses clinical benefit (SMR) and added value (ASMR) of health technologies to inform pricing and reimbursement decisions, as well as public health interventions and care pathways
Germany	Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen (Institute for Quality and Efficiency in Health Care)	IQWiG	Provides scientific evaluations of medical interventions, assessing added benefit of new treatments versus standard care
	Gemeinsamer Bundesausschuss (Federal Joint Committee)	G-BA	Makes binding decisions on reimbursement and coverage, using IQWiG's reports to decide on inclusion in statutory health insurance
Italy	Agenzia Italiana del Farmaco (Italian Medicines Agency)	AIFA	Conducts HTAs for pharmaceuticals, including clinical and economic evaluations, and manages pricing and reimbursement decisions for new medicines
Norway	Direktoratet for medisinske produkter (Norwegian Medical Products Agency)	DMP/NOMA	Leads Norway's participation in the EU HTA Regulation and contributes to national HTA processes. Conducts assessments of medicines and medical devices under both national and EU frameworks
Scotland	Scottish Medicines Consortium	SMC	Provides advice on newly licensed medicines for use in NHS Scotland. Rapidly assesses clinical and cost effectiveness of new drugs, working with patient groups and clinicians to inform decisions
Spain	Agencia Española de Medicamentos y Productos Sanitarios (Spanish Agency of Medicines and Medical Devices)	AEMPS	Provides transparent, evidence-based assessments of health technologies for use in Spain's public healthcare system. Evaluates both clinical and non-clinical (e.g. cost-effectiveness and social) aspects of health technologies
The Netherlands	Zorginstituut Nederland (Netherlands Healthcare Institute)	ZIN	Advises the Dutch government on the inclusion of health technologies in the basic health insurance package. Conducts HTAs for pharmaceuticals, medical devices, and other health interventions, including evaluation of clinical effectiveness, cost effectiveness, budget impact, and societal value
US	Institute for Clinical and Economic Review	ICER	HTA in the US is not centralised under a national body. However, ICER provides independent evaluations of the clinical and economic value of medical interventions to inform pricing, coverage, and access decisions in the US healthcare system
Wales	All Wales Medicines Strategy Group	AWMSG	Adopts NICE guidance where available and evaluates the clinical and cost effectiveness of the remaining new medicines not on the NICE work programme
	Health Technology Wales	HTW	Assesses non-medicine health technologies such as medical devices, diagnostics, procedures, and digital health

Abbreviations: AEMPS, Agencia Española de Medicamentos y Productos Sanitarios; AIFA, Agenzia Italiana del Farmaco; ASMR, added value; AWMSG, All Wales Medicines Strategy Group; CDA-AMC, Canada's Drug Agency; DMC, Danish Medicines Council; DMP, Direktoratet for medisinske produkter; EU, European Union; G-BA, Gemeinsamer Bundesausschuss; HAS, Haute Autorité de Santé; HTA, health technology assessment; HTW, Health Technology Wales; ICER, Institute for Clinical and Economic Review; INESSS, Institut national d'excellence en santé et en services sociaux; IQWiG, Institut für Qualität und Wirtschaftlichkeit im Gesundheitswesen; NHS, National Health Service; NICE, National Institute for Health and Care Excellence; NOMA, Norwegian Medical Products Agency; PBAC, Pharmaceutical Benefits Advisory Committee; SMC, Scottish Medicines Consortium; SMR, clinical benefit; ZIN, Zorginstituut Nederland.

References

1. Harvard Medicine. Confronting health care's carbon footprint. 2023. Available from: https://magazine.hms.harvard.edu/articles/confronting-health-cares-carbon-footprint. Accessed on: 21 July 2025
2. World Health Organization (WHO). Compendium of WHO and other UN guidance on health and environment. 2024. Available from: https://www.who.int/publications/i/item/9789240095380. Accessed on: 26 June 2025.
3. Cecchi L, D'Amato G, Ayres JG, Galan C, Forastiere F, Forsberg B, et al. Projections of the effects of climate change on allergic asthma: the contribution of aerobiology. Allergy. 2010;65(9):1073-81.
4. D'Amato G, Vitale C, De Martino A, Viegi G, Lanza M, Molino A, et al. Effects on asthma and respiratory allergy of Climate change and air pollution. Multidiscip Respir Med. 2015;10:39.
5. Thien F, Beggs PJ, Csutoros D, Darvall J, Hew M, Davies JM, et al. The Melbourne epidemic thunderstorm asthma event 2016: an investigation of environmental triggers, effect on health services, and patient risk factors. Lancet Planet Health. 2018;2(6):e255-e63.
6. Woodcock A, Janson C, Rees J, Frith L, Lofdahl M, Moore A, et al. Effects of switching from a metered dose inhaler to a dry powder inhaler on climate emissions and asthma control: post-hoc analysis. Thorax. 2022;77(12):1187-92.
7. National Institute for Health and Care Excellence (NICE), British Thoracic Society (BTS), Scottish Intercollegiate Guidelines Network (SIGN). Decision aid: asthma inhalers and climate change. 2024. Available from: https://www.nice.org.uk/guidance/ng245/resources/patient-decision-aid-on-asthma-inhalers-and-climate-change-bts-nice-sign-pdf-13558151917. Accessed on: 26 June 2025.
8. National Institute for Health and Care Excellence (NICE), British Thoracic Society (BTS), Scottish Intercollegiate Guidelines Network (SIGN). NG245. Asthma: diagnosis, monitoring and chronic asthma management. 2024. Available from: https://www.nice.org.uk/guidance/ng245/resources/asthma-diagnosis-monitoring-and-chronic-asthma-management-bts-nice-sign-pdf-66143958279109. Accessed on: 26 June 2025.
9. Yuan L, Tao J, Wang J, She W, Zou Y, Li R, et al. Global, regional, national burden of asthma from 1990 to 2021, with projections of incidence to 2050: a systematic analysis of the global burden of disease study 2021. EClinicalMedicine. 2025;80:103051.
10. United Nations. Global issues: population. Available from: https://www.un.org/en/global-issues/population. Accessed on: 21 July 2025
11. Kenny GP, Sigal RJ, McGinn R. Body temperature regulation in diabetes. Temperature (Austin). 2016;3(1):119-45.
12. Gao D, Friedman S, Hosler A, Sheridan S, Zhang W, Lin S. Association between extreme ambient heat exposure and diabetes-related hospital admissions and emergency department visits: A systematic review. Hyg Environ Health Adv. 2022;4.
13. Ratter-Rieck JM, Roden M, Herder C. Diabetes and climate change: current evidence and implications for people with diabetes, clinicians and policy stakeholders. Diabetologia. 2023;66(6):1003-15.
14. Koch CA, Sharda P, Patel J, Gubbi S, Bansal R, Bartel MJ. Climate Change and Obesity. Horm Metab Res. 2021;53(9):575-87.
15. Bouchama A, Dehbi M, Mohamed G, Matthies F, Shoukri M, Menne B. Prognostic factors in heat wave related deaths: a meta-analysis. Arch Intern Med. 2007;167(20):2170-6.
16. Vandentorren S, Bretin P, Zeghnoun A, Mandereau-Bruno L, Croisier A, Cochet C, et al. August 2003 heat wave in France: risk factors for death of elderly people living at home. Eur J Public Health. 2006;16(6):583-91.
17. G. B. D. Adult BMI Collaborators. Global, regional, and national prevalence of adult overweight and obesity, 1990-2021, with forecasts to 2050: a forecasting study for the Global Burden of Disease Study 2021. Lancet. 2025;405(10481):813-38.
18. IPCC. Summary for Policymakers. 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 University Press, Cambridge, UK and New York, NY, USA; 2022.
19. Lakdawalla DN, Doshi JA, Garrison LP, Jr., Phelps CE, Basu A, Danzon PM. Defining Elements of Value in Health Care-A Health Economics Approach: An ISPOR Special Task Force Report [3]. Value Health. 2018;21(2):131-9.
20. United Nations Climate Change (UNCC). Key aspects of the Paris Agreement. Available from: https://unfccc.int/most-requested/key-aspects-of-the-paris-agreement. Accessed on: 26 June 2025
21. Karliner J, Slotterback S, Boyd R, Ashby B, Steele K. Health care's climate footprint: How the health sector contributes to the global climate crisis and opportunities for action (green paper number one). 2019. Available from: https://global.noharm.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf. Accessed on: 26 June 2025.
22. Blom I, Beagley J, Quintana A. The COP26 health commitments: A springboard towards environmentally sustainable and climate-resilient health care systems? The Journal of Climate Change and Health. 2022;6.
23. World Health Organization (WHO). Alliance for Transformative Action on Climate and Health (ATACH). 2022. Available from: https://www.who.int/initiatives/alliance-for-transformative-action-on-climate-and-health. Accessed on: 9 September 2025.
24. NHS England. NHS becomes the world's first national health system to commit to become 'carbon net zero', backed by clear deliverables and milestones. 2020. Available from: https://www.england.nhs.uk/2020/10/nhs-becomes-the-worlds-national-health-system-to-commit-to-become-carbon-net-zero-backed-by-clear-deliverables-and-milestones/. Accessed on: 26 June 2025
25. Scottish Government. NHS Scotland Climate Emergency & Sustainability Strategy 2022-2026. 2022. Available from: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2022/08/nhs-scotland-climate-emergency-sustainability-strategy-2022-2026/documents/nhs-scotland-climate-emergency-sustainability-strategy-2022-2026/nhs-scotland-climate-emergency-sustainability-strategy-2022-2026/govscot%3Adocument/nhs-scotland-climate-emergency-sustainability-strategy-2022-2026.pdf. Accessed
26. NHS England. Delivering a 'Net Zero' National Health Service. 2022. Available from: https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2022/07/B1728-delivering-a-net-zero-nhs-july-2022.pdf. Accessed on: 26 June 2025.
27. National Institute for Health and Care Excellence (NICE). HTA Lab projects – comparing the environmental impacts of health. Available from: https://www.nice.org.uk/about/what-we-do/our-research-work/hta-lab-projects#environment. Accessed on: 26 June 2025
28. Canada's Drug Agency – L'Agence des médicaments du Canada (CDA-AMC). Criteria for conducting Environmental Assessments in CADTH HTAs. 2019. Available from: https://www.cda-amc.ca/criteria-conducting-environmental-assessments-cadth-htas. Accessed on: 26 June 2025
29. Zorginstituut Nederland (ZIN). Proef Zorginstituut: personeelsinzet en milieu meewegen bij beoordeling zorg. 2025. Available from: https://www.zorginstituutnederland.nl/actueel/nieuws/2025/05/22/proef-zorginstituut-personeelsinzet-en-milieu-meewegen-bij-beoordeling-zorg. Accessed on: 26 June 2025
30. Amgros. We will set sustainability criteria in 75% of our tendering procedures. 2024. Available from: https://amgros.dk/about-amgros/news/we-will-set-sustainability-criteria-in-75-of-our-tendering-procedures/. Accessed on: 26 June 2025
31. Amgros. Amgros announces tendering procedure with new environmental criteria. 2024. Available from: https://www.amgros.dk/about-amgros/news/amgros-announces-tendering-procedure-with-new-environmental-criteria/. Accessed on: 26 June 2025
32. Amgros. Suppliers strongly support joint Nordic tendering procedures. 2024. Available from: https://amgros.dk/about-amgros/news/suppliers-strongly-support-joint-nordic-tendering-procedures/. Accessed on: 26 June 2025
33. Sykehusinnkjøp HF (Norwegian Hospital Procurement Trust). New environmental criteria for the procurement of pharmaceuticals. 2023. Available from: https://www.sykehusinnkjop.no/en/nyheter/nyheter-2019/new-environmental-criteria-for-the-procurement-of-pharmaceuticals/. Accessed on: 26 June 2025
34. OECD. Promoting Strategic and Green Public Procurement in France. 2025. Available from: https://www.oecd.org/en/publications/promoting-strategic-and-green-public-procurement-in-france_70da2048-en/full-report/introduction_9a9eabc7.html. Accessed on: 23 September 2025
35. NHS Business Services Authority. Respiratory – Carbon Impact dashboard. Available from: https://www.nhsbsa.nhs.uk/access-our-data-products/epact2/dashboards-and-specifications/respiratory-carbon-impact-dashboard. Accessed on: 26 June 2025
36. NHS Lancashire and South Cumbria Integrated Care Board. 10 point green plan for practices. Available from: https://www.lancashireandsouthcumbria.icb.nhs.uk/GreenerNHS/primary-care/net-zero-resources/10-point-green-plan-practices. Accessed on: 26 June 2025
37. Haute Autorité de santé (HAS). Environmental health roadmap. 2023. Available from: https://www.has-sante.fr/upload/docs/application/pdf/2024-07/environmental_health_roadmap_-_has.pdf. Accessed on: 26 June 2025.
38. Drew J, Christie SD, Rainham D, Rizan C. HealthcareLCA: an open-access living database of health-care environmental impact assessments. Lancet Planet Health. 2022;6(12):e1000-e12.
39. Novo Nordisk. Why PenCycle? 2024. Available from: https://www.pen-cycle.co.uk/patients/diabetes-or-weight-management-patients/why-pencycle.html. Accessed on: 9 September 2025.
40. Novo Nordisk. Introducing ReMed. 2025. Available from: https://www.novonordisk.com/sustainable-business/zero-environmental-impact/recycling-used-devices.html. Accessed on: 9 September 2025.
41. Sustainable Healthcare Coalition (SHC). Building environmental considerations into the evaluation of health interventions. Taking a care pathway approach. 2025. Available from: https://shcoalition.org/wp-content/uploads/2025/02/Building-environmental-considerations-into-the-evaluation-of-health-interventions-Taking-a-care-pathway-approach.pdf. Accessed on: 26 June 2025.
42. Health Care Without Harm. First carbon neutral health system shares their roadmap. 2024. Available from: https://global.noharm.org/resources/first-carbon-neutral-health-system-shares-their-roadmap. Accessed on: 26 June 2025
43. Sustainable Healthcare Coalition (SHC). Sustainable care pathways - patient care pathway carbon calculator. Available from: https://carepathwaycarbon.org/. Accessed on: 29 July 2025
44. Hensher M. Health technology assessment and healthcare environmental sustainability: Prioritizing effort and maximizing impact. Int J Technol Assess Health Care. 2024;40(1):e25.
45. McAlister S, Morton RL, Barratt A. Incorporating carbon into health care: adding carbon emissions to health technology assessments. Lancet Planet Health. 2022;6(12):e993-e9.
46. Marsh K, Ganz M, Nortoft E, Lund N, Graff-Zivin J. Incorporating Environmental Outcomes into a Health Economic Model. Int J Technol Assess Health Care. 2016;32(6):400-6.
47. Mireille M Goetghebeur, Rossella Di Bidino, Juliana Yi, Matthias Perleth, Rebecca Boyce, Li Ying Huang, et al. INAHTA white paper on advancing environmental sustainability through HTA. 2025 Accessed
48. Basile M, Fortunato A, Antonini D, Di Brino E, Di Pippo A, Falasca G, et al. Health Technology Assessment di icodec per la gestione dei pazienti affetti da diabete in Italia. Italian Journal of Public Health. 2024;12(1).
49. Srouji T, Hellerup M. Incorporating Environmental Sustainability Into Health Technology Assessments: Two Adapted Cost-Utility Analyses (CUA) of Insulin Icodec Versus Degludec for Type 2 Diabetes (T2D) Management in England. Value in Health. 2024;27(12 S2).
50. Srouji T, Hellerup M. Incorporating Environmental Sustainability Into Health Technology Assessments: Two Adapted Cost-Utility Analyses of Insulin Icodec versus Degludec for Type 2 Diabetes Management in England. Presented at: ISPOR Europe; 17-20 November; Barcelona, Spain; 2024.
51. Akhtar S. Ease of use of the reusable DuraTouch pen injector in individuals with diabetes with or without previous pen injector experience. Presented at: Presented at the 1st Asian Conference on Innovative Therapies for Diabetes Management; 18-20 November; Singapore and online; 2024.
52. Environmental Resources Management, NHS Sustainable Development Unit, AstraZeneca, Baxter, GSK, Johnson&Johnson, et al. Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices. 2012. Available from: https://ghgprotocol.org/sites/default/files/Summary-Document_Pharmaceutical-Product-and-Medical-Device-GHG-Accounting_November-2012_0.pdf. Accessed on: 23 September 2025.