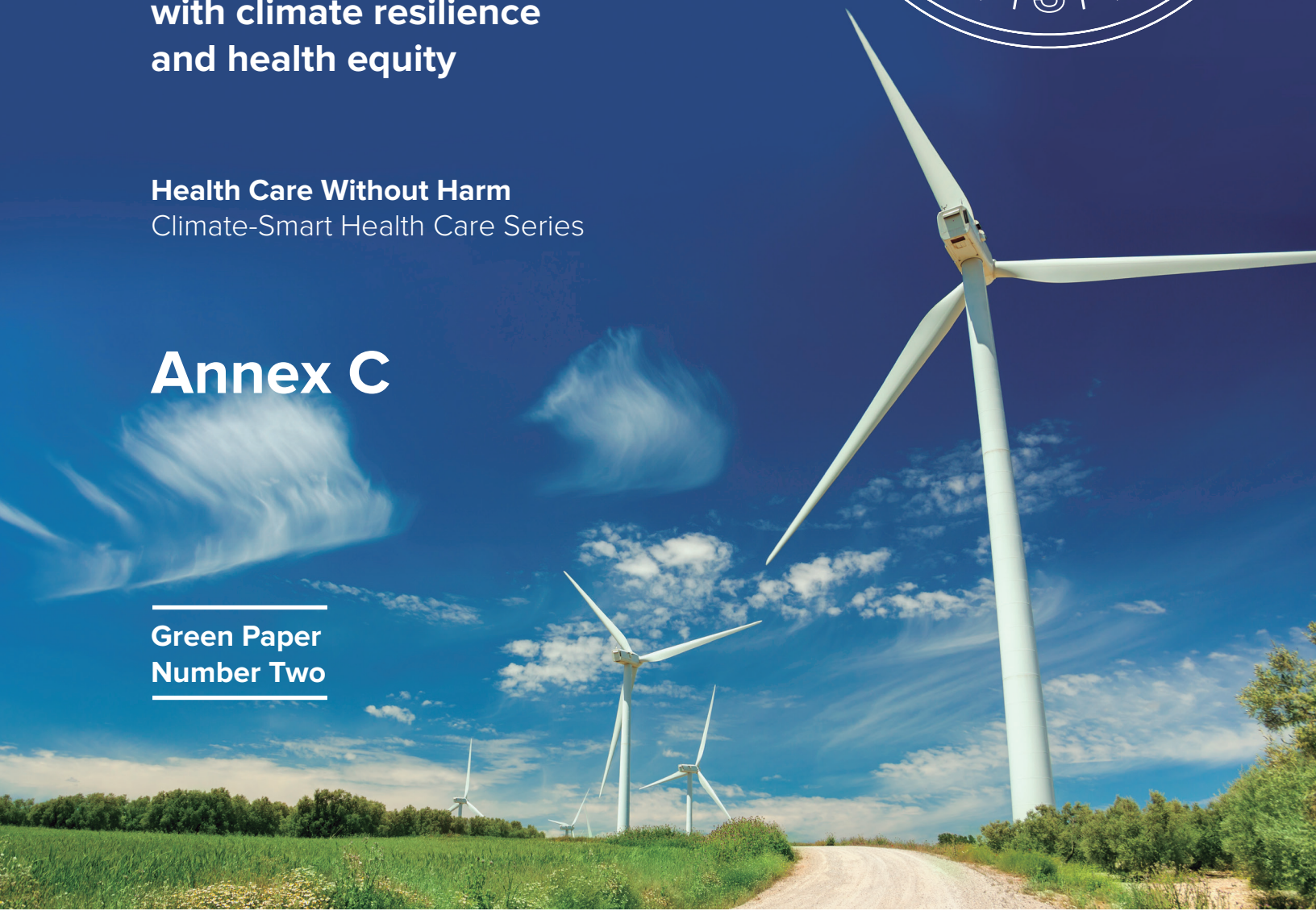
Global Road Map for Health Care Decarbonization

A navigational tool for achieving zero emissions with climate resilience and health equity

Health Care Without Harm
Climate-Smart Health Care Series

Annex C

Green Paper Number Two



Health Care Without Harm

Produced in collaboration with ARUP

Annex C: Recommended interventions for implementing the seven high-impact actions

The Road Map identifies three interrelated, overlapping decarbonization pathways that the health sector must follow to chart a course toward zero emissions. Spanning and connecting these paths are seven high-impact actions. To chart a course to zero emissions, the health care sector must address these interwoven pathways and implement the related high-impact actions simultaneously.

Implementation of these actions across the three pathways and along the country trajectories described in the Road Map will result in a major reduction of health care greenhouse gas emissions. Cumulatively these potential reductions from 2014 to 2050 would total 44.8 gigatons of carbon dioxide equivalent. By means of comparison, it is nearly equivalent to all CO_2e emissions generated across the planet in 2017 (47 gigatons excluding land use).

This Annex describes multiple interventions that the sector can take to implement each high-impact action. The interventions are organized per action along the contours of the three pathways and are intended to accompany the narrative of the pathways and actions in the main report.

There are a set of more specific implementation initiatives that the health sector can take, which are not detailed in this report. Health Care Without Harm, together with the World Health Organization, the World Bank, and UNDP, helped develop several frameworks and guidance documents for such implementation initiatives. Health care policy makers and practitioners can consult these for more details. In addition to the specific references in the recommended interventions below, key resources, which span most, if not all of the high-impact actions and related initiatives include:

- World Health Organization: *Guidance on climate-resilient and environmentally sustainable health care facilities.*[1]
- World Bank: *Climate-smart health care: Low-carbon and resilience strategies for the health sector.*[2]
- World Bank Group: *COVID-19 and climate-smart health care* – Health sector opportunities for synergistic response to the coronavirus and climate crises.[3]
- World Health Organization and World Bank Group: *Access to modern energy services for health facilities in resource-constrained settings.*[4]
- Health Care Without Harm, Practice Greenhealth, and Global Green and Healthy Hospitals: *Sustainable Procurement in Health Care Guide* and other key procurement resources.[5]
- United Nations Development Program: *Sustainable health procurement guidance note.*[6]

Additionally, health care leaders who are considering how to move their systems to zero emissions should consult the approach developed by England's National Health Service, focusing on their efforts to decarbonize health care facilities and operations. In 2020, the NHS became the first national health authority to commit to net zero emissions across all scopes. The NHS Net

Zero Report reviews advancements the NHS has already made in reducing its carbon footprint and overall environmental impact. It also establishes **trajectories to net zero and the interventions** required to achieve that ambition, describing an iterative and adaptive approach.[7]

Recommended interventions

1 - Power health care with 100% clean, renewable electricity

Ensure that health care is powered by zero emissions electricity onsite, through purchased energy, and in the broader economy.

Action taken to decarbonize electricity purchased by the health sector can provide a cumulative emissions reduction of at least 12.7Gt CO_2e between 2014 and 2050.

Specific interventions for achieving zero emissions electricity in the health sector

Facilities and operations

Energy efficiency (also see Action 2, buildings and infrastructure)

- Educate staff and building users to maximize energy efficiency through their own practices and behaviors.
- Systematically maximize energy efficiency in all health care facilities and infrastructure.
- Invest in highly efficient cooling, heating, lighting, and ICT systems and transition these systems from direct fossil fuel consumption to fuels like hydrogen, which can be powered by renewable sources.
- Invest in cold chain technology for vaccine distribution, including refrigeration equipment, storage, and distribution facilities, that is low or zero emissions, renewable energy-powered and high efficiency.

Renewable electricity

- Deploy robust onsite clean, renewable energy in support of high quality care delivery, facility, and community resilience.
- Integrate renewable energy policies and strategies with community renewable energy initiatives.
- Power health care in energy-poor settings.
- Achieve energy self-sufficiency and facility resilience by investing in micro grids for backup generation.

Supply chain

Health care purchasing

- Employ sustainable procurement policies, practices, and guidance.
- Purchase clean, renewable electricity from the grid via Power Purchase Agreements and other mechanisms when available.
- Purchase appropriate solar, wind, and small-scale hydroelectric technology, as well as battery technology for microgrid back up, onsite renewable electricity generation, and resilience.
- Procure only energy efficient medical equipment.[8]
- Procure only energy efficient cooling equipment that also does not use high global warming potential gases, like HFCs.
- Procure only energy efficient heating equipment.
- Procure only energy efficient information and communications technology.
- Advocate for energy efficiency certification standards for medical devices.

Manufacturers and suppliers

- Work directly with health care to innovate and provide renewable energy solutions that are specific to the health care sector.
- Systematically maximize energy efficiency in production, transportation, and storage.
- Invest in robust, onsite clean and renewable electricity.
- Purchase clean, renewable electricity from the grid.
- Improve the energy efficiency and reliable functionality of major medical equipment, electronic devices, and ICT infrastructure. [9,10] [11]
- Develop innovative solutions for off-grid and grid-unstable settings, including robust microgrids, battery storage, and last mile energy distribution.

Wider economy and society

- Advocate for a rapid, ambitious, and thorough energy transition that includes 100% renewable electricity and contributes to meeting existing Paris Agreement commitments and the RTS scenario, while also achieving the much more ambitious B2DS scenario proposed by the International Energy Agency (see the trajectories chapter above).
- Advocate for the phase out of fossil fuel subsidies for power generation, transport, and other sectors[12] and their reinvestment in health subsidies.[13]
- Support policies, including subsidies or tax exemptions, for the rapid and accelerated adoption of clean energy and fuels, like solar, small-scale hydro, and wind generated electricity.[14]

- Advocate for energy efficiency certification standards for medical devices and equipment.
- Join the growing coalition of government investment funds, health organizations, universities, banks, and others that are divesting from fossil fuels in health care pensions, retirement, and other investment portfolios.[15]
- Drive research into future energy solutions that will meet requirements for health care, the environment, and a resilient society.
- Ensure all member organizations' and trade associations' advocacy agendas are consistent with renewable energy decarbonization goals.

2 - Invest in zero emissions buildings and infrastructure

Ensure every health care building and health product manufacturing facility and their infrastructure are necessary, energy efficient, zero emissions, and climate-resilient.

By targeting electrification and employing lower carbon and more circular construction practices, mitigating emissions from health sector buildings and infrastructure can lead to a cumulative emissions reduction of at least 17.8 Gt CO_2e between 2014 and 2050.

Specific interventions for achieving zero emissions buildings and infrastructure in the health sector.

Facilities and operations

- Ensure effective and optimized building utilization, while incorporating designs and locations that promote reusing materials and creating spaces that are multifunctional.
- Support the adoption of telemedicine and other processes (like closer to home care and a focus on preventative interventions) to reduce demand for large, resource-intensive health care facilities.
- Ensure staff responsible for procuring the design and construction of buildings and infrastructure are trained in sustainability.
- Ensure the location of buildings promotes low-carbon transportation.
- Seek building designs that are zero emissions, using green building accreditation tools and standards.
- Site and orient buildings in order to optimize solar shading and natural ventilation.
- Maximize energy efficiency by designing for optimized daylighting, natural and mixed mode ventilation, passive solar heating and cooling strategies, and reflective roofing or cool roofs.
- Maximize green spaces and natural solutions to enhance cooling potential and rainwater management.
- Invest in low- or zero-emissions cold chain infrastructure, including vaccine storage and distribution facilities.
- Invest in low- or zero-carbon information and communications technology infrastructure, including storage, efficient devices, and back up mechanisms.
- Design for and install onsite renewable electricity as an integrated feature of health care facilities.
- Ensure resilience is improved when considering building location, building materials, retrofit, and refurbishment projects
- Reutilize or repurpose building materials like steel girders in refurbishment projects.

Supply chain

Health care purchasing

- Employ sustainable procurement policies, practices, and guidance.
- Procure energy efficient building materials with low- or zero-embodied carbon and/or locally produced or reused materials in all new construction and refurbishments.
- Procure high efficiency heating ventilation and air conditioning (HVAC) equipment, electric lighting, ICT, and other energy efficient equipment (including cooling equipment that does not contain potent global warming F-gases, like HFCs and HCFCs).
- Purchase appropriate solar, wind, and small-scale hydroelectric technology, as well as battery technology for microgrid back up for onsite renewable electricity generation and resilience.
- Plan circular procurement by working with supply chain partners to adopt new circular economy business models, which align commercial incentives with long-lasting, low-impact, reusable, and upgradeable building systems and components

Manufacturers and suppliers

- Design and develop zero carbon approaches to construction and refurbishments in health care.
- Adopt a circular materials strategy, including materials that are healthy and safe, reused and reusable, recycled and recyclable, low-embodied carbon, and, where possible, bio-based and thereby renewable.
- Choose circular design principles, including designing out waste, designing for net positive energy and water use, designing for offsite manufacturing, designing for deconstruction, designing for flexibility and adaptability, designing for reuse and recovery, and designing for material optimization.
- Lead the industry into higher ambition for decarbonization with innovative approaches to low- or zero-emissions building technologies.

Wider economy and society

- Leverage health care's purchasing power in the construction industry to systematically drive carbon reduction through production processes, the reuse of building materials, and the development of sustainable and/or reusable materials.
- Collaborate with local communities and stakeholders to ensure health facilities enable low-carbon lifestyles in adjacent neighborhoods (e.g., be an anchor location for public

transport, waste collection, consolidation, and construction material reuse and redistribution).

- Encourage the development of green spaces and natural environments in and around health facilities.
- Foster a sharing economy by making underused spaces available outside of peak hours and accessible for community use, while providing spaces for car club parking and recharging and an anchor point for district heating/cooling systems.

3 - Transition to zero emissions, sustainable travel and transport

Transition to zero emission fleet vehicles and infrastructure, while encouraging active travel and public transport for patients and staff wherever feasible.

Over the course of the next 30 years, health care emissions can be reduced by at least 1.6Gt CO_2e cumulatively until 2050 by reducing business mileage, shifting to zero emissions or lower carbon modes of travel, and optimizing the use of vehicles over time.

Specific interventions for achieving zero emissions travel and transport in the health sector

Facilities and operations

Promote active travel and public transport at every opportunity

- Incentivize public and active transport, as well as carpooling and lower emission vehicles, through preferential reimbursement rates for staff.
- Encourage active travel for some services, like first aid or responder bicycles, as well as for accessing health care.
- Locate health services facilities close to public transport and integrate health care development with urban planning.[16]

Reduce business travel

- Reduce business mileage by encouraging more virtual approaches to work and incentivize lower carbon forms of travel.
- Systematically discourage air travel by ensuring a justification process and senior level sign off.

Establish zero emissions vehicle fleets and infrastructure

- Establish low- and zero-emission vehicle fleets and their infrastructure.
- Develop low-emission travel infrastructure onsite, like charging stations for visitors, to encourage wider societal shifts.
- Maximize vehicle longevity through appropriate maintenance programs.

Supply chain

Health care purchasing

- Procure low- and zero-emission vehicle fleets with suitable charging/fueling infrastructure.
- Disincentivize and reduce small, single-item deliveries.
- Optimize delivery schedules and incentivize bulk orders.

Manufacturers and suppliers

- Reduce corporate travel and transport emissions by improving logistics, packaging, packing approaches, the management of waste, and circular economy processes.
- Develop zero emissions vehicles for use in the health care sector (including ambulances).
- Invest in zero emissions vehicles and infrastructure to reduce business-related emissions.

Wider economy and society

- Advocate for policies that foster active transport at every opportunity.
- Promote inclusive public transportation infrastructure and development that integrates health planning and transportation planning.
- Promote integrated travel planning with municipal agencies so patients and staff can access services easily, and wherever feasible reduce reliance on single passenger vehicles.
- Encourage and accelerate a full transition to electric and/or hydrogen vehicles through policies that include environmentally sound management of batteries and other components at the end of their life cycle.
- Ensure all transport electrification strategies go hand-in-hand with the decarbonization of electricity generation.

4 - Provide healthy, sustainably grown food and support climate-resilient agriculture

Provide healthy, locally, and sustainably produced fresh and seasonal food with zero food waste.

Overall, these actions can save at least 0.9 Gt of carbon equivalent emissions by 2050.

Specific food-related interventions for achieving zero emissions in the health sector

Facilities and operations

- Promote nutritious, local, and seasonal menus while reducing reliance on meat and dairy in facilities and moving toward a plant-forward[i] menu in countries with a heavy reliance on animal products.
- Promote education and training in sustainable practices for food services staff.
- Reduce food waste by incorporating strategies like room or on-demand service, recovering edible food and redistributing food items to community organizations, and managing the resulting food waste with composting or anaerobic digesters to repurpose for agricultural use.[17] Avoid the use of single-use plates, bottles, and other food ware.
- Utilize hospital and health center grounds to grow food for patients and staff and/or the community.
- Use energy and water efficient technologies for cooking, reheating, and dishwashing (see the energy section above).

Supply chain

Health care purchasing

- Procure, to the extent possible, locally and sustainably produced food and support community-based, agro-ecological, and/or regenerative agriculture.
- Increase the procurement of locally and sustainably produced plant proteins (legumes, nuts, and seeds) to utilize in plant-forward menus.

[i] Plant-forward can be defined as a style of cooking and eating that emphasizes and celebrates, but is not limited to, plant-based foods and that reflect evidence-based principles of health and sustainability. Plant-based foods include fruits and vegetables, whole grains, beans, other legumes and soy foods, nuts and seeds, plant oils, and herbs and spices.

Manufacturers and suppliers (food production, processing, packaging, transport, and distribution)

- Ensure all food packaging is reduced and sustainable (or contributes to a circular economy approach).
- Encourage sustainable practices in food cultivation, manufacture, distribution, and waste management.
- Work with local communities to support sustainability, health, equity, and resilience building in food production, processing, packaging, and distribution.

Wider economy and society

- Encourage local and sustainable community-based agriculture and practices that generate healthy food, reduce carbon emissions, promote soil carbon sequestration, protect biodiversity and nature's systems, and support community rights and resilience.
- Advocate for reduction in unsustainable and unhealthy agricultural practices, including intensive monocultures requiring toxic pesticide use and resulting in soil erosion and depleted soil quality.
- Encourage shifts to plant-forward, biodiverse diets while retaining nutritious elements required for specific populations.

5 - Incentivize and produce low-carbon pharmaceuticals

Reduce unnecessary pharmaceutical use, substitute high emission products with more climate-friendly alternatives, and incentivize the production of green, climate-smart medication.

Action on the emissions arising from the production and utilization of pharmaceuticals can reduce the cumulative health sector footprint by 2.9 Gt CO_2e between 2014 and 2050.

Specific interventions for achieving zero emissions pharmaceuticals

Facilities and operations

- Integrate climate mitigation strategies into professional clinical training programs related to pharmaceutical prescription and administration.
- Encourage early patient diagnosis and management/intervention that will promote longer, healthier living and reduce GHG emissions.
- Establish clear prescribing practices and only prescribe medicines when distinctly necessary and, where appropriate, promotes green and/or social prescribing.
- Encourage social and green prescribing where clinically relevant as a means of reducing dependency on medications and improving health.[18]
- Minimize wastage in medicines usage, including the avoidance of unnecessarily high fresh gas flow rates for all inhaled drugs.
- Systematically switch to lower emissions inhalers, like dry powder-based devices wherever clinically feasible.
- Systematically switch to lower emissions forms of anesthesia.
- Consider waste anesthetic gas destruction and capturing systems.[19]
- Consider alternatives to inhalational analgesics, like nitrous oxide.

Supply chain

Health care purchasing

- Incentivize contracts that ensure the manufacturing, packaging, transport, and delivery of pharmaceutical products are low-carbon through systematic engagement with the supply chain.
- Ensure packaging is sized to order requirements to minimize medication wastage.
- Set criteria to procure green or bio-based packaging and sustainable chemistry pharmaceuticals where feasible.

- Set criteria and, where feasible, targets to substitute metered dose inhalers with low emissions products.
- Substitute high global warming potential anesthetics with lower GWP products.
- Encourage the procurement of anesthetic machines that include gas flow rate efficiency monitors and capture systems where possible.

Manufacturers and suppliers

- Reduce pharmaceutical packaging and information leaflets, and switch to sustainable materials and/or digitalized information in countries with reliable internet access.
- Consider the use of artificial intelligence to reduce manufacturing inefficiencies.
- Collaborate to innovate and implement green, climate-smart pharmaceutical production.
- Consider sustainable vaccine cold chains in the development of vaccines.
- Systematically drive waste reduction in manufacturing and transport processes while also promoting waste minimization in the use of medicines by making compliance easier, ensuring flexibility of doses and packaging.

Wider economy and society

- Advocate for healthy lifestyles and holistic forms of chronic disease self-management.
- Advocate for innovation, research, and development that produces less toxic and more sustainable, climate-friendly pharmaceuticals and environmentally sound means for their disposal.

6. Implement circular health care and sustainable health care waste management

Implement circular economy principles to procure supplies, deploy clean technologies, reduce the volume and toxicity of health care waste, and manage waste sustainably.

Action in these areas can lead to a reduction in cumulative health sector emissions of at least 4.8 Gt CO_2e between 2014 and 2050.

Specific interventions for achieving climate-smart health care waste and circular health care management

Facilities and operations

- Reduce waste in every aspect of health care operations, like by training staff in the appropriate use of specific items and promoting composting or collection campaigns for plastics and other reusable and recyclable materials (see the food section for recommendations on food waste).
- Ensure systematic waste segregation to reduce the amount of waste that requires specialized treatment, and ensure that only hazardous clinical and laboratory waste is treated specifically according to its hazards.
- Prioritize the safe and environmentally sound treatment of hazardous health care waste, like autoclaving or other steam treatment, biodigestion, non-toxic neutralization, or chemical denaturing processes.
- Ensure the safe disposal of old cooling equipment, which contain F-gases.
- Phase out incineration wherever feasible; all incineration methods should be phased down, starting with facilities that do not meet the standards recommended by the Stockholm Convention on Persistent Organic Pollutants, the World Health Organization's health care waste management policy.

Supply chain

Health care purchasing

- Address circularity concepts early in the procurement stage when assessing products and services.
- Establish dialogue with manufacturers, collaborate to prevent the creation of waste, and increase reusability.
- Eliminate toxic materials from all purchased products and assets.

- Ensure contracts and tendering processes incentivize forms of reuse, refurbishment, and recycling.
- Procure suitable systems as services not products so supply chains retain ownership and responsibility for optimized whole-life management.
- Identify which products need to last and which are disposable/perishable, and select material strategies accordingly.
- Work with authorities and third parties (e.g., re-processors, waste treatment services) to improve the reuse and recycling of health care products and materials (including clinical/medical items) as well as reducing the need for incineration to a minimum.

Manufacturers and suppliers

- Transform the medical device industry to a more circular economy to advance the goal of providing increasingly complex care in a low-emissions future.
- Aim to be net-energy positive and net-water positive (discharge cleaner water than you import) in manufacturing facilities.
- Change business models to retain ownership of durable products, like medical equipment, where appropriate, implementing reverse logistics and take-back schemes to recover resources for refurbishment, remanufacturing, and recycling.
- Introduce extended producer responsibility (EPR) schemes for products and packaging.
- Redesign products to eliminate toxic, fossil fuel-based materials and eliminate “monstrous hybrids”: combinations of biological and technical materials which cannot be separated, like blended natural and synthetic fibers in textiles.[20]
- Reduce packaging and where necessary, ensure it is reusable, recyclable, or biodegradable.
- Avoid the use of fossil fuels in manufacturing products and plastics, processing, and transport.
- Ensure the manufacturing of fuels, chemicals, and gases is zero carbon equivalent and sustainable. Wherever possible substitute products and materials with alternative options that do not rely on polluting and toxic processes.
- Ensure wherever possible that all medical instruments and equipment are designed to be reusable, reprocessable, or contribute to a circular economy approach.

Wider economy and society

- Advocate for legislative and regulatory mechanisms solutions to drive a circular health care economy.
- Advocate for a shift in economic thinking away from limitless growth and metrics, like GDP toward economics appropriate for a finite planet.
- Support proposals for sustainable waste management funding, capacity, and infrastructure.
- Advocate for extended producer responsibility (EPR) schemes for products and packaging.

- Advocate for sustainable disposal of e-waste and equipment containing harmful gases, like F gases in cooling equipment in countries where this is not routine.
- Set goals to achieve a reduction in health care waste through national policies. Public health authorities should advocate for scaled-up promotion of non-incineration technologies for the final disposal of health care waste as a tool to prevent environmental pollution and disease burden from incineration pollution, including carbon emissions.
- Support local communities by planning, financing, demonstrating, and providing sustainable waste management services.

7. Establish greater health system effectiveness

Reduce emissions by improving system effectiveness, eliminating inefficient and unnecessary practices, linking carbon reduction and quality of care, and improved resilience.

Greater health system effectiveness can contribute to a cumulative reduction in global health sector emissions of at least 4.1 Gt CO_2e between 2014 and 2050, with the potential to exceed this saving through ambitious and transformative action.

Specific interventions for system-wide efficiency in the health sector

Facilities and operations

- Systematically reduce inefficiencies while improving health coverage and quality of care.
- Eliminate unnecessary procedures and practices and reduce unwarranted variance across care pathways as a means of improving quality of care.
- Systematically review and maximize the use of resources to avoid waste and redundancies.
- Include carbon footprint analysis in planning services across care pathways and delivery mechanisms.
- Target overtreatment and overprescribing as a line of action in combatting climate change, and incentivize appropriate treatment and prescribing through evidence-based guidelines and programs. [21]
- Adjust reimbursement schemes to incentivize low-carbon pathways of care.
- Maximize best practices for both climate and care in clinical delivery.
- Integrate climate impacts into the definitions of clinical quality.
- Use change management lessons learned from quality initiatives, like those practiced by the Institute for Healthcare Improvement.[22]

Supply chain

Health care purchasing

- Explicitly include effectiveness measures, resilience, specific zero carbon, and ecologically sustainable ambitions as part of the tender and selection processes for all services.
- Establish contract criteria that matches health systems' climate ambitions and includes systematic monitoring progress over time with incentives for early achievements.
- Request data from suppliers about the proportion of "spend" on lower-carbon options or those where the supplier publicly reports GHG emissions.

Manufacturers and suppliers

- Ensure all services that contribute to auditing, financing, human resources, consultancies, research, and other support services explicitly target their own emission reductions and system efficiencies, including through their own buildings, fleet, food, and business systems.
- Ensure that information and communication technologies (ICT) support telehealth ambitions, while reducing the footprint of storage capacity, ICT infrastructure, and devices that enable low-emission virtual communication.

Wider economy

- Advocate for every sector to systematically reduce carbon and maximize effectiveness in their operations, services, and own supply chains.
- Align health-financing policies with UHC coverage, decarbonization, and resilience building criteria.
- Advocate for ICT energy efficiency labelling.
- Ensure that the development of extra mile and ICT technologies, including basic access to electricity and the internet, include sustainability and low-carbon criteria as part of their development (e.g., increasing the longevity of devices, improving storage capacity, systematically encouraging lower-carbon virtual technology mechanisms).

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