# 1

# Introduction
## Health Care and the Climate Crisis

*"The pandemic has obligated us to reflect on the importance of human health and its relationship with the health of the planet. Climate change is a reality that affects all of humanity and therefore requires immediate coordinated action from all world leaders."*

Alberto Fernández, President, Republic of Argentina

# Delivering health on a warming planet

The COVID-19 pandemic has provided the world with a harrowing understanding of what a multidimensional crisis on a planetary scale looks like. Among other aspects, it has brought to the fore the centrality of the health sector as a frontline responder. It has shed light on the profound inequalities in health and health care access within and between countries. The pandemic has also highlighted the imperative to strengthen and transform our health systems to be prepared for future pandemics as well as other major health challenges of the 21st century, including climate change.

As the tendrils of the climate crisis have intertwined with and compounded the COVID-19 pandemic (and vice versa), the outbreak of the virus has demonstrated the interconnectedness of health and environment like never before. It has also underscored the urgency of climate action to protect the health of people and the planet alike from what the UN Secretary General calls "the defining issue of our time," and an "existential threat" to humanity.[4]

The Intergovernmental Panel on Climate Change's (IPCC) 2018 special report on global warming of 1.5 degrees Celsius documents the significantly more devastating impacts that could be expected at the 2°C Paris goal. Most importantly, it posits that we now have a decade left to institute "far-reaching and unprecedented changes in all aspects of society," in order to limit global average temperature rise to below 1.5 degrees Celsius with respect to pre-industrial levels by the end of the century. The only scenario in which this is possible is if we reach net-zero emissions globally by 2050.[5] To achieve this, we must accelerate the transformations in energy and land use, buildings, transportation, industry, urban development, and the health care sector itself. We must do so in order to avoid a deeper climate-health emergency that might make the COVID-19 pandemic pale in comparison.

While climate change impacts everyone, just as we have seen with COVID-19, those with the least access to wealth and health hit the hardest. In the case of the climate crisis, those least responsible for creating the problem—the nations and communities within nations who have consumed the least resources and emitted the lowest amount of greenhouse gases—bear the brunt of its impacts. Whether it be a small island state facing rising sea levels, a low-income country weathering climate-induced food insecurity, or an impoverished community located on the fence line of an oil refinery and breathing toxic air, the health impacts of climate change and its driving forces will not be borne equally or fairly. The most vulnerable—including low-income communities, women, indigenous peoples, the elderly, and children—will bear the brunt of climate impacts.[6]

At its heart, climate change raises a series of human rights issues (known collectively as "climate justice"), including an intimate interconnection with the right to health. For instance, there is a clear correlation between those countries facing the most severe climate threats with those needing to make the most progress toward universal health coverage. Indeed, unmitigated climate change will severely hinder countries' ability to achieve their health goals and may well reverse progress made over many decades and add to the burden of disease.[7]

Conversely, taking on climate change requires climate-smart health care to be a central part of the solution. This Road Map aims to help chart a course in that direction. By doing so, it intends to contribute to and catalyze a conversation among health leaders as to the profound structural and system changes necessary to address the greatest challenge of our generation and those that will come after us: recovering our planetary health while fostering an economy based both on justice and equity.

# Health care's climate footprint

In September 2019, Health Care Without Harm and Arup issued Green Paper One, *Health Care's Climate Footprint*.[8] This first ever global estimate found that the health sector, whose mission is protecting and promoting health, makes a major contribution to the climate crisis and therefore has an important role to play in resolving it.

Specifically, Green Paper One found that, based on 2014 data, health care's climate footprint is equivalent to 4.4% of global net emissions (2 gigatons of carbon dioxide equivalent). To provide context, this global health care climate footprint is equivalent to the annual greenhouse gas emissions from 514 coal-fired power plants. If the health sector were a country, it would be the fifth-largest emitter on the planet.

The Green Paper concluded that health care must respond to the growing climate emergency not only by treating those made ill, injured, or dying from the climate crisis and its causes, but also by practicing primary prevention and radically reducing its own emissions in order to align with the 1.5 degree ambition of the Paris Agreement. The sector, the paper argued, must undertake this effort while simultaneously meeting global health goals, like universal health coverage and working to achieve the Sustainable Development Goals.

The paper also concluded that if the health sector around the world were to come together to address the climate crisis, it could influence more than its own footprint. If health care development, growth, and investment can align with global climate goals, the paper argued, the 10% of the world economy that health care represents, together with its political clout at every level of government, as well as its ethical influence as a trusted communicator, the sector could help provide leadership for a low-carbon, climate-smart, more equitable, and healthier future.

Over the past decade, growing legions in the health sector have all recognized climate change as the greatest global health threat in the 21st century.

To achieve this ambitious and necessary end, the paper made a series of recommendations, including developing a Global Road Map to chart the course for zero emissions health care by 2050. Such a road map, the paper argued, is necessary to identify key pathways forward, while establishing timelines and frameworks for action among and between countries.

This Road Map follows through on that recommendation. It effectively provides a plan and charts a course to get health care toward zero emissions. It considers health sector emissions across all its component parts. It drills down into these elements to establish where emissions are most prevalent and explores interventions that can contribute to reducing them. It does so at a global level, and in the accompanying appendix, at a country level for 68 countries.

The Road Map defines how wealthier countries—whose health sectors are the biggest climate polluters—must take the most rapid action to decarbonize. It explores how middle-income countries can invest in health care development that takes it on a pathway to zero emissions, and how low-income countries need access to low-carbon and zero emissions technology that enhance their ability to provide health access and services. It shows how all must act.

# Reinventing health care in the 21st century

Under a business as usual scenario, health care's climate footprint will triple between now and 2050. This is not acceptable. The health sector must reinvent itself to address the urgent 21st century health threat of climate change. This requires system change both within and outside of the health sector.[9] It is at once an enormous challenge and also a timely opportunity.

Health care must do its part to contribute to, as the IPCC report calls for, a 45% reduction of global greenhouse gas emissions by 2030 (from 2010 levels) and "net zero" by 2050.[10] This Road Map aims to identify the pathways available for the health sector to help achieve that transformation.

As health spending continues to grow, the sector must decouple this growth from its climate emissions. The sector must reinvent ways to deliver care and how the products and technologies it uses are made, used, and disposed of. Health financing must be revamped to incentivize climate-smart health care. The health sector must team up with other sectors to accomplish this, while also working collaboratively to reduce the global burden of disease, and therefore the demand for resource intensive health care itself.

Carving a global path to zero emissions health care is just one component of the transformation that the climate crisis urgently requires health care to make. The health sector must also simultaneously build resilience—facility resilience[11] and systems resilience[12], while enhancing its role as an integral member of many communities to serve as an anchor for community climate and economic resilience. (see box: "health care climate resilience")

As it takes on the climate crisis, the health sector must also redouble its efforts to achieve the targets in UN Sustainable Development Goal Three (SDG 3), "Health and Well-Being." These nine targets range from reducing global maternal mortality, to ending epidemics like HIV-AIDS and other communicable diseases, to reducing premature mortality from non-communicable diseases, to reducing deaths from hazardous chemicals, air, water, and soil pollution. Perhaps most importantly, SDG 3 sets a target of achieving universal health coverage (UHC) by 2030 which includes "financial risk protection, access to quality essential health care services, and access to safe, effective, quality, and affordable essential medication and vaccines for all."[13]

Achieving SDG3 and fostering health equity requires a fundamental transformation of the sector including major increases in funding to expand access to health care. Decisions to implement UHC will lock in low- and middle-income countries' health delivery models for decades. It is vital that sustainability and climate-smart health care principles inform the models of UHC that countries adopt.

Decarbonization, climate resilience, and health equity can be mutually reinforcing. They are vital transformations that can often be delivered synergistically. If and how the health sector tackles them will define, to a large degree, its success or failure in taking on the challenges of the 21st century.

This Road Map takes as its point of departure the inextricably interconnected relationship between the need for comprehensive change in terms of health equity, health care climate resilience and adaptation, and health care decarbonization. Its navigational focus, however, is on the latter: how the sector can move toward zero emissions in the context of these other, related transformational priorities. It recognizes that the transformation required to decarbonize must go hand in hand with a broader and deeper transformation of the sector to thoroughly address climate change and to improve global health. In this regard, this Road Map is but one chart in what must be an atlas for health sector transformation.

# The race to zero:
# A growing health care climate movement

Over the past decade, growing legions in the health sector—doctors, nurses, hospitals, health systems, ministries of health, academics, health NGOs, the World Health Organization, and other international bodies— have all recognized climate change as the greatest global health threat in the 21st century.[14] These leaders have taken a series of steps to identify the interconnectivity between public health and a healthy climate to advocate for solutions that will protect public health from climate change, to build greater resilience and responsiveness to the climate crisis, and to reduce their own emissions.

For instance, in a guidance for health facilities in low- and middle-income countries, the World Health Organization recently recognized that, "health care facilities and more broadly the health sector, though profoundly impacted by climate-related shocks and stresses, have an opportunity to significantly reduce global GHG emissions. Therefore, facilities can respond to the growing climate emergency by building resilience to extreme weather events and long-term stresses to continue protecting the health of their population and by reducing and even eliminating all environmental contaminants from their operations.[15]"

Health care, in low-, middle-, and high-income countries, also has the opportunity to chart a course to zero emissions. By doing so, it can leverage its powerful position as a trusted messenger to deliver the truth about the health impacts of climate change and the action necessary to address them, helping lead a global response to the climate emergency. It is already going in this direction.

In January 2020, England's National Health Service announced a commitment to become the first national health system in the world to achieve net zero climate emissions. By October, despite the challenges presented by COVID-19, the NHS issued a plan that lays out the direction, scale, and pace of change to get to net zero. The plan defines a set of trajectories to

reach with an 80% reduction by 2032 and net zero by 2040 for the emissions they control directly. The NHS aims to be fully net zero by 2045 for the emissions they can influence, including the global supply chain. The report also begins to define the interventions required to achieve that ambition, including building 40 new net zero hospitals, retrofitting and upgrading existing buildings, installing onsite renewable energy, and transitioning NHS transport fleet to zero emission vehicles, including developing the world's first hydrogen-electric hybrid double-crewed ambulance.[16]

The NHS net zero plan also calls for leveraging the NHS purchasing power to achieve a net zero supply chain based on more efficient use of supplies, low-carbon substitutions, and product innovation, while ensuring that their more than 80,000 suppliers are decarbonizing their own processes. The plan seeks to avoid carbon offsets as much as possible and aims to spur innovation to address gaps in emissions reduction. Finally, it calls for a new health care service model that delivers health care based in sustainability, greater equity, and zero emissions. NHS's commitment makes it the world's climate flagship health system—one that shows hands on application of the contours of this Road Map that can help others chart their own course.

The same month that the NHS made its announcement, and in the midst of a COVID-19 surge in the country, the United States National Academy of Medicine published a scoping paper it commissioned to "propose potential strategies to mitigate the impact of the U.S. health care system on climate change." The paper called on the U.S. health care sector to move along a similar path as the NHS. Declaring, "it is now time for health care leaders and members of the health professions—among the most trusted people in society—to bend the arc of climate change toward planetary and human health," the paper called on U.S. health care, the single largest health care climate polluter on the planet, to take action. Calling it, "a crucial first step toward an eventual carbon-free
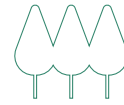
## HEALTH CARE CLIMATE RESILIENCE

As health care navigates opportunities for decarbonization, institutions often find significant overlap with climate resilience or adaptation measures. The converse is also true, where many health care institutions prioritizing climate resilience find low-carbon solutions help achieve this agenda (Figure 1).

While this Road Map focuses on health care decarbonization, the connection with resilience is important to underscore. Indeed, resilience should form a cornerstone of the decarbonization agenda and vice versa. Health care climate resilience can be divided into three inter-related categories: facility and infrastructure resilience, systems resilience, and community resilience.

**Facility and infrastructure climate resilience:** The World Health Organization defines "climate resilient and environmentally sustainable health care facilities as those that anticipate, respond to, cope with, recover from, and adapt to climate-related shocks and stresses, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, so as to bring on going and sustained health care to their target population and protect the health and well-being of future generations."

WHO identifies four core areas of health care facility resilience: 1. A skilled and informed health care workforce empowered to address environmental challenges. 2. Sustainable and safe management of water, sanitation, and health care waste services. 3. Sustainable energy services. 4. Appropriate infrastructure, technologies, products, and processes for the efficient functioning of the facility. WHO recommends that with climate change increasing the risk of severe impacts on health care facilities and placing complex, multifaceted, and unpredictable demands on health systems, all new investments in the health sector should contribute to building resilience to climate change.[17]

**Health system climate resilience:** System resilience is defined by WHO as "the capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; as well as stay informed through lessons learned during the crisis and reorganize if conditions require it. It is the ability to absorb disturbance, to adapt and to respond with the provision of needed services." Health system resilience also relies on cross-sectoral collaboration to achieve improved solutions.[18]

**Community resilience:** Reducing health inequalities is a neglected and fundamental component of providing more sustainable and resilient health services. The health care sector's role in achieving community resilience can involve focusing on reducing inequalities and addressing social injustice through economic investment to address the social determinants of health. Such community-based efforts can reach further than simply managing disruptions or the symptoms of inequity. This should include investing in resilient primary
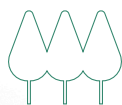
care systems and cadres of primary care workers, particularly in low- and middle-income countries[19]. Fostering community resilience should include supporting the right to livelihood and productive resources by making sure that no individual is living in food or energy poverty, lacks access to clean water and sanitation, access to safe housing, and that adults have the opportunity to work and significantly improve their ability to lead a healthier life.[20] Supporting community health education, strengthening local healing systems, supporting healthy food cultures, and addressing

the needs of marginalized groups can all support community climate resilience. By addressing social determinants of health, communities, families, and individuals can be better positioned to respond to the impacts of climate change, including extreme weather events.
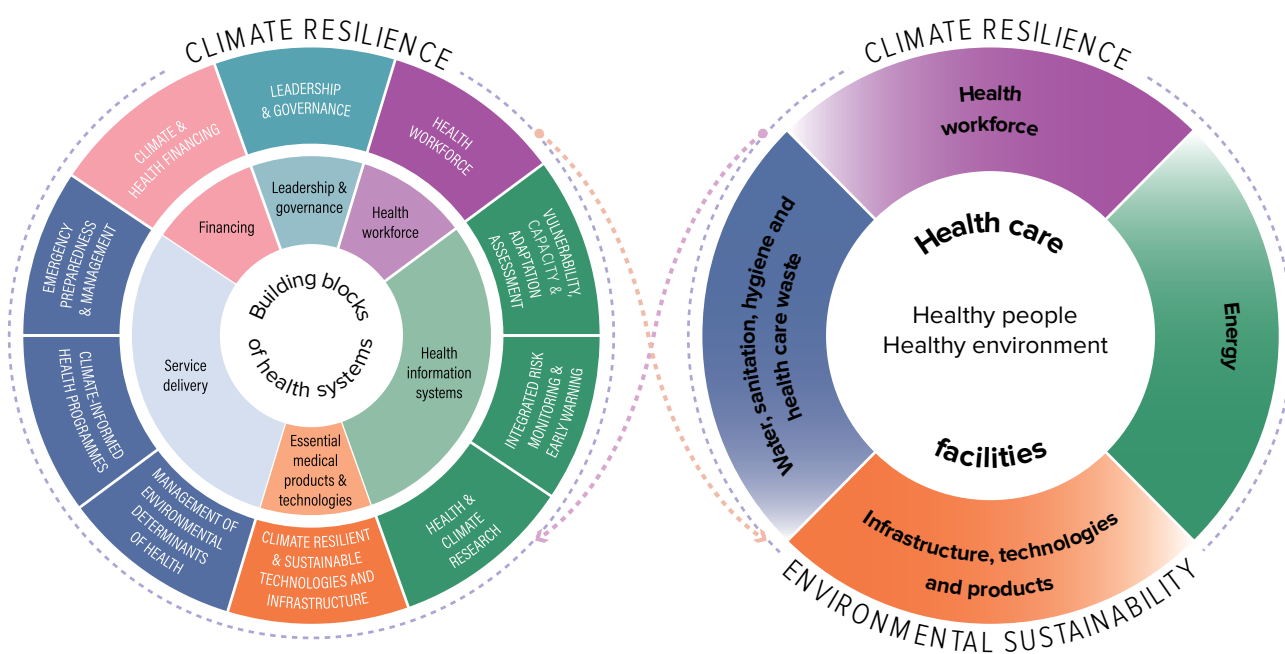


**Figure 1.** WHO's 2015 operational framework for climate-resilient health systems[21] (left) and new 2020 guidance for climate-resilient and environmentally sustainable health care facilities[22] (right)

health care system," the Academy stated, "the U.S. health care sector must reduce its carbon footprint by 50%, in absolute terms, by 2030 compared to a 2010 baseline." They suggested that this would be achieved by reducing the demand for services and by initiating a re-design of health services, the supply chain, infrastructure, and financing systems.[23]

The National Academy report builds on growing momentum for decarbonization in the U.S. health care sector with several major hospitals and health systems making commitments to carbon neutrality, primarily in their operational and purchased energy emissions (Scopes 1 and 2). These include Providence (881 hospitals and health centers), Cleveland Clinic (191 hospitals and health centers), Mass General Brigham (39 hospitals and health centers), and Kaiser Permanente (723 hospitals and health centers).

The momentum in the United States and the United Kingdom is also reflected in growing health care action across other health systems that are major climate emitters in Europe and in countries like New Zealand, where both the Auckland and Counties Manukau District Health Boards, representing a total of 45 hospitals and health centers, have also set plans to achieve carbon neutrality. The government of the Australian Capital Territory announced in 2020 that a new $500 million hospital being built in Canberra's south will be all-electric, ruling out the use of gas for heating and cooling equipment, allowing the hospital to become one of the first entirely powered by renewable energy.

Change is also afoot in low- and middle-income countries whose health systems are responsible for far fewer greenhouse gas emissions, particularly on a per capita basis. In many of these countries, low-carbon or net zero strategies sit in the context of achieving climate resilience. For instance, in the state of Chhattisgarh, India, the government has committed to solarizing all of its health centers and to making them
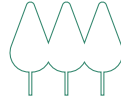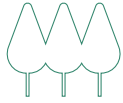
energy efficient in their operations. This strengthens the system's ability to deliver health, to withstand extreme weather events and other crises, and it puts the state's health systems on the road to 100% renewable electricity and zero emissions.[24] There are many other documented examples of hospitals and health systems across Asia, Africa, and Latin America implementing climate-smart health care strategies.[25]

Overall, hospitals, health systems, ministries of health, and other health organizations from around the world are coming together as part of a growing global health care climate movement. Many are part of Health Care Without Harm's Health Care Climate Challenge, a vehicle for health care institutions to commit to climate action along the three main pillars of mitigation, resilience, and leadership. Launched in 2015, the Climate Challenge has grown to include over 300 institutional participants from 34 countries who represent the interests of more than 22,000 hospitals and health centers. These institutions are setting mitigation and resilience targets and documenting their annual progress. From small, rural clinics to large, urban health systems, institutions from around the world are stepping up to the Climate Challenge and committing to be a part of the solution.

Beginning in 2021, Health Care Without Harm has teamed up with the UNFCCC High Level Champions to establish a health care component to the UNFCCC Race to Zero campaign. This will provide hospitals and health systems around the world the opportunity to become part of the UNFCCC's multisectoral Race to Zero.

Finally, several major health care manufacturers have made climate commitments. For instance, several pharmaceutical companies have pledged to source 100% renewable electricity, including, AstraZeneca (by 2025), Novo Nordisk (2030), Merck & Co. (2040), and Johnson & Johnson (2050).[26]

## COVID-19 AND CLIMATE-SMART HEALTH CARE[27]

The COVID-19 pandemic provides both lessons and opportunities for transforming health care in the age of climate change. For instance, in some countries COVID-19 hastened a transition to telemedicine, an action which has significant climate benefits in terms of reducing emissions from patient travel and facility operation. In other nations, investment in onsite renewable electricity to power health in energy-poor settings has led to greater facility and systems resilience during the pandemic. As nations, international financial institutions, and health organizations invest in both health systems' ongoing COVID-19 response as well as in major pandemic recovery initiatives, there will be significant opportunity to leverage these trillions of dollars in investments to foster transformative change that puts the sector on a path to zero emissions and climate resilience.[28]

A wide array of climate-smart interventions—covering both adaptation and mitigation—can be incorporated into the different components of the pandemic response and recovery, including COVID-19 testing and treatment, ensuring stable supply of PPEs and other medical commodities, reducing vaccine waste, planning for COVID-19 vaccine procurement, equitable delivery and waste management, and preparing for long-term healthy and green recovery (Figure 2).

For instance, the emergency response to COVID-19 includes massive investments in cold chain technologies and infrastructure that risk locking many countries' health systems into carbon-intensive vaccine systems for decades to come. Conversely, investment in climate-smart, energy efficient cold chains provide for the possibility to build back better for climate-smart transformation that delivers vaccines and establishes a robust, low-emissions cold chain for the future.[29]

Health systems can implement crosscutting interventions that address both pandemic preparedness as well as climate resilience and adaptation, including integrated disease surveillance systems based on the One Health approach which includes robust information and early warning systems, adequate and well-trained human resources for health, effective systems for risk communication, and resilient, locally sourced supply chains.

Health care climate mitigation can also be incorporated into COVID-19 response activities through the deployment of renewable energy, energy efficiency, low-carbon procurement, and sustainable waste management.

Looking forward, the pandemic recovery phase provides an opportunity to build back better with climate-smart health care that fosters robust resilient, decarbonized health systems that contribute to universal coverage, broader societal climate mitigation and improved population health.
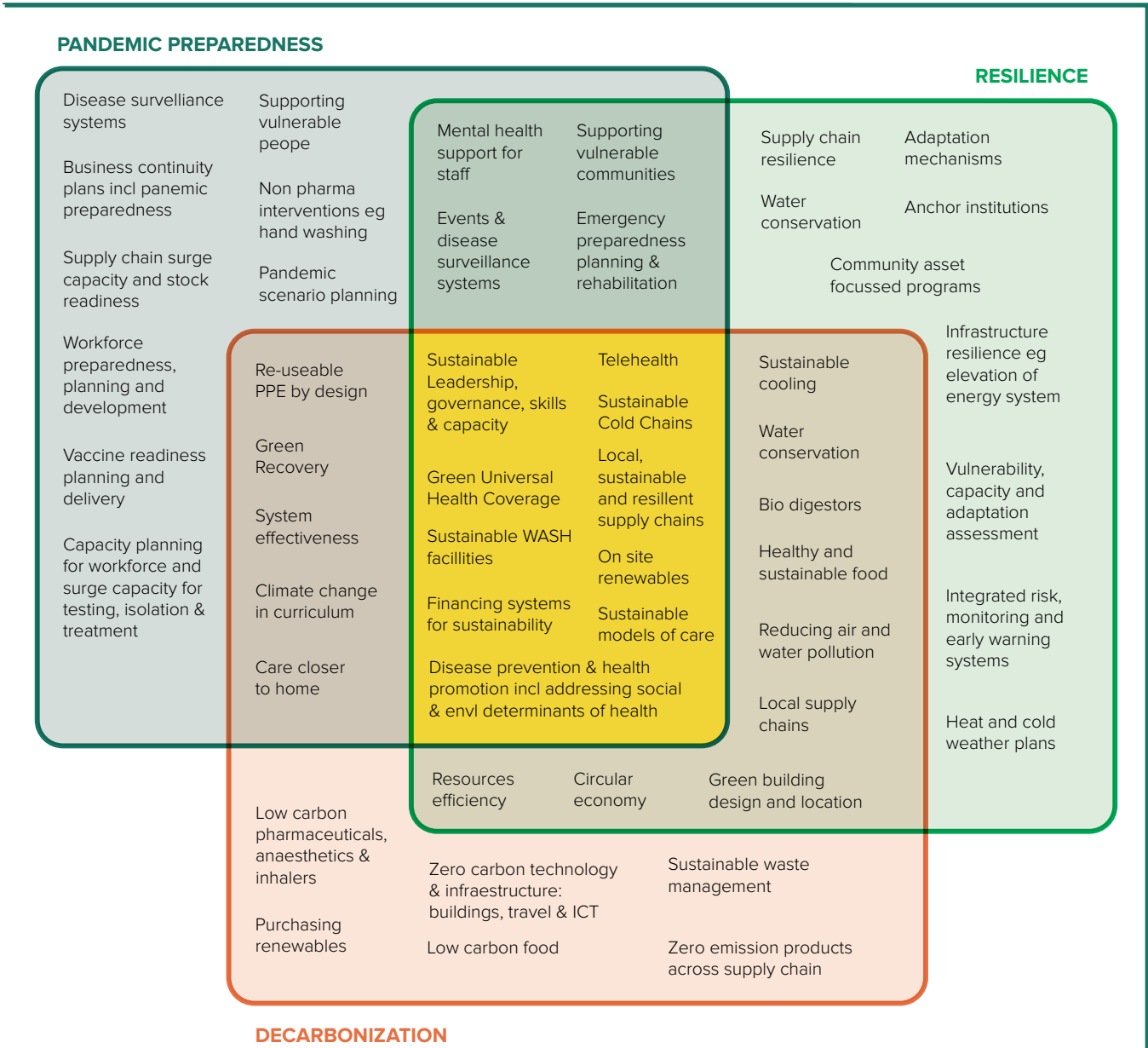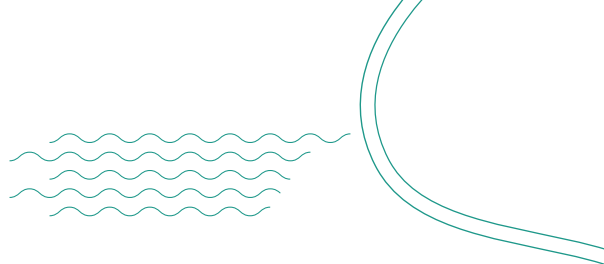
**PANDEMIC PREPAREDNESS**

**RESILIENCE**

Disease survelliance systems

Business continuity plans incl panemic preparedness

Supply chain surge capacity and stock readiness

Workforce preparedness, planning and development

Vaccine readiness planning and delivery

Capacity planning for workforce and surge capacity for testing, isolation & treatment

Supporting vulnerable peope

Non pharma interventions eg hand washing

Pandemic scenario planning

Mental health support for staff

Events & disease surveillance systems

Supporting vulnerable communities

Emergency preparedness planning & rehabilitation

Supply chain resilience

Water conservation

Adaptation mechanisms

Anchor institutions

Community asset focussed programs

Re-useable PPE by design

Green Recovery

System effectiveness

Climate change in curriculum

Care closer to home

Sustainable Leadership, governance, skills & capacity

Green Universal Health Coverage

Sustainable WASH facillities

Financing systems for sustainability

Telehealth

Sustainable Cold Chains

Local, sustainable and resillent supply chains

On site renewables

Sustainable models of care

Disease prevention & health promotion incl addressing social & envl determinants of health

Sustainable cooling

Water conservation

Bio digestors

Healthy and sustainable food

Reducing air and water pollution

Local supply chains

Infrastructure resilience eg elevation of energy system

Vulnerability, capacity and adaptation assessment

Integrated risk, monitoring and early warning systems

Heat and cold weather plans

Low carbon pharmaceuticals, anaesthetics & inhalers

Purchasing renewables

Resources efficiency

Zero carbon technology & infraestructure: buildings, travel & ICT

Low carbon food

Circular economy

Sustainable waste management

Zero emission products across supply chain

Green building design and location

**DECARBONIZATION**

**Figure 2.** Health care decarbonization, resilience and pandemic preparedness often overlap. They can be mutually reinforcing and synergistic.

# How to read this Road Map

This Road Map establishes a vision, a set of navigational tools, and a set of pathways by which the health care sector can chart a course toward zero emissions, while simultaneously building climate resilience and achieving global health goals (see Figure 3 for the Global Road Map infographic).

It is a living document to help traverse an ever-shifting landscape. It can be discussed, debated, amended, and tailored to national and local circumstances. It can be embraced by health care and climate leaders around the world as a navigational "North Star" or "Southern Cross" that can help the sector chart a course to reinventing itself and providing societal leadership in the age of climate change. It establishes a global vision, and, in Annex B, country specific information for 68 nations to begin to develop their own analysis and national road maps or action plans.

This Road Map provides a set of navigational tools and charts a course for health care to reach zero emissions, climate resilience and global health goals.

**THE ROAD MAP IS DIVIDED UP INTO FOUR MAJOR SECTIONS:**

1. **Understanding the topography:** Using a structural path analysis, this section deepens our understanding, derived from Green Paper One and other research, about health care's climate footprint operationally and within the global health care supply chain. Deeper understanding of this topography is essential to chart a course for transformation.

2. **Analyzing the sector's trajectories:** This section considers where the sector is now, the direction it is headed, and the course corrections that are needed to align with the ambition of the Paris Agreement and achieve zero emissions by 2050. It proposes four emissions trajectories for the health care sector, taking into account countries' common but differentiated responsibility for emissions and respective capabilities, levels of economic development, and development pathways in the health sector.

3. **Charting a course:** Based on the topography analysis and the forecasted trajectories, this section charts a course for health care climate action.

   **Three pathways:** Three main interrelated pathways set the contours of this course toward zero emissions. They are:
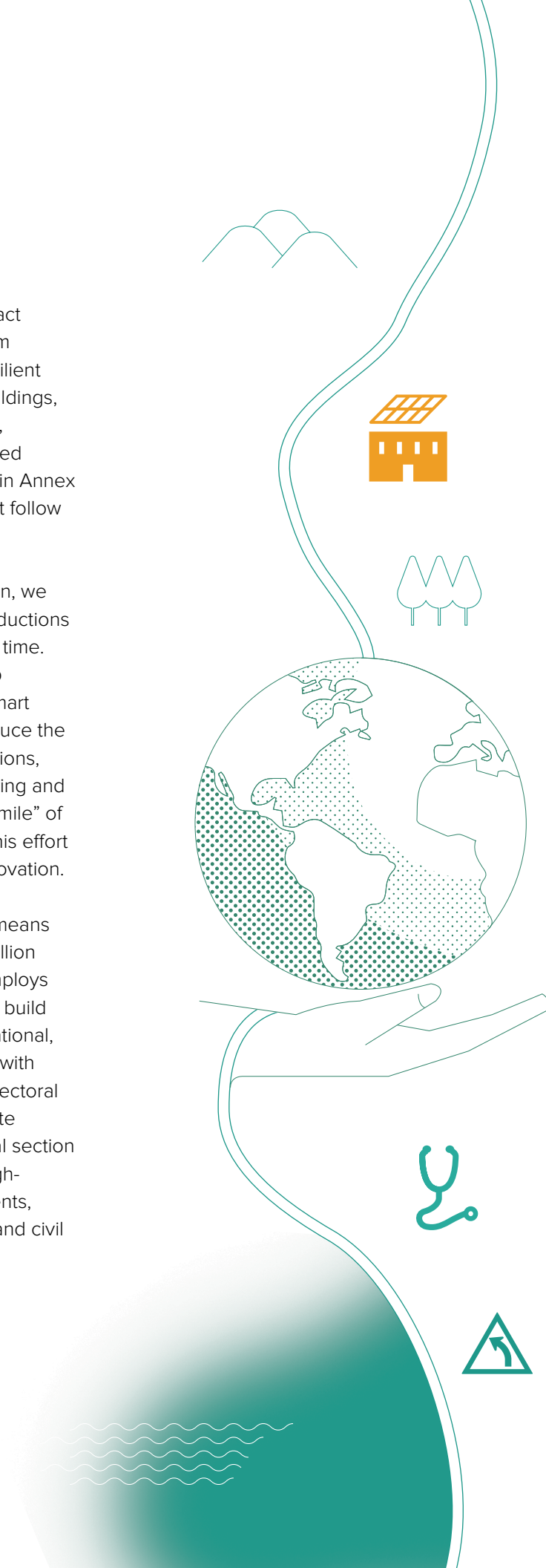
   - Decarbonize health care delivery and build resilience
   - Decarbonize the health care supply chain
   - Accelerate decarbonization in the wider society and economy

   To help guide the sector along each pathway, we provide a series of topline or high-level prescriptions.

**Seven high-impact actions:** Spanning and connecting these paths are seven high-impact actions that the sector must take to transform health care into a decarbonized, climate-resilient sector. These actions address electricity, buildings, and infrastructure, travel and transport, food, pharmaceuticals, circular health, and improved system effectiveness. For each action area, in Annex C, we recommend specific interventions that follow the pathway contours described above.

**Exploring uncharted territory:** In this section, we begin to explore opportunities for further reductions to close the health care emissions gap over time. This uncharted territory includes ramping up telehealth, assuring investment in climate-smart UHC, reducing the burden of disease to reduce the need for resource-intensive health interventions, and other transformational changes. Identifying and forging these solutions to address this "last mile" of decarbonization is a crucial component of this effort that will require creativity and significant innovation.

**4. Driving change:** To embark on this course means driving change in a sector that spends $8 trillion a year, comprises 10% of world GDP, and employs 170 million workers. It requires leadership to build consensus for transformation at the local, national, and global levels. It also requires alignment with global climate and health goals, and cross-sectoral collaboration to achieve health equity, climate justice, and community resilience. In this final section of the Road Map, we propose a series of high-level policy recommendations for governments, international institutions, the private sector, and civil society.

# How the Road Map charts a course toward zero emissions



Business as usual

Progress in line with governments' climate commitments up to 2017

Scope 1
Scope 2
Scope 3

Pathway 1
Pathway 2
Pathway 3

Target trajectory

Action 1 Renewable energy
Action 2 Zero emissions buildings
Action 3 Zero emission transport
Action 4 Healthy sustainable
Action 5 Low carbon pharma
Action 6 Circular health
Action 7 System effectiveness

Uncharted territory

Zero emissions, resilient health sector

2014

2014-2050

2050

Pathway 1: Facilities & Operations

Pathway 2: Supply Chain
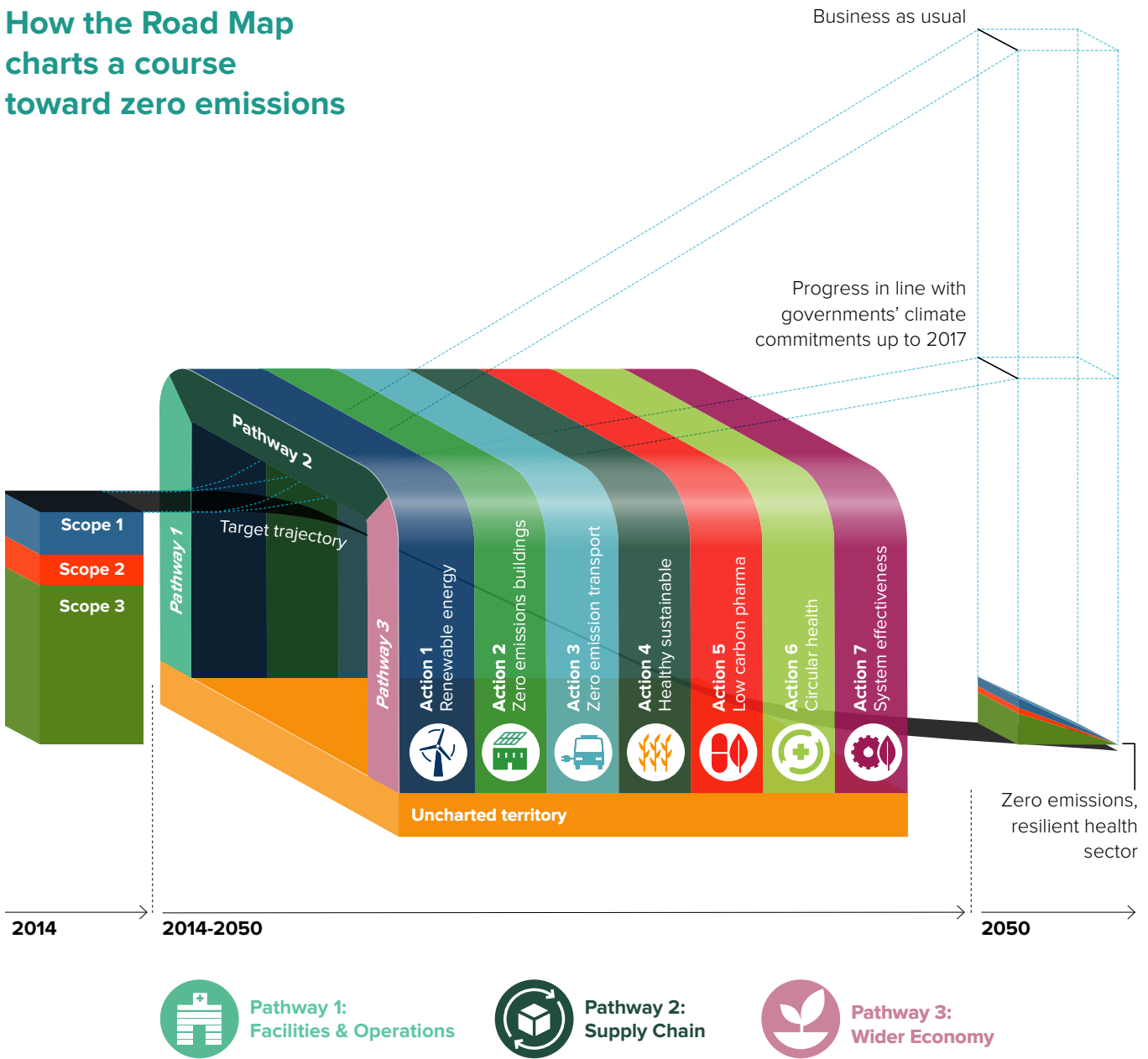
Pathway 3: Wider Economy

**Figure 3.** Assuming countries meet their initial Paris Agreement commitments, three intertwined pathways connected to seven high-impact actions come together to deliver health care decarbonization leading toward a zero emissions, resilient health care sector.