Compendium of WHO and other UN guidance on health and environment

2024 update

World Health Organization

Chapter 7.
Climate change

Suggested citation. Chapter 7. Climate change. In: Compendium of WHO and other UN guidance in health and environment, 2024 update. Geneva: World Health Organization; 2024. https://iris.who.int/handle/10665/378095

Contents

7. Climate change

Overview

Climate change impacts health in a myriad of ways, including by leading to death and illness from increasingly frequent extreme weather events, such as heatwaves, storms and floods; increased malnutrition, as many current food systems do not deliver healthy and sustainable diets; increases and alterations in zoonoses and food-, water- and vector-borne diseases; and mental health issues through, for example, fear about the future or the damage to and loss of natural habitats. Furthermore, climate change is undermining many of the social determinants of good health, such as livelihoods, equality and access to health care and social support structures. The indirect effects of climate change result from, for example, food, nutrition and water insecurity; increasing transmission of vector- and water-borne diseases; the disruption of health care systems and water and sanitation supplies; increased health inequalities; and climate-induced displacement and migration of communities.

There are several contributors to global climate change, including fossil fuel combustion and industrial processes, food systems (including related agricultural practices, deforestation and other land-use changes and consumption), transportation and energy use. In addition, the health sector is a significant contributor to climate change, being responsible for approximately 5.2% of global greenhouse gas (GHG) emissions *(1, 2)*.

All people are exposed to the hazardous effects of climate change, but some groups are particularly vulnerable. This includes people living in small island developing states and other coastal regions; megacities; and mountainous, polar and drought-prone regions; as well as children, indigenous communities, ageing populations, people with underlying health conditions and those living in low-income countries *(1)*.

Chapter updated in 2024

Actions to address the health risks of climate change encompass both mitigation and adaptation.

(a) **Mitigate** climate change by reducing or preventing emissions of GHGs; many of these actions have co-benefits, including for health; for example, they also reduce air pollution, save energy, improve the healthfulness of diets or help to increase physical activity among populations by introducing greener mobility options. Some co-benefits are described in other sections of the Compendium (such as Chapter 2. Air pollution, Chapter 9. Safe environments and mobility, Section 12.1 Cities and other settlements, Section 12.2 Housing and Section 10.2 Healthy diets and the environment).

(b) **Adapt and increase resilience** to climate change by enhancing the ability to anticipate, respond to, cope with and recover from the effects of climate change. This is necessary not only to maintain essential functions of the health system but also to continue improving population health even in the face of an unstable and changing climate.

Many actions will achieve **both decarbonization and resilience**-building goals. For example, the increased use of renewable energy in health care facilities can reduce GHG emissions and improve the climate resilience of the facility.

What are the main health risks related to climate change and which are the most vulnerable populations? What actions are needed to address these risks?	To assess the current effects of climate change and forecast future impacts, it is recommended to conduct a climate change and health vulnerability and adaptation assessment. This process aims to identify critical health risks, the most vulnerable populations, weaknesses in the systems that should protect them and interventions that can respond to the risks *(3)*.

The steps in conducting such an assessment include the following.
1. Getting started: plan the assessment.
2. Vulnerability assessment: describe the current burden of climate-sensitive health outcomes, and vulnerabilities to climate variability and recent climate change.
3. Capacity assessment: assess the capacities of health and health-relevant systems.
4. Future risk assessment: qualitatively or quantitatively, or both, project the health risks of climate change.
5. Adaptation assessment: identify and prioritize policies, programmes and actions to address current and projected health risks.
6. Synthesis: integrate the assessment as input into relevant climate change and health policies, plans and reporting mechanisms.

Detailed guidance on how to conduct vulnerability and adaptation assessments is available *(3)*. |

Climate change and health in small island developing states

Small island developing states are uniquely vulnerable to climate change due to their frequent exposure to extreme weather and climate events and sea level rise, while also being constrained by limited resources and largely dependent on food imports and trade, as well as fragile local food systems. Therefore, WHO has developed a special initiative on climate change and health in small island developing states *(4)*. Although most of the advice in the Guidance table will apply to small island developing states, even more urgent action to adapt to climate change will be needed in these countries. Small island developing states are among the first countries to be adversely affected by climate change and will experience some of the most severe impacts, despite contributing very little to the causes of climate change.

Selected recommendations from the *COP26 special report on climate change and health* for priority actions from the global health community, governments and policy makers (5).

- **Our health is not negotiable.**
  Place health and social justice at the heart of the UN climate talks.
- **Harness the health benefits of climate action.**
  Prioritize those climate interventions with the largest health-, social- and economic gains.
- **Build health resilience to climate risks.**
  Build climate-resilient and environmentally sustainable health systems and facilities, and support health adaptation and resilience across sectors.
- **Create energy systems that protect and improve climate and health.**
  Guide a just and inclusive transition to renewable energy to save lives from air pollution, particularly from coal combustion. End energy poverty in households and health care facilities.
- **Reimagine urban environments, transport and mobility.**
  Promote sustainable, healthy urban design and transport systems, with improved land use, access to green and blue public space, and priority for walking, cycling and public transport.
- **Protect and restore nature as the foundation of our health.**
  Protect and restore natural systems, the foundation for healthy lives, sustainable food systems and livelihoods.
- **Promote healthy, sustainable and resilient food systems.**
  Promote sustainable and resilient food production and more affordable, nutritious diets that deliver on both climate and health outcomes.
- **Finance a healthier, fairer and greener future to save lives.**
  Transition towards a well-being economy.
- **Listen to the health community and prescribe urgent climate action.**
  Mobilize and support the health community on climate action.

The Guidance table provides an overview of the most relevant advice from WHO or other UN organizations. The guidance is further classified according to principally involved sectors, level of implementation, instruments and evidence category.

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
Climate-resilient and low-carbon health systems				
1. Ensure strong leadership and governance for climate resilience, low-carbon pathways and environmental sustainability in health systems. This includes specific governance for climate change and health, the integration of climate change into health policies and programmes, the integration of health into climate change processes, and cross-sectoral collaboration *(6, 7).* Concrete examples of outputs may include the following. **Governance** • Climate change and health focal points are designated within the health ministry, with a specific programme of action and budget allocated. • Climate change and health focal points or units work in collaboration with relevant climate-sensitive health programmes (e.g. vector-borne diseases, nutrition, infectious diseases, disaster risk reduction) to build the resilience of programmes. • The health sector participates meaningfully in the main climate change processes at national, regional and global levels. **Policy** • The health component of National Adaptation Plan (known as HNAP) is developed. • Health is integrated into the Nationally Determined Contributions (or NDCs) and Long-Term Low-Emission Development Strategy. **Cross-sectoral collaboration** • Agreements (e.g. memoranda of understanding) are established between the health ministry and main stakeholders at the national level (e.g. meteorological services, and ministries of environment, food and agriculture, energy, transport, planning, water, sanitation, infrastructure/public works) that include specific roles and responsibilities in relation to protecting health from climate change or reducing GHG emissions, or both. • Main policies and strategies from health-determining sectors reflect climate change and health considerations, both in relation to adaptation (e.g. climate-resilient water safety plans [WSPs]) and mitigation (e.g. maximizing health co-benefits in transport systems). • Health Impact Assessments are conducted for new mitigation and adaptation policies, and for programmes in all health-determining sectors.	Health Environment Other sectors	National	Governance	B

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
2. Strengthen the technical and professional capacity of the health workforce to manage climate-related health risks, reduce the GHG emissions of the health sector and work with communities and other sectors on climate change and health *(6, 7)*. Concrete examples of outputs may include the following. **Health workforce capacity** • Regularly conduct training courses about climate change and health topics for the health workforce. • Curricula on climate change and health, covering both resilience and decarbonization, are developed and taught at secondary or tertiary level, or both. **Organizational capacity development** • Contingency plans to deploy sufficient health personnel in case of acute shocks, such as extreme weather events and outbreaks, are developed at the relevant level (i.e. national, subnational, local). • Innovative approaches to reducing GHG emissions at health care system or facility level are promoted (e.g. teams share best practices across different domains, and a system of rewards is implemented). • Innovative capacity-building plans are developed that respond to identified gaps in human resources and institutional capacity. **Information, awareness and communication** • Internal and external health communication plans are developed that focus on raising awareness of the risks of climate change and health outcomes, and on implementing efficient strategies to build climate-resilient health systems. • Internal and external health communication plans are developed that focus on measuring GHG emissions and implementing strategies to reduce health system emissions. • Health professionals, the media and community leaders are trained in risk communication, including how to communicate uncertainty. • A stakeholder forum is established that focuses on protecting health from climate change as a way to engage health-determining sectors and the community.	Health	National; health care Universal health coverage	Governance; information, education and communication	B

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
3. Implement integrated risk monitoring, early warning systems and GHG emissions tracking to inform timely action.	Health Environment	National; community Universal health coverage	Assessment and surveillance; information, education and communication	B

3. Implement integrated risk monitoring, early warning systems and GHG emissions tracking to inform timely action.

Key risks to monitor include extreme weather events, temperatures, ultraviolet (or UV) radiation, air quality, rainfall and humidity levels, El Niño/La Niña years, seasonal allergen loads and occurrences, food safety, and water availability and quality *(6, 7)*.

Concrete examples of outputs may include the following.

Integrated disease surveillance and early warnings
- An integrated climate and health surveillance system is implemented for specific climate-sensitive diseases.
- Climate-informed health early warning systems that predict the risk of an outbreak of priority infectious diseases (e.g. malaria, dengue, cholera) are developed and implemented.
- The geographical and seasonal distribution of health risks and outcomes (e.g. risk mapping) are tracked for priority climate-sensitive diseases.

Monitoring and progress tracking
- A monitoring process is established within the Ministry of Health that has a tracking system to measure progress in reducing GHG emissions.
- Indicators of climate change are included in relevant monitoring systems at the national level, are reported over time and incorporate information about risks, impacts, vulnerabilities and the capacity of health and emergency preparedness systems, as well as about climate and environmental variables.
- Periodic reviews are conducted to detect improvement or deterioration in capacities, and these are identified through vulnerability and adaptation assessments.

Communication
- A communication plan or strategy to address climate risks to health and health system decarbonization is developed and implemented, outlining the scope of information for diverse audiences (e.g. media, public, health personnel and other sectors) and events. Information about the health system's carbon emissions and best reduction practices and opportunities is shared with relevant stakeholders and communities.
- Community engagement and feedback mechanisms are established to empower affected populations to respond to warnings and to guide future development of monitoring and warning systems.

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
4. Increase resilience and reduce GHG emissions from infrastructure, technologies and the supply chain *(6, 7)*. Concrete examples of outputs may include the following. **Adaptation of current infrastructures, technologies and supply chain** • Iterative review and revision in line with projected climate risks are undertaken of specifications for the siting and construction of health facilities; the provision of energy, water, waste management and sanitation; technologies and the selection of products and processes for services. • Health care facilities are retrofitted according to climate resilience and low-carbon standards. • Training and recommendations for the prescription of pharmaceuticals during extreme heat conditions are revised. • An improvement plan is developed for ensuring health service delivery during extreme weather events and outbreaks of climate-sensitive diseases, based on the results of vulnerability assessments of health care facilities. **Promotion of new technologies** • Access to renewable energy in health care facilities is promoted as an adaptation and sustainable low-carbon measure. • Environmentally sustainable technologies suitable for harsh conditions (e.g. green cooling) are adopted. **Environmental sustainability of health operations** • Assessments are conducted of health sector impacts on the environment, including GHG emissions. • Decarbonization actions are implemented at health system or facility level, or both. • GHG emissions and environmental sustainability considerations are integrated within health sector procurement policies and practices. Further guidance is provided in Section 12.4 Health care facilities.	Health Other sectors	National; community Universal health coverage	Infrastructure, technology and built environment; assessment and surveillance	B

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
5. Improve efforts to respond to environmental risks to health by strengthening monitoring and management of environmental determinants of health, developing and implementing regulatory instruments and mechanisms, and promoting coordinated intersectoral management *(6, 7)*. Concrete examples of outputs may include the following. **Monitoring** • Integrated monitoring systems collect data about environmental hazards (e.g. water quality, water availability, air quality), socioeconomic factors and health outcomes. **Regulatory mechanisms** • Regulations for key environmental determinants of health (e.g. air quality, water quality, food quality and safety, waste management) are designed to reflect broader ranges of expected climatic conditions and the health sector's own contribution to GHG emissions and environmental impacts. • Regulations for clean energy systems are promoted as a means to improve local air quality and reduce the number of premature deaths from exposure to air pollution. **Coordinated cross-sectoral management** • Environmental Health Impact Assessments for policy and programmes, in sectors such as transport, agriculture and energy, are implemented in coordination with the Ministry of Health. • Joint multisectoral risk management approaches to health risks related to disasters, water, waste, food and air pollution are implemented. • A sustainable low-carbon approach is integrated into management of the environmental determinants of health.	Health Transport Energy Agriculture Environment Water/sanitation	National; community	Governance; regulation; assessment and surveillance	B

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
6. Emerging climate and environmental risks to health require updates of existing health programmes and their management to strengthen their response capacity with adequate, effective and sustainable interventions. These programmes include emergency and disaster risk management, public health preparedness, early warnings, food security and nutrition, infectious disease monitoring, climate-sensitive disease surveillance, and several vertical programmes for communicable and noncommunicable diseases, and injury prevention *(6, 7)*. Concrete examples of outputs may include the following. **Health programming** • Health programmes use climate information and evidence to inform action on climate-sensitive health programmes and integrate climate change, health adaptation, and resilience and mitigation (and include procurement processes). • Service delivery is informed by a sound understanding of the different exposure pathways to climate-related hazards and targeted to those most at risk, considering gender differences and diverse vulnerability factors. • Investment plans are developed to address identified capacity gaps in health programmes to deal with the increased health risks from climate variability and change. **Delivery of interventions** • Risk maps and analyses of seasonal trends in diseases are used to target resources and preventive measures to those most at risk. • Short- and long-term climate resilience and sustainable low-carbon interventions are defined and prioritized by key health programmes.	Health	National; health care Universal health coverage	Other management and control	B

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
7. Build preparedness, response capacity and health security in health systems and communities to cope with outbreaks and emergencies triggered by climate variability *(6, 7)*. Concrete examples of outputs may include the following. **Inform policies and protocols** • Policies, protocols and strategies for Health Emergency and Disaster Risk Management (or Health EDRM) plans are reviewed and improved through the integration of information about climate-sensitive health risks, weather and climate (e.g. El Niño/La Niña conditions). • Health sector contingency plans for extreme weather events are developed in line with the WHO Emergency Response Framework, and include risk reduction, preparedness and response. **Risk management** • Risk assessments for current and projected future exposure to extreme weather events are routinely used to inform strategic development plans for the health sector. **Community empowerment** • Stakeholder mechanisms are established to support participation, dialogue and information exchange among stakeholders and, particularly, to empower civil society and community groups as primary actors in emergency preparedness and response. • Capacity development programmes are implemented to identify and support the role of local communities in recognizing risks, preventing exposure to hazards and taking action to save lives during extreme weather events. • Mechanisms are in place to ensure information related to health risks from extreme weather events reaches communities in a way that triggers preventive action by them.	Health	National; health care Universal health coverage	Other management and control; assessment and surveillance	B

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
Climate change mitigation				
8. Conduct health co-benefits assessments of mitigation and adaptation actions in other sectors to inform and drive climate action *(8−10)*.	Health Energy Food Transport Infrastructure Agriculture Other sectors	National; community Universal health coverage	Assessment and surveillance	B
9. Reduce GHG emissions from health care facilities through transition to renewable energy in buildings, transportation and other operations, and through development of green supply chains *(7)*.	Health Energy Infrastructure	National; health care	Regulation; infrastructure, technology and built environment; other management and control	B
10. Mitigate climate change by reducing GHG emissions and other climate-changing pollutants, such as black carbon, for example through more sustainable energy-use choices, agricultural practices, transport options, and a shift to a more plant-based diet, reduced food loss and waste, city densification and use of industrial technology and practices *(1, 11)*.	Agriculture Transport Industry Energy Other sectors	National; community	Taxes and subsidies; infrastructure, technology and built environment	B, C
11. Reduce deforestation and implement afforestation and sustainable forest management practices *(11)*.	Forestry Environment Land use planning	National; community	Other management and control; regulation	C
12. Implement sustainable infrastructure development and spatial planning to avoid locking societies into GHG-intensive emission pathways that may be difficult or costly to change *(11)*.	Land use planning	National; community	Infrastructure, technology and built environment	C
13. Establish and enforce air quality standards, in line with the 2021 update to the WHO air quality guidelines *(12)*.	Environment Health	National	Regulation	A

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
14. Adopt energy-efficient building codes for new buildings and retrofit established buildings *(11)*.	Housing Construction	National; community	Regulation; infrastructure, technology and built environment	C
15. Improve the efficiency of material use, the reuse of materials and products, and recycling, particularly in the industry sector, and reduce product demand overall *(11)*.	Industry Waste	National; community	Infrastructure, technology and built environment; other management and control	C
16. Promote demand-side mitigation that encompasses changes in infrastructure use, end-use technology adoption, and sociocultural and behavioural changes *(11)*. Examples may include the following: • ensuring healthy diets from sustainable food systems and reduced consumption of red and processed meat, while acknowledging nutritional needs and contexts *(13)*; • reducing food waste; • implementing adaptive heating and cooling choices for thermal comfort; • using building-integrated renewable energy; • using electric light-duty vehicles and encouraging a shift to walking, cycling, and shared pooled and public transit; • encouraging sustainable consumption by intensive use of long-life reparable products.	Agriculture Transport Industry Energy Other sectors	National; community Universal health coverage	Information, education and communication; governance; other management and control	C

Heat-health response

17. Develop and implement a national heat–health action plan *(14)*.	Health Environment	National	Governance	B
18. Designate an agency with the authority to coordinate response activities and disseminate information about heat-related health impacts *(15)*.	Health Environment	National	Governance	B, C
19. Plan places that are more resilient to climate change and natural disasters: create well-designed and accessible green and blue spaces that also act as buffer zones and functional landscapes *(15)*.	Land use planning	Community; national	Infrastructure, technology and built environment	B
20. Inform the public about anticipated heatwaves and how long they are forecast to last *(15)*.	Health Environment	National; community Universal health coverage	Information, education and communication	B, C

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
21. Communicate clearly about the dangers of heatwaves, emphasizing that health protection is the first priority. Where possible, encourage people to postpone outdoor or sporting activities during the heat of the day, including at schools. Work with utilities to prevent suspension of water and electricity services *(15)*. Messages may include the following *(16)*. • Keep out of the heat as best as possible, including at night; avoid strenuous physical activity; and ensure children and animals are not left in parked vehicles. • Keep your body cool and hydrated. Wear light and loose-fitting clothing and use light bed linen; take cool showers or baths; and drink regularly but avoid alcoholic, caffeinated and sugary drinks. If necessary and possible, try to spend 2-3 hours of the day in a cool place. • Breastfeeding is the best way to keep your baby hydrated during hot weather. • Keep your home cool. Use the night air to cool down your home by opening windows, and reduce the heat inside your home during the day by using blinds or shutters and turning off non-essential appliances.	Health Environment	National; community; health care; schools/ childcare settings; workplace Universal health coverage	Information, education and communication; other management and control	B, C
22. Inform caregivers and those responsible for particularly vulnerable populations about the risks of and appropriate responses to heatwaves. Additional emergency medical personnel may be assigned to address any increase in demand for services. Cooling centres can be opened to provide relief, and transportation to them can be provided for the most vulnerable *(15)*.	Health	National; community Universal health coverage	Information, education and communication; other management and control	B, C
23. Provide access to additional sources of information, such as media broadcasts and websites offering additional information, and telephone services to report concerns about individuals who may be at risk from a heatwave *(15)*.	Health	National; community Universal health coverage	Information, education and communication	B, C
24. Prevent heat stress in outdoor workers; most can be prevented by *(15)*: • engineering controls, such as general ventilation; evaporative cooling and spot cooling; • changing work practices, such as by providing plenty of drinking-water; • scheduling heavy work during the cooler parts of the day or reducing the physical demands during the hottest part of the day; • alternating periods of work and rest, and ensuring that rest periods can be spent in a cool area; • wearing appropriate clothing; • educating employees about the hazards of heat stress.	Health Labour	Workplace Universal health coverage	Other management and control	B, C

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
Water, sanitation and hygiene (WASH)				
25. Assess climate risks and vulnerabilities or use information from existing assessments to inform implementation of strategies for climate resilience of water and sanitation systems *(17)*.	Water/sanitation	National; community	Assessment and surveillance	B
26. Increase the climate resilience of WASH and waste management services in health care facilities by integrating climate considerations into facility-based improvement tools *(18)*. For more detailed information about safe and climate-resilient health care facilities, please consult Section 12.4 Health care facilities.	Water/sanitation Waste Health	National; community Universal health coverage	Other management and control	B
Drinking-water safety				
Water safety may be affected by (i) more intense precipitation and flooding, (ii) increased drought, (iii) increased temperature and (iv) sea level rise. These can lead to increased levels of waterborne pathogens and other harmful contaminants, increased vector breeding sites, floods, and water and food scarcity.				
27. Develop a WSP to systematically manage all risks within a water supply system — from catchment to consumer — that may impact public health, including climate-related risks. Note: This section describes only how climate considerations can be integrated into the WSP approach. For general information about WSPs, see Section 3.2.1 Drinking-water. The key actions for water safety planning for climate resilience include the following. • Augment the WSP team with relevant climate-related expertise. • Integrate relevant climate information into the description of the water supply system. • Identify climate-related hazards and assess the risks. • Develop an incremental improvement plan to increase climate resilience. • Develop management procedures and supporting programmes that strengthen the climate resilience of the system *(19)*.	Water/sanitation	National; community	Other management and control	B

Chapter updated in 2024

Guidance	Sector principally involved in planning/implementation	Level of implementation	Instruments	Category of evidence

Sanitation safety

Similar to water safety, sanitation safety may be affected by (i) more intense precipitation, (ii) more variable or declining rainfall or run-off, (iii) more frequent or more intense storms or cyclones, (iv) sea level rise and (v) more variable and increasing temperatures. These can lead to damaged infrastructure, flooding of latrines and other sanitation systems that causes faecal environmental contamination and bypassing of treatment processes, spillage and contamination, higher pollution concentrations in wastewater and increased deposits and blockages due to water scarcity *(17, 20)*.

Guidance	Sector principally involved in planning/implementation	Level of implementation	Instruments	Category of evidence
28. Integrate climate considerations into sanitation safety plans *(21)* by targeting the greatest health risks and planning for incremental improvements. The main steps to addressing these concerns include *(17)*: • engaging climate-related experts when preparing a sanitary safety plan to define its scope and priorities; • describing the sanitation system; • identifying hazards and assessing risks; • developing and implementing an incremental improvement plan; • monitoring control measures and verifying performance; • developing supporting programmes and reviewing plans.	Water/sanitation	National; community	Other management and control	B
29. Increase the climate resilience of sanitation systems. Detailed guidance on safe sanitation systems is provided in *(20)*.	Water/sanitation	National; community	Other management and control	A

Food systems

If a vulnerability and adaptation assessment *(3)* has pointed to food systems as a thematic priority, a number of actions can be taken to assess food systems, anticipate any challenges to them and adapt to improve them. This section lists possible examples of concrete actions that can be taken, according to local risks and circumstances, beyond health system strengthening for nutrition *(22)*.

Guidance	Sector principally involved in planning/implementation	Level of implementation	Instruments	Category of evidence
30. Promote cross-sectoral communication to align adaptation actions in agriculture or infrastructure (e.g. increasing WASH coverage), as well as within the health sector *(22)*.	Agriculture Health Other sectors	National	Governance	B

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
31. Promote national commitments to shift towards healthy diets from sustainable food systems (this includes breastfeeding). Where appropriate, shift food consumption patterns to diets that include more plant protein (e.g. beans, chickpeas, lentils and nuts), a reduced amount of animal-based foods (e.g. red and processed meat and dairy) and less saturated fats (e.g. butter, milk, cheese, meat, coconut oil and palm oil) *(13, 23)*. These changes may include: • development of national food-based dietary guidelines that consider sustainability; • development of public food procurement regulations that consider the healthfulness and environmental footprint of food and beverages purchases.	Food Health Environment	National	Information, education and communication	B
32. Raise awareness about and support policy revisions that highlight links between nutrition and climate change within, for example, food-based dietary guidelines, fiscal policies, and food procurement, among decision-makers and policy-makers, and provide education about healthy diets and sustainable food systems to the general public *(22)*.	Food Health Environment	National; community	Information, education and communication	B
33. Train health personnel how to use climate information and early warning systems *(22)*.	Health	Health care Universal health coverage	Information, education and communication	B
34. Integrate risk monitoring for relevant diseases and food hazards, and improve the use of nutrition early warning and early response systems *(22)*.	Food Health Environment	National; community Universal health coverage	Assessment and surveillance; information, education and communication	B
35. Promote better crop diversity and biodiversity to improve nutrition, for example through agricultural subsidies and extension services, with an emphasis on vegetables and fruits, and ensure these are accessible and affordable *(22)*.	Food Agriculture	National; community	Other management and control	B
36. Exploit synergies among horticulture, aquaculture and the rearing of small livestock to reduce waste and expenses on agricultural inputs, and increase the diversity of food production *(22)*.	Food Agriculture	National; community	Infrastructure, technology and built environment	B
37. Improve household food production and livelihoods (i.e. diversify household food production for household consumption to improve the nutritional quality of the family's diet) *(22, 24)*.	Agriculture Health	Community Universal health coverage	Information, education and communication	B
38. Enhance access to and the affordability of healthy foods from sustainable food systems *(22)*.	Food Agriculture	National; community	Taxes and subsidies; other management and control	B

Chapter updated in 2024

Guidance	Sector principally involved in planning/ implementation	Level of implementation	Instruments	Category of evidence
39. Promote sustainable land-use management and integrated agroforestry systems to reduce deforestation, restore degraded soils and promote biodiversity within the agricultural system; promote sustainable exploitation of nutrient-rich non-wood forest products, particularly in areas with traditional agroforestry knowledge (22).	Land use planning Agriculture	National; community	Other management and control	B
40. Create a restored and diversified natural resource base and ensure that populations have the capacities and means to sustainably manage their natural resources (22).	Environment	Community; national	Other management and control	B
41. Add school-based approaches (e.g. school feeding programmes, school gardens, nutrition education) that include consideration of climate variability and long-term change into existing school and nutrition initiatives to create healthy school environments (22, 25, 26).	Education Health	Schools/ childcare settings Universal health coverage	Other management and control; information, education and communication	B

A − WHO guideline, B − WHO best practice/strategy, C − other UN best practice/strategy
GHG: greenhouse gas; WSP: water safety plan.

Selected resources for the Guidance table

Please note that only selected references are listed here. Please consult the reference section for all cited resources.

WHO 2023: Operational framework for building climate resilient and low carbon health systems (6) − The framework's goal is to increase the climate resilience of health systems to protect and improve the health of communities in an unstable and changing climate, while optimizing the use of resources and implementing strategies to reduce GHG emissions.

Intergovernmental Panel on Climate Change 2023: Climate change 2022 − mitigation of climate change (11) − This report provides an updated global assessment of progress in climate change mitigation and pledges, and examines the sources of global emissions.

WHO 2021: Climate change and health: vulnerability and adaptation assessment (3) − This report provides guidance and support to countries conducting national or subnational assessments of current and future vulnerability to the health risks of climate change and developing policies and programmes that could increase resilience.

WHO 2020: WHO guidance for climate-resilient and environmentally sustainable health care facilities (7) − This guidance document provides a set of suggested interventions to increase climate resilience and environmental sustainability in health care facilities.

Additional selected tools and further resources

This list contains additional selected material that is not cited in the Guidance table.

WHO Regional Office for Europe 2023: Zero regrets: scaling up action on climate change mitigation and adaptation for health in the WHO European Region: key messages from the Working Group on Health in Climate Change, second edition (27) − This paper supports the implementation of strategies that not only reduce GHG emissions but also enhance resilience and preparedness in health care systems by promoting sustainable and healthy communities.

WHO 2022: Technical series on adapting to climate sensitive health impacts: diarrhoeal diseases *(28)* — provides specific guidance on vulnerability and adaptation assessment for climate-driven diarrhoeal diseases, among others.

WHO 2021: WHO country support on climate change and health — visual guide *(29)* — This guide provides an overview of the various means of support WHO offers to Member States to advance climate-resilient health.

WHO 2021: Quality criteria for Health National Adaptation Plans *(30)* — This guide presents examples of good practice in devising Health National Adaptation Plans (or HNAPs) to assist countries in developing a comprehensive, feasible and implementable Plan.

WHO 2021: Checklists to assess vulnerabilities in health care facilities in the context of climate change *(31)* — Designed as a complementary tool to WHO's guidance for climate-resilient and environmentally sustainable health care facilities *(7)*, this document supports health care facility managers and other health workers in establishing a baseline with regards to climate change resilience in health care facilities.

WHO 2021: Quality criteria for the evaluation of climate-informed early warning systems for infectious diseases *(32)* — This guide aims to outline the key technical and operational criteria surrounding the performance, application, implementation and effectiveness of early warning systems.

Committee on World Food Security, Food and Agriculture Organization of the United Nations 2021: CFS voluntary guidelines on food systems and nutrition *(33)* — The Voluntary Guidelines present a range of recommendations to promote policy coherence and reduce policy fragmentation between relevant sectors, including agriculture, health and environment. They aim to support the development of coordinated, multisectoral national policies, laws, programmes and investment plans to enable safe and healthy diets achieved through sustainable food systems.

WHO 2018: Achieving health benefits from carbon reductions: manual for CaRBonH calculation tool *(34)* — This tool allows quantification of the physical and economic consequences for human health that are achieved through country-level improvements in air quality by reducing domestic carbon emissions.

WHO 2017: Flooding: managing health risks in the WHO European Region *(35)* — This publication proposes a range of measures that address the health risks of floods and actions to protect population health care, organized around prevention, preparedness, response and recovery.

UNICEF 2015: Unless we act now: the impact of climate change on children *(36)* — This report looks at how children, and particularly the most vulnerable children, are affected by climate change and what concrete steps need to be taken to protect them.

References

1. Climate change and health [website]. Geneva: World Health Organization; 2023 (https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health, accessed 10 October 2021).
2. Romanello M, Di Napoli C, Drummond P, Green C, Kennard H, Lampard P, et al. The 2022 report of the Lancet Countdown on health and climate change: health at the mercy of fossil fuels. Lancet. 2022;400:1619–54.
3. Climate change and health: vulnerability and adaptation assessment. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/345968, accessed 16 August 2023).
4. Climate change and health in small island developing states: a WHO special initiative. Geneva: World Health Organization; 2019 (https://apps.who.int/iris/handle/10665/279987, accessed 15 June 2021).
5. COP26 special report on climate change and health: the health argument for climate action. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/346168, accessed 14 August 2023).
6. Operational framework for building climate resilient and low carbon health systems. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/373837, accessed 20 December 2023)
7. WHO guidance for climate-resilient and environmentally sustainable health care facilities. Geneva: World Health Organization; 2020 (https://iris.who.int/handle/10665/335909, accessed 23 October 2020).
8. A framework for the quantification and economic valuation of health outcomes originating from health and non-health climate change mitigation and adaptation action. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/367385, accessed 25 September 2023).
9. Health in the green economy: health co-benefits of climate change mitigation — housing sector. Geneva: World Health Organization; 2011 (https://iris.who.int/handle/10665/44609, accessed 25 September 2023).
10. Health in the green economy: health co-benefits of climate change mitigation — transport sector. Geneva: World Health Organization; 2012 (https://iris.who.int/handle/10665/70913, accessed 25 September 2023).
11. Summary for policymakers. In: Shukla PR, Skea J, Slade R, Fradera R, Pathak M, Al Khourdajie A, et al., editors. Climate change 2022 — mitigation of climate change: Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, first edition. Cambridge: Cambridge

University Press; 2023:3-48 (https://www.cambridge.org/core/product/identifier/9781009157926%23pre2/type/book_part, accessed 17 August 2023).

12. WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/345329, accessed 10 August 2023).

13. Red and processed meat in the context of health and the environment: many shades of red and green. Information brief. Geneva: World Health Organization; 2023 (https://iris.who.int/handle/10665/370775, accessed 25 September 2023).

14. Heat and health in the WHO European Region: updated evidence for effective prevention. Copenhagen: WHO Regional Office for Europe; 2021 (https://apps.who.int/iris/handle/10665/339462, accessed 12 August 2023).

15. Heatwaves and health: guidance on warning-system development. Geneva: World Meteorological Organization, World Health Organization; 2015. (https://library.wmo.int/records/item/54600-heatwaves-and-health, accessed 8 October 2023).

16. Staying safe in the heat: health advice for times of extreme temperature and wildfires [website]. Geneva: World Health Organization; 2022 (https://www.who.int/europe/news/item/27-07-2022-staying-safe-in-the-heat--health-advice-for-times-of-extreme-temperature-and-wildfires, accessed 16 August 2023).

17. Kohlitz J, Willetts J, Gero A, Lyons S, Boisson S, Medlicott K. Climate, sanitation and health: discussion paper. Geneva: World Health Organization; 2019 (https://www.who.int/publications/m/item/discussion-paper-climate-sanitation-and-health, accessed 8 October 2021).

18. Water and sanitation for health facility improvement tool (WASH FIT): a practical guide for improving quality of care through water, sanitation and hygiene in health care facilities, second edition. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/353411, accessed 7 August 2023).

19. Climate-resilient water safety plans: managing health risks associated with climate variability and change. Geneva: World Health Organization; 2017 (https://apps.who.int/iris/handle/10665/258722, accessed 15 June 2021).

20. Guidelines on sanitation and health. Geneva: World Health Organization; 2018 (https://apps.who.int/iris/handle/10665/274939, accessed 15 June 2021).

21. Sanitation safety planning: manual for safe use and disposal of wastewater, greywater and excreta. Geneva: World Health Organization; 2015 (http://apps.who.int/iris/handle/10665/171753, accessed 15 June 2021).

22. Technical series on adapting to climate sensitive health impacts: undernutrition. Geneva: World Health Organization; 2019 (https://apps.who.int/iris/handle/10665/325751, accessed 15 January 2021).

23. Enabling sustainable lifestyles in a climate emergency. Nairobi: United Nations Environment Programme; 2022 (https://wedocs.unep.org/bitstream/handle/20.500.11822/39972/Lifestyles_climate.pdf?sequence=6&isAllowed=y, accessed 12 August 2023).

24. Sustainable healthy diets: guiding principles. Geneva: World Health Organization, Food and Agriculture Organization of the United Nations; 2019 (https://iris.who.int/handle/10665/329409, accessed 6 October 2023).

25. Action framework for developing and implementing public food procurement and service policies for a healthy diet. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/338525, accessed 6 October 2023).

26. How together we can make the world's most healthy and sustainable public food procurement. Copenhagen: WHO Regional Office for Europe; 2022 (https://iris.who.int/handle/10665/363337, accessed 6 October 2023).

27. Zero regrets: scaling up action on climate change mitigation and adaptation for health in the WHO European Region: key messages from the Working Group on Health in Climate Change, second edition. Copenhagen: WHO Regional Office for Europe; 2023 (https://iris.who.int/handle/10665/368161, accessed 10 August 2023).

28. Technical series on adapting to climate-sensitive health impacts: diarrhoeal diseases. Geneva: World Health Organization; 2022 (https://iris.who.int/handle/10665/365582, accessed 26 September 2023).

29. WHO country support on climate change and health – visual guide. Geneva: World Health Organization; 2021 (https://www.who.int/publications/m/item/who-country-support-on-climate-change-and-health--visual-guide, accessed 25 September 2023).

30. Quality criteria for Health National Adaptation Plans. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/339454, accessed 17 August 2023).

31. Checklists to assess vulnerabilities in health care facilities in the context of climate change. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/340656, accessed 17 August 2023).

32. Quality criteria for the evaluation of climate-informed early warning systems for infectious diseases. Geneva: World Health Organization; 2021 (https://iris.who.int/handle/10665/345530, accessed 10 August 2023).

33. CFS voluntary guidelines on food systems and nutrition. Rome: Food and Agriculture Organization of the United Nations, Committee on World Food Security; 2021 (https://www.fao.org/fileadmin/templates/cfs/Docs2021/Documents/CFS_VGs_Food_Systems_and_Nutrition_Strategy_EN.pdf, accessed 6 October 2023).

34. Achieving health benefits from carbon reductions: manual for CaRBonH calculation tool. Copenhagen: WHO Regional Office for Europe; 2018 (https://iris.who.int/handle/10665/346551, accessed 10 August 2023).

35. Flooding: managing health risks in the WHO European Region. Copenhagen: WHO Regional Office for Europe; 2017 (https://iris.who.int/handle/10665/329518, accessed 10 August 2023).

36. Unless we act now: the impact of climate change on children. New York (NY): United Nations Children's Fund; 2015 (https://www.unicef.org/reports/unless-we-act-now-impact-climate-change-children, accessed 15 January 2021).