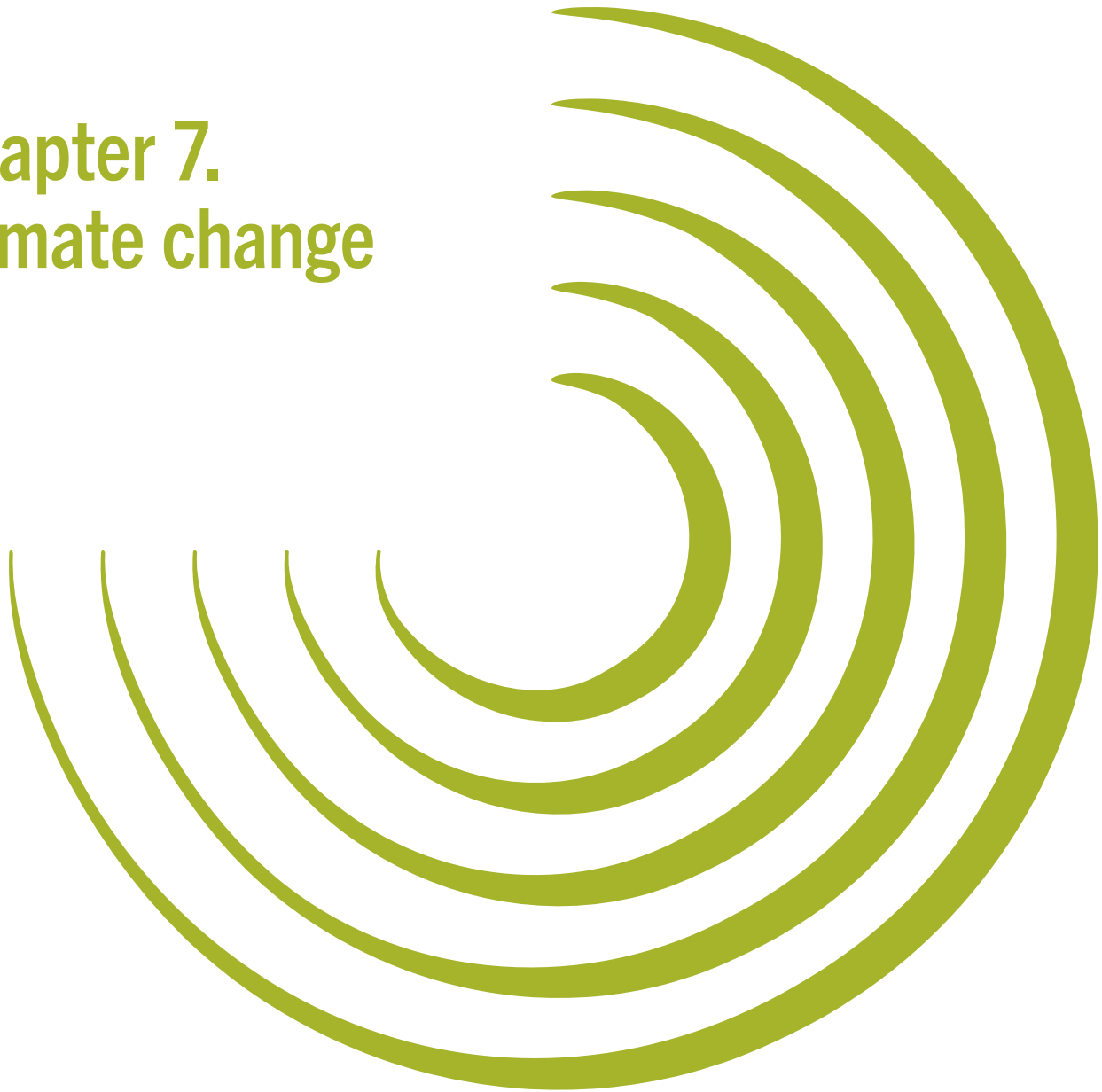


Compendium of WHO and other UN guidance on health and environment



Chapter 7. Climate change



WHO/HEP/ECH/EHD/21.02

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7. Climate change



Overview

Climate change impacts health directly due to extreme weather events. Extreme heat, rising sea levels, floods, extreme precipitation, droughts, and storms are increasingly frequent and lead to tens of thousands of deaths every year, mainly in low- and middle-income countries (1). Indirect effects of climate change result for example from food and water insecurity, increasing transmission of vector- and water-borne diseases, the disruption of the health care system and water and sanitation supplies, increased health inequality, and displacement/migration of communities.

Main contributors to global climate change are fossil fuel combustion and industrial processes but also agriculture, deforestation and other land-use changes, transportation and building energy use (2). In addition, the health sector is a significant contributor to global carbon dioxide emissions (2014 data) (3).

All people are exposed to the hazardous effects of climate change but some groups are particularly vulnerable such as people living in small island nations and other coastal regions, megacities, and mountainous and polar regions. Other vulnerable groups include children, older people and those with underlying health conditions, especially those living in low-income countries (4).

Actions in the area of climate change and health entail the following.

- (a) Mitigate climate change, by reducing or preventing emissions of greenhouse gases; many of these actions have co-benefits, for example they also reduce air pollution or save energy. Such co-benefits are already listed in the respective sections of the compendium – Chapter 2 [Air pollution](#) and section [Housing](#) – the most important ones are listed in this section as well.
- (b) Adapt and increase resilience to climate change by increasing the ability to cope with the effects of climate change, and respond in order to maintain essential functions; this is the main focus of this section.

How vulnerable is population health to climate change, and what adaptation is needed?

























Perform a vulnerability and adaptation assessment to assess the most vulnerable populations, identify weaknesses in the systems that should protect them, and identify interventions to respond (5).








The steps in conducting such an assessment include (5) the following.

- Frame and scope the assessment.
- Analyse the risks of climate-sensitive health outcomes and the impact of climate conditions.
- Analyse the capacity of health and other sectors to manage the risks of those health outcomes.
- Estimate future health risks and impacts under climate change.
- Identify and prioritize policies and programmes to address future health impacts.
- Identify resources for implementation, and estimate costs of action and inaction.






Detailed guidance on how to conduct vulnerability and adaptation assessments is available (5).












Climate change and health in Small Island Developing States (SIDS): SIDS are uniquely vulnerable to climate change due to frequent exposure to extreme weather and climate events, sea level rise, while also being constrained by limited resources. WHO has therefore developed a special initiative on climate change and health in SIDS (6). Though most of the guidance listed below will apply to SIDS even more urgent action to adapt to climate change will be needed in these countries, as they are among the first countries being adversely affected.







|  Guidance |  Sector principally involved in planning/implementation |  Level of implementation |  Instruments |
|---|---|--|--|
| Mitigation | | | |
| 1. Mitigate climate change by reducing GHG emissions and other climate-changing pollutants like black carbon for example through better energy-use choices, agricultural practices, transport, food, city densification and industrial technology use and practices (1, 4). |  Agriculture  Transport  Industry  Energy  Other sectors | National; community | Taxes and subsidies; infrastructure, technology and built environment |
| 2. Reduce deforestation and implement afforestation and sustainable forest management (1). |  Forestry  Environment  Land use planning | National; community | Other management and control; regulations |
| 3. Implement sustainable infrastructure development and spatial planning to avoid locking societies into GHG-intensive emission pathways that may be difficult or very costly to change (1). |  Land use planning | National; community | Infrastructure, technology and built environment |
| 4. Establish and enforce air quality standards, in line with the WHO air quality guidelines 2005 update (7). |  Environment  Health | National | Regulation |
| 5. Adopt very low energy building codes for new buildings and retrofit established buildings (1). |  Housing  Construction | National; community | Regulation; infrastructure, technology and built environment |
| 6. Improve the efficiency of material use, re-use of materials and products and recycling, and reduce product demand overall (1) (Fig. 4.1). |  Industry  Waste | National; community | Infrastructure, technology and built environment; other management and control |
| 7. Ensure and promote enabling environments for behaviour change related to choices of energy use, transport, living, food, waste generation and general consumption (1). |  Agriculture  Transport  Industry  Energy  Other sectors | National; community Universal health coverage | Information, education and communication; other management and control |








|  Guidance |  Sector principally involved in planning/ implementation |  Level of implementation |  Instruments |
|--|--|--|--|
| <p>8. Ensure political commitment and effective leadership to build climate resilience. This includes policy prioritization and planning to address climate risks, establishment of institutional mechanisms, capacities and roles and responsibilities to address climate change impacts, and health protection from climate change in legal and regulatory systems. Partnerships and cross-sectoral cooperation are necessary for efficient regulatory, policy and strategic implementation (8). Concrete examples of outputs may include the following.</p> <p>Governance</p> <ul style="list-style-type: none"> Climate change and health focal points are designated within the health ministry with 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 resilience of programmes. <p>Policy</p> <ul style="list-style-type: none"> National strategy on health and climate change and/or health component in national adaptation plans is developed. <p>Cross-sectoral collaboration</p> <ul style="list-style-type: none"> Agreements (e.g. Memoranda of Understanding) are established between the health ministry and main stakeholders at the national level (e.g. meteorological services, ministries of environment, food and agriculture, energy, transport, planning, water, sanitation, infrastructure/ public works), which include specific roles and responsibilities in relation to protecting health from climate change. Health representation is ensured in main climate change processes at national, regional and global levels (e.g. the United Nations Framework Convention on Climate Change (UNFCCC) meetings and Conference of the Parties (COP), national adaptation plan, national communications to the UNFCCC). Main policies and strategies from health-determining sectors reflect climate change and health considerations both in relation to adaptation (e.g. climate-resilient WSPs) and mitigation (e.g. health co-benefits in transport systems including walking and cycling). Health Impact Assessments (HIAs) are conducted for new mitigation and adaptation policies and programmes in all health-determining sectors. |  Health  Environment  Other sectors | National | Governance |









|  Guidance |  Sector principally involved in planning/ implementation |  Level of implementation |  Instruments |
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| <p>9. Strengthen the technical and professional capacity of health personnel, organizational capacity of health systems, and institutional capacity to work with others (8). Concrete examples of outputs may include the following.</p> <p>Human resource skill building, training and education</p> <ul style="list-style-type: none"> • Training courses on climate change and health topics targeting health personnel are conducted. • Curricula on climate change and health are developed and imparted at secondary and/or tertiary levels. <p>Organizational capacity development</p> <ul style="list-style-type: none"> • Contingency plans for the deployment of 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). • Realistic and innovative capacity-building plans (e.g. from capacity or vulnerability and adaptation assessments) are developed to address identified human resources and institutional capacity gaps. • Contingencies, adaptation costs and potential losses and damages from climate change are incorporated by management staff into investment plans. <p>Communications and awareness raising</p> <ul style="list-style-type: none"> • Internal and external communication plans (including the development of knowledge products) are developed and implemented to raise awareness of health and climate change, and response options targeting key audiences, such as health professionals and decision-makers, communities, the media and other sectors. • Health professionals, the media and community leaders are trained in risk communication, including communication of uncertainty. • Stakeholder forum on protecting health from climate change is established as a way to engage health-determining sectors and the community. |  Health | <p>National; health care</p> <p>Universal health coverage</p> | <p>Governance; information, education and communication</p> |






















|  Guidance |  Sector principally involved in planning/implementation |  Level of implementation |  Instruments |
|---|---|--|--|
| <p>10. Implement integrated risk monitoring and early warning systems to inform preparedness, surveillance and response in a timely manner. Key risks to monitor include extreme weather events, temperatures, UV radiation, seasonal allergen loads and occurrences, and water availability and quality (8). Concrete examples of outputs may include the following.</p> <p>Integrated disease surveillance and early warnings</p> <ul style="list-style-type: none"> • Early detection tools (e.g. rapid diagnostics, syndromic surveillance) are used to identify changing incidence and early action triggered. • Geographic and seasonal distribution of health risks and outcomes (i.e. risk mapping) are tracked. • Early warning systems for relevant extreme weather events and climate-sensitive diseases (e.g. heat-stress, zoonotic diseases, undernutrition) are established. <p>Monitoring</p> <ul style="list-style-type: none"> • Indicators on climate change impacts, vulnerability, response capacity and emergency preparedness capacity, as well as climate and environmental variables are included in relevant monitoring systems at national level and reported over time. • Periodic reviews for improvements or deterioration of capacities are identified in vulnerability and adaptation assessments. • Impacts of main environmental determinants of health are monitored by the health sector. <p>Communication</p> <ul style="list-style-type: none"> • Communication strategy on climate risks to health is developed and implemented, outlining the scope of information for diverse audiences (e.g. media, public, health personnel and other sectors) and events, including who should communicate, and the means of communication. • 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. |  Health  Environment | National; community Universal health coverage | Assessment and surveillance; information, education and communication |

















|  Guidance |  Sector principally involved in planning/ implementation |  Level of implementation |  Instruments |
|---|--|--|--|
| <p>11. Provide climate resilient and sustainable health infrastructure, technologies and services. These may include water and sanitation services, energy supply and waste management technologies. Consider the influence of climatic conditions on medical products, and the use of new information technologies (8). Concrete examples of outputs may include the following.</p> <p>Adaptation of current infrastructures, technologies and processes</p> <ul style="list-style-type: none"> • Specifications for siting and construction of health facilities, and energy, water, sanitation and health care waste management infrastructure and services are revised in line with current and projected climate risks. • Training and recommendations for prescription of pharmaceuticals during extreme heat conditions are revised. <p>Sustainability of health operations</p> <ul style="list-style-type: none"> • Impact of health sector on the environment is assessed, and appropriate mechanisms to monitor carbon emissions and environmental impacts developed. • Sustainability in selection of products, technologies and procurement of services including energy, water, transport and waste management is assessed and prioritized by health facilities. |  Health  Water/sanitation  Energy  Waste  Other sectors | National; community Universal health coverage | Infrastructure, technology and built environment; assessment and surveillance |
| <p>12. Jointly manage environmental determinants of health which are linked to climate change with other sectors, such as energy and transport for air quality, water resources for water availability and quality, municipal services for waste management, etc. (8). Concrete examples of outputs may include the following.</p> <p>Monitoring</p> <ul style="list-style-type: none"> • Integrated monitoring systems allowing collection and analysis of data on environmental hazards, socioeconomic factors and health outcomes are established. • Evidence-based quality standards for climate-sensitive environmental conditions are defined. <p>Regulation</p> <ul style="list-style-type: none"> • Regulations on key environmental determinants of health (air quality, water quality, food quality, housing safety, waste management) are revised and enforced to reflect broader ranges of expected climatic conditions. • Building regulations and waste management infrastructure, environmentally sustainable and resistant to likely local extreme events, are promoted. <p>Coordinated management</p> <ul style="list-style-type: none"> • Health impact assessments (HIAs) for policy and programmes in sectors such as transport, agriculture and energy, are implemented. • Joint multisectoral risk management approaches to health risks related to disasters, water, waste, food and air pollution (e.g. food safety, diarrhoeal disease control, integrated vector management, risk communication) are undertaken. |  Health  Transport  Energy  Environment  Water/sanitation | National; community | Governance; regulations; assessment and surveillance |

|  Guidance |  Sector principally involved in planning/ implementation |  Level of implementation |  Instruments |
|--|--|--|--|
| <p>13. Integrate climate-related health information into health programming. Programmes addressing communicable diseases (particularly vector-borne diseases), NCDs, nutrition and food safety or geriatrics would benefit from consideration of climate risks and vulnerability and becoming increasingly climate resilient (8). Concrete examples of outputs may include the following.</p> <p>Health programming</p> <ul style="list-style-type: none"> • Medium- and long-term plans for disease control programmes are revised to consider capacities that may be stressed or exceeded by climate change. • Investment plans are defined to address identified capacity gaps. <p>Delivery of interventions</p> <ul style="list-style-type: none"> • Risk maps and analysis of seasonal trends in diseases are used to target resources and preventive measures for those most at risk. • Contingency plans for health care provision in extreme weather events, or delivery of interventions to control outbreaks of infectious diseases in new locations, are developed and tested. |  Health | <p>National; health care</p> <p>Universal health coverage</p> | <p>Other management and control</p> |
| <p>14. Establish climate-informed preparedness plans, emergency systems and community-based disaster and emergency management plans for outbreaks and emergencies triggered by climate variability (8). Concrete examples of outputs may include the following.</p> <p>Inform policies and protocols</p> <ul style="list-style-type: none"> • Climate-sensitive health risks are included under national disaster reduction strategy and plans, and wider development processes. • Risk assessments for current and projected future exposure to extreme weather events are routinely used to inform health sector strategic development plans, as part of risk management. • Health sector contingency plans for extreme weather events are developed, including risk reduction, preparedness and response, in line with the WHO emergency response framework. • Emergency response plans for individual health facilities are defined and implemented in case of need. <p>Community empowerment</p> <ul style="list-style-type: none"> • 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 to identify risks, prevent exposure to hazards and take action to save lives in extreme weather events. |  Health | <p>National; health care</p> <p>Universal health coverage</p> | <p>Other management and control; assessment and surveillance</p> |

|  Guidance |  Sector principally involved in planning/ implementation |  Level of implementation |  Instruments |
|---|--|--|--|
| Heat-health response: adaptation and increased resilience | | | |
| 15. Designate an agency with the authority to coordinate response activities and disseminate information about heat-related health impacts (9). |  Health  Environment | National | Governance |
| 16. Plan places that are more resilient to climate change and natural disasters: create well-designed and accessible green and blue spaces which also act as buffer zones and functional landscapes (10). |  Land use planning | Community; national | Infrastructure, technology or built environment |
| 17. Inform the public of anticipated heatwaves and how long they are forecasted to last (9). |  Health  Environment | National; community Universal health coverage | Information, education and communication |
| 18. Communicate clear messages of the dangers of heatwaves, emphasizing that health protection is the first priority. Where possible, postpone outdoor or sporting activities during the heat of the day, including at schools. Work with utilities to prevent suspensions of water and electricity service (9). Examples of messages may include: <ul style="list-style-type: none"> • stay out of the sun between 11:00 and 15:00 • drink more (non-alcoholic) fluids. |  Health  Environment | National; community; health care; schools/child-care settings; workplace Universal health coverage | Information, Education and communication; other management and control |
| 19. Inform caregivers and those responsible for particularly vulnerable populations of the risks 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 thereto can be provided for the most vulnerable (9). |  Health | National; community Universal health coverage | Information, education and communication; other management and control |
| 20. Provide access to additional sources of information, such as media broadcasts, toll-free numbers, websites and hotlines to report concerns about individuals who may be at risk of the effects of heatwaves (9). |  Health | National; community Universal health coverage | Information, education and communication |
| 21. Prevent heat stress in outdoor workers; most can be prevented by (9): <ul style="list-style-type: none"> • engineering controls, such as general ventilation, evaporative cooling and spot cooling; • changing work practices, such as 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; • alternate work and rest periods, with rest periods 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 |

|  Guidance |  Sector principally involved in planning/implementation |  Level of implementation |  Instruments |
|---|---|--|--|
| Drinking-water safety: adaptation and increased resilience | | | |
| Water safety may be affected by i) more intense precipitation and flooding; ii) increased drought; iii) increased temperature; and iv) sea level rise. This can lead to increased levels of waterborne pathogens and other harmful contaminants, increased vector breeding sites, floods, and water and food scarcity. | | | |
| <p>22. Develop a water safety plan (WSP) to systematically manage all risks within a water supply system, from catchment to consumer, which may impact public health, including climate-related risks.</p> <p>Note: This section describes only how climate considerations can be integrated into the WSP approach. For general information on WSPs, see section 3.2.1 Drinking-water.</p> <p>The key actions of water safety planning for climate resilience include the following.</p> <ul style="list-style-type: none"> • Augment the WSP team with relevant climate-related expertise. • Integrate relevant climate information into the water supply system description. • 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 (11). |  Water/sanitation | National; community | Other management and control |
| Sanitation safety: adaptation and increased resilience | | | |
| 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. This can lead to damaged infrastructure, flooding of latrines and other sanitation systems causing faecal environmental contamination and bypassing of treatment processes, spillage and contamination, higher pollution concentration in wastewater, increased deposits and blockages due to water scarcity (12, 13). | | | |
| 23. Perform an assessment of climate risks and vulnerability or use information from existing assessments to inform climate resilience of sanitation systems (12). |  Water/sanitation | National; community | Assessment and surveillance |
| 24. Integrate climate considerations into sanitation safety plans (14) by targeting the greatest health risks and planning for incremental improvements. Main steps to address include (12): <ul style="list-style-type: none"> • engaging climate-related experts when preparing the sanitary safety plan, to define scope and priorities; • describing the sanitation system; • identifying hazards and assessing risks; • developing and implementing an incremental improvement plan; • monitoring control measures and verify performance; • developing supporting programmes and review plan. |  Water/sanitation | National; community | Other management and control |
| 25. Increase climate resilience of sanitation systems. Detailed guidance is provided in (13). |  Water/sanitation | National; community | Other management and control |

|  Guidance |  Sector principally involved in planning/ implementation |  Level of implementation |  Instruments |
|---|--|--|--|
| Undernutrition: adaptation and increased resilience | | | |
| <p>In case a vulnerability and adaptation assessment (5) has pointed to undernutrition as a thematic priority, a number of steps and actions can be taken to assess, anticipate and adapt to improve child nutrition. This section lists possible examples of concrete actions that can be taken to adapt to climate change according to local risks and circumstances, beyond health system strengthening on nutrition (15).</p> | | | |
| Leadership and governance | | | |
| 26. Promote cross-sectoral communication to align adaptation actions in agriculture or infrastructure (such as increasing WASH coverage) with adaptation within the health sector (15). |  Agriculture  Health  Other sectors | National | Governance |
| 27. Promote national commitment to shift towards healthy, sustainable diets (15). |  Food  Health  Environment | National | Information, education and communication |
| Awareness raising and capacity development in the health and nutrition workforce | | | |
| 28. Raise awareness on nutrition and climate change among decision-makers and policy-makers (15). |  Food  Health  Environment | National; community | Information, education and communication |
| Integrated risk monitoring and early warning | | | |
| 29. Train health personnel in the use of climate information and early warning systems (15). |  Health | Health care Universal health coverage | Information, education and communication |
| 30. Integrate risk monitoring across relevant environmental determinants of health (such as WASH) and relevant diseases and food hazards, and improve the use of nutrition early warning/early response systems (15). |  Food  Health  Environment | National; community Universal health coverage | Assessment and surveillance; information, education and communication |
| Climate-resilient and sustainable technologies (in addition to those cited in 3.2.1 Drinking-water, 3.3 Sanitation, 11.1 Cities and other urban settlements, 11.2 Housing, 11.4 Health care facilities) | | | |
| 31. Promote better crop diversity and biodiversity for improved nutrition, with an emphasis on vegetables and fruits, for example through agricultural extension services (15). |  Food  Agriculture | National; community | Other management and control |
| 32. Exploit synergies of horticulture, aquaculture and small livestock rearing to reduce waste and expenses on agricultural inputs; and increase food production diversity (15). |  Food  Agriculture | National; community | Infrastructure, technology and built environment |

|  Guidance |  Sector principally involved in planning/ implementation |  Level of implementation |  Instruments |
|---|---|--|--|
| Management of the environmental determinants of health (in addition to those cited in the respective sections above) | | | |
| 33. Improve household food production and livelihoods (i.e. diversification of household food production for self-consumption to improve the nutritional quality of the family diet) (15). |  Agriculture  Health | Community Universal health coverage | Information, education and communication |
| 34. Enhance the access and affordability of sustainable and healthy foods (15). |  Food  Agriculture | National; community | Taxes and subsidies; other management and control |
| 35. Promote sustainable land use management and integrated agroforestry systems to reduce deforestation, restore degraded soils, promote biodiversity within the agricultural system; and promote sustainable exploitation of nutrient-rich non-wood forest products, particularly in areas with traditional agroforestry knowledge (15). |  Land use planning  Agriculture | National; community | Other management and control |
| 36. Create a restored, diversified natural resource base and ensure that populations have the capacities and means for sustainable management of their natural resources (15). |  Environment | Community; national | Other management and control |
| Climate-informed health and nutrition programmes | | | |
| 37. Use school-based approaches (school feeding programmes, school gardens, nutrition education) to include considerations of climate variability and long-term change into existing nutrition initiatives (15). |  Education  Health | Schools/child-care settings Universal health coverage | Other management and control; information, education and communication |
| 38. Provide education on healthy diets and sustainable food systems. |  Education  Food  Health | National; community Universal health coverage | Information, education and communication |

Selected tools

WHO 2015: *Operational framework for building climate resilient health systems* (8)

WHO 2020: *WHO guidance for climate-resilient and environmentally sustainable health care facilities* (16) provides a set of suggested interventions in four key areas for providing safe and high-quality care in the context of climate change: i) the health workforce; ii) water, sanitation, hygiene and health care waste management; iii) sustainable energy services; and iv) infrastructure, technologies and products.

UNICEF (2015): *Unless we act now: the impact of climate change on children* (2)

WHO 2015: *Heatwaves and health: guidance on warning-system development* (9)
This guidance also includes country examples.

WHO 2017: *Climate-resilient water safety plans: managing health risks associated with climate variability and change* (11)
This guidance also contains numerous support tools.

WHO 2019: *Technical series on adapting to climate sensitive health impacts: undernutrition* (15)

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