ANNUAL REPORT 2021

WHO Asia-Pacific Centre for Environment and Health in the Western Pacific Region

Seoul, Republic of Korea
Caption: Masian tideland experience programme, Incheon, Republic of Korea.
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The WHO Asia-Pacific Centre for Environment and Health in the Western Pacific Region (ACE) was established in 2019. With the ongoing coronavirus disease 2019 (COVID-19) pandemic and a change of leadership at ACE, 2021 has been a challenging year. For these and other reasons, not all planned activities could be carried out. However, activities resumed in the latter part of the year, with strengthened additional management and technical staff capacity.

Global engagement and political commitment to address climate change was highlighted at the 26th session of the Conference of the Parties (COP26) to the United Nations Framework Convention on Climate Change in November 2021. The climate change conference brought together political leaders, scientists, United Nation agencies, civil society organizations and activists to combat climate change at the global, regional and country levels. As the Head of ACE, I represented the Centre at COP26, where WHO initiatives focused on supporting countries to develop climate-resilient, low-carbon, sustainable health systems.

Environmental issues associated with rapid economic development – such as air, soil and water pollution – represent huge challenges for Asian countries. Pacific islanders are on the front lines of the impact of climate change. Supporting countries in building climate-resilient health systems and acting on climate change and environmental protection will require stepping up engagement by governments and the whole of society, from international stakeholders to local communities.

ACE will strengthen its capacity to serve as a technical knowledge hub focused on air quality; climate change; water, sanitation and hygiene; and living environments, supplementing the work of other divisions of World Health Organization Regional Office for the Western Pacific. The Centre will expand collaboration and networking with academic, research and national institutions in the Republic of Korea and across the Western Pacific Region in 2022. ACE will also reach out to communities and civil society organizations, particularly in Seoul.

ACE is grateful for the continued generous support of the Ministry of Environment of the Republic of Korea and the Seoul Metropolitan Government.

Professor Hye Sook Park
Head of the Asia-Pacific Centre for Environment and Health in the Western Pacific Region
# Abbreviations

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<tr>
<td>ACE</td>
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<td>AQG</td>
<td>WHO Global Air Quality Guidelines</td>
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<td>AMR</td>
<td>antimicrobial resistance</td>
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<td>BAR-HAP</td>
<td>WHO Benefits of Action to Reduce Household Air Pollution Tool</td>
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<td>CaRBonH</td>
<td>Carbon Reduction Benefits on Health</td>
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<td>CCE</td>
<td>climate change, the environment and health</td>
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<td>CHEST</td>
<td>Clean Household Energy Solutions Toolkit</td>
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<td>COP</td>
<td>Conference of the Parties</td>
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<td>COVID-19</td>
<td>coronavirus disease 2019</td>
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<td>GCF</td>
<td>Green Climate Fund</td>
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<td>GHG</td>
<td>greenhouse gas</td>
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<td>HAI</td>
<td>health-care associated infections</td>
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<td>HAP</td>
<td>household air pollution</td>
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<td>HEPA</td>
<td>Health and Energy Platform of Action</td>
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<td>HIA</td>
<td>health impact assessment</td>
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<td>IPC</td>
<td>infection prevention and control</td>
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<td>LMICs</td>
<td>low- to-middle-income countries</td>
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<td>LT-LEDS</td>
<td>long-term low emissions development strategy</td>
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<td>NDA</td>
<td>National Designated Authority</td>
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<td>NDCs</td>
<td>nationally determined contributions (national climate goals)</td>
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<td>PM</td>
<td>particulate matter</td>
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<td>SIDS</td>
<td>small island developing states</td>
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<td>TAP</td>
<td>transboundary air pollution</td>
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<td>UHC</td>
<td>universal health coverage</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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<td>WASH</td>
<td>water, sanitation and hygiene</td>
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<td>WHO</td>
<td>World Health Organization</td>
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People enjoying the water in Hangang Park, Seoul, Republic of Korea.
Background
Background

The WHO Asia-Pacific Centre for Environment and Health in the Western Pacific Region (ACE), located in Seoul, Republic of Korea, is a geographically dispersed specialized office in the World Health Organization (WHO) Western Pacific Region.

The Centre was formally established in a January 2019 memorandum of understanding between WHO and the Ministry of Environment of the Republic of Korea and the Seoul Metropolitan Government. The Centre became operational later that year, and moved into new offices in the Seoul Global Center on 6 January 2020.

For the Future: Towards the Healthiest and Safest Region is the Western Pacific Region’s vision for improving health and well-being and serves as the Region’s implementation plan for the global WHO Thirteenth General Programme of Work. Adopted unanimously by Member States in 2019, For the Future sets out four shared thematic priorities for WHO’s work with Member States in the Region. Climate change, the environment and health (CCE) is one of those thematic priorities.

The work of ACE focuses on three areas: air quality, energy and health; climate change and health; and water and the living environment. The Centre has a broad vision: “Healthy Planet, Healthy Environment, Healthy People: The environments of the WHO Western Pacific Region support all people to attain the highest possible level of health and well-being on a changing planet.”

This translates into the Centre’s mission statement: As a centre of technical and scientific excellence, the WHO Asia-Pacific Centre for Environment and Health in the Western Pacific Region will contribute to the development of healthier and safer environments and strengthened community resilience to climate and environmental change for health and health equity for all people of the WHO Western Pacific Region.

The Centre’s objectives are:

- to strengthen the scientific information and evidence for policy-making on existing and emerging climate and environmental determinants of health;
- to assist Member States in developing and implementing policies to protect and promote health and well-being; and
- to support Member States in developing and strengthening technical capacities and programmes in climate change, environment and health.

Climate change, the environment and health is a priority in For the Future, and WHO will support countries in the Region:

- to develop stronger narratives and arguments about the relationship between climate change, environmental degradation and health, including the economic case for climate change action that protects health, and use these to advocate for action on the health impacts of climate change and environmental issues at the highest political and policy-making levels, in close collaboration with civil society and other partners;
- to monitor the health impacts of climate and environmental change on health; and
- to ensure national climate change adaptation and mitigation strategies – and environmental health action plans – prioritize health sector resilience to climate and environmental change, and the ability to mitigate the health impact, including through assessing country-specific vulnerabilities to climate change and environmental health risks, and convening actors across sectors to address identified gaps.¹

Air quality and health in the Western Pacific Region

Air pollution in Ulaanbaatar, Mongolia.
Air pollution concentration levels outdoors, as an annual average, in many parts of the world are higher than WHO Global Air Quality Guidelines (AQG), and this is particularly true among Member States in the Western Pacific Region. Indoor air pollution levels in Member States in the Region are largely driven by a relatively high dependency on solid fuels, used by one third of households (compared to one fourth of households globally), but also other combustion sources including tobacco smoke. Indoor and outdoor air pollution are silent killers (Fig. 1). Over two million deaths per year in the Western Pacific Region have been attributed to elevated air pollution (indoor and ambient) exposure levels, higher than any other WHO region except for the South-East Asia Region, according to the 2017 Global Burden of Disease assessment.

**FIG. 1.** Air pollution – The silent killer

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Scientific research in the Western Pacific Region is partly limited by a lack of air quality monitoring equipment, which limits the awareness of the sources of air pollution and therefore potential motivation for evidence-based decision-making. Achieving the AQG targets will improve the quality of life for everyone in the Western Pacific Region, but it is an effort that requires everyone’s support, as well as assistance from ACE.

Reviews of the scientific literature were conducted by ACE in 2021 to develop background documents, fact sheets and, ultimately, a regional report on air quality and health. The report on air quality and health is intended to enable policy-makers in Member States to use evidence to benefit not only public health but also for other sectors, including agriculture, energy and transport, through: 1) awareness of the air pollution situation, especially levels and sources; and 2) motivation and tools to achieve the AQG targets.

This 2021 ACE Annual Report also provides a snapshot of the upcoming regional report on air quality and health in the Western Pacific Region, including household energy, transboundary dust and waste management, expected to be published by the WHO Regional Office for the Western Pacific in 2022 (Fig. 2). The regional report on air quality and health was developed with the invaluable input and support from WHO country offices throughout the Region.

**FIG. 2. Sources of air pollution**

![Diagram of sources of air pollution](image)
Household air pollution

A woman prepares lunch in a remote village in Port Vila, Vanuatu.

Each year, millions of people die prematurely from illness due to household air pollution (HAP) from inefficient cooking practices using polluting stoves and solid fuels.\(^2\) Shifting from solid fuels to cleaner energy technologies – for instance, liquefied petroleum gas, natural gas or solar power generation – can potentially yield the largest reduction in HAP levels while minimizing adverse health effects. Reducing HAP exposure is a growing success story; however, half of the world’s population remains exposed. The percentage of people exposed to HAP is decreasing at a greater rate in the Western Pacific Region than the global average, with HAP in 2019 standing at ninth out of 69 potentially modifiable risk factor in terms of the number of attributable global deaths, which is an improvement from seventh in 2010.\(^3\) Further research on the health impacts of HAP and on a wide range of health outcomes, intervention-based research and randomized trials, as well as evaluation-based research for the impacts of programmes and policies, is required.

The following options are based on evidence, and may be considered by Member States in the Region as they scale up efforts to combat HAP, which requires a multi-pronged approach:

1. Introduce or expand access to cleaner household air quality through technologies and fuels for cooking, heating and lighting, as well as improved housing and ventilation design.
2. Consider supportive government policies and economic incentives. As most of the burden is concentrated in the low- and middle-income countries (LMICs) of Asia, sustainable support should be considered under the guidance of international organizations. Aid solutions must be cost-effective, but they also

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must enable recipient countries to build a sustainable environment and foster cultural understanding for clean fuel use.

3. Foster education and awareness raising to support needed changes in cultural habits around cooking and household energy management.

4. Support further research that is needed to provide a sufficient basis for practical movement, for example by cooperating with international research groups and recommending local partners for assistance (building-capacity).

5. Make use of the United Nations Environment Programme (UNEP) publication *25 Clean Air Measures for Asia and the Pacific*, particularly measure 13 (Provide clean cooking and heating options) and measure 14 (Strictly enforce bans on household waste burning), by:
   a. using clean fuels – electricity, natural gas and liquefied petroleum gas in cities, and liquefied petroleum gas and advanced biomass cooking and heating stoves in rural areas;
   b. substituting coal with briquettes for cooking and heating; and
   c. strictly enforcing bans on open burning of household waste. Burning bans need to be complemented with comprehensive solid waste management plans, including proper waste collection system, recycling, waste treatment and awareness raising.

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**Resources**

The Health and Energy Platform of Action

The global Health and Energy Platform of Action (HEPA) aims to ensure universal access to clean and sustainable energy to protect health. The initiative has a strong focus on clean cooking solutions and the electrification of health-care facilities and supports the development of global and country implementation road maps for its priority areas of action.

- The *Energy Progress Report* offers a global snapshot of energy access, energy efficiency, renewable energy and international cooperation, and provides an overview of clean energy goals for each country.
- The Clean Household Energy Solutions Toolkit (CHEST) provides information resources and tools for decision-makers to design and implement clean household interventions to protect health and climate. For example, the WHO Benefits of Action to Reduce Household Air Pollution Tool (BAR-HAP) allows users to assess the costs and benefits of interventions to reduce household air pollution.
- The BreatheLife campaign brings together a range of proven solutions and best practices to both reduce air pollution and implement mitigation strategies.
- The COP26 initiative on Low Carbon Sustainable Health Systems provides support to governments and health-care institutions to ramp up climate action in health systems and facilities.
- A Global Road Map for Health Care Decarbonization, developed by Healthcare Without Harm, provides a navigational tool for achieving zero emissions along with climate resilience and health equity. The road map offers detailed interventions, fact sheets and trajectories.
- The Global Green and Healthy Hospitals Network has developed a collection of Energy Case Studies of health-care systems from around the world.
- The Powering Past Coal Alliance is a coalition of national and subnational governments, businesses and organizations advancing the transition from unabated coal power generation to clean energy. They support governments to capitalize on the health co-benefits of reducing coal use.


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Transboundary air pollution

Transboundary air pollution (TAP) is a significant public health issue as it may represent a sizeable portion of prevailing air pollution concentrations, and is therefore responsible for substantial excess mortality and morbidity. In addition, TAP has economic consequences due to the disruption of productivity (transportation and the workforce) and tourism. TAP also entails questions of fairness and environmental justice, in that some communities may suffer most from emissions generated elsewhere. Sources of TAP, such as haze and smoke, may be challenging to identify and fix, particularly with climate change making wildfires more frequent and severe in some parts of the region. Representatives from neighbouring countries need to work together to address TAP and protect their own and other populations, such as with the Association of Southeast Asian Nations Haze Agreement. The usual correlation between air pollution exposure level and socio-demographic development is inversed for fine particles (2.5 micrometres or smaller), a regional pollutant that is carried long distances and affects neighbouring Member States regardless of their development level. International trade, due to offset emissions, is one area requiring further discussion and analysis, as it is less obvious yet potentially more harmful than Asian dust or haze.

The following evidence-based options may be considered by Member States as they combat TAP:

1. Consider:
   a. the latest scientific evidence regarding adverse health effects of TAP in Asia and the efforts of governments and international organizations in minimizing their impact;
   b. up-to-date modelling techniques for long-range TAP and methods to differentiate the health effects of transboundary and domestic pollutants;
c. UNEP’s 25 Clean Air Measures for Asia and the Pacific, particularly measure 21 – Better management of agricultural crop residues: Manage agricultural crop residues, including strict enforcement of bans on open burning. Complement burning ban with measures that use residues. This includes alternative off-site use, technologies that plough residue into fields, and using residues as bedding for livestock or as biogas digesters.

2. Request WHO to:
   a. to provide technical support to Member States on priority actions identified during a consultation;
   b. to build institutional and human capacity of Member States in health impact assessment and the calculation of the burden of disease from air pollution, following WHO methodology for assessment of environmental burden of disease;
   c. to assess the magnitude of health impacts of TAP such as haze in South-East Asia and dust and sandstorms in North-East Asia and disseminate the information and evidence on the health impacts of TAP in the Western Pacific Region; and
   d. to continue regional collaboration and the exchange of best practices on air pollution and health impacts through regional forums, consultation meetings, workshops and conferences.

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The improper management of waste, leading to open burning (or combustion and incineration), can have important implications for individual and population health. The degree of harm (risk or impact) from waste incineration is dependent on the quality and quantity of the materials burned. Some waste, when appropriately sorted, can be turned into a resource as a fuel for creating energy with combustion, replacing other polluting fuels such as coal or gas. Above all, the waste hierarchy should be respected when and where possible – first reduce waste, then reuse waste materials, next recycle unused materials and finally consider waste-to-energy technology, if design and management are of international standards. Only consider landfill as a last resort, and consider how to minimize environmental health damage.

The following options are supported by ACE, based on evidence, and may be considered by Western Pacific Region Member States as they scale up efforts to combat incineration for waste management:

1. Update national guidelines based on:
   a. the latest scientific evidence regarding effects of waste incineration on air pollution and health;
   b. approaches to minimizing the health effects of waste incineration in the Asia Pacific region, particularly by focusing on the role of governments;
   c. improvements and better enforcement of forest, land and water management, as well as fire prevention strategies, including fire-spread protection zones, fire alarms and brigade systems, prohibiting access to forests during droughts, and bans on land clearing; and
   d. measures contained in UNEP’s 25 Clean Air Measures for Asia and the Pacific, particularly measure 22 – Prevent forest and peatland fires, and measure 25 – Improve solid waste management: Encourage centralized waste collection with source separation and treatment, including gas utilization.

2. Communities or municipalities should consider organizing waste collection to minimize domestic management, avoiding the issues of waste incineration but also pest management (when certain waste accumulates).
3. The waste hierarchy should be followed:
   a. First, waste should be minimized by stringent regulation of locally designed or imported products.
   b. Secondly, any waste that cannot be avoided should be destined for reuse or recycling with community programmes, where appropriate.
   c. Thirdly, rather than unsorted waste incineration, waste should be sorted and potentially repurposed as fuel to be combusted within a well-designed and operated waste-to-energy facility, or substitution for other fuels in industries, for example, substituting coal use within industry.

Protective measures for individuals

A pedestrian wearing mask, Beijing, China.

Respirators and air purifiers, when used properly, can reduce individual exposure to air pollutants such as particulate matter (PM). The last decade has seen increased interest in using evidence-based, individual-level strategies to minimize health impacts of PM, while waiting for regional, national and global levels to reduce. Scientific evidence suggests that respirators and air purifiers have the potential to reduce cardiovascular events by abrogating the adverse health effects of PM. Although several countries have their own standard recommendations for respirator use, the scientific background for guidance is absent. Studies looking at the health benefits of using personal protection measures among vulnerable populations, with diverse underlying diseases and characteristics, are needed for ethical recommendations within environments with social, resource and cultural constraints.

Increased concerns regarding the adverse health effects of air pollution have led many individuals to use respirators and air purifiers to reduce personal exposures. Due to the COVID-19 crisis, face masks and respirators have become a natural part of outdoor activities. When used properly, PM-filtrating respirators

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and air purifiers can work as useful tools against high levels of air pollution. Further studies are needed to answer who should use and when to use individual protective measures against air pollution.

The following evidence-based options may be considered by the countries as they scale up efforts to use individual protective measures:

1. **Identify:**
   a. the latest scientific evidence regarding the effects of individual protective measures on air pollution and health; and
   b. approaches to minimize adverse health effects of Asian dust, haze and other air quality issues in the Asia Pacific region, particularly by focusing on individual protective measures.

2. **Support further research needs by:**
   a. establishing knowledge on the efficiency of respirators and air purifiers and their health benefits;
   b. performing trials of the use of personal protection measures for their health benefits in subjects with diverse underlying diseases and characteristics;
   c. develop evidence-based guidelines for health advisories regarding personal protection measures on days with high levels of PM; and
   d. taking advantage of the opportunity that the COVID-19 crisis in Asian countries provides to evaluate how population-level behavioural changes, such as the popular use of respirators during periods of high pollution, affects adverse health effects of PM exposure.
Climate change and health

Kids on scooters riding in Songdo Central Park, Incheon, Republic of Korea.
Climate change and health

Between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year globally from malnutrition, malaria, diarrhoea and heat stress (Fig. 3). WHO supports countries in building climate-resilient health systems and tracking national progress in protecting health from climate change.

**FIG. 3.** An overview of climate-sensitive health risks, their exposure pathways and vulnerability factors.
WHO's workplan on climate change and health includes:

**Advocacy & partnerships** to coordinate with partner agencies within the United Nations System and to ensure that health is properly represented in the climate change agenda, as well as to provide and disseminate information on the threats that climate change presents to human health, and opportunities to promote health while cutting carbon emissions.

**Science and evidence** to coordinate reviews of the scientific evidence on the links between climate change and health, to assess a country's preparedness and needs when facing climate change, and to develop a global research agenda.

**Supporting countries to protect human health from climate change** by strengthening national capacities and improving the resilience and adaptive capacity of health systems to deal with the adverse health effects of climate change.

**Building capacity on climate change and human health** to assist countries to build capacity to reduce health vulnerability to climate change and promote health, while reducing carbon emissions.

The *WHO Global Strategy on Health, Environment and Climate Change* was endorsed by Member States in 2019 at the Seventy-second World Health Assembly, outlining the transformation needed to improve lives and well-being sustainably through healthy environments between 2019 and 2023.5

Recognizing the unique and immediate threats faced by small islands, WHO has responded by developing *Climate Change and Health in Small Island Developing States: A WHO Special Initiative*, which was launched in November 2017 in collaboration with the United Nations Framework Convention on Climate Change (UNFCCC) at the 23rd Conference of the Parties.

With small island developing states (SIDS) being extremely vulnerable to the health impacts of climate change, WHO Member States in 2019 endorsed the Special Initiative, which is a global plan of action for 2019–2023.5

As part of the *Western Pacific Regional Framework for Action on Health and Environment on a Changing Planet*, small island nations have committed to developing a WHO–UNFCCC Health and Climate Change Country Profile to present evidence and monitor progress on health and climate change. In the Western Pacific Region, Fiji, Samoa, Solomon Islands and Vanuatu have so far produced Health and Climate Change Country Profiles.
The effects on health of climate change and the environment are increasingly being incorporated into policy frameworks and regulations. However, the monitoring and coordination of these measures at the regional and national level must be improved in the Western Pacific Region.

**FIG. 4. WHO country support on climate change and health – Key focus areas**

To ensure that health and well-being are protected, it is essential to monitor and quantify impacts on human health and health systems. Multiple national and international efforts have developed indicators for monitoring the climate change impacts, both direct and indirect, as well as environmental measures to prepare for and manage population health risks; however, use of these evidence points is low in the Western Pacific Region (Fig. 4).

Climate change and environmental health indicators are helpful for tracking and communicating complex health trends, informing science and policy decisions, and evaluating public health actions. When provided on a national scale, they can help inform the public, policy-makers and public health professionals about important trends in exposures and how well public health systems are preventing those exposures from causing adverse health outcomes. There is a need for a regional guidance tool that will support Member States in what and how to monitor all aspects of climate change, the environment and human health. The WHO Regional Office for the Western Pacific performs a vital role in this respect, and ACE, in particular, is developing such a tool to support Member States. The objective of such a tool would be to monitor health related to climate change and the environment with indicators tracking human exposures and vulnerabilities, related actions and policies, and health outcomes. By 2024, scientific and strategic information will be available to inform decision-making, guide advocacy and drive action towards successful interventions.
Co-benefits of mitigation

The Government of the Philippines is supporting the adoption of modern Jeepney units — which regardless of the technology, will provide health benefits far exceeding their cost.

Actionable programmes and policies put a country on a climate-resilient development path while working towards long-term, measurable greenhouse gas (GHG) emission reductions, aligned to support global efforts to achieve the aims of the UNFCCC target of limiting the global average temperature rise to below 2 °C, and to pursue efforts to limit it to below 1.5 °C under the Paris Agreement.

As economies continue to grow, it is critical that carbon emissions fall and that the health co-benefits are realized by Member States in the Western Pacific Region. ACE is developing a communication toolkit that will provide insights and resources to aid ministries of health and other public health officials in understanding and communicating actions and plans for health co-benefits.

Inclusion of health co-benefits will attract international and national financing for green, low-carbon projects in the region that also benefit health. These frameworks enable optimal project selection accounting for synergies and trade-offs between different actions and across policy objectives.

Member States and partners in the Western Pacific Region have a mandate to promote healthy populations and to mainstream climate change and health considerations into other policies. The health sector is uniquely positioned – and indeed has a responsibility – to join advocacy efforts for broader national action on air pollution-related health co-benefits.

The public health motives for climate action have a strong science basis and are well evidenced and compelling. We can rise to the challenge by working together, calling for stronger action by our health ministries and public health sectors, and as health professionals we can work to reinforce the need to protect public health by countering climate change, and to ensure it is fully recognized and acted upon. Inclusion of
air pollution-related co-benefits in mitigation projects is an important and innovative step towards raising ambition and achieving the Paris Agreement goals. Member States need to rapidly scale ambition of their existing climate mitigation commitments in order to avoid the worst impacts of future climate change. Many LMIC economies have chosen to adopt a long-term low emission development strategy (LT-LEDS) as a basis for establishing national climate goals via nationally determined contributions (NDCs).

**Carbon Reduction Benefits on Health (CaRBonH) calculation tool**

*Smoke from car exhaust, coal combustion, household cooking and heating are major pollutants in many countries in the Western Pacific Region.*

One quantification tool for countries and areas in the Western Pacific Region to monitor and evaluate the health impacts of climate change is the Carbon Reduction Benefits on Health (CaRBonH) calculation tool. Most preventive actions for health and well-being originate from action outside the health sector, particularly those that impact climate change. WHO recognizes this and has advocated health-in-all policies and whole-of-government approaches. This tool enhances advocacy efforts for broader national action and expands partnerships and communication, including through strengthening engagement with other sectors such as transport, energy, food production, water resources and urban planning to bring about health co-benefits.

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The CaRBonH calculation tool aims to quantify the physical and economic consequences for human health achieved through improvements in country-level air quality from domestic carbon reductions, specifically policy mitigation actions and measures as reported in the NDCs submitted by the Conference of the Parties to the UNFCCC in support of the objectives as set out in Article 2 of the Convention. There is a need for the introduction of a tool that can be used as a mechanism to assess the outcome of climate-driven policies and to promote decision-making in settings where there is limited data availability for the consequential health benefits that can be achieved through policy mitigation actions and measures according to the energy configuration.

CaRBonH is an Excel-based calculation tool that can quantify the physical and economic consequences for human health achieved through improvements in country-level air quality from domestic carbon reductions. The tool’s main goal is to estimate health and economic co-benefits by meeting the NDC goals of each country; users may input their own target goals of emission reduction of GHG, as well as other air pollutants. By using the tool, government planners and decision-makers can assess the health benefits achievable (or achieved) through reductions in domestic carbon emissions for the proposed climate policies.

CaRBonH calculates health benefits of the reduction of emissions into air from implementing NDCs or other preventive policies in each country, using standard health impact assessment (HIA) procedures. The HIA is a practical approach used to judge the potential health effects of a policy, programme or project on a population, particularly on vulnerable or disadvantaged groups. In air pollution HIA studies, health benefits are calculated using concentration-response functions that link population response to changes in ambient air pollution exposure level. By assuming hypothetical scenario of a decrease in air pollution exposure by the public after the implementation of the policy, expected changes in number of cases of mortality or morbidity attributable to the decrease of air pollution concentration are calculated. The CaRBonH tool uses all the information on the changes in the air pollution level, population exposure changes, and morbidity and mortality data to estimate the avoided premature mortality (deaths and life years gained) and prevented annual illnesses (averted cases of asthma, bronchitis, lost workdays and hospital admissions) in each country.
Measure health-care facility energy use

Historically, health systems and the health workforce have not paid adequate attention to the climate and environmental impacts of their facilities and practices. Yet countries are beginning to articulate their needs and take actions to mitigate health system impact in a sustainable way. Health officials in Member States are requesting support and tools from the WHO Regional Office for the Western Pacific to address the causes and impacts of climate change and environmental degradation. Member States have committed to the Paris Agreement.

Health-care facilities, and more broadly the health sector, play a major role in the reduction of global carbon emissions and the journey towards environmental sustainability. Globally, the health sector’s contributions to the carbon footprint are about 4.4% of global net emissions. The emissions are mainly attributed directly to emissions from the operation of health-care facilities and indirectly through carbon impacts from procurement and the health-care supply chain. The proportion of carbon footprints from the health-care facilities in the Western Pacific may also be significant but need to be verified through this project.

In the past decades, the carbon footprint of health-care facilities increased in both developed and developing countries, except for several European countries. This trend will continue in the short-term future in the context of increasing health expenditures and ageing populations. Although the carbon intensity of health expenditures is reducing, it is insufficient to cap the carbon footprint of health-care facilities. The per capita health-care carbon footprint varies greatly among countries, but it is not necessarily related to health-care quality. For instance, a substantial reduction in per capita carbon footprint occurred in England in the past three decades owing to the health care sector’s response to climate change.

Approximately 10–16% of the carbon footprint in health-care facilities is from energy consumption in buildings, a further 10% from transport and the remainder from indirect emissions in supply chains. In the
buildings of health-care facilities, heating, ventilation and air conditioning contribute over half of energy use, followed by water heating and cooking, operation of medical and office equipment, and lighting. The major sources of power used in the buildings of health-care facilities are electricity and natural gas. GHG emissions from supply chains contribute a larger share in the total footprint, in particular pharmaceuticals.

The health sector plays an important role in achieving the carbon-neutral goal. In addition to the decarbonization of the sector itself, health-care facilities need to pay more attention to disease prevention and community health, which in turn reduces the burden of health-care facilities. Therefore, there is a need to deepen research on health-care facilities and climate change. Many LMICs do not have a carbon footprint estimate of their health-care system. There is also a need to finance low-carbon retrofitting in health-care facilities. Energy efficiency improvements of health-care facilities are not inexpensive and the investment payback period is long.

Climate finance for health

Climate finance refers to local, national or transnational financing that seeks to support mitigation and adaptation actions that will address climate change. The UNFCCC, the Kyoto Protocol and the Paris Agreement call for financial assistance from Parties with greater financial resources to those that are less wealthy and more vulnerable. Overall, efforts under the Paris Agreement are guided by its aim of making finance flows consistent with a pathway towards low GHG emissions and climate-resilient development. The inclusion of health can raise the ambition of climate finance, as far more ambition is needed to limit emissions and adapt to the worsening impacts of climate change. Countries have significantly increased health considerations in their NDCs. Almost all (94%) of 142 new or updated NDCs published in 2020–2021 mention health.

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compared to 70% of 184 NDCs in 2019. The health benefits of climate mitigation are now referenced in 28% of new or updated NDCs, up from 10% in 2019. Countries want to “enhance” the ambition of their current plans, either by curbing GHG emissions or making their societies more resilient to the worsening impacts of climate change, or both. Collectively, the countries with updated NDCs that include health represent 37% of global GHG emissions.

Health co-benefits represent selected near-term positive consequences of climate policies that can offset mitigation costs in the short term – before the beneficial impacts of those policies on the magnitude of climate change are evident. By linking health as a co-benefit to mitigation policies and actions not only will GHG reductions be attached to something meaningful, but climate finance will be more ambitious, by being more sustainable, effective, efficient and transformative, as well as with a higher impact.

SIDS, as a group, bear next to no responsibility for climate change, but their geographical, socioeconomic and climate profiles make them particularly vulnerable to its impacts. Spread across three regions, the 39 SIDS nations have received nearly US$ 1.8 billion from multilateral climate funds between 2003 and 2019. This finances, 334 projects in 38 SIDS, with all SIDS except Singapore receiving support. While approved funding for SIDS has increased markedly in the past few years, it fulfils only a small part of actual needs. Since 2015, the Green Climate Fund (GCF) has been the largest contributor to SIDS. In 2019, US$ 110 million was approved for projects in SIDS. Some 60% of this is programmed by the GCF, which also accounts for the 11 largest projects in SIDS. Further scaling up both climate adaptation and mitigation funding to SIDS is vital – both to address the vulnerability of SIDS inhabitants by making agriculture, biodiversity and infrastructure sectors more resilient to climate impacts, and by shifting the energy mixes of SIDS away from fossil fuels.

The ability of countries to engage in climate change adaptation and mitigation actions is highly dependent on their financial capacity. Unfortunately, countries most vulnerable to the impacts of climate change are often also the least able to finance the actions necessary to address these impacts. For this reason, various funds have been established to help countries with limited financial capacity to prepare and cope with the impacts of climate change. The UNFCCC established a financial mechanism to facilitate climate finance initiatives, which also services the Kyoto Protocol and the Paris Agreement.

WHO has been approved as a GCF Readiness Delivery Partner, enabling the Organization to support countries in accessing GCF readiness funds, undertaking adaptation planning and developing strategic frameworks to build their programming with the GCF.
Overview of the Readiness Programme

The Readiness and Preparatory Support Programme supports country-driven initiatives by developing countries to strengthen their institutional capacities, governance mechanisms, and planning and programming frameworks towards a transformational long-term climate action agenda.

The Readiness Programme provides grants and technical assistance to National Designated Authorities and/or focal points. Readiness funding can also be deployed to strengthen Direct Access Entities. The objective is to enhance the capacity of national institutions to efficiently engage with Green Climate Fund (GCF). Dedicated readiness funding may also assist countries in undertaking adaptation planning and developing strategic frameworks to build their programming with GCF.

All developing country Parties to the UNFCCC can access the Readiness Programme. GCF targets at least 50% of the readiness support to particularly vulnerable countries, including least-developed countries, SIDS and African states.

Source: Green Climate Fund, GCF’s Readiness Programme provides resources for countries to efficiently engage with GCF, 12 November 2021.

The Lao People’s Democratic Republic

is highly vulnerable to climate change and the related health risks, including an increased incidence of waterborne and vector-borne diseases. The Lao People’s Democratic Republic Readiness Project was designed to increase the adaptive capacity of national health systems and institutions, and subnational actors, to respond to and manage long-term climate-sensitive health risks, specifically by strengthening the capacity to develop and manage climate-informed early warning systems for climate-sensitive diseases and by establishing a coordination mechanism to share data and knowledge among relevant sectors.

WHO, as a GCF Delivery Partner, is developing a Readiness Project proposal with support from ACE. The proposal aims to ensure enhanced capacity for early intervention of the target climate-sensitive diseases and systematized knowledge-sharing mechanism with stakeholders and other relevant sectors. Because the project focuses on enhanced health system resilience and the reduction of climate-related health risks and vulnerabilities, the project will indirectly benefit all of the Lao People’s Democratic Republic’s 7.1 million people.

The Marshall Islands

is a SIDS that is highly vulnerable to the health impacts of climate variability and change. Without substantial and proactive investment in adaptation in the health sector, including expanding reach to vulnerable communities and subpopulations, the current and projected climatic changes will result in increased health risks through direct and indirect pathways. While there has been progress related to climate change and health-related interventions and planning in the Marshall Islands, greater coordination, strengthened capacity and strategic frameworks, and an increased knowledge base can contribute significantly to building the climate resilience of health systems.

An opportunity exists to fill previously identified gaps in adaptation planning for the health sector, as well as scale up the scope and geographic reach of interventions to further reduce the health impacts of climate change. Therefore, WHO, as a GCF Delivery Partner, is developing a Readiness Project proposal with support from ACE. The proposal aims to strengthen the capacity of a national designated authority and climate change and health stakeholders to better understand and adapt to the health risks of climate change. In addition, the proposal aims to ensure the strategic frameworks are in place. The direct beneficiaries of this project include involved governmental staff, and because the project focuses on enhanced health system resilience, reduction of climate-related health risks and vulnerabilities, it will indirectly benefit all of the 58,000 people who live in the Marshall Islands.

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9 World Health Organization, Human Health and Climate Change in Pacific Island countries, Manila, WHO Western Pacific Region, 2015. (https://iris.wpro.who.int/handle/10665.1/12399)
The publication, *WHO Manifesto for a Healthy Recovery from COVID-19*, provides an overview of WHO prescriptions and related actions for a green and healthy recovery from COVID-19. The practical steps outlined in this report aim at creating a healthier, fairer and greener world, while investing to maintain and resuscitate economies impacted by COVID-19.

Policy-makers, national and local decision-makers, and a wide array of other actors wishing to contribute to a healthy recovery can now take decisive steps by shaping the way we live, work and consume. Effects on environmental degradation and pollution and climate change will be wide ranging.

**Prescriptions for a healthy green recovery from COVID-19:**

1. Protect and preserve the source of human health: Nature.
2. Invest in essential services, from water and sanitation to clean energy in health-care facilities.
3. Ensure a quick healthy energy transition.
4. Promote healthy, sustainable food systems.
5. Build healthy, livable cities.
6. Stop using taxpayer money to fund pollution.
Father and daughter, 3 years old, suffering from severe malnutrition in Goroka General Hospital, Papua New Guinea.

WASH in healthcare facilities
WASH in health-care facilities

The term "WASH in health-care facilities" refers to the provision of water, sanitation, health-care waste management; hygiene and environmental cleaning infrastructure; and services across all parts of a facility. Water, sanitation and hygiene (WASH) services in health-care facilities are needed more than ever to protect vulnerable health workers and patients at time when COVID-19 is exposing key vulnerabilities in health systems, such as inadequate infection prevention and control.

- **Disease prevention**: WASH is necessary in order to carry out basic infection, prevention and control (IPC) measures, which in turn reduce health-care-associated infections, prevent spread of antimicrobial resistance (AMR) and effectively prevent and treat a wide range of illnesses and diseases – helping to ensure safe, quality health care.

- **Quality care**: WASH is a fundamental human right, increases patient satisfaction and uptake of services, and is particularly important around the time of childbirth – when far too many mothers and newborns suffer and die, including from preventable conditions such as sepsis.

- **Pandemic preparedness**: COVID-19 has highlighted the need for WASH to ensure resilient health-care facilities that are prepared to respond to pandemics, outbreaks and climate threats.

- **Effective health systems**: WASH services within health-care facilities contribute to better health outcomes, more cost-effective services, improved occupational safety for health-care workers and a stronger health system.

- **Healthier and more productive communities**: WASH provides the foundation for sustainably managed and well-run health-care systems that can generate improved community health and resilience.

Data on the extent of the problem of unsafe health care reveals a shocking picture. Between 5.7 and 8.4 million people die each year in LMICs as a result of poor-quality care.\(^\text{11}\) An estimated 15% of patients in LMICs acquire one or more infections during a typical hospital stay.\(^\text{12}\) Infections associated with unclean births account for 26% of neonatal deaths and 11% of maternal mortality; together these account for more than 1 million deaths globally each year.\(^\text{13,14}\)

According to updated data from the WHO/United Nations Children’s Fund Joint Monitoring Programme, major gaps exist globally: one in four facilities have no basic water services; one in 10 have no sanitation services; and one in three do not have adequate facilities to clean hands at the point of care. Furthermore, one in three do not segregate waste safely.\(^\text{15}\)

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The importance of WASH in health-care facilities was highlighted in a World Health Assembly resolution in 2019. Many countries have incomplete WASH standards for health-care facilities, while if they do exist there is limited financing or action to drive implementation. While 94% of countries that participated in the WHO-led Global Analysis and Assessment of Sanitation and Water had a policy for drinking water and sanitation, fewer than one sixth of countries with costed WASH plans have sufficient financing to implement them. The World Health Assembly resolution urges Member States to conduct comprehensive assessments and develop and implement a road map so that every health-care facility in every setting has safely managed and reliable water supplies. It also calls for sufficient, safely managed and accessible toilets or latrines for patients, caregivers and staff of all sexes, ages and abilities; appropriate core components of IPC programmes, including good hand hygiene infrastructure and practices; routine, effective cleaning; safe waste management systems, including those for excreta and medical waste disposal; and, whenever possible, sustainable and clean energy. The resolution also calls for the establishment and implementation of minimum standards for safe water, sanitation and hygiene and IPC in all health-care settings.


17 Water, sanitation and hygiene in health care facilities SEVENTY-SECOND WORLD HEALTH ASSEMBLY WHA72.7 Agenda item 28 May 2019 (https://apps.who.int/gb/ebwha/pdf_files/WHA72/A72_R7-en.pdf)

The eight practical steps to improve WASH in health-care facilities and advance the quality care form the basis and framework for national action and commitments. They are a distillation of “what works” from over 50 countries and were developed through a multi-year, iterative process facilitated by WHO and the United Nations Children’s Fund. The steps also are the basis for tracking country progress and reporting on global commitments.

**FIG. 6.** Eight practical steps to improve WASH in health-care facilities

1. **Conduct Situation Analysis and Assessment**
2. **Set Targets and Define Road Map**
3. **Establish National Standards and Accountability Mechanisms**
4. **Improve Infrastructure and Maintenance**
5. **Monitor and Review Data**
6. **Develop Health Workforce**
7. **Engage Communities**
8. **Conduct Operational Research and Share Learning**

The country tracker (Fig. 7) presents a snapshot of progress on five of the eight practical steps from selected countries (Cambodia, the Lao People’s Democratic Republic, Mongolia, Papua New Guinea, the Philippines and Viet Nam) in the Western Pacific Region.

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FIG. 7. Country progress at a glance in the Western Pacific Region, October 2020

<table>
<thead>
<tr>
<th>Country</th>
<th>Situational analysis</th>
<th>Baseline assessment or data</th>
<th>National coordination &amp; road maps</th>
<th>WASH in health-care facilities</th>
<th>Health-care waste management</th>
<th>Infrastructure improvement</th>
<th>WASH indicators in national monitoring</th>
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The following steps relate to those detailed in Figs. 6 and 7:

**STEP 1. Multisectoral situational analyses and setting baselines.** Cambodia has completed the analysis of the policy and technical basis for improving WASH in health-care facilities. The Lao People’s Democratic Republic and Viet Nam have drafted and are working on updating, reviewing and validating their analyses.

**STEP 2. National coordination, development of road maps and targets** have two criteria for achieving green status: formulating a national technical working group or coordination body to coordinate with different ministries and implementing partners; and developing a national costed road map or strategy with targets. Cambodia, the Lao People’s Democratic Republic and Papua New Guinea have done both.

**STEP 3. Standards.** Cambodia has published and is disseminating standards on WASH and/or waste. The Lao People’s Democratic Republic and Viet Nam have developed specific climate standards for health-care facilities. The Philippines has linked national standards with accountability mechanisms, such as facility accreditation systems.

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**STEP 4. Infrastructure improvement.** The Philippines has undertaken concerted national and subnational infrastructure improvement efforts.

**STEP 5. Integrating WASH into national monitoring systems.** This area has seen the least progress. Most of countries are in the process of reviewing and adapting monitoring systems but have not yet operationalized these data collection systems.

To accelerate investments and improvements in WASH services in health-care facilities, WHO will support Member States:

- to implement costed national road maps with appropriate financing;
- to monitor and regularly review progress in improving WASH services, practices and an essential enabling environment;
- to develop capacities of the health workforce to sustain WASH services and promote and practise good hygiene; and
- to integrate WASH into regular health sector planning, budgeting and programming, including COVID-19 response and recovery efforts to deliver quality services.

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**WASH and antimicrobial resistance in health-care facilities**

Antimicrobial resistance (AMR) refers to microorganisms, such as bacteria, fungi, viruses and parasites, that can become resistant to antimicrobials through a variety of mechanisms, such as mutation or genetic exchange (acquired resistance). This can occur in microorganisms in the body of human or animal hosts, but also in environmental settings where the release of excreta and presence of antimicrobial agents and other pollutants weaken or deplete the main populations of the target bacteria, allowing the remaining resistant strains to persist or flourish.

LMICs bear a greater burden of infectious disease, and with limited resources they will be most adversely affected by AMR. However, multidrug-resistant bacteria are carried in the intestinal tract of people and animals around the world, which means untreatable symptomatic infections are challenging health-care systems everywhere, rendering antimicrobials less effective (Fig. 8). As the recent COVID-19 pandemic has shown, global solutions are needed to address global public health challenges, and the role of infection prevention in communities and health facilities is more important than ever.
Health-care-associated infections (HAI) are one of the most common adverse events in care delivery and a major public health problem with an impact on morbidity, mortality and quality of life. WASH, both independently and in combination, support IPC and reduce HAIs. However, influencing factors such as resource constraints, behavioural variations and cultural practices impinge on the outcomes, which result in AMR generation.

Within health-care facilities, resistant bacteria and fungi transmit to and from environmental reservoirs within health-care facilities, such as sinks, surfaces, equipment and plumbing systems. Among the antibiotic resistance bacteria are carbapenem-resistant Enterobacteriaceae; carbapenems are a mainstay for the treatment of antibiotic-resistant bacterial infections.

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21 Adapted from Inter-Agency Coordination Group (2019). No time to wait: Securing the future from drug-resistant infections. (https://www.who.int/publications/i/item/no-time-to-wait-securing-the-future-from-drug-resistant-infections)


WHO is supporting Member States on WASH

To ensure universal access to safe water supplies, as well as sanitation, proper hygiene practices and health-care waste management in health-care facilities, WHO will provide technical guidance to Member States in the following areas:

- Following the eight practical steps recommended by WHO and United Nations Children's Fund to achieve WASH in health-care facilities, including conducting national assessments and analyses, setting targets and standards, and developing the health workforce for WASH in health-care facilities.
- Health-care facilities without access to WASH should prioritize immediate low-cost interventions such as basic hand hygiene stations, regular cleaning, improved drinking water, and improved and accessible toilets.
- Increase isolation of patients between units or points of exposure to reduce local transmission.
- Focus attention on possible in-facility reservoirs of infectious bacteria and AMR, such as plumbing (including showers), water sinks, surfaces and infectious waste disposal bins.
- Health-care facility waste-water treatment may not be essential where waste water goes to central community secondary waste-water treatment or where additional barriers to AMR spread and exposure exist.
- If waste water from health-care facilities does not go to a central community secondary treatment plant, pre-treatment is needed to reduce pathogen and AMR concentrations before release into the environment. Treatment technologies should be chosen to minimize AMR releases, not necessarily relying on traditional domestic waste treatment options. In some instances, pretreatment may be required or desirable regardless of downstream treatment levels.
- Minimize antimicrobial waste through good antimicrobial inventory control and develop supportive policies, plans and accountability mechanisms. Antimicrobial waste should be segregated from other wastes, and encapsulated and buried, incinerated or returned to the manufacturer.
- Incorporate information on environmental risks of AMR in guidelines and training for health-care professionals.

Climate-resilient and environmentally sustainable health-care facilities via WASH

Lack of good quality water, or irregular access, is a major problem in many health-care facilities in less developed regions, particularly in areas of natural water scarcity, and has implications for sanitation and hygiene. This problem is increasingly aggravated by climate variability and change and may result in shortage of water for prolonged periods or excess water for short periods (drought followed by heavy rains and flash floods). Floods may also adversely impact sanitation systems and overflow of waste waters. Even when water becomes available or in periods of drought, people may undertake various initiatives to overcome shortages, such as storing water or accessing water of lower quality. Sea-level rise may also increase salinity in coastal aquifers affecting water quality and flooding sewage systems. Achieving optimal use of water resources means that some health-care facilities may need to conserve water, while others need to increase their use. This needs careful consideration to ensure that actions in one area do not impact on other areas.25,26

In order to protect the health of populations from the effects of climate change and avoid widening health inequities, the WHO Regional Office for the Western Pacific will support Member States:

- to regularly assess health vulnerabilities and adaptation capacities;
- to develop and implement an evidence-based adaptation plan for health;
- to strengthen the climate resilience and environmental sustainability of the health system and facilities;
- to close the financing gap for health adaptation and resilience; and
- to protect health and advance climate justice by implementing health-promoting interventions in other sectors (Fig. 9).

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People enjoying the outdoors in Songdo Central Park in Incheon, Republic of Korea.
ACE activities in 2021
Air quality and health has been a principal focus for many Member States as it is responsible for more than half of the burden of disease attributable to the environment. Air quality and health is one of the key technical areas on which ACE focuses. In 2021, several activities have taken place on air quality and health, as follows.

Report: Air Quality and Health in the Western Pacific Region
A draft report on Air Quality and Health in the Western Pacific Region was prepared with collaboration of Health and Environment unit in the WHO Regional Office for the Western Pacific and is currently under technical review. The report contains a scientific review of the latest evidence on air pollution and health, with a special focus on the emerging priority topics in the Western Pacific Region, following ACE's vision statement of “Healthy Planet, Healthy Environment, Healthy People.” The topics include:

- Indoor air quality, for “Healthy People”, including:
  - household air pollution: traditional cooking and lighting, energy transitions (clean fuels);
  - waste management: residential waste burning; agricultural practices (crop residue burning); and
  - protective measures for individuals: masks, air purifiers.

- National ambient air quality, for “Healthy Environment”, including:
  - wildfires;
  - COVID-19: ability of aerosols to carry viruses; personal and societal responses; and
  - effective advocacy and communication strategies: citizen engagement and empowerment.

- Regional ambient air quality, for “Healthy Planet”, including:
  - international trade and/or transport: production and transport emissions (offset); and
  - transboundary (long-range) air pollution: wildfires – border-crossing.

Each topical review has been prepared to provide a list of options or measures for effective action against the issue by the nation or region, including the UNEP’s 25 Clean Air Measures based on high-quality data and state-of-the-art modeling. If implemented, the options and measures will help one billion people at an affordable cost (5% of a projected annual gross domestic product increase), assisting the WHO’s global transformation via the “Triple Billion” targets as part of WHO’s Thirteenth General Programme of Work.
Symposium: Multiple exposure environmental epidemiology using big data, 5 July 2021

ACE was represented in a number of technical meetings, open to the public, presenting state-of-the-art evidence as a knowledge hub. One meeting was a symposium entitled "Multiple exposure environmental epidemiology using big data" on 5 July 2021, organized jointly by Seoul National University and University of Copenhagen, with participation by Seoul National University College of Medicine, Catholic University of Korea and Chungnam National University College of Medicine. There, the former ACE Head of Office, Dr Marco Martuzzi, presented on the topic of "Environmental health issues in Asia", while ACE short-term consultant Dr Thomas Cole-Hunter presented on the topic of "Environmental exposures". Approximately 55 people participated in the event virtually.

12th World Clean Air Forum, 9 September 2021

A second meeting was a forum, the 12th World Clean Air Forum, on 9 September 2021, organized by Konkuk University, with participation by Global Alliance for Clean Air, Harvard University, Seoul National University, Nagoya University, the Chinese Academy of Sciences, the Indian Institutes of Technology and the Mongolian Ministry of Environment and Tourism. ACE short-term consultant Dr Thomas Cole-Hunter presented on the topic of "Air Quality around the world before, during and after the COVID-19 pandemic". Approximately 110 individuals virtually participated in the event.
Climate change and health

Technical Advisory Group on Climate Change and Environment

In October 2019, the WHO Regional Committee for the Western Pacific endorsed *For the Future: Towards the Healthiest and Safest Region*, which articulates a shared vision for WHO’s work with Member States and partners in the coming years. As the Region’s implementation plan for the global WHO Thirteenth General Programme of Work, *For the Future* identifies climate change and the environment (CCE) as one of four thematic priorities for the Region going forward. The overall goal of the CCE thematic priority is to ensure that countries and communities have the capacity to anticipate and respond to the changing environment and climate, with the health sector helping drive achievement of the Sustainable Development Goal and Paris Agreement targets. The climate change and environment thematic priority of *For the Future* focuses on four areas, called pillars: 1) advocacy; 2) building resilience into health systems; 3) monitoring the impact of CCE on human health; and 4) promoting the CCE agenda in all programmes within WHO. ACE leads the monitoring pillar, coordinating expert guidance on CCE monitoring.

COP26 Special Report on Climate Change and Health: The Health Argument for Climate Action

ACE provided input, via technical and regional consultations, into the technical document prepared by WHO for UNFCCC COP26. The 10 recommendations in the *COP26 Special Report on Climate Change and Health* propose a set of priority actions from the global health community to governments and policy-makers, calling on them to act with urgency on the current climate and health crises. Dr Johanna Wegerdt (Technical Officer, ACE) contributed to this report as an expert.

More information: https://www.who.int/publications/i/item/cop26-special-report

2021 WHO Health and Climate Change Global Survey Report

Mounting an effective response to the health risks posed by climate change is now urgent for all countries. The consequences of the climate emergency are severe for population health and health systems, and further drive health and social inequalities. The 2021 WHO Health and Climate Change Global Survey provides a valuable snapshot of the overall progress governments have made in addressing the health risks of climate change. The findings on key health and climate change indicators aim to empower policymakers to make informed decisions on the implementation of policies and plans, identify evidence gaps, and better understand the barriers to achieving adaptation and resilience priorities in the health sector, while maximizing the health benefits of sector-wide climate mitigation efforts. Dr Johanna Wegerdt (Technical Officer, ACE) contributed as one of the collaborators to develop and validate the survey and report.

More information: http://www.quotidianosanita.it/allegati/allegato5817876.pdf

Inaugural webinar of The Innovators series

The Innovation and Research (INR) team at the WHO Regional Office for the Western Pacific invited ACE to organize the inaugural webinar of “The Innovators” series. ACE staff arranged for Sir Andy Haines, Professor at the London School of Hygiene & Tropical Medicine and former chair of WHO Task Force on Health Systems Research, to be the keynote speaker. He was joined by two experts, Dr Johan C.I. Kuylenstierna and Dr Chris Malley, researchers at Stockholm Environment Institute, to talk about the health co-benefits from climate mitigation policies and actions. There were 65 participants from the health sector and other sectors. The meeting was opened by Gauden Galea, the WHO Representative in China, and Angela Pratt, Executive Officer.
Director in the Office of the Regional Director, Western Pacific Region. WHO supports countries in the Region to ensure that national climate change mitigation strategies prioritize the health sector and have the ability to mitigate the health impact of climate change. The aim was to raise awareness about innovation within WHO and raise awareness about the activities of the Innovation and Research team, which is working on innovative approaches to health co-benefits of climate change mitigation policies and plans.

**WHO Western Pacific Innovation Challenge: Innovation for the Future of Public Health**

WHO in the Western Pacific Region has launched the first “WHO Western Pacific Innovation Challenge: Innovation for the Future of Public Health”. The Challenge is calling for innovators to submit their solutions to better the health and well-being of people in the Western Pacific Region. The demand for health innovations in the Region is high and will continue to increase as socioeconomic dynamics continue to evolve. WHO in the Western Pacific Region has made efforts to embed innovation in its organizational culture, and is working to empower countries to chart a sustainable path to improving the health of people across the Region. The Innovation Challenge is an opportunity for WHO to source and select innovators with profound understanding of the health needs of people in the Western Pacific Region and to create an ecosystem of innovators who have sustainable, cost-effective and inclusive solutions that can address these needs. WHO believes in the potential for both entrepreneurial forms of innovation, with new technologies, services and products that can advance the efficiency and effectiveness of public health, as well as more home-grown innovative solutions that may have significant impact because they are already adapted to the local context, potentially costing less to implement and scale. All solutions submitted to the Innovation Challenge are beyond the idea stage and past pilot testing to prove feasibility, and ideally effectiveness. ACE is supporting the initiative by judging the climate change and healthy environments and populations category, which calls for creating healthier environments, better food choices, safer settings and inclusive health services for a healthy start for every newborn, and a long life for every person.

**Advancing Health-care Decarbonization and Climate Resilience in South-East Asia, 10 June 2021**

The webinar on “Advancing Health-care Decarbonization and Climate Resilience in South-East Asia” was virtually launched on 10 June 2021, with Health Care Without Harm, the organization that developed the first-ever Global Road Map to Health Care Decarbonization and build the resilience of the health-care sector because the climate crisis is a global health emergency, of far greater magnitude than even COVID-19. The objective of webinar was:

1. to introduce Health Care Without Harm’s Global Road Map for Health Care Decarbonization and discuss how it can transform the health-care sector and society in South-East Asia through sustainable, resilient, low-carbon pathways;
2. to map out and showcase the sustainable practices of health facilities and the climate leadership of health professionals in South-East Asia;
3. to feature key health ministry officials, policy-makers, hospital directors and medical associations, amplifying the health and climate voices in the Region supporting the Road Map’s aim towards low-carbon and climate-resilient health care; and
4. to reach the broad sector of health and climate advocates in South-East Asia to help mainstream health-care resilience.

Dr Johanna Wegerdt (Technical Officer, ACE) participated in this webinar as a speaker. She presented WHO’s documents *Guidance on Climate-resilient and Environmentally Sustainable Health Care Facilities* and *Access to...*
Modern Energy Services for Health Facilities in Resource-constrained Settings. A key message was that the health sector must also address its own contribution to carbon emissions and environmental degradation. Thus, the health sector can also lead by example, through taking action to reduce its own contribution to climate change and environmental damage – for example, through greater use of renewable power and energy efficiency measures and improving waste and water management. For the Future: Towards the Healthiest and Safest Region, the guiding vision for WHO work with Member States in the Western Pacific, sets out thematic priorities for the coming years, which includes climate change and the environment.

Webinar on Universal Health Coverage and Health, 17 June 2021

The webinar on Universal Health Coverage and Health was co-organized by ACE and WHO Regional Office for the Western Pacific on 17 June 2021 to discuss how climate change threatens the achievement of universal health coverage (UHC) and the ways decision-makers can implement plans to mitigate those threats. The objective of the webinar was: 1) to raise awareness of all attending WHO staff and external participants in the Region on CCE; 2) to highlight the importance of integrated efforts on CCE and UHC; and 3) to share best practices and facilitate knowledge exchange among participants on CCE and UHC. The former ACE Head of Office, Dr Marco Martuzzi, moderated the webinar. The chair of CCE Technical Advisory Group, Professor Yun-Chul Hong, offered a presentation titled “In what ways does climate change undermine the success of UHC programmes in low- and middle-income countries, particularly in Asia Pacific?” and the chair of UHC Technical Advisory Group, Professor Gillian Biscoe, discussed “How can climate change adaptation measures accelerate progress to UHC as a foundation of health?” The webinar provided an excellent opportunity to map out an integrated approach as well as ways to mainstream CCE across the Western Pacific Region.

Water and living areas

Water partnership

Building on previous experience, ACE reached out to Ministry of Environment of the Republic of Korea and Korea Water to establish a new partnership on water and health, focusing on improved and innovative strategies and technologies on WASH. WHO and the Government of Australia established the Water Quality Partnership for Health in 2005 and promoted the institutionalization of water safety plan implementation through the development and implementation of national policies and frameworks that defined roles and responsibilities in terms of establishing monitoring and assessing the performance of water safety plans. This is part of a WHO–Australian (Department of Foreign Affairs and Trade) project (2018–2022) on Strengthening the quality and sustainability of water, sanitation and hygiene services, including in health-care facilities. ACE is developing a continuation the Water Quality Partnership. There has been discussions on common interest areas on appropriate WASH technology and policy guidelines at the WHO Regional Office.

Waste management and health

ACE has carried out activities in waste management and health to provide Member States with updated evidence on waste and health, with special reference to COVID-19-related waste streams and health-care waste. ACE disseminates best practices and supports Member States to network with experts on waste management. To develop cooperation in work on waste management, discussions have been conducted with Korean Environment Corporation.
WASH – Why not yet?

ACE is producing an analysis of factors that have hampered progress in the WASH area in WHO Western Pacific Region and is developing recommendations on the way forward. To implement UHC by 2030, WHO in the Western Pacific Region must find a better way to focus on its roles of generating and disseminating standards and guidelines in strengthening health-sector capacities in providing WASH support and public health oversight. This analysis will provide an overview of the status of drinking water, sanitation and hygiene in the Western Pacific Region to support policies, strategies and programmes towards the common aim of achieving the Sustainable Development Goals, the WHO Thirteenth General Programme of Work and the objectives of For the Future: Towards the Healthiest and Safest Region, the vision of WHO work with Member States in the Western Pacific. With an analysis on the key obstacles hindering the progress of WASH improvements, this analysis aims to provide essential information for reflection on ways to streamline international and national efforts for WASH development in the Region. In addition, it will provide the basis for discussion and advocacy work at all levels to fine-tune investments for the attainment of universal coverage with safely managed drinking water, sanitation and hygiene in the countries of the Western Pacific Region.

Chemical safety

There are common interest areas on chemical safety for WHO and the Korea National Institute of Chemical Safety, with discussions of common interest areas on chemical incidents and health. A chemical incident is the uncontrolled release of a toxic substance, such as the explosion of a factory that stores such substances. The negative impact of a chemical incident on the local economy can also be extremely high and may include disruption of agriculture, loss of jobs and rising costs for health care. To strengthen capacities in relation to preparedness, detection and alert, and response and recovery, ACE is preparing to provide a comprehensive overview of the principles and roles of public health in management of chemical incidents and emergencies.

Collaboration

First Seminar with Republic of Korea National Institute of Environmental Research, 13 May 2021

The First Working Group Seminar between ACE and the National Institute for Environmental Research (Republic of Korea) was organized to develop climate change and environmental health indicators in the Western Pacific Region. Local experts were invited to provide a technical presentation on CCE health indicators that could help set a foundation for the way forward. The chair of CCE Technical Advisory Group, Professor Yun-Chul Hong, discussed Western Pacific Environment and Health Information System that was created to review and evaluate environmental health indicators to inform policies and services. Dr Yeora Chae, Korea Environmental Institute, presented on how to evaluate the socioeconomic cost of climate change mitigation and adaption in the Western Pacific Region. The inaugural seminar allowed ACE to have fruitful discussions on climate change and environmental health indicators with the National Institute for Environmental Research and further collaborative work was also discussed.


The Policy Dialogue on the Future of Multilateralism and the Role of the Republic of Korea was organized to celebrate the 30th anniversary of the Republic of Korea’s entry into the United Nations. The event was virtually organized by the Ministry of Foreign Affairs of the Republic of Korea and United Nations entities operating in the country. The policy dialogue provided an opportunity to look forward and examine the unique role that the Republic of Korea can play as a bridge between developing and developed countries.
and in strengthening multilateralism in key areas, including development cooperation in the post-COVID-19 era, climate action, and ensuring inclusive and resilient socioeconomic development. The policy dialogue invited prominent experts and stakeholders to discuss some of the key global challenges requiring global action and the role of the Republic of Korea in supporting and strengthening forward-looking multilateralism and the United Nations. Ms Jinwon Yi, a National Professional Officer at ACE, presented during the panel discussion on Multilateral Climate Action for People and Planet, using the opportunity to introduce ACE’s role in addressing climate change.

ACE National Professional Officer, Ms Jinwon Yi, presents during the panel discussion on Multilateral Climate Action for People and Planet at the Republic of Korea–United Nations 30 Anniversary, on 22 October 2021.

WHO facilities in the Republic of Korea, including ACE, operate under various international conventions regulating the presence of the United Nations in countries, involving formal relationships with various government counterparts, typically coordinated by the Ministry of Foreign Affairs.

Second Seminar with Republic of Korea National Institute of Environmental Research, 8 December 2021

The second working group seminar included presentations and discussion on three topics:

- Key messages from the recently updated WHO Global Air Quality Guidelines
- Development of climate change and environmental health indicators
- Mitigation and health: integrated assessment model.

The participants were from the Environmental Health Bureau of the Ministry of Environment, the Korea National Institution of Environment Research, the Seoul Metropolitan Government, academia and ACE.

Through the presentations and a fruitful discussion, knowledge on air quality, environmental health indicators and climate change was shared. ACE will put greater effort into organizing such seminars both within the country and at the regional level. This will strengthen the role of ACE as a regional knowledge hub by providing updated scientific evidence on environment and health, coupled with sharing the knowledge with the public and stakeholders to contribute to policy-making decisions.
Appendix

Glossary

**Abatement:** The reduction or elimination of pollution, which involves either legislative measures or technological procedures, or both. (1)

**Access (to water, sanitation and hygiene or WASH):** Implies sufficient water to meet domestic needs is reliably available close to home, and sanitation and hygiene facilities close to home that can be easily reached and used when needed. (8)

**Accountability research:** Assessment of the effectiveness of interventions. Knowledge gained from such assessments can provide valuable feedback for improving regulatory or other action. (1)

**Adaptation:** Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, public and private adaptation, and autonomous and planned adaptation. (2)

**Adaptive capacity:** Ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences. (2)

**Affordable (WASH services):** Payment for services does not present a barrier to access or prevent people meeting other basic human needs. (8)

**Air quality guideline level:** A particular form of a guideline recommendation consisting of a numerical value expressed as a concentration of a pollutant in the air and linked to an averaging time. It is assumed that adverse health effects do not occur or are minimal below this concentration level. (1)

**Air quality guidelines:** A series of WHO publications that provide evidence-informed, non-binding recommendations for protecting public health from the adverse effects of air pollutants by eliminating or reducing exposure to hazardous air pollutants and by guiding national and local authorities in their risk management decisions. The 2021 volume is the latest issue of the series. (1)

**Air quality standard:** A given level of an air pollutant (for example, a concentration or deposition level) that is adopted by a regulatory authority as enforceable. Unlike an air quality guideline level, a number of elements in addition to the effect-based level and averaging time must be specified in the formulation of an air quality standard, including measurement technique and strategy, data handling procedures (quality assurance/quality control, and statistics used to derive the value to be compared with the standard. (1)

**Air pollution:** Degradation of air quality with negative effects on human health or the natural or built environment due to the introduction, by natural processes or human activity, into the atmosphere of substances (gases, aerosols) that have a direct (primary pollutants) or indirect (secondary pollutants) harmful effect. (4)

**AirQ+:** A software tool for health risk assessments of air pollution that looks at the effects of short-term changes in air pollution (based on risk estimates from time-series studies) and of long-term exposures (using the life-tables approach and based on risk estimates from cohort studies). (1)

**Ambient air pollution:** Air pollution in the outdoor environment, that is, in outdoor air, but which can enter or be present in indoor environments. (1)
Basic WASH services in health-care facilities: WHO has developed a set of minimum, global standards for environmental health in health-care facilities. Derived from these standards, a “basic” level of service has been defined and is achieved when key conditions are met in five areas: water, sanitation, hygiene, waste management and environmental cleaning. (5)

Black carbon: An operationally defined term that describes carbon as measured by light absorption. As such, it is not the same as elemental carbon, which is usually monitored with thermal-optical methods. (1)

Capacity development: Process by which people, organizations and societies systematically stimulate and develop their capacities over time to achieve social and economic goals. The concept extends the term of capacity-building to encompass all aspects of creating and sustaining capacity growth over time. It involves learning, various types of training, and continuous efforts to develop institutions, political awareness, financial resources, technology systems and the wider enabling environment. (2)

Carbon emissions: The amount of carbon dioxide (CO2) emission that would cause the same integrated radiative forcing or temperature change, over a given time horizon, as an emitted amount of a greenhouse gas (GHG) or a mixture of GHGs.

Carbon monoxide: Colourless, odourless, toxic gas produced by incomplete combustion of carbon-containing materials. (6)

Climate: Usually defined as the “average weather” or more rigorously as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classic period is 30 years as defined by the World Meteorological Organization. These relevant quantities are most often surface variables such as temperature, precipitation and wind. (2)

Climate change: Climate change refers to a change in the state of the climate that can be identified (for example, by using statistical tests) through changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in Article 1, defines climate change as: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes. (2)

Climate change hazard: Process, phenomenon or human activity that may cause loss of life, injury or other health impact, property damage, social or economic disruption, or environmental degradation. (2)

Climate change risk: Potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to such a hazard, on lives, livelihoods, health and well-being; ecosystems and species; economic, social and cultural assets; services, including ecosystem services; and infrastructure. (2)

Climate projection: Simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission, concentration or radiative-forcing scenario used, which is in turn is based on assumptions concerning, for example, future socioeconomic or technological developments that may or may not be realized. (2)
Climate variability: Variations in the mean state and other statistics (for example, standard deviations, occurrence of extremes) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability) or to variations in natural or anthropogenic external forces (external variability). (2)

Climate-resilient development path: Climate trajectories that strengthen sustainable development and efforts to eradicate poverty and reduce inequalities while promoting fair and cross-scalar adaptation to and resilience in a changing climate. These climate trajectories raise the ethics, equity and feasibility aspects of the deep societal transformation needed to drastically reduce emissions to limit global warming (for example, to 1.5 °C) and achieve desirable and liveable futures and well-being for all. (4)

Climate-resilient pathways: Iterative processes for managing change within complex systems to reduce disruptions and enhance opportunities associated with climate change. (2)

Co-benefits: Positive effects that a policy or measure aimed at one objective might have on other objectives, thereby increasing the total benefits for society or the environment. Co-benefits are often subject to uncertainty and depend on local circumstances, implementation practices and other factors. Co-benefits are also known as ancillary benefits. (2)

Concentration–response function: A statistical function or model based on the results of epidemiological studies to estimate the relative risk from air pollution for a disease or health outcome (for example, premature death, heart attack, asthma attack, emergency room visit, hospital admission) in a population per unit concentration of an air pollutant. (1)

Conference of the Parties (COP): The supreme body of United Nations conventions, such as the United Nations Framework Convention on Climate Change (UNFCCC), comprising parties with a right to vote that have ratified or acceded to the convention. (4)

Disaster: Serious disruption of the functioning of a community or society at any scale due to hazardous events interacting with conditions of exposure, vulnerability or capacity, leading to one or more human, material, economic or environmental losses or impacts. (2)

Disaster risk: Potential loss of life, injury, or destruction or damage of assets that could occur to a system, society or community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity. (2)

Disaster risk management: Process for designing, implementing and evaluating strategies, policies and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life and sustainable development. (2)

Dust storm (or sandstorm): A mix of dust and/or sand particles that has been elevated to great heights by a strong, turbulent wind and can travel great distances and reduce visibility. Dust or sand readily penetrates into buildings, results in severe soiling and may also cause considerable erosion. The particles are usually lifted to greater heights in a dust storm than in a sandstorm. (1)

Early warning system: Set of technical, financial and institutional capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare to act promptly and appropriately to reduce the possibility of harm or loss. (2)

Equitable (access to WASH): Implies the progressive reduction and elimination of inequalities between population subgroups. (7)

Exposure: Presence of people, livelihoods, species or ecosystems, environmental functions, services or resources, infrastructure, as well as economic, social or cultural assets, in places and settings that could be adversely affected. (2)
Extreme weather event: An event that is rare at a particular place and time of year. Definitions of "rare" vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of "extreme weather" may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (for example, drought or heavy rainfall over a season). (2)

Fine particulate matter: Particles with aerodynamic diameters of less than 2.5 μm (2.5 micrometres or smaller). (6)

Green Climate Fund: A fund created to support the efforts of developing countries in responding to the challenge of climate change. (10)

Greenhouse gases (GHGs): Those gases in the atmosphere that absorb and emit radiation at specific wave-lengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. Water vapour, carbon dioxide, nitrous oxide, methane and ozone are the primary GHGs in the atmosphere, alongside entirely human-made gases such as the halocarbons and others dealt with under the Montreal and Kyoto Protocols. (6)

Hazard: The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. (2)

Health: State of complete physical, mental and social well-being, and not merely the absence of disease or infirmity. (2)

Health-care facilities: Health-care facilities are formally recognized facilities that provide health care. These may be primary, secondary or tertiary – public or private – and temporary structures designed for emergency contexts. Primary care facilities are where patients generally first engage with the health system. Secondary and tertiary facilities are generally upon referral and provide more intensive technology and sub-specialized care. (5)

Health systems: Ensemble of all public and private organizations, institutions and resources mandated to improve, maintain or restore health and incorporate disease prevention, health promotion and efforts to influence other sectors to address health concerns in their policies. (2)

Household air pollution: A range of health-damaging pollutants arising from burning biomass fuels (dung, wood, coal) for traditional cooking or lighting in inefficient stoves, open hearths or kerosene (simple-wick) lamps, including: particulate matter, methane, carbon monoxide, polyaromatic hydrocarbons and volatile organic compounds. Pollutants, besides biomass smoke, may also include formaldehyde, radon, tobacco smoke, allergens, bacteria and virus within and around buildings and structures, especially as it relates to the health and comfort of occupants. (6)

Household fuel combustion: Air pollution generated by the inefficient combustion of fuels in the household environment that results in household air pollution and contributes to local ambient air pollution. (6)

Human system: Any system in which human organizations and institutions play a major role. Often, but not always, the term is synonymous with the terms society or social system. Agricultural systems, urban systems, political systems, technological systems and economic systems are all human systems in the sense applied in the context of the Intergovernmental Panel on Climate Change report. (2)

Hygiene: The conditions and practices that help to maintain health and prevent spread of disease, including handwashing, menstrual hygiene management and food hygiene. (7)

Impacts (consequences, outcomes): The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including...
extreme weather and climate events), exposure and vulnerability. Impacts generally refer to effects on lives; livelihoods; health and well-being; ecosystems and species; economic, social and cultural assets; services, including ecosystem services; and infrastructure. Impacts may be referred to as consequences or outcomes, and can be adverse or beneficial. (2)

**Integrated exposure–response function:** Models that combine exposure and risk data for different sources of combustion-related pollution, such as outdoor air, second-hand tobacco smoke, active smoking and household air pollution. (1)

**Interim target:** An air pollutant concentration associated with a specific decrease of health risk. Interim targets serve as incremental steps in the progressive reduction of air pollution towards air quality guideline levels and are intended for use in areas where air pollution is high. They are steps towards ultimately achieving air quality guideline levels, rather than end targets. (6)

**Kyoto Protocol:** The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty adopted in December 1997 in Kyoto, Japan, at the Third Session of the Conference of the Parties to the UNFCCC. There was agreement to reduce anthropogenic greenhouse gas emissions, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF6) by at least 5% below 1990 levels in the first commitment period (2008–2012). (4)

**Long-term, low-emission development strategy (LT-LEDS):** In accordance with Article 4, paragraph 19, of the Paris Agreement, all Parties should strive to formulate and communicate long-term, low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances. (11)

**Mitigation:** A human intervention to reduce emissions or enhance the sinks of greenhouse gases. (4)

**Mitigation measures:** In climate policy, technologies, processes or practices that contribute to mitigation (for example, renewable energy technologies, waste minimization processes, public transport commuting practices). (2)

**Monitoring:** Performance and analysis of routine measurements aimed at detecting changes in the environment or health status of populations. Not to be confused with surveillance although surveillance techniques may be used in monitoring. (3)

**Monitoring and evaluation:** Mechanism put in place at national to local scales to monitor and evaluate efforts to reduce greenhouse gas emissions or adapt to the impacts of climate change with the aim of systematically identifying, characterizing and assessing progress over time. (2)

**National Designated Authority (NDA):** National Designated Authorities are government institutions that serve as the interface between each country and the Green Climate Fund. They provide broad strategic oversight of the Fund’s activities in the country and communicate the country’s priorities for financing low-emission and climate-resilient development. (13)

**Nationally Determined Contributions (NDCs):** A term used under the United Nations Framework Convention on Climate Change (UNFCCC) in which a country that has joined the Paris Agreement outlines its plans for reducing its emissions. Some countries’ NDCs also address how they will adapt to climate change impacts, and what support they need from, or will provide to, other countries to adopt low-carbon pathways and to build climate resilience. (4)

**Open defecation:** Excreta of adults or children deposited (directly or after being covered by a layer of earth) in the bush, a field, a beach or other open area; discharged directly into a drainage channel, river, sea or other water body; or wrapped in temporary material and discarded. (8)

**Paris Agreement:** The Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) was adopted on December 2015 in Paris, France, at the 21 session of the Conference of the Parties (COP21) to the UNFCCC. One of the goals
of the Paris Agreement is "Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels", recognizing that this would significantly reduce the risks and impacts of climate change. (4)

**Particulate matter:** A mixture of solid and liquid particles in the air that are small enough not to settle out on to the Earth's surface under the influence of gravity, classified by aerodynamic diameter. (1)

**Resilience:** Ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. (2)

**Respirable particulate matter:** Particles (complex mixtures of pollutants) with aerodynamic diameters of 10 μm or less (10 micrometres or smaller). (6)

**Risk assessment:** Qualitative or quantitative scientific estimation of risks. (2)

**Sanitation:** Access to and use of facilities and services for the safe disposal of human urine and faeces. A safe sanitation system is a system designed and used to separate human excreta from human contact at all steps of the sanitation service chain from toilet capture and containment through emptying, transport, treatment (in-situ or off-site) and final disposal or end use. (7)

**Scenario:** Plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (for example, the rate of technological change, prices) and relationships. Scenarios are neither predictions nor forecasts but are useful to provide a view of the implications of developments and actions. (4)

**Solid fuel:** Solid materials burned as fuels, includes coal as well as biomass (wood, animal dung, crop waste and charcoal) fuels. (6)

**Surveillance:** Continuous analysis, interpretation and feedback of systematically collected data for the detection of trends in the occurrence or spread of a disease, based on practical and standardized methods of notification or registration. Sources of data may be related directly to disease or factors influencing disease. (3)

**Ultrafine particle:** Particles of an aerodynamic diameter less than or equal to 0.1 μm (that is 100 nanometres). Owing to their small mass, their concentrations are most commonly measured and expressed in terms of particle number concentration per unit volume of air (for example, number of particles per cubic centimetre). (1)

**United Nations Framework Convention on Climate Change (UNFCCC):** Convention signed at United Nations Conference on Environment and Development in 1992. Governments that become Parties to the Convention agree to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. (3)

**Universal health coverage:** Universal health coverage (UHC) means that all individuals and communities receive the health services they need without suffering financial hardship. It includes the full spectrum of essential, quality health services, from health promotion to prevention, treatment, rehabilitation and palliative care. Without WASH services, the goal of UHC cannot be achieved. (5)

**Vulnerability:** The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity. (2)

**Waste water:** Liquid waste discharged from homes, commercial premises and similar sources to individual disposal systems or to municipal sewer pipes and which contains mainly human excreta and used water. (9)
References for the Glossary


10. https://www.greenclimate.fund/about


12. https://www.greenclimate.fund/about/partners/nda