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Health system strengthening interventions to improve the health of displaced and migrant populations in the context of climate change





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Foreword

Globally, over 1 billion people are on the move, either migrating voluntarily or being forcibly displaced, both within and across borders. Behind these movements are economic, environmental, political and conflict-related factors, among others, with climate change an increasingly emerging driver.

Migration and displacement are broadly recognized as key determinants of health and well-being. The health of migrants, refugees and other displaced populations is shaped by their individual characteristics, their places of origin, their journey and the policies, legislation and health services in their origin, transit and destination countries. The contexts surrounding migration across all its phases profoundly affect health outcomes. Health systems must, therefore, be adaptive and inclusive, integrating refugees and migrants within the broader health system responses as well as within health system strengthening interventions.

The WHO 14th General Programme of Work emphasizes the need to address the social, economic and environmental determinants of health and to strengthen prevention approaches by acting on the root causes of ill health. It underscores the importance of addressing the health risks associated with climate change by developing climate-sensitive and low-carbon health systems. These efforts are crucial to promoting and protecting the health of all individuals, including displaced and migrant populations.

In today's rapidly changing world, the pace of climate change and environmental degradation has accelerated, emerging as an escalating threat to human health. Extreme weather events and rising global temperatures are increasing in frequency, intensity and duration, disproportionately affecting regions and populations in vulnerable situations including refugees, migrants and other displaced groups. Climate hazards impact health both directly and indirectly, exacerbating noncommunicable diseases, increasing the emergence and spread of climate-sensitive diseases and increasing health emergencies.

Climate change is a risk multiplier, intensifying human migration and displacement and impacting population health through stressors such as extreme weather, prolonged droughts and environmental degradation. It is projected that sudden-onset extreme weather events such as droughts, cyclones and floods will internally displace over 216 million people by 2050.

The consequences of climate change for health depend on the resilience and adaptability of affected populations, including displaced and migrant groups, as well as the effectiveness of action on climate change. Climate change challenges health systems by straining health infrastructure, reducing workforce capacity and undermining progress towards universal health coverage. It compounds existing disease burdens and heightens barriers to accessing health services, often at critical moments of need.

The urgency of transformative action cannot be overstated – efforts taken now to reduce emissions and avoid crossing dangerous temperature thresholds and irreversible tipping points will determine the future health and well-being of communities worldwide. Embedding refugee and migrant inclusivity within climate resilience frameworks is crucial for mitigating health risks and ensuring health equity.

This Global Evidence Review on Health and Migration consolidates the available evidence on health system interventions that address the needs of climate-affected displaced and migrant populations. It outlines priority actions to develop health systems that are both inclusive for refugees and migrants and climate resilient. Achieving health for all in the face of climate change requires transformative strategies, collective commitment and sustained action.

It is hoped that this report will serve as a vital resource for policy-makers, practitioners and stakeholders, fostering informed decisions and collaborative efforts to ensure that, as the world evolves, no one is left behind.



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A handwritten signature in black ink that reads "Jeremy Farrar".

A handwritten signature in blue ink that reads "Ailan Li".



Preface

The interactions between climate change, migration, displacement and health are complex. Yet there is an urgent need to address the health implications for those populations who are displaced in the changing climate, which requires immediate attention and action through cross-sectoral and interdisciplinary collaboration.

Migration and displacement are key determinants of health. While there are many reasons why people migrate or move, climate-related factors are increasingly emerging as drivers of movement. Climate change is both a direct driver of displacement and migration and an intensifier of environmental changes (such as deforestation, desertification, loss of biodiversity) and economic and political instability.

Environmental changes caused by climate change, such as rising temperatures, directly and indirectly heighten health risks, including increased mortality, injuries from extreme weather events and the spread of climate-sensitive diseases such as vector- and foodborne illnesses. The threat of environmental changes extends beyond physical health, as the loss of land, property and livelihoods significantly impact mental health and well-being. Those displaced or forced to migrate to new areas because of climate change-related environmental threats can have further mental health pressures from the ensuing loss of community and identity and the disruption of social support networks. These impacts are influenced by diverse factors across broad cultural, social, economic and political contexts, necessitating cross-sectoral responses.

This Global Evidence Review on Health and Migration provides a global overview of existing evidence on health system interventions aimed at addressing the health needs of displaced and migrant populations in the context of climate change. Understanding the social determinants of health and the root causes of ill health and strengthening health systems with an integrated approach are essential to achieving universal health coverage and ensuring health for all in a changing climate.

This review is designed as a practical tool for policy-makers, presenting actionable strategies to strengthen health systems, enhance care delivery and support vulnerable populations facing current and future climate-related challenges. It also identifies critical evidence gaps – particularly regarding long-term health interventions for climate-affected displaced and migrant populations, as well as for the integration of climate mitigation strategies into health system responses. Bridging these evidence gaps through targeted research is urgently needed to guide informed and effective policy and practice.

A shift beyond short-term, reactive responses will be essential to establish refugee- and migrant-inclusive, climate-resilient health systems that are effective, sustainable and accessible. Addressing the longer-term health needs of these communities through climate-conscious strategies will be critical to ensuring global health equity.

This review also highlights innovative, adaptive and cross-sectoral interventions that are both inclusive for refugees and migrants and climate resilient. Policy alignment and the meaningful inclusion of climate-affected migrants in health system planning and development are imperative to building sustainable, responsive health care services. Ensuring that the needs of displaced and migrant groups are reflected in national health policies, programmes and systems is essential to delivering equitable and accessible health care for all.



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Declaration of interest

All external experts participated in their individual capacity and submitted a declaration of interest to WHO, disclosing any potential conflicts that might affect – or be reasonably perceived to affect – their objectivity and independence with regard to the subject matter of this report. WHO reviewed all declarations in accordance with its corporate policies and concluded that none presented a potential or reasonably perceived conflict of interest in relation to the topics discussed at the meeting or addressed in this guidance.

Abbreviations

COVID-19	coronavirus disease
GEHM	Global Evidence Review on Health and Migration (series)
IDP	internally displaced person
IFRC	International Federation of Red Cross and Red Crescent Societies
IOM	International Organization for Migration
mhGAP	WHO Mental Health Gap Action Programme
MSF	Médecins Sans Frontières
NGO	nongovernmental organization
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WASH	water, sanitation and hygiene

Glossary

Adaptation. "In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects" [\(1\)](#).

Climate change. "A change in the state of the climate that can be identified (e.g. by using statistical tests) by 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 forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use" [\(1\)](#).

Climate migration. "The movement of a person or groups of persons who, predominantly for reasons of sudden or progressive change in the environment due to climate change, are obliged to leave their habitual place of residence or choose to do so, either temporarily or permanently, within a State or across an international border" [\(2\)](#).

Climate-resilient health systems. "[t]hose capable of anticipating, responding to, coping with, recovering from and adapting to climate-related shocks and stress, to bring about sustained improvements in population health, despite an unstable climate" [\(3\)](#).

Climate-sensitive diseases. The WHO Special Programme for Research and Training in Tropical Diseases describes climate-sensitive diseases as "those that are impacted by changes in the environment and climate. These include infectious diseases, such as those transmitted by vectors (mosquitoes, ticks, etc.), water (cholera, typhoid, etc.) or animals (rabies, anthrax, etc.), as well as non-infectious diseases that are affected by temperature, humidity, rainfall, air quality or extreme weather events (heat stroke, asthma, cardiovascular diseases, etc.)" [\(4\)](#).

Displacement. "The movement of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters". This is intended to cover both internal and cross-border displacement of populations [\(2\)](#).

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" [\(1\)](#).

Health system. "The health system comprises all the organizations, institutions, people, resources and actions whose primary purpose is to improve, restore or maintain health. The goals of a health system are improving health and health equity in ways that are responsive, financially fair and make the best or most efficient use of available resources. Six health system building blocks together constitute a complete health system – health service delivery; health workforce; health information; medical technologies; health financing; leadership and governance" [\(5\)](#).

Health system strengthening. "[a]ny array of initiatives that improve one or more of the functions of health systems and that lead to better health through improvements in access, coverage, quality or efficiency" (5).

Internally displaced person (IDP). "[a] person or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural or human-made disasters and who have not crossed an internationally recognized State border" (2).

Migration. "The movement of persons away from their place of usual residence, either across an international border or within a State" (2).

Migrant. "An umbrella term, not defined under international law, reflecting the common lay understanding of a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons" (2).

Migrant-sensitive health systems. "[t]hose that 'consciously and systematically incorporate the needs of migrants into health financing, policy, planning, implementation and evaluation'" (6).

Mitigation (of climate change). "A human intervention to reduce greenhouse gas emissions or enhance the sinks that reduce greenhouse gases" (1).

Refugee. The definition used by the International Organization for Migration is as follows. "A person who, owing to a well-founded fear of persecution for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to fear or other limiting factors, is either unable or unwilling to avail themselves of the protection of that country; or who, not having a nationality and being outside the country of their former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it" (2).

Resilience. "The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning and/or transformation" (1).

Trapped populations. "Populations that do not migrate, yet are situated in areas under threat,... at risk of becoming 'trapped' or having to stay behind, where they will be more vulnerable to environmental shocks and impoverishment" (7).

References¹

1. Glossary [online database]. Geneva: Intergovernmental Panel on Climate Change; 2025 (<https://apps.ipcc.ch/glossary/>).
2. Key migration terms [website]. International Organization for Migration; 2019 (<https://www.iom.int/key-migration-terms>).
3. Operational framework for building climate resilient and low carbon health systems. Geneva: World Health Organization; 2023 (<https://iris.who.int/handle/10665/373837>). Licence: CC BY-NC-SA 3.0 IGO.
4. EWARS-csd: overview [website]. TDR, the Special Programme for Research and Training in Tropical Diseases; 2025 (<https://tdr.who.int/activities/ewars-csd>).
5. 21st century health challenges: can the essential public health functions make a difference? Geneva: World Health Organization; 2021 (<https://iris.who.int/handle/10665/351510>). Licence: CC BY-NC-SA 3.0 IGO.
6. Health of migrants: the way forward: report of a global consultation, Madrid, Spain, 3–5 March 2010. Geneva: World Health Organization; 2010 (<https://iris.who.int/handle/10665/44336>). Licence: CC BY-NC-SA 3.0 IGO.
7. Environmental migration [website]. International Organization for Migration; 2025 (<https://environmentalmigration.iom.int/environmental-migration#:~:text=Trapped%20populations%20are%20those%20E2%80%9Cwho,to%20environmental%20shocks%20and%20impoverishment>).

¹ All references were accessed on 30 March 2025.

Executive summary

The health of refugees and migrants is directly related to their access to quality, effective and appropriate health care along all their routes of travel. Refugees and migrants face challenges in accessing health care, including financial, legal and cultural barriers, that are well documented.

These challenges vary according to national and regional legislation and services. Additionally, their global context is increasingly affected by the changing climate, which not only directly affects individual health but also impacts upon health systems and exacerbates health inequities. Climate change continues to drive increasing migration and population displacement and to directly and indirectly affect the health and well-being of those displaced. Health systems must increasingly and urgently consider the additional challenges presented by climate change in order to effectively respond to health needs and work towards universal health coverage and health equity.

From the literature considered within this review, a total of 95 health system interventions were identified, spanning the six health system building blocks. The majority (53%) focused on service delivery, particularly in the context of climate-related emergencies. These included the provision of health and immunization services, mental health interventions and access to safe water, sanitation and hygiene services. Interventions pertaining to governance and the health workforce constituted 37% of total interventions. These primarily focused on the inclusion of climate-affected migrants in policies and plans for governance, as well as on enhancing the capacity of the health workforce to address the health needs of displaced and migrant populations. The least represented interventions related to health financing, medicines and supplies, and the health information system, accounting for approximately 10% of all interventions identified. These included efforts to expand health coverage, ensure the availability of medical supplies and monitor climate-sensitive health risks within each respective building block.

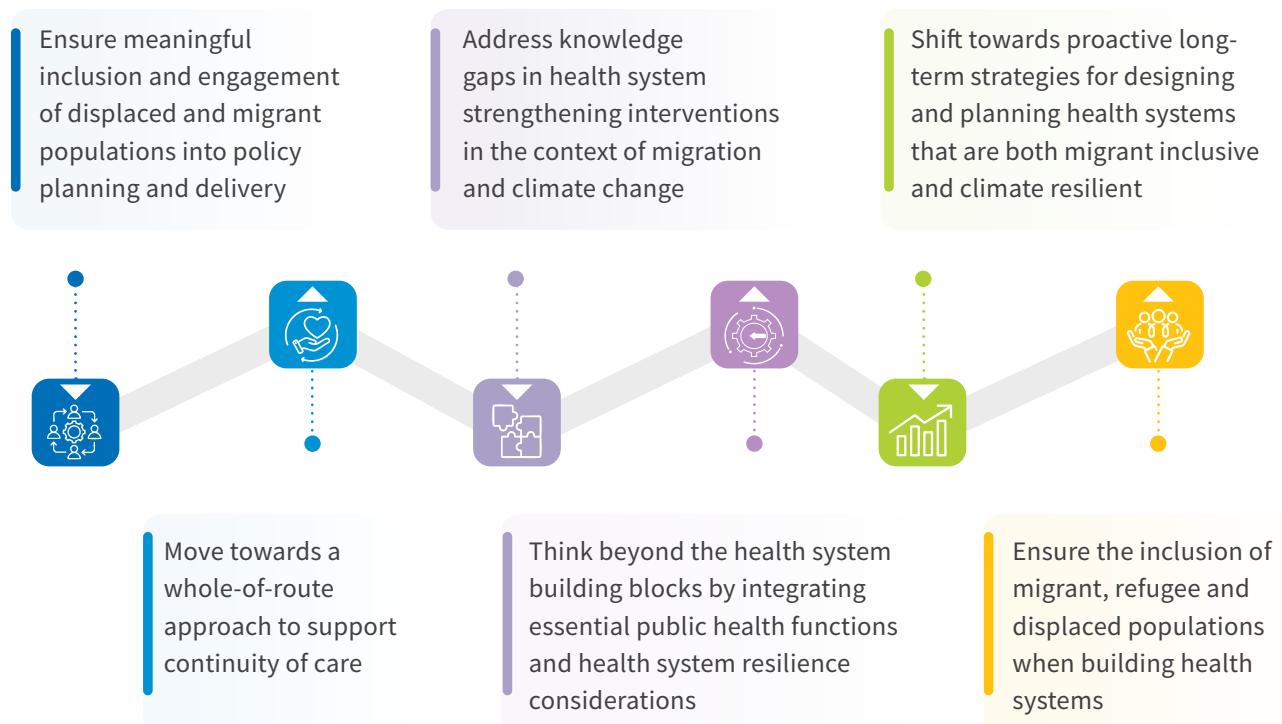
Additionally, only six health system interventions explicitly included climate mitigation strategies; the remainder focused on climate adaptation, primarily in response to extreme weather events.

This evidence review found that innovative interventions are emerging but also that many existing interventions can be adapted to meet population needs. The examples identified demonstrate that cross-sectoral and interdisciplinary collaboration is vital, as is engagement with the migrant community. The review also highlighted possible evidence gaps for future research and action. There is an increasing need for evidence to be amassed concerning longer-term sustainable interventions. These should include interventions covering climate mitigation; evaluating the effectiveness and impact of interventions and population outcomes; addressing less-documented building blocks of health systems (such as health financing, medicines and supplies, and health information systems) and that cut across multiple building blocks (health system-wide approaches); and more evidence from less-represented regions, such as the WHO European, South-East Asia and Western Pacific Regions, particularly those particularly vulnerable to climate change impacts.

Moving forward, to build migrant-inclusive and climate-resilient health systems, evidence gaps identified in this review must be filled through cross-sectoral and interdisciplinary research and action. To ensure coherence across policies, programmes and frameworks, applying a migration lens to the climate-resilient health system agenda and a climate lens to migration health efforts is crucial. It is also important to move beyond short-term reactive responses and consider the longer-term health needs of climate-affected displaced and migrant populations.

Policy considerations

To strengthen and adapt existing health systems to better address the health needs of displaced and migrant populations in the context of climate change, the following policy considerations are suggested based on the review findings.



1. Introduction

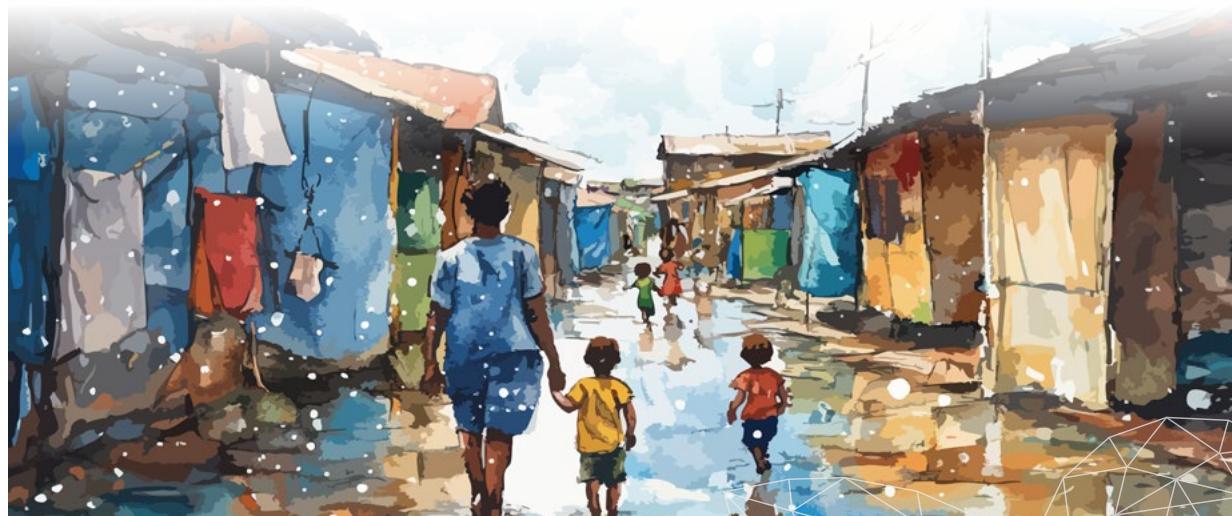
1.1 Focus of this review

This review in the Global Evidence Review on Health and Migration (GEHM) series addresses health system strengthening at the nexus of health, climate change, migration and displacement. Specifically, it examines how health systems are responding to the emerging health needs of displaced and migrant populations in the context of climate change. The review addresses the following question: what are the health system interventions to improve the health of displaced and migrant populations in the context of climate change?

The Glossary outlines the definitions used in this review, which includes the working definitions of a climate migrant as set out by the International Organization for Migration (IOM) in its definition of climate migration ("for reasons of sudden or progressive change in the environment due to climate change"); the review also considers populations that have moved/been displaced for any reason (such as conflict) and are then exposed to climate-sensitive health risks and outcomes. In this GEHM, the populations have been identified as climate migrants when reported as such in the texts and are referred to more generally as climate affected when they were identified as displaced (irrespective of the reason) and exposed to climate-related health risks. This is an evolving field of research; therefore, definitions may continue to evolve. This is also discussed further in the limitations (section 3.1.2).

In this report, migrant-inclusive health systems describes health systems that consciously and systematically incorporate the health and wider needs of migrants into policy, planning, implementation and evaluation. This includes considering epidemiological profiles, as well as relevant cultural, language and socioeconomic factors.

This review included health system interventions for all populations that are displaced or that migrate, across all climate change-related events (both acute and long term). The search strategy is outlined in Annex 1.

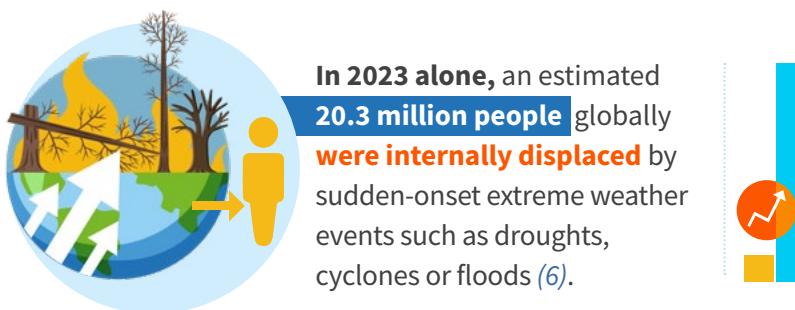


1.2 Climate change, health, migration and displacement



Climate change affects health directly – for example, through direct exposure to extreme heat – or indirectly by influencing disease vectors as well as the social and environmental determinants of health (4). Climate hazards such as cyclones and heat waves also disrupt health services and affect health workers.

Climate change is a risk multiplier. The combined impact of climate change stressors, such as extreme weather or prolonged droughts, contributes to human displacement, which has consequences for population health (1,5). Climate-related displacement may happen within and across borders.



It is estimated that, **by 2050**, climate change will cause the **internal displacement of over 216 million people globally**, with migration hotspots in rural, urban and coastal areas (7).

Data on cross-border movement have been more challenging to estimate, although there are some data from Central America, the Sahel and the Pacific Islands (8).

Displaced and migrant groups may be exposed to climate hazards at any point along their route, including departure, in transit and at their destination. Migrants may also move towards areas where climate change poses health risks, such as labour migrants facing heat stress risks in various global contexts; examples include migrant construction workers in the Middle East, migrant farmworkers

in the Americas and migrant brick kiln workers in India (9–13). Meanwhile, some climate-affected populations may be trapped or immobile (14). There is growing recognition of the importance of understanding the climate–migration–health nexus, particularly regarding the health needs of those affected (15–19). Studies have investigated various health issues associated with climate migration, including health access, food insecurity and changing patterns of communicable and noncommunicable diseases (20). Climate-affected displaced and migrant populations face physical, mental health and social health challenges, with women, children and elderly people being disproportionately vulnerable (21–23).

1.3 Health systems in the context of climate change, migration and displacement

Globally, health systems, particularly in low- and middle-income countries, are confronted with the challenge of achieving universal health coverage: to ensure that all people have access to quality health services when needed without financial burden (24). In addition, health systems must respond and strengthen their capacity to adapt to the effects of climate change (25). WHO's *Operational framework for building climate resilient and low carbon health systems* outlines the importance of not only adaptation to climate risks but also building resilience. This includes managing climate-related health risks; developing health system capacity, long-term vision and adaptive management; and promoting whole-of-society action (26).

The health systems of countries that receive refugees and migrants must also adapt to changing health needs and numbers while meeting the needs of their citizens and residents (27). Climate change is a risk multiplier and health systems have additional pressures along all the routes of migration and displacement (28,29). WHO regions facing high levels of climate-related displacement, such as Africa, South-East Asia and the Western Pacific, have noted increasing strain on health systems; this includes shortages in financial resources and medical supplies, as well as difficulty in coordinating services among providers (30,31).

In addition, health systems responding to migrant health needs face the risk of being disrupted by the changing climate: health services can be interrupted when electricity grids are damaged; medicine supply chains are disrupted when roads are flooded; and health facilities can be destroyed by cyclones. When looking to develop climate-resilient health facilities, risks have been specifically identified from hazards including floods, storms and hurricanes, temperature extremes, as well as water shortages (32). Services serving displaced and migrant populations might be at greater risk of these hazards; for example, if they are delivered in temporary or semi-permanent structures, are put in place rapidly or are in remote locations.

1.4 Health system strengthening

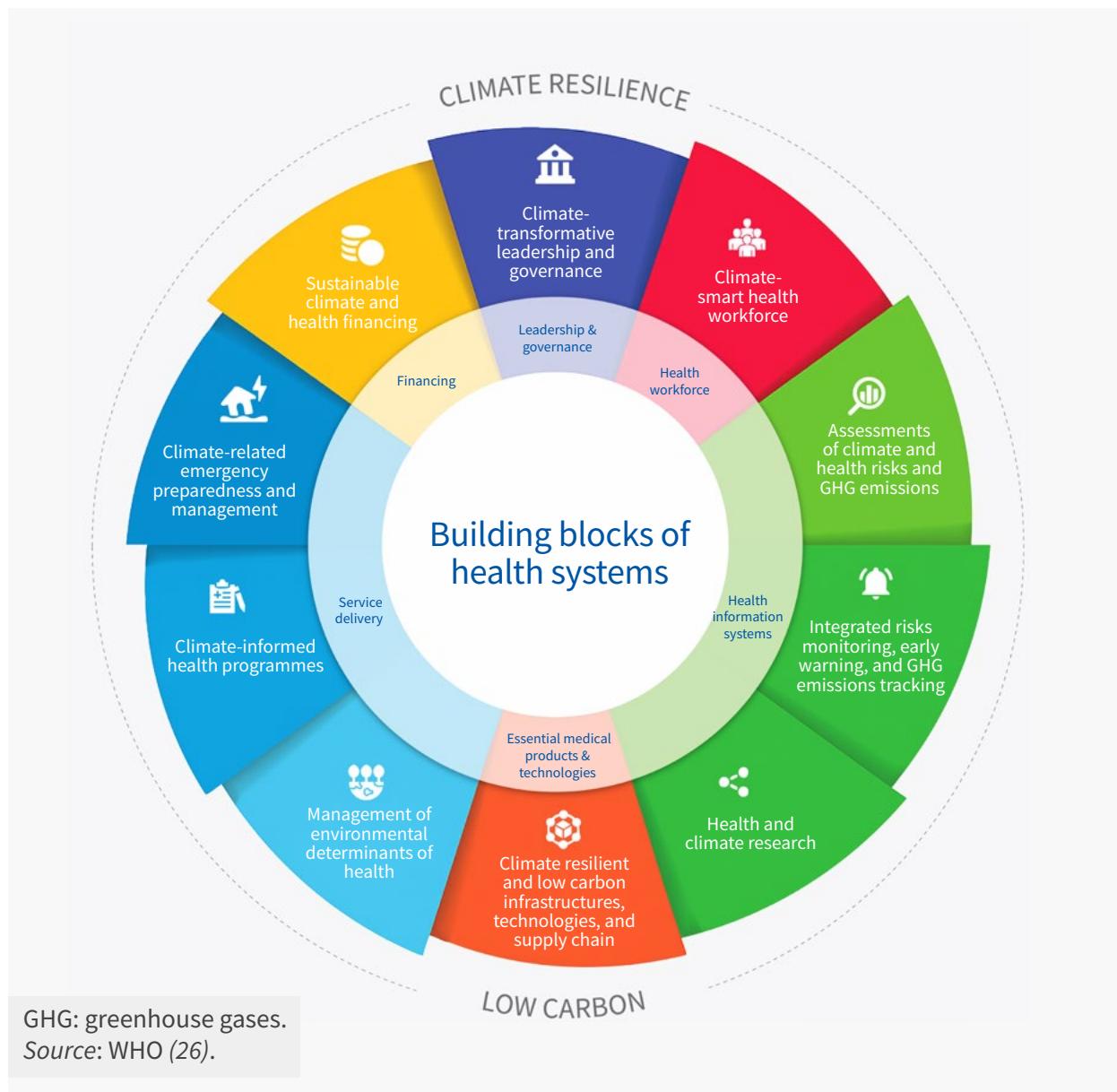
WHO's framework to guide health systems strengthening (33) conceptualizes six building blocks:

- **leadership and governance:** ensuring effective leadership and governance structures to guide health system policies and reforms;
- **health financing:** developing sustainable and equitable financing mechanisms to ensure access to health services without financial hardship;
- **health workforce:** ensuring an adequate and skilled workforce to deliver health services;
- **medicines and supplies:** ensuring access to essential medical products and technologies;
- **health information systems:** strengthening health information systems and research capacity to inform policy and practice; and
- **service delivery:** ensuring that health services are accessible, equitable and of high quality.

These health system building blocks are essential to improving the health of displaced and migrant populations, and the results of this review are organized using this framework. The WHO World report on the health of refugees and migrants outlined some interventions under the building blocks framework to build refugee- and migrant-sensitive health systems (3). The Report also highlighted the importance of making health systems inclusive of the needs of refugees and migrants by integrating them as patients, providers, facilitators and decision-makers.

With the increasing recognition that health systems need to both reduce their greenhouse gas emissions and prepare health systems for the health impacts of climate change, WHO developed its *Operational framework for building climate resilient and low carbon health systems* (26), which identified 10 components (Fig. 1).

Fig. 1. WHO Operational framework for building climate resilient and low carbon health systems



To advance the agenda of migrant-inclusive and climate-resilient health systems, there is a need to identify evidence on health system strengthening interventions that respond to the health needs of climate-affected displaced and migrant populations. Adopting a health systems strengthening approach is key to achieving health and health equity.

1.5 Methodology

A scoping review of peer-reviewed and grey literature was conducted covering the period January 2014 to June 2024, using English language studies only for feasibility considerations. Peer-reviewed literature was sourced from PubMed and Embase, while grey literature was sourced from the search engines of United Nations agencies such as the International Labour Organization, IOM, the United Nations Children's Fund (UNICEF), the United Nations Office on Drugs and Crime, the United Nations High Commissioner for Refugees (UNHCR) and WHO. Other databases for sourcing grey literature include the Climate Change and Human Health Literature Portal, Google Scholar, the International Migration Institute website, OAIster, Science.gov, and the World Bank online database. A full list of the databases used and the search strategy is given in Annex 1.

The search strategy combined three key areas of interest:



refugees, migrants and
displaced populations



climate change and
its specific hazards



health systems and
their building blocks.

The review included publications that described a specific health system intervention implemented in response to a climate change more generally or to a specific climate hazard (sudden-onset events such as cyclones, floods and wildfires, as well as slow-onset effects including rising sea levels and droughts) and to address the health needs of refugees, migrants and displaced populations of any type (e.g. those that moved because of the climate hazard or those who are exposed to a climate hazard regardless of the reason for migration or displacement). Publications were excluded if they did not fit within these criteria or if the full text was not available. Inclusion and exclusion criteria are further detailed in Annex 1.

A comprehensive string of relevant terms spanning the intersection of climate change, migration and health systems was developed for peer-reviewed literature. An initial set of 4574 articles was identified; after removal of duplicates and screening of the title and abstract, 334 progressed to full-text review; 22 articles describing 38 interventions were included for data extraction. For grey literature, simpler strings were applied to 29 search engines, giving an initial set of 3928 documents, of which 393 documents progressed to full-text screening, and 34 articles describing 57 interventions were included.

Data that were extracted included bibliometric information; geographical focus; detailed description of the health system intervention; the type of climate hazard addressed by the intervention; and the type of displaced or migrant population. Interventions were then classified based on three main criteria: which was the main health system building block addressed by the intervention; whether

the intervention was reactive/short term (e.g. direct health response to a climate-related disaster) or anticipatory/long term (e.g. building and improving health infrastructure) in nature; and whether the intervention was primarily a climate adaptation measure (reducing risks and addressing the impacts of climate change) or a mitigation measure (reducing greenhouse gases to slow or stop the progression of climate change).

Within each building block, interventions were further categorized into subcategories. During this phase of the research, two members of the research team were involved in reviewing each article, extracting the data and categorizing the interventions. When categorizing interventions, one researcher performed the initial data extraction and charting, while another researcher reviewed and independently categorized them. When there was a discrepancy, a third researcher made the final decision.



2. Results

The review of the literature identified 56 relevant articles, which described 95 health system interventions.

Each health system intervention was categorized according to the main health system building block it addressed, with the following distribution:

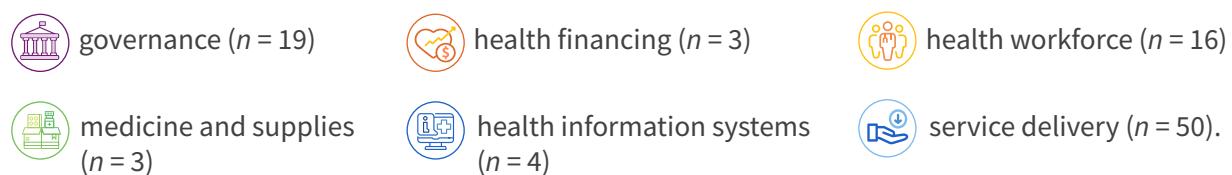


Table 1 outlines the intervention themes identified through the literature review, with examples.

Table 1. Key intervention themes identified through the literature review, including some illustrative examples of interventions to strengthen health systems for displaced and migrant populations in the context of climate change

Building blocks	Intervention types	Illustrative examples from the literature
Governance ($n = 19$) 	<p>Including the needs of climate-affected migrants in climate and health policies and plans ($n = 7$)</p> <p>Enhancing coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations ($n = 8$)</p> <p>Involving displaced and/or relocated communities in the planning and implementation of health interventions ($n = 1$)</p> <p>Including climate migrants in the health systems of receiving countries ($n = 3$)</p>	<p>The Government of Vanuatu and partners created the National Policy on Climate Change and Disaster-induced Displacement for populations affected by climate change; the Policy's strategic area 7 covered health, nutrition and psychosocial well-being; the main objective was to provide equal access to health care for all climate-displaced migrants (34)</p>

Building blocks	Intervention types	Illustrative examples from the literature
Health financing (n = 3) 	<p>Allocating an additional budget to improve health services and infrastructure for climate-affected displaced and migrant populations (n = 2)</p> <p>Improving the breadth of health insurance coverage to include climate-affected displaced and migrant populations (n = 1)</p>	<p>After Hurricane Katrina hit in 2005, the Government of the United States of America implemented the Section 1115 Medicaid Emergency Waivers, which allowed the United States to expedite the Medicaid coverage to displaced individuals by streamlining documentation and income requirements; the Texas waiver programme TexKat was the largest programme, which included an urgent medical care delivery phase for the first month and a health care coverage phase for the next 5 months (35)</p>
Health workforce (n = 16) 	<p>Training health workers and building their competencies to meet the health needs of climate-affected migrants (n = 9)</p> <p>Expanding health workforce capacity in response to climate-related events and emergencies (n = 7)</p>	<p>In Mali, where climate change remains one of the leading drivers of conflict and displacement in the Sahel, the Government expanded health workforce availability by incentivizing health workers to be assigned in areas of dire need; cash incentives vary depend on local ministries and external assistance (36)</p>
Medicine and supplies (n = 3) 	<p>Ensuring the availability of medical supplies for climate-affected displaced and migrant groups (n = 3)</p>	<p>Between May 2023 and May 2024, the IOM provided menstrual hygiene kits and sanitary pads to flood-displaced women and girls in Danyar Refugee Camp in Somalia (37)</p>

Building blocks	Intervention types	Illustrative examples from the literature
Health information system (n = 4) 	<p>Establishing integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations (n = 4)</p>	<p>In 2021 the International Centre for Diarrhoeal Disease Research in Bangladesh implemented a waste-water surveillance programme in a refugee camp to detect climate-sensitive infections, such as <i>Vibrio cholerae</i> and <i>Salmonella typhi</i>; the programme has been expanded in two cities through a joint effort involving the Government and multilateral organizations (38)</p>
Service delivery (n = 50) 	<p>Providing humanitarian response and health services during climate-related emergencies (n = 21)</p> <p>Ensuring access to health services to displaced populations in climate-affected protracted crises (n = 6)</p> <p>Providing mental health interventions for climate-affected displaced and migrant populations (n = 8)</p> <p>Improving WASH services for climate-affected displaced and migrant populations (n = 13)</p> <p>Ensuring access to vaccines recommended in the WHO Essential Programme on Immunization for climate-affected displaced and migrant populations (n = 2)</p>	<p>The Honduran Red Cross activated humanitarian service points at the point of departure and along the route of migrating caravans of people who are vulnerable to climate hazards; these points provided migrants with water, face masks, prehospital care and information about safety, security and coronavirus disease (COVID-19) prevention (39)</p>

Fifty-two interventions could be described as short-term or reactive in nature, responding to an abrupt shock such as an extreme weather event. The other 43 interventions were geared towards longer-term health system strengthening – for example establishing mechanisms (such as a disease surveillance system) that can remain and be sustained beyond a single disaster event. Overall, 89 focused on climate adaptation in response to health impacts, two addressed climate mitigation explicitly only (i.e. reducing greenhouse gas emissions) and four incorporated both adaptation and mitigation elements. Of note, other interventions such as sustainable health care delivery (e.g. telemedicine, decentralized health care services) may also have an indirect mitigation effect on climate change.

Almost three quarters of the health interventions ($n = 69$) catered to the needs of populations where climate change was identified in the publications as a driver of population displacement. Nine interventions were for those displaced by conflict and also at risk of climate hazards; six had both climate change and conflict identified as displacement drivers; and in 11 interventions, the driver of migration was not specified in the study. More than half (62%) of the interventions were implemented for internally displaced people (IDPs): 16% were for refugees, 4% for hospital evacuees, 5% for multiple migrant populations (e.g. refugees and IDPs) and the rest were unspecified (12%).

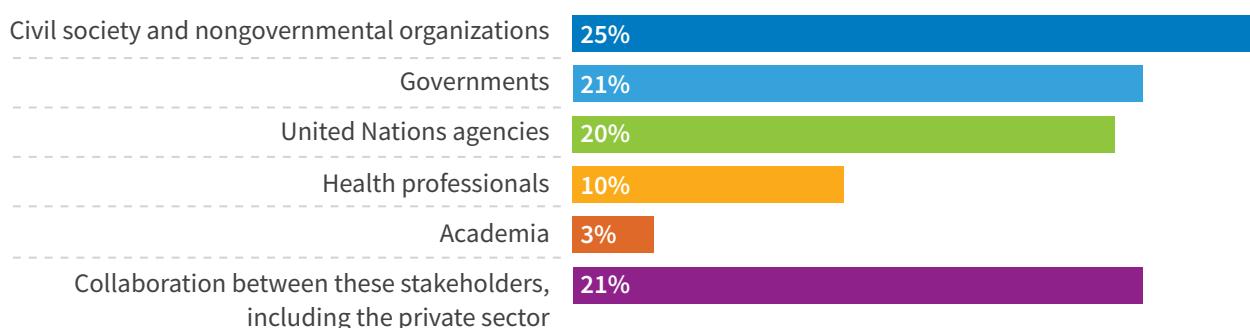
Climate hazards described in the studies that affected displaced and migrant populations included:

- tropical cyclones (26%)
- floods (19%)
- droughts (12%)
- sea level rise (1%)
- wildfires (1%)
- multiple hazards, including heavy rains, mudslides and rising temperatures (14%).

The remaining publications referred to climate change in general.

Health system interventions were implemented by a variety of actors (Fig. 2).

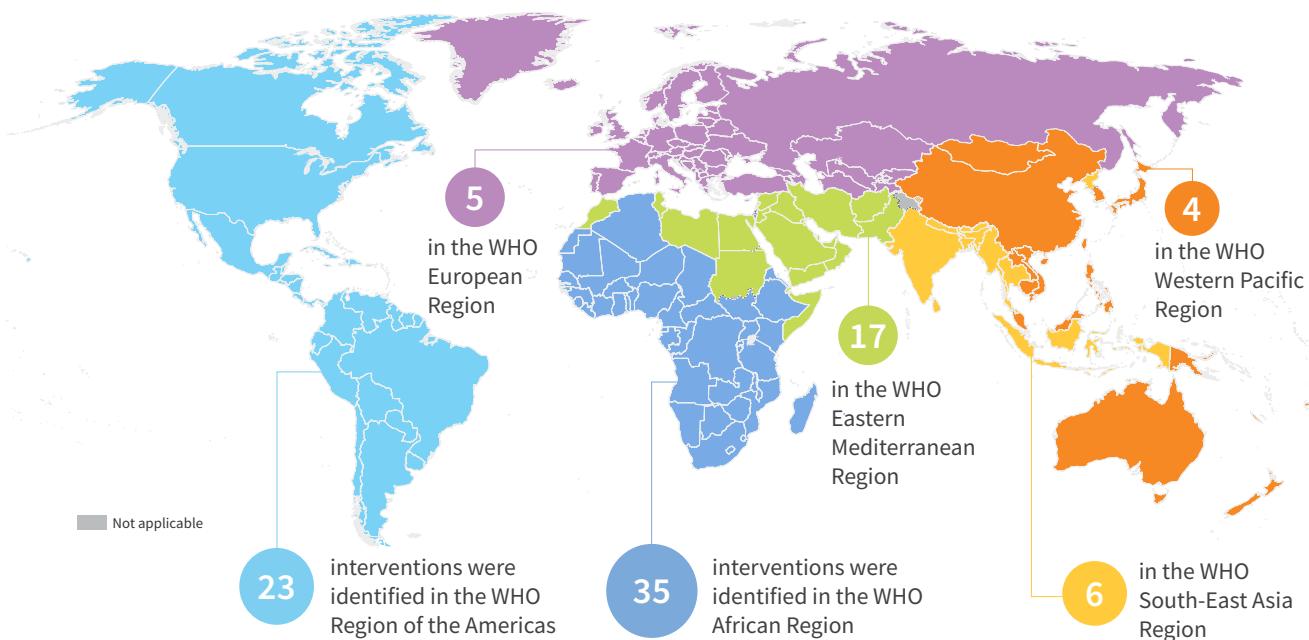
Fig. 2. Actors implementing health system interventions for displaced and migrant populations affected by climate change



The majority ($n = 61$) of health system interventions identified were implemented in low- or middle-income countries. For example, seven interventions were implemented in Somalia, while six were implemented in each of Ethiopia, South Sudan and Yemen. Forty-three were implemented in fragile and conflict-affected situations (40). Among the high-income countries (24 interventions identified),

18 interventions were in the United States of America (Fig. 3). Four interventions did not explicitly specify a country or region, while one was implemented in more than one WHO region – a governance intervention in Namibia, Samoa and Yemen (39).

Fig. 3. Health system interventions across WHO regions



Note: the designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Source: created by the WHO GIS Centre for Health DNA/DDI. © WHO 2025; Licence: CC BY-NC-SA 3.0 IGO.



2.1 Governance

Governance is a critical part of the health system as it heavily influences the other building blocks. Key components of governance include oversight, agenda and priority-setting, policy- and decision-making, regulation, and coalition building (33).

There were 19 governance interventions, which were further grouped into four subcategories:

- include the needs of climate-affected displaced and migrant populations in climate and health policies and plans ($n = 7$) (34,39,41–45);
- enhance coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations ($n = 8$) (46–51);

- involve displaced and/or relocated communities in the planning and implementation of health interventions ($n = 1$) (39); and
- include climate migrants in the health system of receiving countries ($n = 3$) (50,52,53).

2.1.1 Include the needs of climate-affected displaced and migrant populations in climate and health policies and plans

Several countries and international organizations are beginning to recognize the health needs of displaced and migrant groups affected by climate change by integrating these issues into national policies and plans. For example, the Governments of Ethiopia (41), South Sudan (42) and Vanuatu (34) have considered the health and well-being of displaced populations in their national climate change and disaster plans. A dedicated section on health outlines their responses to the health needs of displaced populations in the context of climate change, including strategies for health system strengthening and resilience building.

Meanwhile, regional platforms such as the Regional Inter-Agency Standing Committee for Southern Africa are starting to integrate migration and displacement concepts in climate and health response plans, recognizing that climate change, being a driver for migration, can have adverse effects on displaced populations (44). International organizations, including nongovernmental organizations (NGOs), are also collaborating with governments to explore the health needs of climate migrants and to assess how well these health needs are incorporated into disaster response plans (39,44,45).

2.1.2 Enhance coordination of services across agencies in responding to the health needs of displaced and migrant populations affected by climate change

Following extreme weather disasters and emergencies, coordination across agencies and stakeholders was found to be essential in managing the health and well-being needs of affected displaced and migrant populations. Some interventions include the activation of emergency response plans and forming coalitions to coordinate health responses (46–50). Other interventions focus on strengthening collaboration between governments, civil society organizations and international agencies to establish safe spaces, procure and distribute medical supplies, reinforce human resources, and connect those displaced populations affected by climate change with appropriate services (47–51).

2.1.3 Involve displaced and/or relocated communities in the planning and implementation of health interventions

Here, the term relocated communities is derived from community relocation, which can be defined as the permanent (or long-term) movement of a community (or a significant part of it) from one location

to another and in which the important characteristics of the original community, including its social structures, legal and political systems and worldviews, are retained: the community stays together at the destination in a social form that is similar to the community of origin (54).

Community engagement and incorporating inputs from displaced populations are essential in ensuring that health interventions designed for them are tailored to their needs. The humanitarian responses from the International Federation of Red Cross and Red Crescent Societies (IFRC), for example, consider inputs from displaced populations to better understand their needs following climate-related disasters, ensuring equitable access to health, particularly among more vulnerable groups (e.g. elderly people or people with disabilities). Community engagement also led to the installation of water systems in evacuation centres that were identified by the internally displaced community in Samoa affected by climate change (39).

2.1.4 Include climate migrants in the health system of receiving countries

In instances where climate migrants cross national borders, governments in receiving countries such as Ethiopia and Malawi have made efforts to include them in their respective national health care systems, granting them the same rights to access health care as local citizens (52,53). Health care services, including acute care, chronic disease care, sexual and reproductive health services, mental health support and vaccinations, were provided to displaced populations upon arrival in receiving areas in the United States and in settlements and camps in Ethiopia (50,52).



2.2 Health financing

Health financing is vital to ensure adequate funding for health, allowing people to access the care they need without facing financial hardship. A well-designed health financing system can raise necessary funds during times of high demand, reduce reliance on out-of-pocket payments and strengthen social protection systems (33).

Two health financing interventions were identified during this review, which could be grouped as:

- allocate additional budget to improve health services and infrastructure for climate-affected displaced and migrant populations ($n = 2$) (39,55); and
- improve the breadth of health insurance coverage to include climate-affected displaced and migrant populations ($n = 1$) (35).

2.2.1 Allocate additional budget to improve health services and infrastructure for climate-affected displaced and migrant populations

International agencies have started allocating additional funds to address the health needs of displaced and migrant populations in the context of climate change. The UNHCR, for example, launched the Climate Resilience Fund to increase the availability of environmentally sustainable resources in displacement settings, such as clean energy to power water systems and health infrastructure used by refugees and their host communities (55). Improving the health infrastructure in these settings enhances the availability and quality of health services not only for displaced and migrant populations but also for the communities that host them. The IFRC, through the Disaster Relief Emergency Fund, also made available additional funds to improve health care service provision for populations displaced by climate-related disasters to address their immediate health needs (39).

2.2.2 Improve the breadth of health insurance coverage to include climate-affected displaced and migrant populations

Depending upon the health financing structure, health insurance/financing mechanisms may not be readily available for populations that migrate or are displaced both within countries and across borders. This may have consequences for populations displaced by climate-related events, who may require immediate health care services and face financial repercussions. In the United States, after Hurricane Katrina hit in 2005, the United States Government implemented waivers that allowed states to expedite the provision of health insurance to those displaced (35).



2.3 Health workforce

The health workforce consists of "all people engaged in actions whose primary intent is to protect and improve health" (33). This includes health service providers (such as midwives, nurses, physicians and others) and health management and support workers. They can be in the public or private sector; they may be paid or unpaid (voluntary) and they include both professional and lay cadres. A well-performing health workforce is characterized by available, competent, responsive and productive health workers. Achieving this requires opportunities for capacity-building and strengthening, as well as policies governing recruitment, retention and labour migration management (33). The review yielded 16 health workforce interventions, which were further divided into two groups:

- train health workers and build their competencies to meet the health needs of climate-affected migrants ($n = 9$) (38,39,56–62); and
- expand health workforce capacity in response to climate-related events and emergencies ($n = 7$) (36,39,46,48–50,63).



2.3.1 Train health workers and build their competencies to meet the health needs of climate-affected displaced and migrant populations

Building and maintaining the competence of health workers is essential for the provision of high-quality and responsive health services. This can be achieved through education and training programmes as well as capacity-building and strengthening activities (33). It is important to develop the necessary skills to address emerging climate-related health needs (64). The Refugee and migrant toolkit developed by WHO is available for governments, organizations and health care professionals working in refugee and migrant health, with a module on climate change risks among migrants (56). In several regions, programmes have trained local community health care workers and volunteers in delivering community-based mental health and psychosocial interventions for displaced victims of tropical storms and flooding. This resulted in identifying medical needs and onward referral to specialized mental health care facilities where appropriate (38,57). In Pakistan, a mobile application was used to aid local community health workers in tracking, counselling and referring individuals with mental health concerns after being displaced by flooding (57).

Capacity-building programmes were identified to address climate-related health outcomes. Globally, academic institutions offer educational and practical courses to medical students and other health professionals that provide training in addressing the health needs of displaced populations in climate-related disasters that lead to complex humanitarian emergencies (61,62). At the national level, these courses included training health workers in climate-affected displacement camps in Somalia to reduce neonatal and maternal mortality (58) and training in blood smear preparation and microfilaria detection for health volunteers in communities displaced by flooding in Samoa (39). General medical training for health care workers who treat displaced populations in climate-affected areas such as Brazil and South Sudan were also reported (59,60).

2.3.2 Expand health workforce capacity in response to climate-related events and emergencies

Apart from capacity-building of health workers, ensuring the availability of adequate numbers of health workers is essential for ensuring continuous delivery of health services. This is crucial in disaster settings, where resources and capacities are limited and overstretched. Mali, like other countries in the Sahel region, is severely affected by climate change, leading to the displacement of large numbers of people. To address the emerging health needs, the Government of Mali implemented an incentive programme that encouraged health professionals to relocate and practice in climate-affected areas (36).

The review found examples of hospitals in the United States receiving an influx of migrants and patient evacuees following climate-related disasters that increased health care staff by hiring extra qualified personnel, providing them with accommodation and ensuring on-site availability. Displaced health care professionals were also able to provide assistance in these hospitals to support increased patient numbers (46,50). In another example, health care professionals and volunteers from international

agencies and neighbouring areas were also deployed to climate-affected localities to aid in addressing the health needs of displaced populations. For example, medical teams composed of doctors and nurses were deployed to provide medical assistance to populations displaced by tropical storms and torrential rains in Italy (49), Mozambique (39) and Nicaragua (48). Another example included mental health counsellors being hired in schools to provide counselling to students displaced by a tornado in the United States (63).



2.4 Medicines and supplies

High-quality and well-functioning health systems provide equitable access and ensure the availability, quality and efficacy of essential medicines, vaccines, diagnostics and other medical technologies. Achieving this requires robust systems for manufacturing, quality assurance, procurement, supply, storage and distribution (33). The three interventions that related to this building block centred on ensuring the availability of medical supplies for climate-affected displaced and migrant populations (37,44,48).

2.4.1 Ensure the availability of medical supplies for climate-affected displaced and migrant populations

Extreme weather, such as tropical storms, can overwhelm health systems and disrupt the supply of essential medicines and medical supplies. For example, in Nicaragua, medical supplies distributed in temporary shelters set up in hurricane response during the coronavirus disease (COVID-19) pandemic included prophylactic medicines for climate-sensitive diseases such as leptospirosis, personal protective equipment and antigen and polymerase chain reaction tests for COVID-19 (48). In another example, the sexual and reproductive health needs of women and girls in flood-displaced communities in Somalia and South Sudan were addressed by distributing oral contraceptives, condoms, injectables and menstrual hygiene kits (37,44).





2.5 Health information systems

Health information systems ensure the production, analysis, dissemination and use of reliable and timely health information to aid decision-makers, implementers and health professionals. Important components include robust disease surveillance systems, the development of standardized tools and instruments, and the collation and publication of health statistics (33). Populations residing in displacement camps and temporary evacuation centres are at high risk for contracting communicable diseases through issues such as overcrowding, poor sanitation, lack of vaccination and delayed health service delivery (65). Therefore, robust health information systems, including integrated surveillance systems, are essential for monitoring diseases with outbreak potential in these settings. The literature revealed four interventions relating to the establishment of integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations (38,47,66,67).

2.5.1 Establish integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations

Following acute displacements due to extreme weather events, governments and other stakeholders in Mozambique, Sierra Leone and the Solomon Islands enhanced surveillance and disease reporting in established sentinel sites and evacuation camps (47,66,67). Emergency surveillance task forces were established to monitor climate-sensitive diseases and diseases with high outbreak potential, such as dengue, acute watery diarrhoea and cholera. Data from these surveillance efforts were used for health programme planning as well as in implementing water, sanitation and hygiene (WASH) interventions and health promotion strategies for affected populations (47,67).

Integrated surveillance systems have been implemented for populations in protracted displacements, such as Rohingya residing in camps in Cox's Bazar, Bangladesh. Collaboration between academic institutions, government agencies and multilateral organizations enabled the monitoring and detection of climate-sensitive diseases in the waste-water of low-resource settings, including refugee camps (38).



2.6 Service delivery

According to the WHO health systems framework (33), "good health services are those which deliver effective, safe, quality personal and non-personal health interventions to those that need them, when and where needed, with minimum waste of resources". These include prevention, treatment or rehabilitation services, which may be delivered at home, in the community, in the workplace or in health facilities. This building block involves how inputs and services are organized and managed to ensure access, quality, safety and continuity of care across health conditions and settings over time. The organization and management of the health provider networks, along with adequate infrastructure and logistics, are essential for effective health service delivery (33).

A total of 50 interventions involved the provision of health services to displaced populations in the context of climate change. These were further classified into five groups:

- provide humanitarian response and health services during climate-related emergencies ($n = 21$) ([39,46,47,49,60,68–77](#));
- ensure access to health services to displaced populations in climate-affected protracted crises ($n = 6$) ([37,39,78–80](#));
- provide mental health interventions for climate-affected displaced and migrant populations ($n = 8$) ([47,49,59,63,81–85](#));
- improve WASH services for climate-affected displaced and migrant populations ($n = 13$) ([37,39,68,73,86–92](#)); and
- ensure access to vaccines for climate-affected displaced and migrant populations ($n = 2$) ([47,93](#)).

2.6.1 Provide humanitarian response and health services during climate-related emergencies

With the climate crisis increasing the frequency and intensity of extreme weather events, countries lacking preparedness and resilience will continue to face worsening humanitarian needs ([94](#)). Climate-related disasters disrupt the delivery of quality and safe health care services, particularly among displaced populations ([95](#)).

In response, governments and international agencies such as IFRC, IOM, Médecins Sans Frontières (MSF) and UNHCR have provided primary health care services, including disease consultations, screening and treatment of common climate-sensitive diseases (e.g. malaria, respiratory tract infections and diarrhoea) for displaced people and in evacuation camps in areas that are climate affected, including Mozambique, Somalia, South Sudan and the United States ([39,60,68–72](#)). No-cost medicine was distributed in temporary evacuation centres housing displaced populations in Italy and the United States ([49,71,72](#)). The nutritional needs of internally displaced children and pregnant and lactating women were addressed through systematic nutritional screenings in Somalia ([68](#)), and high-nutrient feeding interventions took place in Chad and other parts of the Horn of Africa for refugees and IDPs ([73,74](#)). Emergency mental health and psychosocial support and routine vaccinations against communicable diseases were provided in Chad and Somalia, particularly among internally displaced children ([68,74](#)). Emergency WASH services were delivered in Chad, Iraq, Germany, Mozambique, Namibia, Sierra Leone, South Sudan and Yemen for refugees and IDPs. These interventions include providing safe drinking-water, repairing and rehabilitating existing water systems, distributing water treatment tablets, distributing body bags, emptying latrines and setting up sanitation and hand-washing facilities ([39,47,69,73–75](#)).

Some interventions involved establishing emergency medical facilities and deploying mobile health clinics to provide emergency health services and medicine to displaced populations in Chad, Germany, Iraq, Sierra Leone, Somalia and the United States (39,46,47,49,71,72,74,77). In anticipation of a large influx of displaced patients during extreme weather events, hospitals, such as those in New York City, United States, implemented preparatory measures to ensure continuous provision of health services, such as adjusting operating room schedules, ensuring early delivery of supplies and maintaining adequate on-site staff (46).

2.6.2 Ensure access to health services to displaced populations in climate-affected protracted crises

Populations displaced due to protracted crises face long-term exposure to climate and health risks, particularly in IDP and refugee camp settings (96). Refugee settlements are rarely based on principles that enhance the well-being and resilience of refugees and often do not contain adequate sanitation (97).

In these situations, organizations such as MSF have shifted from emergency care to more sustained health services to meet the ongoing needs of displaced populations affected by climate hazards. Free basic public health services are provided in clinics and health posts inside refugee and IDP camps in Chad, Somalia and South Sudan (78–80). These services include vaccinations, maternal care, health consultations, care services for chronic diseases such as HIV and tuberculosis, and psychological support. Referrals to tertiary hospitals are also available. Health facilities have also been enhanced or newly established to accommodate climate-affected refugees during protracted crises. For example, humanitarian service points are set up along the migration routes of caravans in Central America to provide health care (39), while health facilities in refugee camps are being equipped with solar power systems to ensure continued provision of health care in Bangladesh (59).

2.6.3 Provide mental health interventions for climate-affected displaced and migrant populations

Mental health and psychosocial support services are important for displaced and migrant populations due to their risk of developing mental disorders (98). Additionally, climate change and climate-related disasters have also been found to negatively affect the mental health of vulnerable populations, particularly displaced and migrant groups (99–101).

Directly following extreme weather disasters, governments and international agencies have supported the deployment of psychologists in Canada, Italy, Sierra Leone and the United States to provide psychological first-aid, counselling and support to displaced populations (47,49,63,81). Screening for mental health outcomes and proper referral to specialized mental health care was also available in these countries, as well as in Bangladesh (49,63,82,83). Other mental health programmes were also implemented, such as peer mentorship programmes, mindfulness and psycho-educational programmes in Canada and migration helplines in India (82,84). Mental health was also integrated into community-based health

services and within basic health services for refugees and IDPs residing in camps in Bangladesh and Burkina Faso according to the WHO Mental Health Gap Action Programme (mhGAP) guidelines (83,85).

2.6.4 Improve WASH services for climate-affected displaced and migrant populations

Displaced populations often live in camps or temporary shelters that do not have access to clean water and proper sanitation, increasing their risk of contracting communicable diseases. Women, for example, are impacted when there is no access to adequate WASH services such as menstrual and feminine hygiene products and safe spaces (102). WASH has been included here because of its role in disease prevention and health promotion, both of which are part of an integrated health service delivery.

International organizations, including IFRC, IOM, UNHCR and UNICEF, are leading WASH interventions in IDP and refugee camps and in areas affected by water insecurity and droughts. These organizations have provided clean and safe water for populations displaced due to the changing climate in Afghanistan, Ethiopia, Mozambique, Pakistan, Somalia, Yemen and other parts of Africa by establishing water and rehydration points, constructing lead-line hand pumps, digging boreholes, repairing damaged water systems and providing water trucking (37,68,86–89). Solar-powered water systems have been constructed in Ethiopia, Mozambique and Yemen (87,89–91), and rainwater harvesting systems have been installed in Samoa (39) to provide more reliable and more economical access to water without the need to rely on more expensive short-term emergency water interventions such as water trucking. Sanitation facilities, including latrines, handwashing stations, lavatory facilities and private spaces, have been constructed in refugee and IDP camps in Ethiopia, Pakistan and Somalia (37,86,87). Hygiene kits and water treatment supplies were also distributed in camps in Ethiopia, Somalia and Yemen (37,87,88). Hygiene promotion and health education programmes were also implemented in camps in Afghanistan, Ethiopia, Mozambique, Pakistan, Somalia and Yemen, with a focus on combating vaccine hesitancy, preventing acute watery diarrhoea and cholera and promoting proper handwashing (37,68,86–88,91). Where outbreaks of acute watery diarrhoea or cholera occurred, such as in Yemen, screening, treatment and vaccination efforts were implemented (68). Some interventions in Afghanistan, Bangladesh and Somalia focused on the menstrual hygiene of women and girls in camps by distributing gender-response hygiene kits and communal female WASH units with private toilets, showers and disposal systems (37,88,92).

2.6.5 Ensure access to vaccines for climate-affected displaced and migrant populations

Overcrowding and poor sanitation in refugee camps and temporary shelters increase the risk of disease outbreaks, such as cholera. In response to outbreaks in Malawi and Sierra Leone, governments have implemented mass vaccination campaigns to administer oral cholera vaccine to displaced populations living in temporary shelters following a climate-related disaster or in IDP and refugee camps in cases of protracted displacement. Vaccination task forces were formed to coordinate the campaign activities and vaccines were distributed with the help of community health workers (47,93).

3. Discussion

3.1 Strengths, limitations and research gaps

3.1.1 Strengths

This review identified 95 interventions across 56 publications that focused on strengthening health systems for displacement and migration in the context of climate change. The WHO health system building blocks framework was used as an approach to categorizing the interventions. The interventions were then further classified as intervention types, and this is discussed in detail in the Results. These intervention types provide a structured framework for governments, policy-makers and implementers to address health system challenges faced at the climate–migration–health nexus. For example, under the governance building block, four intervention types were identified: including the needs of climate-affected displaced and migrant populations in climate and health policies and plans; enhancing coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations; involving displaced and/or relocated communities in the planning and implementation of health interventions; and including climate migrants in the health system of receiving countries.

3.1.2 Limitations

This review only included references in English, both for peer-reviewed and for grey literature; consequently, interventions in other languages may have been missed. The unavailability of full text for some literature also posed a limitation to accessing potentially relevant and different evidence. There were also gaps in interventions identified; this might be if the context was not labelled as related to climate change or if the intervention was used across other contexts. In this review, each intervention was classified according to the main/primary building block that it addressed, based on the researchers' judgement. Many interventions in the literature also addressed either a second or multiple building blocks.

There was also variability in migration terms used in the literature, such as "climate-affected migrants" and "climate-induced migration". Such variability was addressed by interpreting the wider report to understand which population was being referred to, and the terminology in this report has been aligned with the Glossary and explanation at the beginning of this report.

3.1.3 Research gaps

There are clear evidence gaps, detailed as follows.

Long-term interventions that proactively address the health needs of displaced populations

were found but are scarce. The majority of the interventions found were short term and reactive in nature, often implemented in response to climate-related disasters and emergencies (e.g. tropical cyclone). For example, the service delivery building block comprised at least half of the total interventions, most of which focused on activating emergency response protocols and providing emergency health services to displaced populations directly following a climate hazard (39,46–49,51,60,68–77). While interventions that respond to current and urgent health risks are important, there is a need for health systems to implement resilient, scalable and sustainable interventions that tackle climate and health challenges for the long term. Long-term interventions that proactively address the health needs of displaced populations were found but less frequently. These include installing water systems in possible evacuation centres in Samoa (39) and establishing a waste-water surveillance system in Rohingya camps in Bangladesh to detect climate-sensitive diseases and prevent outbreaks (38). The latter example provided pathways to enable government buy-in and ownership. The programme was expanded to two cities through a joint effort involving five Government bodies and multilateral organizations following its success in the camps (38).

There is limited evidence of interventions integrating climate mitigation.

Climate action within health systems has two dimensions – climate mitigation, which aims to reduce greenhouse gas emissions to slow progression, and climate adaptation, which aims to address and reduce its health impacts. In this review, around 90% of the interventions involved climate adaptation and only six were found to explicitly include mitigation principles. These mitigation strategies were found incorporated in government plans (34,41–43), in the UNHCR Climate Resilience Fund (55) and in the Climate Change module of the WHO Refugee and migrant toolkit (56). The full discussion on climate mitigation is beyond the scope of this review. However, health systems also contribute to climate change – estimates show that around 4–5% of global greenhouse gas emissions are attributable to the health sector (103). Hence, there is a need to also incorporate climate mitigation measures, even if the primary focus is health system adaptation and resilience to climate change.

Gaps in evidence on synergy on health system strengthening planning, resilience and preparedness.

Another evidence gap is in health system-wide approaches that cut across multiple building blocks. Certain health system building blocks were underrepresented, and

the interventions in these areas were also very limited in scope. For example, the interventions under medicine and supplies only involved the distribution of medical and health care supplies, despite the building block also covering other aspects of the supply chain (such as manufacturing, quality control, storage or distribution). Similarly, the health financing building block had only three interventions, which covered allocating additional budget to health services and infrastructure and expanding health insurance coverage. Additionally, the interventions found under the health information system building block only focused on disease surveillance during climate-related events, lacking the other functions of comprehensive information systems for collecting and managing health data on climate migrants. There is a need for a variety of interventions that address different aspects of a building block. In addition, the effectiveness of many included interventions was not explicit in the reports. Most included reviews only documented the implementation phase, and only a few were seen to have an evaluation component (36,38,48,57,66,76,82). More thorough research needs to be conducted regarding the effectiveness, sustainability and impacts of these implemented interventions.

Some geographical areas were underrepresented. In terms of geographical distribution, the health system interventions identified in this review were mostly implemented in low- or middle-income countries, particularly in the WHO African Region and the WHO Eastern Mediterranean Region. A large proportion of these interventions were also implemented in countries with fragile and conflict-affected situations. Only a small number of interventions were identified in the WHO South-East Asia Region and the WHO Western Pacific Region despite their experiences of climate change and migration (104,105). The WHO European Region, which also experiences climate change and related internal displacement (106), was also underrepresented in the current review. This may be linked to the limitations identified above regarding the unavailability of full texts for some published works and the inclusion of English language studies only. Understanding the context-specific operationalization of health systems interventions is important to support climate-affected displaced and migrant populations in accessing health care. This also helps to identify evidence, policy or implementation gaps, which could inform future research and policy priorities and offer crucial guidance for targeted support and resource allocation in the future.

3.2 Key findings from the evidence review

There were three key findings from the review:



interventions show extensive coordination between humanitarian organizations, governments, academics, the private sector and community members;



innovative interventions are emerging; and



existing interventions can be adapted to be migrant inclusive and climate resilient.

3.2.1 Interventions show extensive coordination between humanitarian organizations, governments, academics, the private sector and community members

The climate–migration–health nexus presents opportunities for cross-sectoral and interdisciplinary collaboration. This review has shown coordination across all actors involved in the health and wider response. For example, in the response of the cities of Houston and Orlando in the United States to the influx of refugees displaced by hurricanes, coordination between the health sector, local governments, the private sector and NGOs was essential. Referral systems to points of care were made available to migrants through the network of stakeholders that supported the health sector (50). Coordination with the WASH sector was also prominent, particularly during emergency responses. Intersectoral collaboration is needed to create programmes that address the overarching health needs of migrant populations in the context of climate change.

Over half of the identified interventions supported populations that were internally displaced. International refugees and migrants may face additional legal and social challenges in destination countries, as they often face discrimination, possible abuse or exploitation. Additionally, cross-border migrants may face barriers in accessing essential health care because of their legal status (107).

Engaging with displaced/or relocated populations and migrants is also important to ensure that interventions are tailored to their own needs in their own contexts. For example, the IFRC gathers input from displaced communities to ensure that their humanitarian interventions are evidence informed (39). Similarly, involving local community health workers and volunteers in delivering interventions to displaced populations can also be effective, as is the case with the community-based mental health and psychosocial interventions in Myanmar following a tropical cyclone (38) and in Pakistan following intense flooding (57).

3.2.2 Innovative interventions are emerging

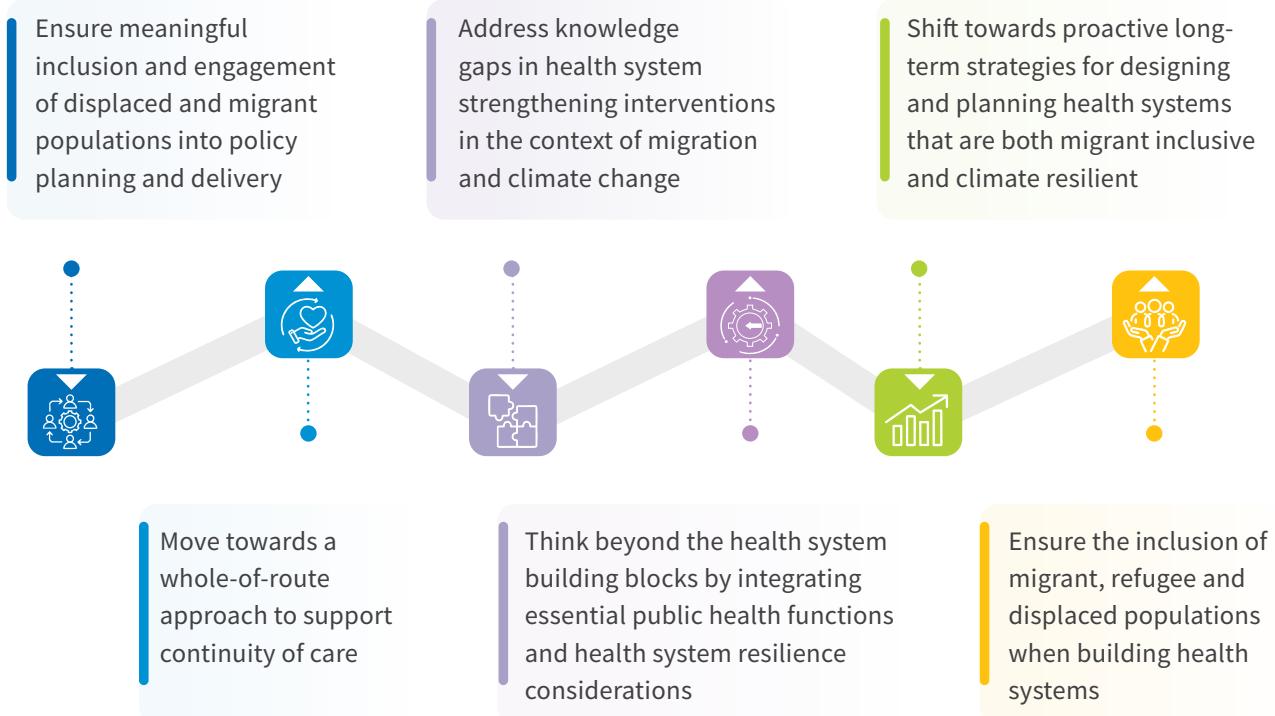
This review yielded a diverse array of health system interventions that are aimed at strengthening health systems to respond to the needs of displaced and migrant populations affected by changing climates or facing climate hazards. Innovative interventions that address the health needs of displaced populations in the context of climate change are emerging. For example, the mPareshan application, used to deliver mental health interventions and facilitate referrals for populations affected by floods in Pakistan, demonstrates how technology can be incorporated in a community-based mental health response (57). Health systems are also beginning to adopt interventions that incorporate climate-related considerations. Implementing climate-resilient and environmentally sustainable technologies for electrifying health care facilities is essential to ensure the continuous operation of clinics, particularly in regions vulnerable to extreme weather events and climate change (108). Installing solar-powered water systems in communities and photovoltaic electrical systems in health facilities, for example, has allowed displaced populations to have continuous access to clean water and electricity, thereby reducing reliance on high-carbon-emitting fuel generators (59,87,89–91). Climate-related displacement also served as the basis for the United States Government to expedite Medicaid coverage to those affected by Hurricane Katrina in 2005 (35). These examples demonstrate the importance of innovative thinking in health system strengthening, particularly in the context of climate change and migration. While they look promising, they are few and far between.

3.2.3 Existing interventions can be adapted to be migrant inclusive and climate resilient

Many of the interventions found are familiar health system strategies that are not new in principle or practice but are still effective in the context of migrant populations affected by climate change. For example, rehabilitating and refurbishing water systems (37,68,86–89), deploying mobile health units to provide emergency health care (39,46,47,49,71,72,74,76) or mass vaccination campaigns (47,93) are actions that have been implemented for broad population groups. In this case, they are also applicable to the displaced populations in the context of climate change. Efforts should not only focus on innovation but also on strengthening and improving the systems that are already in place to improve their climate resilience and reduce their greenhouse gas emissions and on the integration of displaced and migrant populations within these systems to support the target of universal health coverage. The principle of universal health coverage emphasizes making essential health services available and accessible to both host and migrant populations. This involves making sure that migrants can access health services and addressing the specific barriers that limit service utilization among migrants. Combining well-known strategies with innovation allows for well-rounded health system interventions to support the health of climate-affected displaced and migrant populations.

3.3 Policy considerations

To strengthen health systems to better address the health needs of displaced populations, including refugees and migrants, in the context of climate change, the review identified the following priorities.



3.3.1 Ensure meaningful inclusion and engagement of displaced and migrant populations into policy planning and delivery

Incorporating inputs from displaced populations is essential to ensuring that health interventions designed for these groups are tailored to their needs. Integrating community perceptions to support the design and implementation of interventions should be a hallmark feature of governments and organizations that address the health needs of climate-displaced populations.

3.3.2 Address knowledge gaps in health system strengthening interventions in the context of migration and climate change

Interventions to address identified knowledge gaps should be implemented through policies and programmes, with ongoing evaluation. This will require transdisciplinary and intersectional

research (109,110) to build evidence for health system-strengthening interventions that are effective and sustainable. Implementation research must build on existing good practices as well as embrace innovation in designing new interventions. Further research is needed to understand which are the key populations and geographical areas on which to focus. It is critical to ensure that there is context-specific adaptation and localization, as well as dissemination and scale-up in diverse settings.

3.3.3 Shift towards proactive long-term strategies for designing and planning health systems that are both migrant inclusive and climate resilient

It is crucial to move beyond short-term reactive responses and to look at the longer-term health needs of climate-affected displaced and migrant populations. The focus must include proactive, long-term strategies for designing and planning health systems that are migrant inclusive and climate resilient. So far, most health system strengthening interventions identified are reactive in nature, implemented in response to specific climate hazards or health emergencies. While these immediate short-term actions are necessary, they should be designed with sustainability and scalability in mind. When built to last and expanded effectively, these interventions can contribute to long-term improvements in health systems (26).

3.3.4 Move towards a whole-of-route approach to support continuity of care

The additional health risks that migrants face due to climate change emphasize the urgent need for access, continuity and safety in health care as these are often disrupted by factors such as weak health system capacity and barriers to access (e.g. gender, cultural, financial, social, language) (21). In many countries, health system access among climate-affected displaced and migrant populations is fragmentary, mostly limited to emergency services, immunization and mother and child preventive services (31). A whole-of-journey approach is urgently needed that considers migrants' health service access, safety from domestic and gender-based violence and safety from climate hazards (21,79,110–112).

3.3.5 Think beyond the health system building blocks by integrating essential public health functions and health system resilience considerations

The essential public health functions form a basis for improving public health practice and building resilient health systems capable of meeting universal health coverage goals. Essential public health functions include health service equity and quality; public health research, evaluation and knowledge; access to and utilization of health products; public health workforce development; community engagement and social protection; health promotion; disease prevention and early detection; health protection; multisectoral planning, financing and management for public health;

public health stewardship; public health emergency management; and public health surveillance and monitoring (113). This review captures examples of critical interventions by including interventions on surveillance and community engagement that are characteristic of the essential public health functions. The integration of essential public health functions and health system resilience considerations to the health system building blocks is essential for creating more adaptable and sustainable health care systems that are capable of anticipating, absorbing and recovering from chronic or acute shocks and ensuring refugee- and migrant-inclusive health systems in the context of climate change.

While widely used and understood globally by health stakeholders, including ministries of health, the health system building blocks framework may not include some of the complexities of strengthening health systems: interventions on health promotion and education, information dissemination, occupational health initiatives in the workplace and interventions addressing the social determinants of health of displaced populations. Examples include the designing and creating of laundry bags to improve the menstrual hygiene and privacy for girls in refugee camps (92) and vector-control strategies to prevent dengue outbreaks following floods (66). While these are beyond the scope of this report, they are still relevant and important to enhance the health of displaced and migrant populations amidst the climate crisis. In addition, the building blocks tend to focus on the provider/supplier side rather than on the demand/accessibility perspective.

3.3.6 Ensure the inclusion of migrant, refugee and displaced populations when building health systems

When building climate-resilient and environmentally sustainable migrant-inclusive health systems, it is essential to observe both the inclusion of displaced and migrant populations, and climate change-related considerations. There is a need for synergy across policies, guidance and monitoring frameworks, all of which play a role in supporting the implementation of appropriate and accessible health services. This will require including displaced populations when building climate-resilient and environmentally sustainable health systems and including climate considerations in efforts addressing the health needs of refugees, migrants and displaced populations in humanitarian, emergency and development settings.

3.4 Next steps for supporting migrant-inclusive and climate-resilient health systems

This review showcases opportunities for migrant inclusivity to be embedded within climate resilience frameworks and for climate considerations to be included in refugee and migrant health system

strengthening. Table 2 is an initial mapping for incorporating migrant-inclusive approaches into climate-resilient and environmentally sustainable health systems and incorporating a climate perspective into efforts addressing the health needs of refugees, migrants and displaced populations. For example, the need to train health workers and build their competencies to meet the health needs of climate-affected displaced and migrant populations identified within this review builds upon the need for a climate-smart health workforce, as highlighted in the *Operational framework for climate resilient and low carbon health systems* (26). Similarly, the need to establish integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations brings together and expands upon the framework's components of health and climate research, "integrated risks monitoring and early warning" and "assessment of climate and health risks".

Table 2. Mapping of findings against the *Operational framework for climate resilient and low carbon health systems*

Climate-resilient and low-carbon health systems	Health system building blocks	Migrant- and refugee-inclusive health systems in the context of climate change
Climate transformative leadership and governance	Governance 	<ul style="list-style-type: none"> Include the needs of climate-affected migrants in climate and health policies and plans Enhance coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations Involve displaced and/or relocated communities in the planning and implementation of health interventions Including climate migrants in the health system of receiving countries
Sustainable climate and health financing	Health financing 	<ul style="list-style-type: none"> Allocate an additional budget to improve health services and infrastructure for climate-affected displaced and migrant populations Improve the breadth of health insurance coverage to include climate-affected displaced and migrant populations

Climate-resilient and low-carbon health systems	Health system building blocks	Migrant- and refugee-inclusive health systems in the context of climate change
Climate-smart health workforce	Health workforce 	<p>Train health workers and build their competencies to meet the health needs of climate-affected migrants</p> <p>Expand health workforce capacity in response to climate-related events and emergencies</p>
Climate-resilient and low-carbon infrastructures, technologies and supply chain	Medicine and supplies 	<p>Ensure the availability of medical supplies for climate-affected migrants and displaced people</p>
<p>Health and climate research</p> <p>Integrated risks monitoring, early warning and greenhouse gas emissions tracking</p> <p>Assessments of climate and health risks and greenhouse gas emissions</p>	Health information systems 	<p>Establish integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations</p>
<p>Climate-related emergency preparedness and management</p> <p>Climate-informed health programmes</p> <p>Management of environmental determinants of health</p>	Service delivery 	<p>Provide humanitarian response and health services during climate-related emergencies</p> <p>Ensure access to health services for displaced populations in climate-affected protracted crises</p> <p>Provide mental health interventions for climate-affected displaced and migrant populations</p> <p>Improve WASH services for climate-affected displaced and migrant populations</p> <p>Ensure access to vaccines for climate-affected displaced and migrant populations</p>

This is a first step and further work might include mapping of wider interventions for migrant- and refugee-inclusive health systems, as well broadening out the model beyond the building blocks. Such an integrated health system strengthening approach is crucial to achieving universal health coverage and health for all within a changing climate.

4. Conclusions

This report provides a global, systematic overview of health system interventions for addressing the health needs of displaced and migrant populations in the context of climate change, spanning the health system building blocks. The review included peer-reviewed and grey literature publications that detailed specific health system interventions responding to climate change more generally or to a specific climate hazard aimed at addressing the health needs of refugees, migrants and displaced populations.

While many of the documented interventions are familiar, some demonstrate innovation. Building on this work, there is also now a need for a stronger focus on integrated and systemic approaches to effectively strengthen health systems to improve the health of displaced and migrant populations in the changing climate. Additionally, the inclusion of literature in different languages would help to capture more varied evidence.

To ensure migrant-inclusive and climate-resilient health systems, the evidence gaps identified in this review must be addressed through cross-sectoral and interdisciplinary research and action. To ensure coherence across policies, programmes and frameworks, it is crucial to apply a migration lens to the climate-resilient health systems agenda and a climate lens to migration health efforts. Finally, it is crucial to move beyond short-term reactive responses to the longer-term health needs of climate-affected displaced and migrant populations to build effective, resilient, realistic and accessible migrant-inclusive and climate-resilient health systems.



References¹

1. World migration report 2020. Geneva: International Organization for Migration; 2019 (https://publications.iom.int/system/files/pdf/wmr_2020.pdf). Licence: CC BY-NC-ND 3.0 IGO.
2. Refugee data finder. In: Refugee population statistics [online database]. Geneva: United Nations High Commissioner for Refugees; 2023 (<https://www.unhcr.org/refugee-statistics>).
3. World report on the health of refugees and migrants. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/360404>). Licence: CC BY-NC-SA 3.0 IGO.
4. Haines A, Ebi K. The imperative for climate action to protect health. *N Engl J Med*. 2019;380(3):263–73 (<https://doi.org/10.1056/nejmra1807873>).
5. Uddin R, Philipsborn R, Smith D, Mutic A, Thompson LM. A global child health perspective on climate change, migration and human rights. *Curr Probl Pediatr Adolesc Health Care*. 2021;51(6):101029 (<https://doi.org/10.1016/j.cppeds.2021.101029>).
6. GRID 2024: global report on internal displacement. Geneva: Internal Displacement Monitoring Centre; 2024 (<https://api.internal-displacement.org/sites/default/files/publications/documents/IDMC-GRID-2024-Global-Report-on-Internal-Displacement.pdf>).
7. Clement V, Rigaud KK, de Sherbinin A, Jones B, Adamo S, Schewe J et al. Groundswell part 2: acting on internal climate migration. Washington, DC: World Bank; 2021 (<https://openknowledge.worldbank.org/entities/publication/2c9150df-52c3-58ed-9075-d78ea56c3267>). Licence: CC BY-4.0.
8. The slow onset effects of climate change and human rights protection for cross-border migrants. Geneva: Office of the United Nations High Commissioner for Human Rights; 2018 (https://www.ohchr.org/sites/default/files/Documents/Issues/Migration/OHCHR_slow_onset_of_Climate_Change_EN.pdf). Licence: CC BY-4.0.
9. Radhan B, Kjellstrom T, Atar D, Sharma P, Kayastha B, Bhandari G et al. Heat stress impacts on cardiac mortality in Nepali migrant workers in Qatar. *Cardiology*. 2019;143(1–2):37–48 (<https://doi.org/10.1159/000500853>).
10. Kjellstrom T, Oppermann E, Lee JK. Climate change, occupational heat stress, human health, socioeconomic factors. In: Theorell T, editor. *Handbook of socioeconomic determinants of occupational health: from macro-level to micro-level evidence*. Cham: Springer International; 2020:71–89 (https://doi.org/10.1007/978-3-030-31438-5_37).

¹ All references were accessed on 30 March 2025.

11. El Khayat M, Halwani DA, Hneiny L, Alameddine I, Haidar MA, Habib RR. Impacts of climate change and heat stress on farmworkers' health: a scoping review. *Front Public Health.* 2022;10:782811 (<https://doi.org/10.3389/fpubh.2022.782811>).
12. Bloss JE, LePrevost CE, Zahra AG, Firnhaber GC, Cofie LE, Zepeda R et al. Advancing the health of migrant and seasonal farmworkers in the United States: identifying gaps in the existing literature, 2021. *Health Promot Pract.* 2022;23(3):432–44 (<https://doi.org/10.1177/15248399211033308>).
13. Lundgren-Kownacki K, Kjellberg SM, Gooch P, Dabaieh M, Anandh L, Venugopal V. Climate change-induced heat risks for migrant populations working at brick kilns in India: a transdisciplinary approach. *Int J Biometeorol.* 2018;62(3):347–58 (<https://doi.org/10.1007/s00484-017-1476-0>).
14. Adams H. Why populations persist: mobility, place attachment and climate change. *Popul Environ.* 2016;37(4):429–48 (<https://doi.org/10.1007/s11111-015-0246-3>).
15. Nash SL. From Cancun to Paris: an era of policy making on climate change and migration. *Glob Policy.* 2018;9(1):53–63 (<https://doi.org/10.1111/1758-5899.12502>).
16. Abubakar I, Aldridge RW, Devakumar D, Orcutt M, Burns R, Barreto ML et al. The UCL–Lancet Commission on Migration and Health: the health of a world on the move. *Lancet.* 2018;392(10164):2606–54 ([https://doi.org/10.1016/S0140-6736\(18\)32114-7](https://doi.org/10.1016/S0140-6736(18)32114-7)).
17. Schütte S, Gemenne F, Zaman M, Flahault A, Depoux A. Connecting planetary health, climate change, migration. *Lancet Planet Health.* 2018;2(2):e58–9 ([https://doi.org/10.1016/S2542-5196\(18\)30004-4](https://doi.org/10.1016/S2542-5196(18)30004-4)).
18. McMichael C. Human mobility, climate change, health: unpacking the connections. *Lancet Planet Health.* 2020;4(6):e217–18 ([https://doi.org/10.1016/S2542-5196\(20\)30125-x](https://doi.org/10.1016/S2542-5196(20)30125-x)).
19. Hunter LM, Koning S, Fussell E, King B, Rishworth A, Merdjanoff A et al. Scales and sensitivities in climate vulnerability, displacement, health. *Popul Environ.* 2021;43(1):61–81 (<https://doi.org/10.1007/s11111-021-00377-7>).
20. Schwerdtle PN, McMichael C, Mank I, Sauerborn R, Danquah I, Bowen KJ. Health and migration in the context of a changing climate: a systematic literature assessment. *Environ Res Lett.* 2020;15: 103006 (<https://doi.org/10.1088/1748-9326/ab9ece>).
21. Bellizzi S, Popescu C, Panu Napodano CM, Fiamma M, Cegolon L Global health, climate change and migration: the need for recognition of "climate refugees". *J Glob Health.* 2023;13:103006 (<https://doi.org/10.7189/jogh.13.03011>).
22. Mannanal MS, Mohan A. Unveiling the health concerns of climate migrants: a narrative review. *Asian Res Arts Soc Sci.* 2024;22(3):50–60 (<https://doi.org/10.9734/arjass/2024/v22i3522>).

23. Anantapong K, Moura HF, Udomrathn P, Persaud A, Javed A, Ramachandran P et al. Geopsychiatry: climate change, migration, mental health. *Ind Psychiatry J.* 2024;33 (suppl 1):S257–60 (https://doi.org/10.4103/ijp.ipj_33_24).
24. Universal health coverage [fact sheet]. World Health Organization; 2023 ([https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-\(uhc\)](https://www.who.int/news-room/fact-sheets/detail/universal-health-coverage-(uhc))).
25. Mosadeghrad AM, Isfahani P, Eslambolchi L, Zahmatkesh M, Afshari M. Strategies to strengthen a climate-resilient health system: a scoping review. *Glob Health.* 2023;19(1):62 (<https://doi.org/10.1186/s12992-023-00965-2>).
26. Operational framework for building climate resilient and low carbon health systems. Geneva: World Health Organization; 2023 (<https://iris.who.int/handle/10665/373837>). Licence: CC BY-NC-SA 3.0 IGO.
27. Mapping health systems' responsiveness to refugee and migrant health needs Geneva: World Health Organization; 2021 (<https://iris.who.int/handle/10665/346682>). Licence: CC BY-NC-SA 3.0 IGO.
28. Vearey J, Orcutt M, Gostin L, Braham CA, Duigan P. Building alliances for the global governance of migration and health. *BMJ.* 2019;366:l4143 (<https://doi.org/10.1136/bmj.l4143>).
29. Darlington F, Norman P, Goules M. Health and internal migration. In: Smith DP, Finney N, Halfacree K, Walford N, editors. *Internal migration: geographical perspectives and processes.* Farnham: Ashgate; 2016:113–28.
30. How climate change exacerbates population displacement [news release]. ReliefWeb; 26 April 2024 (<https://reliefweb.int/report/world/how-climate-change-exacerbates-population-displacement>).
31. Negev M, Teschner N, Rosenthal A, Levine H, Lew-Levy C, Davidovitch N. Adaptation of health systems to climate-related migration in sub-Saharan Africa: closing the gap. *Int J Hyg Environ Health.* 2019;222(2):311–14 (<https://doi.org/10.1016/j.ijheh.2018.10.004>).
32. Schwerdtle PN, Ngo TA, Hasch F, Phan TV, Quitmann Q, Montenegro-Quiñonez CA. Climate change resilient health facilities: a scoping review of case studies in low and middle-income countries. *Environ Res Lett.* 2024;19:074041 (<https://doi.org/10.1088/1748-9326/ad472b>).
33. Everybody's business: strengthening health systems to improve health outcomes: WHO's framework for action. Geneva: World Health Organization; 2007 (<https://iris.who.int/handle/10665/43918>). Licence: CC BY-NC-SA 3.0 IGO.
34. Vanuatu: national policy on climate change and disaster-induced displacement. Port Villa: Vanuatu National Disaster Management Office; 2018 (<https://ndmo.gov.vu/images/download/Vanuatu-National-Policy-on-Climate-Change-and-Disaster-Induced-Displacement-2018-published.pdf>).
35. Quast T. Healthcare utilization by children with asthma displaced by Hurricane Katrina. *J Asthma.* 2018;55(4):416–23 (<https://doi.org/10.1080/02770903.2017.1339244>).

36. Forced displacement of and potential solutions for IDPs and refugees in the Sahel: Burkina Faso, Chad, Mali, Mauritania, and Niger. Washington, DC: World Bank Group; 2014 (<https://documents1.worldbank.org/curated/en/229401467990086793/pdf/899510WP0Box380placement0study0WEB.pdf>).
37. Menstrual hygiene support for women and girls in Somalia: World Menstrual Hygiene Day [website]. International Organization for Migration; 2025 (<https://somalia.iom.int/stories/menstrual-hygiene-support-women-and-girls-somalia-world-menstrual-hygiene-day>).
38. Climate and health solutions space [website]. ClimaHealth; 2021 (<https://climahealth.info/climate-and-health-solutions-space/>).
39. Displacement in a changing climate: localized humanitarian action at the forefront of the climate crisis. Geneva: International Federation of Red Cross and Red Crescent Societies; 2021 (<https://www.ifrc.org/sites/default/files/2021-11/2021-Climate-Displacement-Report-Final.pdf>).
40. Classification of fragile and conflict-affected situations [website]. World Bank; 2025 (<https://www.worldbank.org/en/topic/fragilityconflictviolence/brief/classification-of-fragile-and-conflict-affected-situations>).
41. Ethiopia 2018: humanitarian and disaster resilience plan. Addis Ababa: United Nations Office for the Coordination of Humanitarian Affairs and the Government of Ethiopia; 2018 (<https://www.refworld.org/policy/legalguidance/ocha/2018/en/121068>).
42. Revised national development strategy 2021–2024: consolidate peace and stabilize the economy. Juba: Republic of South Sudan and United Nations Development Programme; 2022 (<https://www.refworld.org/policy/strategy/natlegbod/2022/en/147818>).
43. RIASCO action plan for southern Africa: response plan for the El Niño-induced drought in southern Africa May 2016–April 2017. Geneva: Regional Inter-Agency Standing Committee; 2016 (<https://library.alnap.org/help-library/riasco-action-plan-for-southern-africa-response-plan-for-the-el-nino-induced-drought-in>).
44. Doherty P, Wheeler E, Mochache V, Mark TJ, Lutah G, Bero B et al. Considerations for program managers to improve sexual and reproductive health services for displaced populations. Glob Health Sci Pract. 2023;11(4):e2300036 (<https://doi.org/10.9745/ghsp-d-23-00036>).
45. Spickett J, Katscherian D, Brown H. Climate change, vulnerability and health guide. Perth: Curtin University WHO Collaborating Centre for Climate Change and Health Impact Assessment; 2015 (<https://doi.org/10.17605/OSF.IO/K38SW>).
46. Adalja AA, Watson M, Bouri N, Minton K, Morhard RC, Toner ES. Absorbing citywide patient surge during Hurricane Sandy: a case study in accommodating multiple hospital evacuations. Ann Emerg Med. 2014;64(1):66–73.e61 (<https://doi.org/10.1016/j.annemergmed.2013.12.010>).

47. Musoke R, Chimbaru A, Jambai A, Njuguna C, Kayita J, Bunn J et al. A public health response to a mudslide in Freetown, Sierra Leone, 2017: lessons learnt. *Disaster Med Public Health Prep.* 2020;14(2):256–64 (<https://doi.org/10.1017/dmp.2019.53>).
48. Shultz JM, Berg RC, Kossin JP, Burkle Jr F, Maggioni A, Pinilla Escobar VA et al. Convergence of climate-driven hurricanes and COVID-19: the impact of 2020 hurricanes Eta and Iota on Nicaragua. *J Clim Change Health.* 2021;3:100019 (<https://doi.org/10.1016/j.joclim.2021.100019>).
49. Valente M, Zanellati M, Facci G, Zanna N, Petrone E, Moretti E et al. Health system response to the 2023 floods in Emilia-Romagna, Italy: a field report. *Prehosp Disaster Med.* 2023;38(6):813–17 (<https://doi.org/10.1017/S1049023X23006404>).
50. Clark-Ginsberg A, Becerra-Ornelas A, Chandra A. Capacities of health systems in climate migrant receiving communities: insights in the US Gulf Coast. Washington, DC: Urban Institute; 2023 (<https://issuelab.org/resources/43676/43676.pdf>).
51. Ashraf M, Shahzad S, Sequeria P, Bashir A, Azmat SK. Understanding challenges women face in flood-affected areas to access sexual and reproductive health services: a rapid assessment from a disaster-torn Pakistan. *BioMed Res Int.* 2024;(1):1113634 (<https://doi.org/10.1155/2024/1113634>).
52. Ethiopia: refugee policy review framework update as of 30 June 2023. Geneva: United Nations High Commissioner for Refugees; 2024 (<https://data.unhcr.org/en/documents/details/107226>). Licence: CC BY-4.0.
53. Support urgently needed to avert a deeper Sahel crisis, UNHCR's protection chief warns [news release]. United Nations High Commissioner for Refugees; 25 March 2024 (<https://www.unhcr.org/news/press-releases/support-urgently-needed-avert-deeper-sahel-crisis-unhcr-s-protection-chief>).
54. Campbell J. International relocation from Pacific Island countries: adaptation failure. In: Proceedings of the Environment, Forced Migration, Social Vulnerability International Conference, Bonn, Germany, 9–11 October 2008. Apia: SPREP; 2008 (<https://library.sprep.org/sites/default/files/644.pdf>). Licence: CC BY-NC-SA 4.0.
55. UNHCR launches fund to shield refugees and other displaced people from climate shocks [news release]. United Nations High Commissioner for Refugees; 24 April 2024 (<https://www.unhcr.org/news/press-releases/unhcr-launches-fund-shield-refugees-and-other-displaced-people-climate-shocks>).
56. Module 3: tackling the social determinants of health and workers' and occupational health and safety; tool 10: climate change. In: Refugee and migrant health toolkit [online application]. World Health Organization; 2015 (<https://www.who.int/tools/refugee-and-migrant-health-toolkit/module-3/tool-10>).

57. Rabbani F, Siddiqui A, Merali Z. Responding to mental health challenges of flood-affected communities through technology-driven local solutions in Pakistan: the mPareshan Project. Karachi: Brain and Mind Institute and Department of Community Health Sciences, Aga Khan University; 2022 (<https://hub.connectingclimateminds.org/research-and-action/case-studies/14>).
58. Amsalu R, Schulte-Hillen C, Garcia DM, Lafferty N, Morris CN, Gee S et al. Lessons learned from helping babies survive in humanitarian settings. *Pediatrics*. 2020;146 (suppl 2):S208–17 (<https://doi.org/10.1542/peds.2020-016915L>).
59. Climate change impacts on health: affecting development and human mobility. Geneva: International Organization for Migration; 2023 (https://www.iom.int/sites/g/files/tmzbdl486/files/documents/2024-01/iom-health_climate-change_position-paper_21.12.2023.pdf). Licence: CC BY-NC-ND 3.0 IGO.
60. Unshattered hope in the face of adversity in South Sudan [blog]. Médecins Sans Frontières; 15 November 2023 (<https://www.msf.org/unshattered-hope-face-adversity-south-sudan>).
61. Evans DP, Anderson M, Shahpar C, del Rio C, Curran JW. Innovation in graduate education for health professionals in humanitarian emergencies. *Prehosp Disaster Med*. 2016;31(5):532–8 (<https://doi.org/10.1017/S1049023X16000650>).
62. Williams H, Downes E. Development of a course on complex humanitarian emergencies: preparation for the impact of climate change. *J Nurs Scholarsh*. 2017;49(6):661–9 (<https://doi.org/10.1111/jnu.12339>).
63. Kanter RK, Abramson D. School interventions after the Joplin tornado. *Prehosp Disaster Med*. 2014;29(2):214–17 (<https://doi.org/10.1017/S1049023X14000181>).
64. Sorensen CJ, Fried LP. Defining roles and responsibilities of the health workforce to respond to the climate crisis. *JAMA Netw Open*. 2024;7(3):e241435 (<https://doi.org/10.1001/jamanetworkopen.2024.1435>).
65. Altare C, Kahi V, Ngwa MC, Goldsmith A, Hering H, Burton A et al. Infectious disease epidemics in refugee camps: a retrospective analysis of UNHCR data (2009–2017). *J Glob Health Rep*. 2019;3:e2019064 (<https://doi.org/10.29392/joghr.3.e2019064>).
66. Shortus M, Musto J, Bugoro H, Butafa C, Sio A, Joshua C. Vector-control response in a post-flood disaster setting, Honiara, Solomon Islands, 2014. *Western Pac Surveill Response J*. 2016;7(1):38–43 (<https://doi.org/10.5365/wpsar.2015.6.3.004>).
67. Mugabe VA, Gudo ES, Inlamea OF, Kitron U, Ribeiro GS. Natural disasters, population displacement and health emergencies: multiple public health threats in Mozambique. *BMJ Glob Health*. 2021;6(9):e006778 (<https://doi.org/10.1136/bmjgh-2021-006778>).

68. Emergency health: 2023 global highlights. Geneva: International Organization for Migration; 2023 (https://www.iom.int/sites/g/files/tmzbdl486/files/documents/2024-05/iom-emergency-health-infosheet-2023_08.05.2024.pdf). Licence: CC BY-NC-ND 3.0 IGO.
69. Benkritly M, Hujale M. Sudanese refugees fleeing conflict find safety in South Sudan [news release]. United Nations High Commissioner for Refugees; 27 June 2023 (<https://www.unhcr.org/news/stories/sudanese-refugees-fleeing-conflict-find-safety-south-sudan>).
70. Hujale M. Displaced Somalis and refugees struggle to recover as climate change brings new threats [news release]. United Nations High Commissioner for Refugees; 17 August 2012 (<https://www.unhcr.org/news/stories/displaced-somalis-and-refugees-struggle-recover-climate-change-brings-new-threats>).
71. Lien C, Raimo J, Abramowitz J, Khanijo S, Kritharis A, Mason C et al. Community healthcare delivery post-Hurricane Sandy: lessons from a mobile health unit. *J Community Health*. 2014;39(3):599–605 (<https://doi.org/10.1007/s10900-013-9805-7>).
72. Sood RK, Bocour A, Kumar S, Guclu H, Potter M, Shah TB. Impact on primary care access post-disaster: a case study from the Rockaway Peninsula. *Disaster Med Public Health Prep*. 2016;10(3):492–95 (<https://doi.org/10.1017/dmp.2016.80>).
73. Horn of Africa drought emergency [website]. United Nations High Commissioner for Refugees; 2023 (<https://www.unhcr.org/uk/emergencies/horn-africa-drought-emergency>).
74. Chad floods deepen humanitarian crisis with high risk of disease outbreaks [blog]. Médecins Sans Frontières; 5 December 2022 (<https://www.msf.org/floods-n%E2%80%99jamena-chad-deepen-humanitarian-crisis-high-risk-disease-outbreaks>).
75. People cut off from healthcare after cyclone Freddy batters Malawi [news release]. Médecins Sans Frontières; 24 March 2023 (<https://www.msf.org/people-cut-healthcare-after-cyclone-freddy-batters-malawi>).
76. Kearns RD, Stringer L, Craig J, Godette-Crawford R, Black PS, Andra DL et al. Relying on the National Mobile Disaster Hospital as a business continuity strategy in the aftermath of a tornado: the Louisville experience. *J Bus Contin Emer Plan*. 2017;10(3):230–48 (<https://pubmed.ncbi.nlm.nih.gov/28222847/>).
77. UNHCR ramps up aid to thousands displaced by Somalia drought [news release]. United Nations High Commissioner for Refugees; 11 March 2023 (<https://www.unhcr.org/news/briefing-notes/unhcr-ramps-aid-thousands-displaced-somalia-drought>).
78. Soaring needs persist in Twic County one year on [news release]. Médecins Sans Frontières; 17 May 2023 (<https://www.msf.org/south-sudan-soaring-needs-persist-twic-county-one-year>).

79. Lindvall K, Kinsman J, Abraha A, Dalmar A, Abdullahi MF, Godefay H et al. Health status and health care needs of drought-related migrants in the Horn of Africa: a qualitative investigation. *Int J Environ Res.* 2020;17(16):5917 (<https://doi.org/10.3390/ijerph17165917>).
80. Bourgois X. Dwindling rains in northern Cameroon spark conflict and displacement [news release]. United Nations High Commissioner for Refugees; 10 November 2021 (<https://www.unhcr.org/news/stories/dwindling-rains-northern-cameroon-spark-conflict-and-displacement>).
81. Lalani N, Drolet JL, McDonald-Harker C, Brown MRG, Brett-MacLean P, Agyapong VIO et al. Nurturing spiritual resilience to promote post-disaster community recovery: the 2016 Alberta wildfire in Canada. *Front Public Health.* 2021;9 (<https://doi.org/10.3389/fpubh.2021.682558>).
82. Taioli E, Tuminello S, Lieberman-Cribbin W, Bevilacqua K, Schneider S, Guzman M et al. Mental health challenges and experiences in displaced populations following Hurricane Sandy and Hurricane Harvey: the need for more comprehensive interventions in temporary shelters. *J Epidemiol Community Health.* 2018;72(10):867–70 (<https://doi.org/10.1136/jech-2018-210626>).
83. Alam F, Hossain R, Ahmed HU, Alam MT, Sarkar M, Halbreich U. Stressors and mental health in Bangladesh: current situation and future hopes. *BJPsych Int.* 2021;18(4):91–4 (<https://doi.org/10.1192/bji.2020.57>).
84. Bharadwaj R, Huq S. Climate-induced migration and health issues: a toolkit for policymakers. London: International Institute for Environment and Development; 2022 (<https://issuelab.org/resources/43319/43319.pdf>).
85. Mental health and climate change: policy brief. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/354104>). Licence: CC BY-NC-SA 3.0 IGO.
86. Akbar M. Empowering women and girls through water and sanitation initiatives in post-flood Pakistan [news release]. International Organization for Migration; 22 March 2024 (<https://reliefweb.int/report/pakistan/empowering-women-and-girls-through-water-and-sanitation-initiatives-post-flood-pakistan>).
87. Viray K. Solar energy delivers clean water to drought-affected families in Ethiopia [blog]. In: International Organization for Migration Storyteller; 2024 (<https://storyteller.iom.int/stories/solar-energy-delivers-clean-water-drought-affected-families-ethiopia>).
88. Global annual results report 2021: ensuring that every child lives in a safe and clean environment. Goal Area 4: progress, results achieved and lessons from 2021 [website]. United Nations Children's Fund; 2022 (<https://www.unicef.org/reports/global-annual-results-2021-goal-area-4>).
89. UNICEF DRR in action: every country protected; every child resilient. New York: United Nations Children's Fund; 2022 (<https://www.unicef.org/documents/unicef-drr-action-every-country-protected-every-child-resilient>). Licence: CC BY-4.0.

90. Chiriac M. Ripples of change: durable water solutions reshape communities along Yemen's West Coast. International Organization for Migration; 21 March 2024 (<https://yemen.iom.int/stories/ripples-change-durable-water-solutions-reshape-communities-along-yemens-west-coast>).
91. Mohammed M. Green energy grants conflict-affected communities in Yemen access to safe water [blog]. In: International Organization for Migration Storyteller; 2024 (<https://storyteller.iom.int/stories/green-energy-grants-conflict-affected-communities-yemen-access-safe-water>).
92. Hirani SAA. Barriers to women's menstrual hygiene practices during recurrent disasters and displacement: a qualitative study. *Int J Environ Res.* 2024;21(2):153 (<https://doi.org/10.3390/ijerph21020153>).
93. Msyamboza KP, M'Bang'ombe M, Hausi H, Chijuwa A, Nkukumila V, Kubwalo HW et al. Feasibility and acceptability of oral cholera vaccine mass vaccination campaign in response to an outbreak and floods in Malawi. *Pan Afr Med J.* 2016;23:203 (<https://doi.org/10.11604/pamj.2016.23.203.8346>).
94. Climate change [fact sheet]. World Health Organization; 12 October 2023 (<https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>).
95. Salam A, Wireko AA, Jiffry R, Ng JC, Patel H, Zahid MJ et al. The impact of natural disasters on healthcare and surgical services in low- and middle-income countries. *Ann Med Surg (Lond).* 2023;85(8):3774–7 (<https://doi.org/10.1097/ms9.0000000000001041>).
96. Neef K, Jones E, Marlowe J. The conflict, climate change, displacement nexus revisited: the protracted Rohingya refugee crisis in Bangladesh. *J Peacebuild Dev.* 2023;18(3):231–47 (<https://doi.org/10.1177/15423166231190040>).
97. Fransen S, Werntges A, Hunns A, Sirenko M, Comes T. Refugee settlements are highly exposed to extreme weather conditions. *PNAS.* 2024;121(3):e2206189120 (<https://doi.org/doi: 10.1073/pnas.2206189120>).
98. Mental health of refugees and migrants: risk and protective factors and access to care. Geneva: World Health Organization; 2023 (<https://iris.who.int/handle/10665/373279>). Licence: CC BY-NC-SA 3.0 IGO.
99. Hayes K, Blashki G, Wiseman J, Burke S, Reifels L. Climate change and mental health: risks, impacts and priority actions. *Int J Ment Health Sys.* 2018;12(1):28 (<https://doi.org/10.1186/s13033-018-0210-6>).
100. Lebel L, Paquin V, Kenny TA, Fletcher C, Nadeau L, Chachamovich E et al. Climate change and Indigenous mental health in the circumpolar north: a systematic review to inform clinical practice. *Transcult Psychiatry.* 2022;59(3):312–36 (<https://doi.org/10.1177/13634615211066698>).

101. Middleton J, Cunsolo A, Jones-Bitton A, Wright CJ, Harper SL. Indigenous mental health in a changing climate: a systematic scoping review of the global literature. *Environ Res Lett.* 2020;15(5):053001 (<https://doi.org/10.1088/1748-9326/ab68a9>).
102. What is WASH? [news release]. Washington, DC: USA for UNHCR The UN Refugee Agency; 3 April 2024 (<https://www.unrefugees.org/news/what-is-wash/>).
103. Pichler P, Jaccard IS, Weisz U, Weisz H. International comparison of health care carbon footprints. *Environ Res Lett.* 2019;14:064004 (<https://doi.org/10.1088/1748-9326%2Fab19e1>).
104. When it comes to fighting climate change, green is golden [news release]. Asian Development Bank; 22 March 2023 (<https://www.adb.org/news/features/when-it-comes-fighting-climate-change-green-golden>).
105. Countries in the western Pacific on the frontlines of the climate crisis, says WHO [news release]. World Health Organization; 7 April 2022 (<https://www.who.int/westernpacific/news/item/07-04-2022-countries-in-the-western-pacific-on-the-frontlines-of-the-climate-crisis--says-who>).
106. Scissa C, Martin SF. Migration in the context of climate and environmental changes within central Asia and to the European Union and the Russian Federation. Geneva: International Organization for Migration; 2024 (https://environmentalmigration.iom.int/sites/g/files/tmzbdl1411/files/documents/2024-05/pub2023-041-el-migration-in-the-context-of-climate-ca-eu-rf_0.pdf). Licence: CC BY-NC-ND 3.0 IGO.
107. The critical challenges of migration and displacement. Statement by the ICRC President, Peter Maurer, at the National Autonomous University of Mexico [news release]. International Committee of the Red Cross; 18 October 2017 (<https://www.icrc.org/en/document/speech-migration-and-internal-displacement-national-and-global-challenges>).
108. WHO, World Bank, International Renewable Energy Agency, Sustainable Energy for All. Energizing health: accelerating electricity access in health-care facilities. Geneva: World Health Organization; 2023 (<https://iris.who.int/handle/10665/365657>). Licence: CC BY-NC-SA 3.0 IGO.
109. Cundill G, Singh C, Adger WN, Safra de Campos R, Vincent K, Tebboth M et al. Toward a climate mobilities research agenda: intersectionality, immobility, and policy responses. *Glob Environ Change.* 2021;69:102315 (<https://doi.org/https://doi.org/10.1016/j.gloenvcha.2021.102315>)
110. McMichael C, Yee M. 10 health consequences of climate change for migrants and immobile populations. In: Andreas N, Natasha P, Bukola S, editors. *De Gruyter handbook of climate migration and climate mobility justice.* Berlin: De Gruyter; 2024:216–34 (<https://doi.org/10.1515/9783110752144-011>).

111. Bellizzi S, Molek K. The high risk of gender-based violence for migrant women and girls. *J Pediatr Adolesc Gynecol.* 2021;35(3):265–6 (<https://doi.org/10.1016/j.jpag.2021.12.008>).
112. Anastario M, Shehab N, Lawry L. Increased gender-based violence among women internally displaced in Mississippi 2 years post-hurricane Katrina. *Disaster Med Public Health Prep.* 2009;3(1):18–26 (<https://doi.org/10.1097/DMP.0b013e3181979c32>).
113. Defining essential public health functions and services to strengthen national workforce capacity. Geneva: World Health Organization; 2024 (<https://iris.who.int/handle/10665/376579>). Licence: CC BY-NC-SA 3.0 IGO.

Annex 1. Search strategy

Peer-reviewed literature

For peer-reviewed articles, PubMed (MEDLINE) and Embase were searched using a comprehensive keyword list. MeSH and Emtree terms (subject headings) were not used to ensure specificity of search terms and yield a manageable number of results. Key words were searched within titles and abstract, using filters for year (2014–2024) and language (English) and included a list of exclusionary terms. All the predefined terms were combined using the "OR" Boolean operator (within columns in Table A1.1); each area of interest was combined using the "AND" operator and the exclusionary terms were combined using the "NOT" operator. A second round of automated exclusions were applied using R to filter out the remaining exclusionary terms.

Table A1.1. Full list of migration, climate and health systems terms

Migration terms	Climate terms	Health systems terms
· "migra**"	· "climatic"	· "healthcare"
· "immigrَا**"	· "global warming"	· "governance"
· "emigra**"	· "global heating"	· "health policy"
· "refugee**"	· "greenhouse effect"	· "information system"
· "asylum seeker**"	· "temperature"	· "e-health"
· "internally displaced"	· "rapid onset event"	· "telehealth"
· "forcibly displaced"	· "extreme heat"	· "early warning system"
· "displaced"	· "typhoon"	· "insurance"
· "deport**"	· "cyclone"	· "medicine**"
· "unaccompanied minor**"	· "hurricane"	· "pharmaceutical**"
· "exodus"	· "storm"	· "supply chain"
· "human traffick**"	· "wildfire"	· "supplies"
· "detention**"	· "bushfire"	· "emergency response"
· "immobil**"	· "fire"	· "disaster response"
· "trapped population"	· "landslide"	· "Health"
· "cross-border"	· "disaster**"	· "health strengthening"
· "transient**"	· "slow onset event"	· "essential medicine"

Migration terms	Climate terms	Health systems terms
· "relocat*"	· "sea level rise"	· "screening"
· "settle*"	· "pollution"	· "diagnosis"
· "nomad*"	· "air quality"	· "health resilience"
· "detain*"	· "haze"	· "financing"
· "resettle*"	· "drought"	· "funding"
· "undocumented person*"	· "desertification"	· "physician*"
· "IDP"	· "extreme weather"	· "nurse*"
· "forced displacement"	· "climate"	· "financial"
· "internal displacement"	· "flood*"	· "emergency preparedness"
· "cross-border"	· "rainfall"	· "health system*"
· "irregular migra*"	· "rain"	· "health response"
· "returnee*"	· "ocean acidification"	

The full search string for PubMed and Embase was as follows. Removal of duplicates was completed using EndNote and during title and abstract screening.

PubMed

(("climatic"[Title/Abstract] OR "global warming"[Title/Abstract] OR "global heating"[Title/Abstract] OR "greenhouse effect"[Title/Abstract] OR "temperature"[Title/Abstract] OR ("rapid"[All Fields] OR "rapidities"[All Fields] OR "rapidity"[All Fields] OR "rapidness"[All Fields]) AND "onset event"[Title/Abstract]) OR "extreme heat"[Title/Abstract] OR "typhoon"[Title/Abstract] OR "cyclone"[Title/Abstract] OR "hurricane"[Title/Abstract] OR "storm"[Title/Abstract] OR "wildfire"[Title/Abstract] OR "bushfire"[Title/Abstract] OR "fire"[Title/Abstract] OR "landslide"[Title/Abstract] OR "disaster*"[Title/Abstract] OR ("slow"[All Fields] AND "onset event"[Title/Abstract]) OR "sea level rise"[Title/Abstract] OR "pollution"[Title/Abstract] OR "air quality"[Title/Abstract] OR "haze"[Title/Abstract] OR "drought"[Title/Abstract] OR "desertification"[Title/Abstract] OR "extreme weather"[Title/Abstract] OR "climate"[Title/Abstract] OR "flood*"[Title/Abstract] OR "rainfall"[Title/Abstract] OR "rain"[Title/Abstract] OR "ocean acidification"[Title/Abstract]) AND ("migra*"[Title/Abstract] OR "immigran*"[Title/Abstract] OR "emigran*"[Title/Abstract] OR "refugee*"[Title/Abstract] OR "asylum seeker*"[Title/Abstract] OR "internally displaced"[Title/Abstract] OR "forcibly displaced"[Title/Abstract] OR "displaced"[Title/Abstract] OR "deport*"[Title/Abstract] OR "unaccompanied

minor*[Title/Abstract] OR "exodus"[Title/Abstract] OR "human traffick*[Title/Abstract] OR "detention*[Title/Abstract] OR "immobil*"[Title/Abstract] OR "trapped population"[Title/Abstract] OR "cross-border"[Title/Abstract] OR "transient*[Title/Abstract] OR "relocat*[Title/Abstract] OR "settle*[Title/Abstract] OR "nomad*[Title/Abstract] OR "detain*[Title/Abstract] OR "resettle*[Title/Abstract] OR "undocumented person*[Title/Abstract] OR "IDP"[Title/Abstract] OR "forced displacement"[Title/Abstract] OR "internal displacement"[Title/Abstract] OR "cross-border"[Title/Abstract] OR "irregular migra*[Title/Abstract] OR "returnee*[Title/Abstract]) AND ("healthcare"[Title/Abstract] OR "governance"[Title/Abstract] OR "health policy"[Title/Abstract:~3] OR "information system"[Title/Abstract] OR "e-health"[Title/Abstract] OR "telehealth"[Title/Abstract] OR "early warning system"[Title/Abstract] OR "insurance"[Title/Abstract] OR "medicine*[Title/Abstract] OR "pharmaceutical*[Title/Abstract] OR "supply chain"[Title/Abstract] OR "supplies"[Title/Abstract] OR "emergency response"[Title/Abstract] OR "disaster response"[Title/Abstract] OR "Health"[Title/Abstract] OR "health strengthening"[Title/Abstract:~3] OR "essential medicine"[Title/Abstract] OR "screening"[Title/Abstract] OR "diagnosis"[Title/Abstract] OR "health resilience"[Title/Abstract:~3] OR "financing"[Title/Abstract] OR "funding"[Title/Abstract] OR "physician*[Title/Abstract] OR "nurse*[Title/Abstract] OR "financial"[Title/Abstract] OR "emergency preparedness"[Title/Abstract] OR "health system*[Title/Abstract] OR "health response"[Title/Abstract:~3])) NOT ("cellular migration"[Title/Abstract] OR "migraine"[Title/Abstract] OR "intracellular trafficking"[Title/Abstract] OR "membrane trafficking"[Title/Abstract] OR "gene migration"[Title/Abstract] OR "mRNA"[Title/Abstract] OR "DNA"[Title/Abstract] OR "RNA"[Title/Abstract] OR "Genetics"[Title/Abstract] OR "avian"[Title/Abstract] OR "bird"[Title/Abstract] OR "animal"[Title/Abstract] OR "acupuncture"[Title/Abstract] OR "silica-immobilized"[Title/Abstract] OR "silica-immobilised"[Title/Abstract] OR "migrans"[Title/Abstract] OR "coral"[Title/Abstract] OR "gardening"[Title/Abstract] OR "coral"[Title/Abstract] OR "nurse sharks"[Title/Abstract] OR "mouse"[Title/Abstract] OR "fish"[Title/Abstract] OR "mice"[Title/Abstract] OR "cellular"[Title/Abstract] OR "cell"[Title/Abstract] OR "mutation"[Title/Abstract] OR "silica"[Title/Abstract] OR "soil"[Title/Abstract] OR "rabbit*[Title/Abstract] OR "plant"[Title/Abstract] OR "in vitro"[Title/Abstract] OR "valve"[Title/Abstract] OR "aorta"[Title/Abstract] OR "rat"[Title/Abstract] OR "rats"[Title/Abstract] OR "beagle*[Title/Abstract] OR "canine"[Title/Abstract] OR "equine"[Title/Abstract] OR "murine"[Title/Abstract] OR "rodent*[Title/Abstract] OR "animals"[Title/Abstract] OR "broiler"[Title/Abstract] OR "cadaver"[Title/Abstract] OR "piglet*[Title/Abstract] OR "porcine"[Title/Abstract] OR "pig"[Title/Abstract])) AND (y_10[Filter]) AND (english[Filter]))

Embase

(climatic:ti,ab,kw OR 'global warming':ti,ab,kw OR 'global heating':ti,ab,kw OR 'greenhouse effect':ti,ab,kw OR temperature:ti,ab,kw OR 'rapid onset event':ti,ab,kw OR 'extreme heat':ti,ab,kw OR typhoon:ti,ab,kw OR cyclone:ti,ab,kw OR hurricane:ti,ab,kw OR storm:ti,ab,kw OR wildfire:ti,ab,kw OR bushfire:ti,ab,kw OR fire:ti,ab,kw OR landslide:ti,ab,kw OR disaster*:ti,ab,kw OR 'slow onset event':ti,ab,kw OR 'sealevelrise':ti,ab,kw OR pollution:ti,ab,kw OR 'airquality':ti,ab,kw OR haze:ti,ab,kw

OR drought:ti,ab,kw OR desertification:ti,ab,kw OR 'extreme weather':ti,ab,kw OR climate:ti,ab,kw OR flood*:ti,ab,kw OR rainfall:ti,ab,kw OR rain:ti,ab,kw OR 'ocean acidification':ti,ab,kw) AND (healthcare:ti,ab,kw OR governance:ti,ab,kw OR (health NEAR/3 policy):ti,ab,kw) OR 'information system':ti,ab,kw OR 'e health':ti,ab,kw OR telehealth:ti,ab,kw OR 'early warning system':ti,ab,kw OR insurance:ti,ab,kw OR medicine*:ti,ab,kw OR pharmaceutical*:ti,ab,kw OR 'supply chain':ti,ab,kw OR supplies:ti,ab,kw OR 'emergency response':ti,ab,kw OR 'disaster response':ti,ab,kw OR health:ti,ab,kw OR (health NEAR/3 strengthening):ti,ab,kw) OR 'essential medicine':ti,ab,kw OR screening:ti,ab,kw OR diagnosis:ti,ab,kw OR (health NEAR/3 resilience):ti,ab,kw) OR financing:ti,ab,kw OR funding:ti,ab,kw OR physician*:ti,ab,kw OR nurse*:ti,ab,kw OR financial:ti,ab,kw OR 'emergency preparedness':ti,ab,kw OR 'health system*':ti,ab,kw OR (health NEAR/3 response):ti,ab,kw)) AND (migra*:ti,ab,kw OR immigran*:ti,ab,kw OR emigra*:ti,ab,kw OR refugee*:ti,ab,kw OR 'asylum seeker*':ti,ab,kw OR 'internally displaced':ti,ab,kw OR 'forcibly displaced':ti,ab,kw OR displaced:ti,ab,kw OR deport*:ti,ab,kw OR 'unaccompanied minor*':ti,ab,kw OR exodus:ti,ab,kw OR 'human traffick*':ti,ab,kw OR detention*:ti,ab,kw OR immobil*:ti,ab,kw OR 'trapped population':ti,ab,kw OR transient*:ti,ab,kw OR relocat*:ti,ab,kw OR settle*:ti,ab,kw OR nomad*:ti,ab,kw OR detain*:ti,ab,kw OR resettle*:ti,ab,kw OR 'undocumented person*':ti,ab,kw OR idp:ti,ab,kw OR 'forced displacement':ti,ab,kw OR 'internal displacement':ti,ab,kw OR 'cross border':ti,ab,kw OR 'irregular migra*':ti,ab,kw OR returnee*:ti,ab,kw) NOT ('cellular migration':ti,ab,kw OR migraineti,ab,kw OR 'intracellular trafficking':ti,ab,kw OR 'membrane trafficking':ti,ab,kw OR 'gene migration':ti,ab,kw OR mrna:ti,ab,kw OR dna:ti,ab,kw OR rna:ti,ab,kw OR genetics:ti,ab,kw OR avian:ti,ab,kw OR bird:ti,ab,kw OR animal:ti,ab,kw OR acupuncture:ti,ab,kw OR 'silica immobilized':ti,ab,kw OR 'silica immobilised':ti,ab,kw OR migrans:ti,ab,kw OR gardening:ti,ab,kw OR coral:ti,ab,kw OR 'nurse sharks':ti,ab,kw OR mouse:ti,ab,kw OR fish:ti,ab,kw OR mice:ti,ab,kw OR cellular:ti,ab,kw OR cell:ti,ab,kw OR mutation:ti,ab,kw OR silica:ti,ab,kw OR soil:ti,ab,kw OR rabbit*:ti,ab,kw OR plant:ti,ab,kw OR 'in vitro':ti,ab,kw OR valve:ti,ab,kw OR aorta:ti,ab,kw OR rat:ti,ab,kw OR rats:ti,ab,kw OR beagle*:ti,ab,kw OR canine:ti,ab,kw OR equine:ti,ab,kw OR murine:ti,ab,kw OR rodent*:ti,ab,kw OR animals:ti,ab,kw OR broiler:ti,ab,kw OR cadaver:ti,ab,kw OR piglet*:ti,ab,kw OR porcine:ti,ab,kw OR pig:ti,ab,kw) AND [english]/lim AND [2014-2024]/py.

Grey literature

For grey literature, general search engines such as Google, Google Scholar and OAIster were used alongside other general and institutional databases that may have specialized content related to climate change, migration and health systems, such as the World Bank and Science.gov. Other climate-related databases that were used included ClimaHealth and Climate Change and Human Health Literature Portal. Migrant-related repositories that were used include the IOM and RefWorld websites. Health-focused databases that were used include the WHO and United States National Institutes of Health websites, as well as MedRxiv. Since each search engine had different search features, sort options and filters, a unique search strategy was developed for each (Table A1.2).

Table A1.2. Grey literature search engines, search terms and filters

Database	Search terms	Sort and filters used
Google	(migrant OR refugee OR asylum seeker OR displace) AND climate AND "health system"	Sorted by relevance
Google Scholar	(migrant OR refugee OR asylum seeker OR displace) AND climate AND "health system"	Date: 2014–2024 Sort by relevance, any type
ReliefWeb	(migrant OR refugee OR asylum seeker OR displace) AND climate AND "health system"	Language: English, date: 17 June 2014 to 17 June 2024
RefWorld	Climate, "health system"	Language: English, date: 17 June 2014 to 17 June 2024
WHO	Climate and migrant	No sort/filter
Active Learning Network for Accountability and Performance	migration, climate	Sort by relevance, date: 18 June 2014 to 18 June 2024
International Labour Organization	Climate health	Language: English, date: 2014–2024, topic: labour migration
IOM	"health" and "climate"	Date: 2014–2024, sort by latest

Database	Search terms	Sort and filters used
UNHCR	Health and climate	Date: 2014–2024, sort by relevance
IFRC		Filters: climate change, migration, date: 17 June 2014 to 17 June 2024, sort by relevance
World Bank	Climate health migrant	Language: English, date: 2014–2024, sort by relevance
OAIster	"climate" AND "health" AND "migrant"	Search results display: show all Language: all, date: 2014–2024 Audience: any audience Content type: any content Searching databases: all and OAIster
Science.gov	Climate health migrant	Date: 2014 – 2024, sort by rank
BMC Proceedings	Climate, migrant	Sort by newest first (manual cut off at 2013 or earlier)
Social Science Research Network	Climate, migrant, health	Search in title, abstract and key words, all dates displayed
UNICEF	Climate and health	Date: 7 March 2015 to 14 June 2024 Content: climate change, climate change and impacts, displacement, health, internal displacement, migrant and refugee crisis, migration, refugees
Trip Pro	Climate AND migrant	Date: 2014–2024, sort by relevance
Open Science Framework	Climate, migrant, health system	Sort by relevance
National Institute of Health	Climate AND migrant	Date: fiscal year 2014–2024 (only kept the most recent iterations), projects and news tabs
MedRxiv	Climate AND migrant	Date: 2014–2024, sorted by best match
ClimaHealth	Health AND migrant	No filter/sort

Database	Search terms	Sort and filters used
Climate Change and Human Health Literature Portal	migrant	Date: 2014–2023 (no 2024 results); sort by: year (recent first)
Connecting Climate Minds	No search bar	All documents under "Research & Action" tab
GreenFILE	Health and migrant	Date: 2014–2024, find all my search terms
Migrant Research Hub	Health and climate	Date: 2014–2021, language: English
International Migration Institute	1. Climate, Health 2. Climate (articles published 2014 onwards) 3. Health (articles published 2014 onwards)	No filter
United Nations Office on Drugs and Crime	Climate, migrant, health system	Sort by date
MSF	Climate	Sort by most recent
IOM Policy Development	Climate, Health	Filter: all content types, all topics

This search prioritized the general term "migrant" instead of "refugee" to simplify the search process, given the databases' limitations in handling complex queries, ensuring efficient screening of results from all 29 search engines. Despite this limitation, the available research was able to capture case studies and experiences of refugees and IDPs with many examples coming from MSF, IOM, United Nations Human Rights Council and the UNHCR's RefWorld. The search terms were adjusted depending on the database. For example, migrant-related websites were searched using terms related to "climate" and "health". Conversely, terms related to "climate" and "migrants" were used in health-related websites. By searching through a diverse selection of databases, grey literature on different migrant types, climate hazards and health care settings was collected. However, other migrant types such as international students, expatriates or victims of human trafficking did not appear in any of the searches. This could be due to the limitation of search terms used and databases chosen.

For each search engine, up to 200 entries, starting with the most recently published, were screened and then duplicates removed. Publications were screened based on title, abstract, summary and/or rapid keyword search in the full text when accessible.

Inclusion/exclusion criteria and screening process

Inclusion criteria were:

- published since 2014
- published in the English language
- of any type of article (original article, review, commentary).

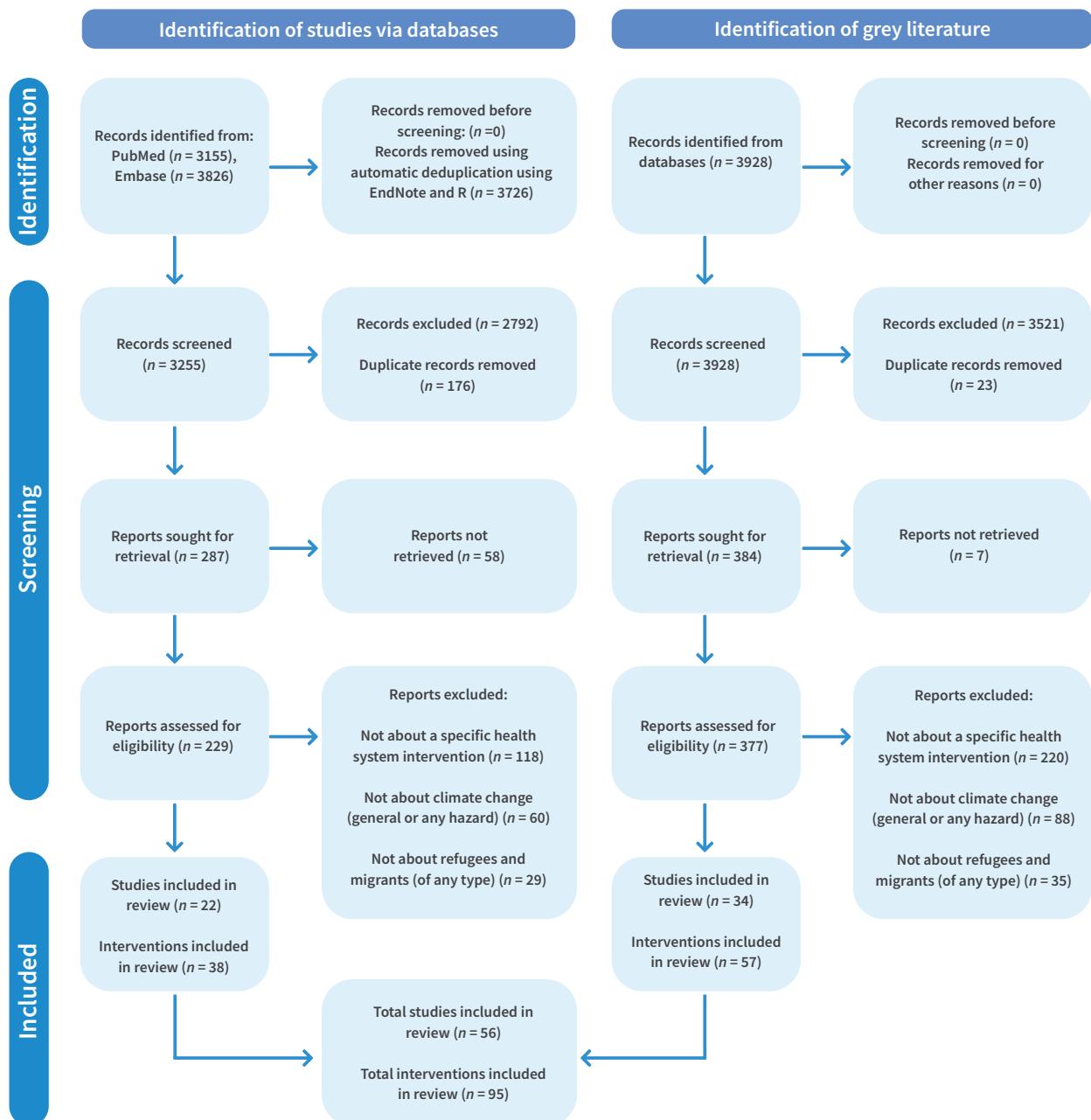
Exclusion criteria were:

- unavailable full text
- not describing a specific health system intervention
- not about refugees, migrants and displaced populations (of any type)
- not about climate change (general or any specific hazard).

Each publication underwent screening by two reviewers. The Principal Investigator helped to resolve discrepancies in screening outcomes between the two reviewers to make the final decision regarding inclusion.

Fig. A1.1. gives the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) breakdown of the results of the searches of the peer-reviewed and grey literature.

Fig. A1.1. Search strategy



Annex 2. Health system interventions identified in this review

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Include the needs of climate-affected displaced and migrant populations in climate and health policies and plans (n = 7)	Vanuatu National Disaster Management Office (1)	Vanuatu	Nonspecific	Nonspecific	The Government of Vanuatu and partners created the <i>National Policy on Climate Change and Disaster-induced Displacement</i> for populations affected by climate change-related displacement; the Policy's strategic area 7 covers health, nutrition and psychosocial well-being; the main objective is to provide equal access to health care for all climate-displaced populations
	United Nations Office for the Coordination of Humanitarian Affairs and Government of Ethiopia (2)	Ethiopia	IDP	Drought	The Ethiopia Humanitarian and Disaster Resilience Plan (2018) addressed the needs of nearly 1 million IDPs affected by recurrent droughts Key areas of focus included: <ul style="list-style-type: none">· enhancing WASH services by extending and developing water networks;· expanding health service coverage;· enhancing emergency preparedness; and· training communities to better manage water use

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Include the needs of climate-affected displaced and migrant populations in climate and health policies and plans (n = 7)	Republic of South Sudan and United Nations Development Programme (3)	South Sudan	IDP, refugee	Drought	South Sudan's Revised National Development Strategy 2021–2024 addressed gaps in policy implementation and aid services for IDPs, refugees and returnees by focusing on enhancing disaster management and early warning systems through staff training; the Strategy advocates for increased funding from Government and other stakeholders for disaster preparedness and response and resettlement assistance
	Regional Inter-Agency Standing Committee (4)	Angola, Lesotho, Madagascar, Malawi, Mozambique, Swaziland, Zimbabwe	IDP, refugee	Drought	The Regional Inter-Agency Standing Committee has developed a Response Plan for El Niño-related droughts in southern African countries, addressing humanitarian needs, resilience and climate and other impacts on migration trends; recommendations focus on water access, WASH integration to health services, disease screening for vulnerable populations, maintaining supplies, health worker training, immunization services, multisectoral approaches to health and nutrition and emergency preparedness considering La Niña risks

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Include the needs of climate-affected displaced and migrant populations in climate and health policies and plans (n = 7)	IFRC (5)	Mozambique	IDP	Flood	In response to flooding in Mozambique, the Mozambique Red Cross Society developed an Early Action Plan for Disaster Preparedness benefiting up to 7500 displaced or affected people; activities include providing health care, distributing mosquito nets, chlorine and other items to reduce outbreaks and activating volunteers and communication lines
	Doherty et al. (6)	Madagascar	IDP	Nonspecific	The Women's Integrated Sexual Health programme collaborated with the Malagasy Government to research climate change impacts on IDPs' access to sexual and reproductive health and family planning services and to what extent such services are incorporated into disaster response plans
	Spickett et al. (7)	No specified country	Nonspecific	Nonspecific	A guidance document has been produced to assist decision-makers and others to undertake assessment of potential health impacts and associated social implications arising from climate change; a section on vector-borne diseases considered refugees and migrants as a vulnerable population and that health promotion, diseases screening and health education should be considered as interventions for them

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Enhance coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations (n = 8)	Adalja et al. (8)	United States	Hospital evacuee	Cyclone/typhoon/hurricane/storm	<p>As part of the New York hospital system response to Hurricane Sandy, all hospitals activated their incident command systems and participated in the citywide unified command structure; hospitals also coordinated patient transfers for disaster evacuation purposes</p> <p>On 26 October, the New York State Department of Health and the New York City Department of Health and Mental Hygiene activated the interagency Healthcare Facility Evacuation Centre, involving other agencies such as the fire department and emergency medical services</p>
	Musoke et al. (9)	Sierra Leone	IDP	Mudslide, heavy rain	<p>Following a mudslide that occurred in Freetown, Sierra Leone, in 2017 due to 3 days of torrential rains, WHO supported the country's Public Health Emergency Operations Centre</p> <p>The Government, United Nations agencies and international NGOs coordinated health responses such as disease surveillance, case management, procurement of medical supplies and disease prevention activities for affected and displaced individuals</p>

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Enhance coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations (n = 8)	Shultz et al. (10)	Nicaragua	IDP	Cyclone/typhoon/hurricane/storm	In the wake of 2020 hurricanes Eta and Iota in Nicaragua, disaster response logistics planning was conducted through Sistema Nacional para la Prevención, Mitigación y Atención de Desastres, the Nicaraguan Government's disaster response agency. Multiple United Nations agencies, funds and programmes and international NGOs participated in the response (IOM, Plan International, Save the Children, UNICEF, World Food Programme)
	Valente et al. (11)	Italy	IDP	Heavy rain, flood	Following intense rainfall in Italy in May 2023, an emergency response plan was activated in coordination with local governments, rescue corps, local police, volunteers, the European Union and neighbouring countries; the worst-affected Emilia-Romagna Region activated seven rescue coordination centres and 160 municipal operation centres, utilized ambulances offered by NGOs and four helicopters for emergency services and employed specialized alpine rescue volunteers

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Enhance coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations (n = 8)	Clark-Ginsberg et al. (12)	United States	IDP, refugee	Cyclone/typhoon/hurricane/storm	In response to the displacement of people due to hurricanes (Katrina in the United States and Maria in Puerto Rico), Houston and Orlando formed a coalition of stakeholders to provide health care services to affected migrants; the coalition included core members of the health system, emergency response organizations and individual community members and organizations
	Clark-Ginsberg et al. (12)	United States	IDP, refugee	Cyclone/typhoon/hurricane/storm	For refugees and migrants in Houston and Orlando (United States) displaced by either Hurricane Katrina or Maria, private sector organizations, which mostly supported the physical health needs, and NGOs and churches, which provided mental health support, were engaged to support arriving refugees and migrants
	Clark-Ginsberg et al. (12)	United States	IDP, refugee	Cyclone/typhoon/hurricane/storm	Government agencies in the United States set up formal structures to coordinate health service access for refugees and migrants displaced by hurricanes In Florida, the Hispanic Office for Local Assistance connected migrants with health care services; in Louisiana, the Department of Health was the designated lead coordination agency under the public health and medical service emergency support function

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Enhance coordination of services across agencies in responding to the health needs of climate-affected displaced and migrant populations (n = 8)	Ashraf et al. (13)	Pakistan	IDP	Flood	In response to the 2022 Pakistan floods, the Khyber Pakhtunkhwa Department of Health coordinated with United Nations agencies to provide displaced women with maternal newborn and child health services and support, hygiene kits and baby and delivery kits; the district health officers of all districts coordinated with local organizations to establish safe shelter spaces for pregnant women
Involve displaced and/or relocated communities in the planning and implementation of health interventions (n = 1)	IFRC (5)	Namibia, Samoa, Yemen	IDP	Drought, flood, cyclone/typhoon/hurricane/storm	The IFRC engaged communities across various humanitarian responses In the Namibia Red Cross Society's 2021 response to worsening droughts, refugees and migrants were consulted to ensure equitable access to assistance, particularly for vulnerable groups In Yemen, the Yemen Red Cross Society integrated community perceptions and views into needs assessments, ensuring community participation during their operations in response to severe floods in 2021 In Samoa, the Samoa Red Cross Society involves household members in preparation of relocation sites for those displaced by tropical cyclones and provides household training in cleaning and maintaining rainwater harvesting systems

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Include climate-displaced migrants in the health system of receiving countries (n = 3)	UNHCR (14)	Ethiopia	IDP, refugee	Drought	Ethiopia hosts refugees and IDPs impacted by drought; its refugee policy involves inclusion of refugees in the national health care system and national strategic health plans, access to health services under the same terms as Ethiopian nationals, access to free services (TB, HIV and leprosy treatment; sexual and reproductive health services; vaccinations) at public health facilities in camp settings and continuity of care in secondary and tertiary health services in non-camp hospitals
	UNHCR (15)	Mali	Refugee	Nonspecific	Facing an influx of climate-displaced refugees from Burkina Faso and Niger, Mali maintains open borders and offers registered refugees the same rights as Malians, including access to health care and education; UNHCR also works with Malian organizations to provide refugees and IDPs essential services such as shelter and protection from gender-based violence, health care access and WASH facility improvements

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Governance (n = 19)					
Include climate-displaced migrants in the health system of receiving countries (n = 3)	Clark-Ginsberg et al. (12)	United States	IDP, refugee	Cyclone/typhoon/hurricane/storm	Health coalitions in Houston and Orlando (United States) offered health services to refugees and migrants displaced by hurricanes, including basic medication, diagnostic tests, acute care and mental health services; in Orlando, posttrauma services were scaled up and some providers operated at the airport to support arriving refugees and migrants
Health financing (n = 3)					
Allocate additional budget to improve health services and infrastructure for climate-affected displaced and migrant populations (n = 2)	UNHCR (16)	No country specified	IDP, refugee	Nonspecific	The UNHCR Climate Resilience Fund was launched in 2024, aiming to raise US\$ 100 million by the end of 2025 for climate-affected refugees and displaced communities; the Fund will increase sustainable energy in displacement settings; support restoration; invest in climate-resilient infrastructure and livelihoods; reduce the environmental impact of humanitarian responses; and prioritizing local projects involving affected communities

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health financing (n = 3)					
Allocate additional budget to improve health services and infrastructure for climate-affected displaced and migrant populations (n = 2)	IFRC (5)	Yemen	IDP	Flood	A Disaster Relief Emergency Fund was launched in respective Red Cross and Red Crescent societies in response to disasters and emergencies; funding was able to support the Yemen Red Crescent Society for over 6 months, providing immediate needs such as household materials and hygiene kits to 1000 households affected by floods, with priorities for IDPs and host communities
Improve the breadth of health insurance coverage to include climate-affected displaced and migrant populations (n = 1)	Quast (17)	United States	IDP	Cyclone/typhoon/hurricane/storm	After Hurricane Katrina hit in 2005, the United States Government implemented the Section 1115 Medicaid Emergency Waivers, which allowed the States to expedite the Medicaid coverage to displaced individuals by streamlining documentation and income requirements; the Texas waiver programme (TexKat) was the largest programme, which included an urgent medical care delivery phase for the first month and a health care coverage phase for the next 5 months

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health workforce (n = 16)					
Train health workers and build their competencies to meet the health needs of climate-affected displaced and migrant populations (n = 9)	WHO (18)	No country specified	Nonspecific	Nonspecific	The WHO Refugee and migrant health toolkit is designed to be used by WHO Member States, WHO country offices, United Nations partners, nongovernmental actors and health professionals working in refugee and migrant health; the toolkit includes a module on climate change (Tool 10)
	ClimaHealth (19)	Myanmar	IDP	Cyclone/typhoon/hurricane/storm	PATH (international, not-for-profit global health organization) and WHO integrated climate and health responses to Cyclone Mocha in Myanmar through emergency MHPSS services and building mental health intervention capacity among local community-building organizations through training programmes, which were expected to be completed by December 2023 The training programme is a scalable model for vulnerable communities globally

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health workforce (n = 16)					
Train health workers and build their competencies to meet the health needs of climate-affected displaced and migrant populations (n = 9)	Rabbani et al. (20)	Pakistan	IDP	Flood	The mPareshan intervention, a feasibility study by Aga Khan University from 2021 to 2022, aimed to improve mental health in flood-displaced and affected communities in Badin District, Pakistan, through training female health workers and supervisors in communication and counselling using a WHO-adapted curriculum; the second phase implemented a digital app, mPareshan, which provided psychoeducational counselling and referral services
	Amsalu et al. (21)	Somalia	IDP	Nonspecific	Save the Children, in coordination with the Puntland Ministry of Health, facilitated an 8-day Helping Babies Survive training course in 2016 and a subsequent 14-day master trainer course in 2019; health care providers in Bossaso City, Somalia, were trained on maternal health, intrapartum care, supportive supervision and health information systems for displaced populations

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health workforce (n = 16)					
Train health workers and build their competencies to meet the health needs of climate-affected displaced and migrant populations (n = 9)	IFRC (5)	Samoa	IDP	Flood	To prevent vector-borne diseases such as filariasis after heavy floods in Samoa between 2016 and 2019, which displaced many, volunteers from Samoa's Red Cross Society captured mosquitos, removed potential breeding sites and were trained in blood sample collection for microfilaria detection
	IOM (22)	Brazil	IDP, refugee	Nonspecific	Since 2023, IOM has provided technical support and training for health care workers in border municipalities of Brazil to address climate change-related health risks among migrating groups; the IOM has also provided equipment and supplies for these municipalities and increased awareness of prevention and treatment of climate-related health issues
	MSF (23)	South Sudan	IDP	Flood	In 2023 the MSF Academy for Healthcare began training South Sudanese health care workers in several states to strengthen competencies and improve quality of care in areas with high displacement and fragile health systems aggravated by violence and severe floods

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health workforce (n = 16)					
Train health workers and build their competencies to meet the health needs of climate-affected displaced and migrant populations (n = 9)	Evans et al. (24)	United States	Nonspecific	Nonspecific	The Rollins School of Public Health of Emory University offers the Graduate Certificate in Humanitarian Emergencies, field practice programmes and a complex humanitarian emergency fellowship to prepare health care professionals for complex humanitarian emergencies, including climate-related disasters and displacements; the Certificate programme serves as foundational training, while the field practice and fellowship facilitate work experience in complex humanitarian emergency settings
	Williams and Downs (25)	No country specified	Nonspecific	Nonspecific	The Introduction to Complex Humanitarian Emergencies course was designed to prepare nurses in addressing the health needs of displaced populations following climate change, natural disasters or conflicts; the course was developed using the Sphere Humanitarian Charter and Minimum Standards as the practical framework, in consultation with resettled refugees and experts on the field of humanitarian response

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health workforce (n = 16)					
Expand health workforce capacity in response to climate-related events and emergencies (n = 7)	World Bank Group (26)	Mali	IDP	Nonspecific	In Mali, where climate change remains one of the leading drivers of conflict and displacement in the Sahel region, the Government incentivizes civil servants such as health workers to be assigned in areas of dire need; cash incentives vary depending on local ministries and external assistance
	Clark-Ginsberg et al. (12)	United States	Refugee	Cyclone/typhoon/hurricane/storm	In response to Orlando's new refugee and migrant population arriving after Hurricane Maria in 2017, staff changes across Orlando's health system were made, with more qualified bilingual staff and volunteers hired to meet the needs of the new, predominantly Spanish-speaking population from Puerto Rico
	Adalja et al. (8)	United States	Hospital evacuee	Cyclone/typhoon/hurricane/storm	In response to Hurricane Sandy, New York hospitals focused on augmenting and supporting hospital staff to manage the increased influx of evacuated patients by creating sleeping quarters for employees, organizing meals and planning for employees to remain on site for 72 hours; facilities that received evacuated patients also used displaced health professionals to alleviate pressures from the patient surge

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health workforce (n = 16)					
Expand health workforce capacity in response to climate-related events and emergencies (n = 7)	Shultz et al. (10)	Nicaragua	IDP	Cyclone/typhoon/hurricane/storm	In the wake of 2020 Hurricanes Eta and Iota in Nicaragua, the Pan American Health Organization/WHO Regional Office for the Americas brought in almost 20 medical teams for deployment in Puerto Cabezas and surrounding municipalities to assist those displaced, responding to reports of low health workforce capacity
	IFRC (5)	Mozambique	IDP	Cyclone/typhoon/hurricane/storm	A Red Cross field hospital was deployed in Mozambique to provide health services to those displaced by 2019 tropical Cyclone Idai; Red Cross doctors and nurses worked with local health providers to strengthen district hospital capacity through WASH, deliver supplies, support operating rooms and maternal wards and assist with surgeries
	Valente et al. (11)	Italy	IDP	Heavy rain/flooding	Following intense rainfall that occurred in Italy in May 2023, the Crisis Unit of the Ferrara Province activated extra family and community nurses, which provided primary health care to people displaced, alongside general practitioners, who voluntarily provided extra support

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health workforce (n = 16)					
Expand health workforce capacity in response to climate-related events and emergencies (n = 7)	Kanter and Abramson (27)	United States	IDP	Cyclone/typhoon/hurricane/storm	Responding to the 2011 tornado in Joplin (Missouri, United States), staff from public and private schools were trained in reassurance techniques, classroom mental health interventions and recognizing serious symptoms for referral; licenced mental health counsellors were also hired to support displaced schoolchildren
Medicine and supplies (n = 3)					
Ensure the availability of medical supplies for climate-affected displaced and migrant populations (n = 3)	Shultz et al. (10)	Nicaragua	IDP	Cyclone/typhoon/hurricane/storm	In response to Hurricanes Eta and Iota in Nicaragua, UNICEF distributed nutritional supply kits and personal protective equipment for 1000 health workers, and international NGOs provided chlorine, hygiene kits, water filters and leptospirosis treatment for those displaced In neighbouring Honduras, the Pan American Health Organization/WHO Regional Office for the Americas and WHO donated 40 000 antigen tests and 300 000 polymerase chain reaction tests to improve early COVID-19 detection

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Medicine and supplies (n = 3)					
Ensure the availability of medical supplies for climate-affected displaced and migrant populations (n = 3)	Shultz et al. (10)	South Sudan	IDP	Cyclone/typhoon/hurricane/storm	The Women's Integrated Sexual Health programme supported the Boma Health Initiative and community health workers in South Sudan; flood-displaced women and girls in Rubkona and Aweil East were given access to oral pills, condoms, injectables and referrals for long-acting reversible contraceptives
	Doherty et al. (6)	Somalia	IDP	Flood	Between May 2023 and May 2024, the IOM provided menstrual hygiene kits and sanitary pads to flood-displaced women and girls in Danyar Refugee Camp in Somalia
Health information systems (n = 4)					
Establish integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations (n = 4)	Shortus et al. (29)	Solomon Islands	IDP	Flood	After flash floods in 2014 displaced people in the Solomon Islands, dengue outbreaks increased; in response, a paper-based Early Warning Alert and Response Network was established to monitor diseases, and the National Surveillance Unit used syndromic surveillance to collect data on eight diseases from sentinel sites

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health information systems (n = 4)					
Establish integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations (n = 4)	Musoke et al. (9)	Sierra Leone	IDP	Mudslide, heavy rain	In response to the 2017 Freetown mudslide in Sierra Leone, which displaced over 5000 people, the Ministry of Health, supported by WHO, aimed to improve weekly reporting of priority diseases through the Integrated Disease Surveillance and Response system; nine health facilities submitted daily reports and shared in weekly epidemiological bulletins in the Public Health Emergency Operations Centre that covered children's diarrhoeal symptoms, suspected cholera and typhoid fever
	Mugabe et al. (30)	Mozambique	IDP	Cyclone/typhoon/hurricane/storm	In response to the cholera outbreak following the onslaught of Cyclones Idai and Kenneth in Mozambique, a multisectoral and multidisciplinary task force was formed to carry out active surveillance, case detection and investigation, laboratory diagnosis and management of suspected cholera cases; the surveillance was combined with WASH interventions and social mobilizations that involved door-to-door health promotion and education strategies regarding proper hygiene and vaccination for displaced populations

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Health information systems (n = 4)					
Establish integrated surveillance systems for monitoring climate-sensitive health risks and outcomes among climate-affected displaced and migrant populations (n = 4)	ClimaHealth (19)	Bangladesh	Refugee	Nonspecific	In 2021 the International Centre for Diarrhoeal Disease Research in Bangladesh implemented a waste-water surveillance programme in a refugee camp to detect climate-sensitive infections, such as <i>Vibrio cholerae</i> and <i>Salmonella typhi</i> ; the programme has been expanded in two cities through a joint effort involving the Government and multilateral organizations
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	IFRC (5)	Mozambique	IDP	Cyclone/typhoon/hurricane/storm	After tropical Cyclone Idai in Mozambique in 2019, the Mozambique Red Cross Society managed cholera outbreaks through providing clean water, treating water sources, repairing hand pumps and building latrines; a 36-bed cholera treatment unit was established, serving 114 055 people with emergency shelter kits and supporting 28 712 IDPs in camps with WASH services

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	IFRC (5)	Namibia	Refugee	Drought	The Namibia Red Cross Society distributed over 20 000 water purification tablets, jerry cans, hand sanitizers and hygiene kits to Angolan refugees (displaced by droughts) in Namibia, while 17 handwashing stations were set up; health education on TB, malaria, COVID-19 and other communicable diseases was also provided
	IFRC (5)	Yemen	IDP	Flood, heavy rain	In response to the 2021 rains and floods, volunteers of the Yemen Red Crescent Society distributed food and non-food items such as shelter kits and personal hygiene kits to affected people, including IDP families; volunteers also provided first aid, evacuation, ambulance services and MHPSS services
	IFRC (5)	Iraq	IDP	Drought	In 2021 a Disaster Relief Emergency Fund was approved targeting 43 116 people in Iraq displaced by climate-exacerbated water shortages; the Iraqi Red Crescent Society deployed mobile health teams, providing medical supplies and health education to 40 870 individuals and a WASH intervention ensured clean water and sanitation for 7186 households, including displaced returnees in camps

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	IFRC (5)	Germany	IDP	Flood, heavy rain	Responding to displacement from July 2021 storms, the German Red Cross provided drinking-water, food, accommodation, electricity, psychological help and mobile clinics with a fully equipped emergency practice (two treatment rooms, a laboratory and sonography, with capacity to treat 100 patients a day); the German Red Cross established an emergency waste-water treatment facility originally designed for use in Bangladesh and a modular facility providing shelter, electricity, WASH, communications and essential services
	IOM (31)	Somalia	IDP	Flood	In 2023 IOM supported the Somalian Ministry of Health after flash floods and other climate disasters increased displacement; seven health care facilities and 20 mobile clinics provided around 300 000 primary health care consultations, 73 000 routine vaccinations for children and 260 000 systematic malnutrition screenings for children under-5 years and pregnant and lactating women

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	Benkrityl and Hujale (32)	South Sudan	Refugee	Flood	In 2023 UNHCR worked with South Sudan's Government to provide refugees with emergency assistance at the transit centre near the Sudan–South Sudan border, where camps experience flood risks; assistance included water, food, sanitation facilities and primary health care
	Hujale (33)	Somalia	IDP	Cyclone/typhoon/hurricane/storm	In 2020 Cyclone Gati hit Bossaso, Somalia's coastal settlements hosting IDPs facing extreme temperatures, water shortages and floods; in response, UNHCR airlifted relief items to hard-hit areas in the Bari Region
	MSF (23)	South Sudan	IDP	Flood	In 2023 MSF teams supported at-risk communities (including flood-affected IDPs) in South Sudan by running health clinics, outreach and disease prevention activities and training community health care workers in remote areas
	Lien et al. (34)	United States	IDP	Cyclone/typhoon/hurricane/storm	In response to Hurricane Sandy in 2012, the North Shore Long Island Jewish Health System launched a mobile health unit operation to serve displaced populations at no cost and without requiring insurance; operating for 64 days, the mobile health unit included community needs assessment, preparation, staff recruitment and evaluation; pharmacies donated vaccines and medical supplies

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	Sood et al. (35)	United States	IDP	Cyclone/typhoon/hurricane/storm	After Hurricane Sandy in New York, organizations ensured continued access to primary care through mobile health clinics; on 5 November 2012, the Mayor's administration deployed six mobile health clinics staffed with primary care providers to deliver free medical care and prescription drugs to affected residents, supporting those who were uninsured or lost access to medications during evacuation
	Valente et al. (11)	Italy	IDP	Heavy rain, flood	Responding to intense rainfall in May 2023 in Italy, general practitioners distributed free medicine in evacuation centres, while mobile clinics called Socio-Sanitary Assistance Posts offered nursing and medical services and health promotion leaflets were distributed to those displaced; in flooded areas, health institutions monitored gastrointestinal, cutaneous and respiratory infections and authorities recommended tetanus toxoid boosters
	UNHCR (36)	Horn of Africa	IDP, refugee	Nonspecific	In this region where climate change exacerbates poor living conditions of refugees and IDPs, UNHCR supported health facilities to enhance nutritional assistance for women and children through high-nutrient feeding and medical treatment

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	MSF (37)	Chad	IDP	Flood	In response to 2022 flooding in Chad, MSF collaborated with the Chad Ministry of Health to establish and run mobile clinics in displacement sites and to support existing health centres where people sought shelter; MSF provided basic health care, nutritional support, vaccinations, water supply, sanitation services and consultations for malaria, respiratory tract infections and diarrhoea
	MSF (38)	Malawi	IDP	Cyclone/typhoon/hurricane/storm	Responding to the aftermath of Cyclone Freddy in Malawi in 2023, MSF provided support to the local hospital by donating medical supplies and allocating staff to treat patients and undertake orthopaedic surgeries; in evacuation camps, MSF provided clean water and chlorine to purify drinking-water, rehabilitated water networks, emptied latrines and distributed blankets and cooking equipment

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	Musoke et al. (9)	Sierra Leone	IDP	Mudslide, heavy rain	As part of Sierra Leone's response to the 2017 Freetown mudslide that displaced 5905 people, essential services were provided at no cost in clinics that served affected populations and new clinics established at IDP sites; services provided include reproductive health services, treatment of children, TB and HIV treatment, access to safe drinking-water, water quality monitoring, hand washing stations and distribution of body bags
	Musoke et al. (9)	Sierra Leone	IDP	Mudslide, heavy rain	Following a mudslide that occurred in Freetown, Sierra Leone in 2017 because of 3 days of torrential rains, additional clinics were temporarily established at sites for IDPs; partner agencies and organizations supported the provision of health care in these temporary facilities
	Kearns et al. (39)	United States	IDP	Cyclone/typhoon/hurricane/storm	Responding to the 2014 tornado that hit Louisville (United States), a mobile hospital was established that could respond and assist post disaster; it included a five-bed emergency department, an 11-bed inpatient acute care unit, a central medical supply, a laboratory, a pharmacy and a radiology unit

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	Adalja et al. (8)	United States	Hospital evacuee	Cyclone/typhoon/hurricane/storm	Learning from Hurricane Irene, New York hospitals anticipated requests to absorb a limited number of patients from hospitals within their individual system while responding to Hurricane Sandy; precautions were taken to ensure hospitals were prepared to shelter in place and receive evacuated patients; efforts included proactive management of the in-hospital census, adjusting operating room schedules, enhancing security, scheduling supply deliveries to arrive early and ensuring adequate staffing levels and accommodations; receiving hospitals also suspended elective surgeries for approximately 2 days to free operating room space
	Adalja et al. (8)	United States	Hospital evacuee	Cyclone/typhoon/hurricane/storm	To meet the needs of displaced residents in New York, the New York City Department of Health and Mental Hygiene opened eight medical shelters staffed by volunteer health professionals

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide humanitarian response and health services during climate-related emergencies (n = 21)	UNHCR (40)	Somalia	IDP	Drought	In 2022 UNHCR and humanitarian partners assisted drought-displaced populations in Somalia through delivering shelter materials and hygiene items; separated and unaccompanied children were provided with medical assistance, psychosocial support, counselling and safe spaces to protect against forced child recruitment
Ensure access to health services to displaced populations in climate-affected protracted crises (n = 6)	MSF (41)	South Sudan	IDP	Flood	In South Sudan in 2023, MSF shifted from an emergency care response to comprehensive, decentralized medical care to flood-affected IDPs through an 86-bed hospital, two health posts and four community sites in camps, providing outpatient consultations, emergency care, maternal care, chronic disease care (e.g. for TB and HIV) and psychological support; consultations at camps and nearby health posts were provided
	Lindvall et al. (42)	Somalia	IDP	Nonspecific	IDPs displaced by conflicts and climate change and living in camps in Somalia have full and free access to basic public health services such as vaccinations and maternal and child care; however, tertiary and specialized services such as surgery are not free

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Ensure access to health services to displaced populations in climate-affected protracted crises (n = 6)	Lindvall et al. (42)	Kenya	IDP, refugee	Drought	Drought-displaced refugees and migrants arriving in formally designated camps in Kenya undergo a standardized health screening for malnutrition and diseases (e.g. viral haemorrhagic fever, poliomyelitis) and are also asked about their vaccination status; to ensure continuation of care for TB and HIV, counsellors provide free treatment for concerned individuals
	Bourgois (43)	Chad	IDP, returnee	Flood	Due to severe floods in the northern region of Cameroon in 2021, 12 500 people fled across the Logone river to Chad; 2 months after this, 4000 returned while close to 9000 remained in Chad; the UNHCR and the United Nations Refugee Agency collaborated with NGO partners and Chadian authorities to provide IDPs and returnees with shelter, health care and other basic necessities
	IFRC (5)	Guatemala, Honduras	Refugee	Nonspecific	The Honduran Red Cross activated humanitarian service points at the point of departure and along the route of migrating caravans where people are vulnerable to climate hazards; these points provided migrants with water, face masks, prehospital care and information about safety, security and COVID-19 prevention

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Ensure access to health services to displaced populations in climate-affected protracted crises (n = 6)	IOM (22)	Bangladesh	Refugee	Nonspecific	IOM has provided solar power systems to informal camps hosting Rohingya in Cox's Bazar, Bangladesh; IOM has 27 facilities equipped with solar photovoltaic systems in Bangladesh, including four health facilities, women and girls' safe spaces and water supply networks and 100 climate-resilient community clinics
Provide mental health interventions for climate-affected displaced and migrant populations (n = 8)	Kanter and Abramson (27)	United States	IDP	Cyclone/typhoon/hurricane/storm	After schoolchildren were displaced by the 2011 tornado in Joplin (Missouri, United States), public school psychologists sent surveys to parents to identify children who needed counselling and facilitated selective referrals to mental health providers for children with the greatest needs
	Valente et al. (11)	Italy	IDP	Heavy rain, flood	As part of Italy's emergency response measures following intense rainfall in May 2023, over 120 psychologists who specialize in emergency mental care were deployed to offer psychological support to displaced populations; psychological services were subsequently expanded to the rest of the population

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide mental health interventions for climate-affected displaced and migrant populations (n = 8)	Musoke et al. (9)	Sierra Leone	IDP	Heavy rain, mudslide	Following a mudslide that occurred in Freetown, Sierra Leone in 2017, WHO supported 21 mental health nurses to provided psychological first aid and intensive listening forums for displaced populations and front-line workers; teachers were also trained to support children with distress
	Lalani et al. (44)	Canada	IDP	Wildfire	After displacement from the 2016 wildfire in Alberta, Canada, populations in Fort McMurray received young people and family-focused mental health programmes, including peer mentorship, mindfulness and counselling; programmes taught coping strategies and emotional regulation, alongside a "Journey of Hope" initiative to support families and children's mental health
	Taioli et al. (45)	United States	IDP	Cyclone/typhoon/hurricane/storm	Project Restoration provided mental health services to displaced populations after Hurricane Sandy hit the United States in 2012; individuals in high-risk areas in the Rockaways were screened for mental and behavioural issues and then linked to care at the Far Rockaway Treatment Centre

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Provide mental health interventions for climate-affected displaced and migrant populations (n = 8)	Alam et al. (46)	Bangladesh	Refugee	Flood, cyclone/typhoon/hurricane/storm	Bangladesh faces climate-related disasters, affecting Rohingya; mental health services were integrated into basic care following WHO's mhGAP guidelines; primary health care providers are trained in mhGAP methods and patients with severe issues are referred to district hospitals for specialized care
	Bharadwaj and Huq (47)	India	IDP	Nonspecific	A migration helpline in Jharkhand, India, has been helping climate-displaced migrants in distress through counselling
	WHO (48)	Burkina Faso	IDP	Nonspecific	The Integrated Production Diversification and Nutritional Improvement programme in Burkina Faso enhances food security and raises awareness of climate change and resource management techniques among IDPs; it includes MHPSS service components to address mental health stressors, establish community support groups, integrate basic mental health care in nonspecialized settings and promote the rights of those with psychosocial disabilities

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Improve WASH services for climate-affected displaced and migrant populations (n = 13)	IOM (31)	Somalia, Yemen	IDP, in-transit	Drought, flood	In 2023 IOM provided essential health and WASH services in Somalia and Yemen to address acute watery diarrhoea and cholera response and prevention in the wake of climate-related droughts and floods; this included direct assistance in hotspots for over 26 000 IDPs and host community members, the establishment of 12 water points along refugee and migrant routes, joint hygiene promotion and solid waste management activities, oral cholera vaccination campaigns and cholera treatment kits
	Negussie (28)	Somalia	IDP	Heavy rain, drought	IOM provided WASH services for the menstrual hygiene of IDPs in Danyar Refugee Camp, Somalia, which has experienced both torrential rains and drought; between May 2023 and May 2024, IOM distributed hygiene kits and sanitary pads to nearly 60 000 families, constructed nearly 2800 sanitary structures and conducted reproductive health hygiene promotion and awareness sessions for nearly 700 000 people

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Improve WASH services for climate-affected displaced and migrant populations (n = 13)	Akbar (49)	Pakistan	IDP, returnee	Flood	Responding to Pakistan's 2022 floods, which destroyed houses and latrines of those fleeing the flood, IOM constructed latrines, handwashing stations and lead-line hand pumps in affected villages and conducted WASH awareness sessions on hygiene techniques and waterborne disease risks for those returning to their homes
	Viray (50)	Ethiopia	IDP	Drought	In collaboration with local water offices of drought-stricken communities in Ethiopia, IOM provided safe drinking-water to 7500 individuals by constructing solar-operated water systems; IOM has also provided potable drinking-water across Ethiopia through emergency water trucking, constructing and rehabilitating WASH facilities, distributing WASH items and promoting hygiene awareness to drought-affected populations and host communities
	UNICEF (51)	Ethiopia	IDP	Drought	In response to Ethiopia's drought, conflict and COVID-19, in 2021 UNICEF's WASH programme reached 14 million people through emergency water trucking, repairing water systems and providing hygiene kits; sanitation interventions and a mass handwashing campaign further supported displaced communities and transit centres

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Improve WASH services for climate-affected displaced and migrant populations (n = 13)	UNICEF (51)	Afghanistan	IDP	Drought	In 2021 UNICEF responded with WASH interventions to Afghanistan's humanitarian crisis caused by the political situation coupled with a severe drought; interventions included support and supplies for water system chlorination, water trucking, delivery of water and sanitation services and schools and hygiene promotion nationally
	UNICEF (51)	Yemen	IDP	Nonspecific	In 2021 UNICEF's WASH programme in Yemen targeted IDP camps, rehabilitating water and sanitation systems, delivering gender-responsive hygiene kits and promoting handwashing for COVID-19 and cholera prevention; the programme also trained over 600 technicians on climate-resilient sanitation safeguards
	UNICEF (52)	Mozambique	IDP	Drought	In response to the 2016–2017 Mozambique drought, UNICEF installed multiuse solar-powered water systems on 54 boreholes and rehabilitated 98 boreholes, improving water access for more than 95 000 people; in 2019 these systems operated throughout the cyclone period, supporting previously and newly displaced communities who lost safe water access, without relying on water trucking

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Improve WASH services for climate-affected displaced and migrant populations (n = 13)	UNHCR (36)	Horn of Africa	IDP, refugee	Nonspecific	In this region where climate change exacerbates the living conditions of refugees and IDPs, UNHCR provides access to water through water trucking, drilling of additional boreholes and rehabilitation of existing water and sanitation systems
	Chiriac (53)	Yemen	IDP	Nonspecific	IOM helped to rehabilitate the water supply system of Yakhtol, Yemen, constructing a collective water tank, installing solar pumping units and a generator and setting up an equipment room; this provided 14 000 people with access to clean water in the district; IDPs residing in these communities have faced disrupted access to clean water due to climate change and land degradation
	Mohammed (54)	Yemen	IDP	Drought	IOM, in collaboration with the local Water Corporation of At Turbah, Yemen, established a solar power system providing clean water to communities experiencing displacement and drought; IOM teams conducted cleaning and awareness campaigns for residents and organized operation and management sessions for the water committee overseeing the wells

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Improve WASH services for climate-affected displaced and migrant populations (n = 13)	IFRC (5)	Samoa	IDP	Heavy rain, sea level rise	Building on its WASH and rainwater harvesting experience from the 2009 tsunami, the Samoa Red Cross Society has become the lead implementing agency in the national WASH sector for rainwater harvesting; it is annually requested by the Government to install household rainwater harvesting systems and ventilated latrine systems; the Society has successfully advocated for mandatory rainwater harvesting systems in new structures to increase resilience for relocated households
	Hirani (55)	Bangladesh	Refugee	Nonspecific	OXFAM (an NGO) constructed a communal female WASH unit that includes private toilets, showers and laundering areas to provide privacy and improve menstrual hygiene for women and girls in Rohingya camps, which are prone to climate-exacerbated floods and face difficulties in waste disposal; some units had an innovative discrete chute system used to dispose menstrual products

Intervention type	Source	Country/region	Migrant type	Climate hazard	Brief summary
Service delivery (n = 50)					
Ensure access to vaccines for climate-affected displaced and migrant populations (n = 2)	Mysamboza et al. (56)	Malawi	IDP	Flood	In response to Malawi's 2014 cholera outbreak, a mass campaign to provide oral cholera vaccine was conducted by a National Task Force involving Malawi's Ministry of Health and partners; the campaign comprised a coordination and monitoring workshop and a vaccine campaign targeting 160 000 flood-displaced camp residents and surrounding communities in the Nsanje district; health care and community workers administered 91.9% of the received doses of oral cholera vaccine
	Musoke et al. (9)	Sierra Leone	IDP	Heavy rain, mudslide	As part of Sierra Leone's response to the 2017 mudslide, an oral cholera vaccine campaign was implemented among affected and displaced populations aged 1 year and over; WHO supported community health workers and community leaders in administering 518 013 vaccines across two campaigns

MHPSS: mental health and psychosocial support; TB: tuberculosis.

References¹

1. Vanuatu: national policy on climate change and disaster-induced displacement. Port Villa: Vanuatu National Disaster Management Office; 2018 (<https://www.refworld.org/policy/strategy/natlegbod/2018/en/121425>).
2. Ethiopia 2018: humanitarian and disaster resilience plan. Addis Ababa: United Nations Office for the Coordination of Humanitarian Affairs and the Government of Ethiopia; 2018 (<https://www.refworld.org/policy/legalguidance/ocha/2018/en/121068>).
3. Revised national development strategy 2021–2024: consolidate peace and stabilize the economy. Juba: Republic of South Sudan and United Nations Development Programme; 2022 (<https://www.refworld.org/policy/strategy/natlegbod/2022/en/147818>).
4. RIASCO action plan for southern Africa: response plan for the El Niño-induced drought in southern Africa May 2016–April 2017. Geneva: Regional Inter-Agency Standing Committee; 2016 (<https://library.alnap.org/help-library/riasco-action-plan-for-southern-africa-response-plan-for-the-el-nino-induced-drought-in>).
5. Displacement in a changing climate: localized humanitarian action at the forefront of the climate crisis. Geneva: International Federation of Red Cross and Red Crescent Societies; 2021 (<https://www.ifrc.org/sites/default/files/2021-11/2021-Climate-Displacement-Report-Final.pdf>).
6. Doherty P, Wheeler E, Mochache V, Mark TJ, Lutah G, Bero B et al. Considerations for program managers to improve sexual and reproductive health services for displaced populations. Glob Health Sci Pract. 2023;11(4):e2300036 (<https://doi.org/10.9745/ghsp-d-23-00036>).
7. Spickett J, Katscherian D, Brown H. Climate change, vulnerability and health guide. Perth: Curtin University WHO Collaborating Centre for Climate Change and Health Impact Assessment; 2015 (<https://doi.org/10.17605/OSF.IO/K38SW>).
8. Adalja AA, Watson M, Bouri N, Minton K, Morhard RC, Toner ES. Absorbing citywide patient surge during Hurricane Sandy: a case study in accommodating multiple hospital evacuations. Ann Emerg Med. 2014;64(1):66–73.e61 (<https://doi.org/10.1016/j.annemergmed.2013.12.010>).
9. Musoke R, Chimbaru A, Jambai A, Njuguna C, Kayita J, Bunn J et al. A public health response to a mudslide in Freetown, Sierra Leone, 2017: lessons learnt. Disaster Med Public Health Prep. 2020;14(2):256–64 (<https://doi.org/10.1017/dmp.2019.53>).
10. Shultz JM, Berg RC, Kossin JP, Burkle Jr F, Maggioni A, Pinilla Escobar VA et al. Convergence of climate-driven hurricanes and COVID-19: the impact of 2020 hurricanes Eta and Iota on Nicaragua. J Clim Change Health. 2021;3:100019 (<https://doi.org/10.1016/j.joclim.2021.100019>).

¹ All references were accessed on 30 March 2025.

11. Valente M, Zanellati M, Facci G, Zanna N, Petrone E, Moretti E et al. Health system response to the 2023 floods in Emilia-Romagna, Italy: a field report. *Prehosp Disaster Med.* 2023;38(6):813–17 (<https://doi.org/10.1017/S1049023X23006404>).
12. Clark-Ginsberg A, Becerra-Ornelas A, Chandra A. Capacities of health systems in climate migrant receiving communities: insights in the US Gulf Coast. Washington, DC: Urban Institute; 2023 (<https://issuelab.org/resources/43676/43676.pdf>).
13. Ashraf M, Shahzad S, Sequeria P, Bashir A, Azmat SK. Understanding challenges women face in flood-affected areas to access sexual and reproductive health services: a rapid assessment from a disaster-torn Pakistan. *BioMed Res Int.* 2024;(1):1113634 (<https://doi.org/10.1155/2024/1113634>).
14. Ethiopia: refugee policy review framework update as of 30 June 2023. Geneva: United Nations High Commissioner for Refugees; 2024 (<https://data.unhcr.org/en/documents/details/107226>). Licence: CC BY-4.0.
15. Support urgently needed to avert a deeper Sahel crisis, UNHCR's protection chief warns [news release]. United Nations High Commissioner for Refugees; 25 March 2024 (<https://www.unhcr.org/news/press-releases/support-urgently-needed-avert-deeper-sahel-crisis-unhcr-s-protection-chief>).
16. UNHCR launches fund to shield refugees and other displaced people from climate shocks [news release]. United Nations High Commissioner for Refugees; 24 April 2024 (<https://www.unhcr.org/news/press-releases/unhcr-launches-fund-shield-refugees-and-other-displaced-people-climate-shocks>).
17. Quast T. Healthcare utilization by children with asthma displaced by Hurricane Katrina. *J Asthma.* 2018;55(4):416–23 (<https://doi.org/10.1080/02770903.2017.1339244>).
18. Module 3: tackling the social determinants of health and workers' and occupational health and safety; tool 10: climate change. In: Refugee and migrant health toolkit [online application]. World Health Organization; 2015 (<https://www.who.int/tools/refugee-and-migrant-health-toolkit/module-3/tool-10>).
19. Climate and health solutions space [website]. ClimaHealth; 2021 (<https://climahealth.info/climate-and-health-solutions-space/>).
20. Rabbani F, Siddiqui A, Merali Z. Responding to mental health challenges of flood-affected communities through technology-driven local solutions in Pakistan: the mPareshan Project. Karachi: Brain and Mind Institute and Department of Community Health Sciences, Aga Khan University; 2022 (<https://hub.connectingclimateminds.org/research-and-action/case-studies/14>).
21. Amsalu R, Schulte-Hillen C, Garcia DM, Lafferty N, Morris CN, Gee S et al. Lessons learned from helping babies survive in humanitarian settings. *Pediatrics.* 2020;146 (suppl 2):S208–17 (<https://doi.org/10.1542/peds.2020-016915L>).

22. Climate change impacts on health: affecting development and human mobility. Geneva: International Organization for Migration; 2023 (https://www.iom.int/sites/g/files/tmzbdl486/files/documents/2024-01/iom-health_climate-change_position-paper_21.12.2023.pdf). Licence: CC BY-NC-ND 3.0 IGO.
23. Unshattered hope in the face of adversity in South Sudan [blog]. Médecins Sans Frontières; 15 November 2023 (<https://www.msf.org/unshattered-hope-face-adversity-south-sudan>).
24. Evans DP, Anderson M, Shahpar C, del Rio C, Curran JW. Innovation in graduate education for health professionals in humanitarian emergencies. *Prehosp Disaster Med.* 2016;31(5):532–8 (<https://doi.org/10.1017/S1049023X16000650>).
25. Williams H, Downes E. Development of a course on complex humanitarian emergencies: preparation for the impact of climate change. *J Nurs Scholarsh.* 2017;49(6):661–9 (<https://doi.org/10.1111/jnu.12339>).
26. Forced displacement of and potential solutions for IDPs and refugees in the Sahel: Burkina Faso, Chad, Mali, Mauritania, and Niger. Washington, DC: World Bank Group; 2014 (<https://documents1.worldbank.org/curated/en/229401467990086793/pdf/899510WP0Box380splacement0study0WEB.pdf>).
27. Kanter RK, Abramson D. School interventions after the Joplin tornado. *Prehosp Disaster Med.* 2014;29(2):214–17 (<https://doi.org/10.1017/S1049023X14000181>).
28. Menstrual hygiene support for women and girls in Somalia: World Menstrual Hygiene Day [website]. International Organization for Migration; 2025 (<https://somalia.iom.int/stories/menstrual-hygiene-support-women-and-girls-somalia-world-menstrual-hygiene-day>).
29. Shortus M, Musto J, Bugoro H, Butafa C, Sio A, Joshua C. Vector-control response in a post-flood disaster setting, Honiara, Solomon Islands, 2014. *Western Pac Surveill Response J.* 2016;7(1):38–43 (<https://doi.org/10.5365/wpsar.2015.6.3.004>).
30. Mugabe VA, Gudo ES, Inlamea OF, Kitron U, Ribeiro GS. Natural disasters, population displacement and health emergencies: multiple public health threats in Mozambique. *BMJ Glob Health.* 2021;6(9):e006778 (<https://doi.org/10.1136/bmjgh-2021-006778>).
31. Emergency health: 2023 global highlights. Geneva: International Organization for Migration; 2023 (https://www.iom.int/sites/g/files/tmzbdl486/files/documents/2024-05/iom-emergency-health-infosheet-2023_08.05.2024.pdf). Licence: CC BY-NC-ND 3.0 IGO.
32. Benkritly M, Hujale M. Sudanese refugees fleeing conflict find safety in South Sudan [news release]. United Nations High Commissioner for Refugees; 27 June 2023 (<https://www.unhcr.org/news/stories/sudanese-refugees-fleeing-conflict-find-safety-south-sudan>).
33. Hujale M. Displaced Somalis and refugees struggle to recover as climate change brings new threats [news release]. United Nations High Commissioner for Refugees; 17 August 2012 (<https://www.unhcr.org/news/stories/displaced-somalis-and-refugees-struggle-recover-climate-change-brings-new-threats>).

34. Lien C, Raimo J, Abramowitz J, Khanijo S, Kritharis A, Mason C et al. Community healthcare delivery post-Hurricane Sandy: lessons from a mobile health unit. *J Community Health.* 2014;39(3):599–605 (<https://doi.org/10.1007/s10900-013-9805-7>).
35. Sood RK, Bocour A, Kumar S, Guclu H, Potter M, Shah TB. Impact on primary care access post-disaster: a case study from the Rockaway Peninsula. *Disaster Med Public Health Prep.* 2016;10(3):492–95 (<https://doi.org/10.1017/dmp.2016.80>).
36. Horn of Africa drought emergency [website]. United Nations High Commissioner for Refugees; 2023 (<https://www.unhcr.org/uk/emergencies/horn-africa-drought-emergency>).
37. Chad floods deepen humanitarian crisis with high risk of disease outbreaks [blog]. Médecins Sans Frontières; 5 December 2022 (<https://www.msf.org/floods-n%E2%80%99djamena-chad-deepen-humanitarian-crisis-high-risk-disease-outbreaks>).
38. People cut off from healthcare after cyclone Freddy batters Malawi [news release]. Médecins Sans Frontières; 24 March 2023 (<https://www.msf.org/people-cut-healthcare-after-cyclone-freddy-batters-malawi>).
39. Kearns RD, Stringer L, Craig J, Godette-Crawford R, Black PS, Andra DL et al. Relying on the National Mobile Disaster Hospital as a business continuity strategy in the aftermath of a tornado: the Louisville experience. *J Bus Contin Emer Plan.* 2017;10(3):230–48. (<https://pubmed.ncbi.nlm.nih.gov/28222847/>).
40. UNHCR ramps up aid to thousands displaced by Somalia drought [news release]. United Nations High Commissioner for Refugees; 11 March 2023 (<https://www.unhcr.org/news/briefing-notes/unhcr-ramps-aid-thousands-displaced-somalia-drought>).
41. Soaring needs persist in Twic County one year on [news release]. Médecins Sans Frontières; 17 May 2023 (<https://www.msf.org/south-sudan-soaring-needs-persist-twic-county-one-year>).
42. Lindvall K, Kinsman J, Abraha A, Dalmar A, Abdullahi MF, Godefay H et al. Health status and health care needs of drought-related migrants in the Horn of Africa: a qualitative investigation. *Int J Environ Res.* 2020;17(16):5917 (<https://doi.org/10.3390/ijerph17165917>).
43. Bourgois X. Dwindling rains in northern Cameroon spark conflict and displacement [news release]. United Nations High Commissioner for Refugees; 10 November 2021 (<https://www.unhcr.org/news/stories/dwindling-rains-northern-cameroon-spark-conflict-and-displacement>).
44. Lalani N, Drolet JL, McDonald-Harker C, Brown MRG, Brett-MacLean P, Agyapong VIO et al. Nurturing spiritual resilience to promote post-disaster community recovery: the 2016 Alberta wildfire in Canada. *Front Public Health.* 2021;9 (<https://doi.org/10.3389/fpubh.2021.682558>).
45. Taioli E, Tuminello S, Lieberman-Cribbin W, Bevilacqua K, Schneider S, Guzman M et al. Mental health challenges and experiences in displaced populations following Hurricane Sandy and Hurricane Harvey: the need for more comprehensive interventions in temporary shelters. *J Epidemiol Community Health.* 2018;72(10):867–70 (<https://doi.org/10.1136/jech-2018-210626>).

46. Alam F, Hossain R, Ahmed HU, Alam MT, Sarkar M, Halbreich U. Stressors and mental health in Bangladesh: current situation and future hopes. *BJPsych Int.* 2021;18(4):91–4 (<https://doi.org/10.1192/bji.2020.57>).
47. Bharadwaj R, Huq S. Climate-induced migration and health issues: a toolkit for policymakers. London: International Institute for Environment and Development; 2022 (<https://issuelab.org/resources/43319/43319.pdf>).
48. Mental health and climate change: policy brief. Geneva: World Health Organization; 2022 (<https://iris.who.int/handle/10665/354104>). Licence: CC BY-NC-SA 3.0 IGO.
49. Akbar M. Empowering women and girls through water and sanitation initiatives in post-flood Pakistan [news release]. International Organization for Migration; 22 March 2024 (<https://reliefweb.int/report/pakistan/empowering-women-and-girls-through-water-and-sanitation-initiatives-post-flood-pakistan>).
50. Viray K. Solar energy delivers clean water to drought-affected families in Ethiopia [blog]. In: International Organization for Migration Storyteller; 2024 (<https://storyteller.iom.int/stories/solar-energy-delivers-clean-water-drought-affected-families-ethiopia>).
51. Global annual results report 2021: ensuring that every child lives in a safe and clean environment. Goal Area 4: progress, results achieved and lessons from 2021. [website]. United Nations Children's Fund; 2022 (<https://www.unicef.org/reports/global-annual-results-2021-goal-area-4>).
52. UNICEF DRR in action: every country protected; every child resilient. New York: United Nations Children's Fund; 2022 (<https://www.unicef.org/documents/unicef-drr-action-every-country-protected-every-child-resilient>). Licence: CC BY-4.0.
53. Chiriac M. Ripples of change: durable water solutions reshape communities along Yemen's West Coast. International Organization for Migration; 21 March 2024 (<https://yemen.iom.int/stories/ripples-change-durable-water-solutions-reshape-communities-along-yemens-west-coast>).
54. Mohammed M. Green energy grants conflict-affected communities in Yemen access to safe water [blog]. In: International Organization for Migration Storyteller; 2024 (<https://storyteller.iom.int/stories/green-energy-grants-conflict-affected-communities-yemen-access-safe-water>).
55. Hirani SAA. Barriers to women's menstrual hygiene practices during recurrent disasters and displacement: a qualitative study. *Int J Environ Res.* 2024;21(2):153 (<https://doi.org/10.3390/ijerph21020153>).
56. Msyamboza KP, M'Bang'ombe M, Hausi H, Chijuwa A, Nkukumila V, Kubwalo HW et al. Feasibility and acceptability of oral cholera vaccine mass vaccination campaign in response to an outbreak and floods in Malawi. *Pan Afr Med J.* 2016;23:203 (<https://doi.org/10.11604/pamj.2016.23.203.8346>).

