July 2025

Narrative Analysis: Case studies in heat resilience

Extreme heat poses significant threats to public health, infrastructure, and ecosystems worldwide. In response, various countries have adopted comprehensive governance structures and strategies to mitigate and adapt to these risks.

As climate change intensifies, extreme heat is emerging as a defining public health and development challenge across the globe. From heatwaves that overwhelm hospitals to chronic heat and urban heat islands that threaten vulnerable communities, the risks are growing, and so is the need for effective, coordinated responses.

This narrative analysis highlights how 12 countries are confronting the realities of extreme heat through diverse governance models, partnerships, and innovations.

The case studies span multiple regions and development contexts—Argentina, Australia, Bangladesh, Canada, Ecuador, Egypt, France, India, Senegal, the Republic of Korea, the United Kingdom, and the United States, offering a cross-cutting view of what is working, where gaps remain, and how national strategies are evolving in the face of escalating climate threats.

Rather than a one-size-fits-all approach, these profiles underscore the importance of adaptable, community-centred solutions, multi-sector collaboration, and strong institutional frameworks. By capturing lessons, successes, and persistent challenges, this analysis contributes to the growing global dialogue on how to govern for resilience in a warming world.

This collection of case studies complements the broader efforts led by the Global Heat Health Information Network (GHHIN), the United Nations Office for Disaster Risk Reduction (UNDRR), and the World Meteorological Organization (WMO) in support of the United Nations Secretary-General's Call to Action on Extreme Heat (2024).

GLOBAL HEAT HEALTH INFORMATION NETWORK
WORLD METEOROLOGICAL ORGANIZATION
UNDRR UN Office for Disaster Risk Reduction
Duke NICHOLAS INSTITUTE for ENERGY, ENVIRONMENT & SUSTAINABILITY

Methods

The case studies presented in this resource are based on information provided by country representatives through semi-structured interviews or written surveys focused on four key questions. Representatives were solicited from the Global Heat Health Information Network (GHHIN) database, which focuses on health and meteorological sectors and may not be fully representative of all relevant sectors and perspectives.

While not comprehensive, these case studies provide insights into country-level actions and challenges in managing extreme heat, complementing the broader data collection efforts led by GHHIN, UNDRR, and the WHO-WMO Climate and Health Joint Programme. They underscore the importance of coordinated efforts, innovative solutions, and international collaboration in building climate resilience.

Four key questions:

1. What specific initiatives and activities is your country implementing to address the challenges of extreme heat? Please provide details on your country's efforts, such as heat action plans, early warning systems, public health campaigns, or any other relevant programmes.
2. Which public agencies or government bodies are responsible for carrying out these extreme heat initiatives and activities? Please list the relevant ministries, departments, local government entities, or other public bodies, and briefly describe their roles.
3. Has your country established any partnerships with external organizations to combat extreme heat? If so, please describe these collaborations, including:
   (a) Partnerships with NGOs or community organizations;
   (b) Public-private partnerships with businesses or industry;
   (c) Collaborations with international organizations or other countries. Please provide specific examples of joint initiatives or programmes where possible.
4. What are the key achievements or successes in your country's efforts to manage extreme heat? If available, please highlight any measurable outcomes, such as reductions in heat-related illnesses or mortality, increased public awareness of heat risks, enhanced resilience of vulnerable populations, or implementation of innovative heat management strategies.

The case studies were reviewed based on six key dimensions to initiate an in-depth exploration of the complexities of heat governance. These dimensions include:

- Governance structures
- Coordination across sectors
- Data and impact attribution
- Public awareness and engagement
- Innovation in long-term heat resilience
- Sustainability of public-private partnerships (PPPs)

Representatives were given the opportunity to review the synthesized case studies for clarification and verification, ensuring accuracy and reflecting the most up-to-date information on the complexities of heat governance within their sector.

Common lessons

Community engagement is crucial: Successful implementation of heat action plans requires active engagement and participation of local communities. Educating the public about heat risks and involving them in planning and response activities enhance the effectiveness of interventions.

Multi-sectoral approach: Addressing extreme heat requires coordinated involvement from sectors including health, urban planning, agriculture, and disaster management. Integrated strategies—such as joint task forces and cross-sector response plans—are essential for building sustainable, wide-reaching resilience to heat.

Importance of early warning systems: Robust early warning systems are essential for prompt and effective dissemination of heat alerts and advisories. Leveraging technology, such as mobile phones and app-based alerts, can enhance outreach.

Building resilient infrastructure: Investing in heat-resilient infrastructure, such as green spaces, cool roofs, and energy-efficient buildings, helps mitigate the impacts of extreme heat. Urban planning must incorporate these elements from the outset.

Strengthening healthcare systems: Enhancing the capacity of healthcare systems to manage heat-related illnesses through training, resource allocation, and infrastructure improvements is critical for reducing heat-related morbidity and mortality.

Data collection and research: Continuous data collection, research, and analysis are vital for understanding heat patterns, assessing the effectiveness of interventions, and refining heat action plans. Collaboration with academic and research institutions can support these efforts.

Public-private partnerships: Leveraging the resources and expertise of the private sector through partnerships can enhance the implementation of heat action plans. These partnerships can provide innovative solutions, funding, and technical support.

Policy and regulatory support: Strong policy frameworks and regulatory support are necessary to enforce heat mitigation measures. Policies should incentivize the adoption of heat-resilient practices and ensure compliance across various sectors.

Common challenges

Lack of awareness and education: Many communities are not fully aware of the dangers of extreme heat and the necessary precautions to take, leading to insufficient public response during heatwaves.

Resource constraints: Financial and technical limitations often impede both the initial implementation and long-term sustainability of heat action plans. This challenge is particularly acute in rural and low-income urban areas, where constrained budgets and lack of technical infrastructure restrict access to essential resources such as cooling centres, early warning systems, and public health initiatives.

Data and monitoring limitations: Inadequate meteorological data and monitoring systems make it difficult to accurately predict and respond to extreme heat events. This also affects the ability to issue timely warnings and measure the impact of interventions.

Healthcare system capacity: The healthcare infrastructure is often overwhelmed during heatwaves, lacking sufficient resources, trained personnel, and facilities to handle the increased incidence of heat-related illnesses.

Coordination and integration issues: Coordination between different government agencies, local authorities, NGOs, and private sector entities is often weak, leading to fragmented efforts and inefficient use of resources.

Urban planning challenges: Rapid urbanization and poor urban planning exacerbate the urban heat island effect, making cities more vulnerable to extreme heat. Integrating heat mitigation measures into existing urban infrastructure is complex and costly.

Rural challenges: Limited infrastructure, inadequate healthcare access, and insufficient communication networks in rural areas hinder effective heat response and resilience.

Discussion

Governance structures

Governance structures for managing extreme heat vary widely and significantly influence the effectiveness of data collection, monitoring, and response capabilities. These structures – centralized, decentralized, or mixed – determine the degree of coordination across national, regional, and local authorities and influence how effectively these strategies integrate across sectors.

Centralized systems use strong national frameworks that integrate real-time health and meteorological monitoring, ensuring consistent data collection and enabling effective early warning systems and impact attribution. In contrast, decentralized systems delegate responsibility to regional and local authorities, allowing for localized strategies but often resulting in fragmented efforts and inconsistencies in data monitoring, particularly where resources are limited. Mixed governance models combine national frameworks with local flexibility, aiming to balance consistency and adaptability. International organizations often provide technical support and capacity-building to help harmonize efforts, ensuring consistency and effectiveness across regions.

Coordination across sectors

Effective heat resilience hinges on comprehensive multisectoral collaboration, integrating health, urban planning, energy, emergency management, and environmental services. Success relies on coordinated mechanisms and partnerships that bring these sectors together efficiently. Interagency committees, task forces, and public-private partnerships (PPPs) are central to this integration, providing a platform for cohesive planning and response. NGOs and international entities play supportive roles by offering resources, training, and expertise, reinforcing these structures within existing governance frameworks.

Data-sharing platforms and standard operating procedures (SOPs) are essential for effective coordination, facilitating better communication and collaboration across sectors. Direct stakeholder engagement is crucial. Collaborative workshops and planning sessions equip stakeholders with practical tools and knowledge to develop heat action strategies that are tailored to local and regional needs, ensuring relevance and community support. Such targeted engagement ensures that solutions are relevant, actionable, and sustainable, promoting cohesive and effective heat resilience efforts.

Data gaps and impact attribution

Governance models directly influence the efficiency of data collection and impact attribution in managing extreme heat. Centralized systems have the advantage of integrating health surveillance and meteorological data efficiently, enhancing monitoring and early warning capabilities. However, decentralized models, while capable of addressing local needs and conditions, often encounter inconsistencies due to variations in regional capacity and resources, leading to disparities in data quality and coverage.

International organizations, such as the United Nations Development Programme (UNDP) and WMO, provide technical assistance to build and enhance local data systems. These efforts aim to strengthen monitoring and surveillance capabilities, but challenges persist, particularly in accurately attributing indirect heat impacts like mental health issues and cardiovascular conditions. Fragmented data sources and limited integration across systems continue to complicate comprehensive impact assessments, making it challenging to fully capture the direct and indirect effects of extreme heat on health, infrastructure, and local economies.

Even where systems are advanced, gaps in coordination among health and environmental data streams limit the accuracy of evaluations. These complexities highlight the difficulties in developing a complete understanding of heat impacts, emphasizing the need for improved data integration, consistent methodologies, and targeted resources to support vulnerable populations more effectively.

Public awareness and engagement

Engaging the public and vulnerable groups in heat resilience requires comprehensive strategies, including public awareness campaigns, early warning systems, and community engagement tailored to local contexts. Despite linking public health guidance with actionable steps, these systems often face barriers such as socioeconomic challenges, accessibility issues, infrastructure gaps, and low trust in authorities. Generalized messaging may fail to connect with marginalized or technology-limited communities. To overcome these obstacles, localized and culturally relevant communication strategies that utilize trusted community figures and networks are essential for building trust and engagement.

Translating awareness into action relies on direct, locally-driven efforts led by local governments and civil society organizations. Socio-economic factors, cultural practices, and ingrained behaviours can still hinder the uptake of protective measures. Strengthening partnerships with community leaders and investing in culturally appropriate education and resources can enhance these efforts, promoting long-term behaviour change and resilience.

Innovation in heat resilience

Countries are advancing heat resilience through technological, policy, and social innovations aimed at building adaptive and integrated frameworks. Technological advancements, such as real-time heat monitoring, smart city solutions, and parametric insurance models, enhance resilience by providing data-driven adaptation strategies. Green infrastructure and cooling centre projects also mitigate urban heat island effects, showcasing the adaptability of technology across diverse environments.

Policy reforms are developing adaptive frameworks that incorporate traditional knowledge and localized cooling measures. Designed for flexibility, these policies can be applied in both urban and rural contexts and across governance levels, ensuring widespread and effective implementation.

Social innovations prioritize culturally relevant, community-based programmes that address the needs of marginalized populations. NGOs and civil society organizations work closely with communities to create tailored heat action plans that integrate local and Indigenous knowledge, enhancing the relevance and impact of these strategies.

Despite progress, scaling these innovations remains a challenge, particularly in rural and underserved communities where gaps in resources and technology persist. To address these disparities, innovative financing models, such as parametric insurance, are being explored to ensure equitable access to resilience strategies and extend advancements to all communities.

Sustainability of public-private partnerships

PPPs are crucial for developing infrastructure and services that enhance heat resilience, including urban cooling solutions, energy-efficient systems, and healthcare initiatives. The sustainability of these partnerships depends on factors such as the strength of government support, local capacity, and the balance between domestic resources and external assistance.

For PPPs to thrive, strong collaboration between governments and private entities is essential. This collaboration facilitates the integration of heat resilience measures into national and local strategies, enabling multi-sectoral coordination that leverages expertise from various industries. Such partnerships can promote innovative solutions like green technologies and efficient infrastructure planning. However, scaling these efforts to reach all communities, regardless of their geographical or socioeconomic context, requires addressing gaps in resources and capacity.

Sustainability also hinges on building local ownership and capacity. Partnerships that rely extensively on external funding or expertise may face vulnerabilities if international support declines. To mitigate this risk, there is a need for locally-driven growth models that prioritize long-term planning and local investment. Strengthening local capacity and ensuring community involvement can help reduce dependency on external aid and foster sustainable development that benefits diverse populations equitably.

Case studies

COUNTRY HEAT POLICY OVERVIEW

Argentina

Argentina has adopted several governance structures to address the impacts of extreme heat, focusing on integrating efforts into broader climate adaptation and disaster management frameworks.

The National Weather Service (SMN) first introduced an early warning system for extreme heat in Buenos Aires in 2009, which has now expanded to cover 71 meteorological stations for country-wide alerts issued year-round due to changing climate patterns. These alerts are disseminated through various channels, including email systems and media partnerships, ensuring broad coverage across regions.

The Ministry of Health, in collaboration with SMN, leads public health campaigns and has developed a sentinel surveillance system to monitor heat-related morbidity, tracking the health impacts of extreme temperatures across provinces. Argentina also involves provincial and local governments in implementing heat action plans and managing hospital responses during heatwave alerts, with emergency services playing a critical role in the outreach and protection of vulnerable populations.

Early warning systems are further integrated into workplace regulations, adapting work hours and hydration protocols during extreme heat events, particularly in sectors like construction and agriculture, where workers are at higher risk. While not formalized, coordination with the energy and agricultural sectors helps manage the impacts of blackouts and other heat-related disruptions.

Public-private partnerships play an increasing role in Argentina's heat resilience efforts, including collaborations with organizations like the Argentine Red Cross and professional medical associations to improve emergency care and healthcare system capacity.

Partnerships are also emerging in urban planning and energy sectors, including projects to develop green spaces and cool roofs to mitigate the urban heat island effect in low-income areas, such as the Cool Roofs Initiative, which targets temperature reduction in disadvantaged neighbourhoods.

An important actor in these efforts is the Centre for the Implementation of Public Policies for Equity and Growth (CIPPEC), an independent, non-partisan organization dedicated to policy innovation. Through its "Cities" Programme, CIPPEC conducted dialogues on urban heat resilience to support climate adaptation at the municipal level and was instrumental in presenting a forthcoming project with Wellcome Trust, which aims to enhance Argentina's heat resilience framework through strengthened municipal engagement.

Argentina's key achievements include expanding the early warning system to cover the entire population, developing the sentinel surveillance project to improve data on heat-related health impacts, and leveraging international funding for research.

Additionally, Argentina's public-private partnerships have enhanced its ability to respond to heat risks, and collaborations with international organizations, such as the United Nations and the World Bank, continue to strengthen the country's capacity to manage extreme heat effectively. Argentina has also begun discussions around integrating heat resilience measures into long-term urban development plans, aiming to create a sustainable framework for heat adaptation in the years to come.

COUNTRY HEAT POLICY OVERVIEW

Australia

Australia has implemented a coordinated, multi-tiered approach to managing extreme heat through federal and state-level initiatives.

Australia has implemented a coordinated, multi-tiered approach to managing extreme heat through federal and state-level initiatives. The Australian Bureau of Meteorology (BOM) launched the National Heatwave Warning Framework in November 2022, which issues heatwave warnings along with behavioural advice during periods of extreme heat. These warnings are disseminated nationwide through online portals, mobile apps, and media partnerships, supporting the management of critical services and infrastructure while providing targeted advice to vulnerable populations. State and territory government emergency services and health departments, in collaboration with federal health authorities, implement localized heat action plans tailored to regional needs, ensuring that responses to extreme heat are context-specific.

The National Heatwave Warning Framework aligns with the Australian Warning System, providing a consistent three-level warning structure (Advice, Watch and Act, Emergency Warning) across Commonwealth, State, and Territory Governments. This system is designed to reduce the impact of heatwaves not only on health but also on critical infrastructure, ecosystems, and societal functions. The warnings allow for a wide range of preparatory actions as heatwaves intensify, escalating advice from vulnerable individuals to healthy people, and including guidance on protecting infrastructure.

Each State and Territory has developed its own heat health plans to address heat risks through prevention, preparedness, response, and recovery strategies. Lead agencies vary by jurisdiction but typically include health departments, emergency services, and meteorological bodies. The decentralized approach ensures that State and Territory Governments can adapt their heat action plans to local conditions while benefiting from federal coordination.

Cross-sectoral collaboration primarily involves the integration of public health, meteorological services, and emergency management. While public-private partnerships have not played a prominent role in Australia's heat resilience efforts, there is ongoing exploration of partnerships to incorporate heat resilience into urban planning and infrastructure projects. Efforts are increasingly focused on integrating Indigenous knowledge into heat resilience strategies, recognizing that Western approaches may not be sufficient and that engagement with Indigenous ways of understanding and managing heat could offer valuable insights.

Key achievements include the nationwide Multi Hazard Early Warning System (MHEWS), an informed heatwave warning system developed by BOM, which provides timely information to both the public and authorities, enabling prompt action. Localized heat action plans have been developed across States and Territories, allowing for tailored responses to regional climate conditions and population needs. These efforts have significantly strengthened Australia’s resilience to extreme heat and improved cross-sectoral public health response capabilities.

Australia’s model of decentralized, State-led heat management supported by strong national coordination highlights the importance of localized adaptation strategies. While public-private partnerships were not prominently featured, Australia’s comprehensive warning system and cross-government collaboration provide a robust foundation for responding to extreme heat. This model offers valuable insights for countries with similar governance structures and emphasizes the need for integrating Indigenous knowledge, health, climate, and urban planning efforts to build long-term resilience.

COUNTRY HEAT POLICY OVERVIEW

Bangladesh

Bangladesh has adopted various governance structures within its broader climate change adaptation and disaster management frameworks to address extreme heat.

Key national policies include the National Adaptation Programme of Action (NAPA), the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), and the National Disaster Management Plan (NDMP), which collectively outline measures for mitigating and adapting to extreme heat.

The Ministry of Environment, Forest and Climate Change, the Bangladesh Meteorological Department (BMD), and the Disaster Management Bureau (DMB) play central roles in policy development, early warning systems, and disaster preparedness. Local governments and municipalities implement heat adaptation plans, supported by NGOs and community-based programmes that raise awareness and build resilience.

Public-private partnerships (PPPs) are increasingly vital in addressing extreme heat in Bangladesh. These partnerships focus on enhancing climate resilience through various initiatives and enhance Bangladesh's ability to adapt to and mitigate the impacts of extreme heat, contributing significantly to the country's overall climate resilience.

Examples of PPPs for extreme heat include the Dhaka North City Corporation (DNCC) collaboration with private real estate developers to create green spaces in urban areas, including parks, rooftop gardens, and green belts, to mitigate the urban heat island effect; the Cool Roofs Initiative, a partnership between the Government and local private companies, implements reflective rooftops in urban slums to reduce indoor temperatures; and BRAC, a major NGO, partners with private hospitals and pharmaceutical companies to improve healthcare responses to heat-related illnesses through training and public awareness campaigns. These diverse PPPs enhance Bangladesh's resilience to extreme heat and contribute to overall climate adaptation efforts.

Key achievements include developing heat action plans, enhancing urban planning to reduce heat impacts, conducting public education campaigns, and preparing the health sector to manage heat-related illnesses. Bangladesh also collaborates with international organizations to strengthen its capacity to manage extreme heat effectively.

COUNTRY HEAT POLICY OVERVIEW

Canada

Canada has adopted comprehensive governance structures to address extreme heat, involving national strategies, institutional frameworks, provincial and local government initiatives, and public-private partnerships.

At the national level, the National Adaptation Strategy and the Pan-Canadian Framework on Clean Growth and Climate Change outline measures to build resilience against extreme heat. The Health and well-being system in the National Adaptation Strategy particularly emphasizes protecting Canadians from climate-related health risks, including extreme heat.

Health Canada plays a pivotal role by providing evidence-based guidance, heat health science, and best practices for provincial and local authorities to implement Heat Alert and Response Systems (HARS). It also collaborates with Environment and Climate Change Canada (ECCC) to inform heat-related weather warnings. Provincial and territorial governments lead the response to heat health risks, with the Federal Government supporting local-level adaptation.

Provincial heat action plans in Ontario, Quebec, and British Columbia, along with municipal heat response plans in cities like Toronto, Montreal, and Vancouver, outline specific measures such as establishing cooling centres, disseminating heat health messages, and modifying urban design to reduce heat risks. These efforts are also extended to Indigenous communities, where culturally appropriate response planning is underway.

Public-private partnerships (PPPs) play a significant role in enhancing heat resilience. In Toronto, PPPs have focused on retrofitting buildings with energy-efficient cooling systems, creating green roofs, and expanding urban parks to mitigate the urban heat island effect. Similarly, Hydro-Québec collaborates with businesses to promote energy-saving technologies that reduce electricity demand during heatwaves.

Key achievements include the widespread implementation of HARS, public education campaigns, and strengthened health sector preparedness to manage heat-related illnesses. Canada also collaborates with international organizations to share best practices, filling knowledge gaps and advancing research, such as addressing indoor heat health risks. These coordinated efforts aim to protect public health, enhance urban resilience, and mitigate the impacts of extreme heat across Canada.

COUNTRY HEAT POLICY OVERVIEW

Ecuador

Ecuador has integrated measures to address extreme heat within its broader climate change adaptation and disaster risk management frameworks.

Key national strategies include the National Climate Change Strategy (ENCC), which outlines resilience building across sectors like agriculture, health, and urban planning, and the National Plan for Good Living, which incorporates environmental sustainability and climate resilience. The National Adaptation Plan (NAP) focuses on adapting to climate change impacts, including extreme weather events like heat waves, by enhancing early warning systems and promoting public awareness.

The Ministry of Environment, Water, and Ecological Transition (MAATE) leads climate policy development, while the National Risk and Emergency Management Service (SNGRE) manages disaster risk, including preparedness and response to extreme heat. Local initiatives, especially in cities like Quito and Guayaquil, include municipal climate action plans aimed at mitigating the urban heat island effect through green spaces and improved urban planning. Community-based adaptation programmes, supported by NGOs and international organizations, focus on local resilience through education and infrastructure improvements.

Public private partnerships (PPPs) do play a role in Ecuador, though perhaps not as robust as in other case study nations. For example, in Guayaquil, the local government partners with construction companies and paint manufacturers to promote the installation of cool roofs in residential and commercial buildings. These roofs use reflective materials to reduce indoor temperatures and energy consumption.

In addition, utility companies in Ecuador, in partnership with local governments and international organizations, promote energy efficiency programmes that help residents and businesses reduce their energy consumption during heatwaves. These programmes include incentives for installing energy-efficient cooling systems and improving building insulation. And, the Ministry of Agriculture works with agribusinesses and NGOs to promote sustainable farming practices that can withstand extreme heat. This includes the development and distribution of heat-resistant crop varieties and the implementation of water-efficient irrigation systems.

Key measures include developing early warning systems, conducting public awareness campaigns, and incorporating green infrastructure in urban planning. The healthcare sector is being strengthened to handle heat-related illnesses through training and improved infrastructure. Ecuador collaborates with international organizations like the UNDP and the World Bank for technical assistance and funding and conducts research to better understand and mitigate the impacts of extreme heat. These integrated efforts aim to build resilience against the impacts of extreme heat in Ecuador.

COUNTRY HEAT POLICY OVERVIEW

Egypt

Egypt has implemented various governance structures to address the challenges posed by extreme heat, integrating these efforts into broader climate change adaptation and disaster risk management strategies.

The National Climate Change Strategy and Egypt Vision 2030 outline Egypt's overall approach to enhancing resilience across sectors such as agriculture, health, and urban planning. The Egyptian Environmental Affairs Agency (EEAA) and the Ministry of Environment lead these efforts, collaborating with other relevant ministries and organizations.

The National Centre for Disaster Risk Reduction (NCDRR) is expected to play an increasing role in disaster risk management, including extreme heat preparedness, though its involvement in this area is still developing. Local initiatives in cities like Cairo and Alexandria are focused on addressing the urban heat island effect through increased green spaces, improved urban planning, and public awareness campaigns. However, the scale and impact of these initiatives vary, and they may be more pilot projects than widespread programmes at this stage.

Community-based adaptation programmes, supported by NGOs and international organizations, contribute to local resilience through awareness programmes and infrastructure improvements, including cooling centres, health services, and urban greening. However, these initiatives are often localized and vary in scope and effectiveness.

Public-private partnerships (PPPs) are beginning to play a role in enhancing climate resilience, though their scale and impact are still evolving. For example, Cairo has explored smart city technologies to monitor heat, with potential partnerships involving companies like IBM and Vodafone Egypt. These efforts are in the early stages, and their impact is still being assessed.

In Alexandria, there are ongoing discussions about potential collaborations between the Alexandria Health Directorate and private sector entities like Cleopatra Hospitals Group to improve heat-health preparedness, but these initiatives are not yet fully operational.

Egypt also collaborates with international organizations like the United Nations Development Programme (UNDP) and the World Bank for technical assistance and funding. Ongoing research and data collection by Egyptian institutions, supported by international partners, aims to better understand and mitigate the impacts of extreme heat. These efforts are part of a broader strategy to build resilience against climate-related risks, including extreme heat.

COUNTRY HEAT POLICY OVERVIEW

France

France has developed a comprehensive framework to manage extreme heat, significantly reducing heat-related mortality and improving public awareness.

The approach includes national, regional, and local initiatives, guided by lessons learned from the 2003 heatwave, which prompted the creation of a robust governance structure to prepare for and respond to heat risks.

The Ministry for Ecological Transition leads national climate change adaptation efforts, while the Ministry of Health oversees the inter-ministerial system for health management of heatwaves, active annually from June to September. Météo-France provides weather forecasts and early warnings, while Santé publique France manages health surveillance systems and public health campaigns to raise awareness of heat risks.

Local governments, including departmental prefects and mayors, are responsible for implementing heat management plans, such as ORSEC (Organisation de la Réponse de Sécurité Civile), and communal safeguard plans. These local strategies include access to cooled public places, ensuring access to water, and maintaining registers of vulnerable individuals for targeted interventions.

France's heat response benefits from strong collaboration across sectors. Public-private partnerships with Electricité de France (EDF) ensure energy stability during heatwaves, while Veolia manages water resources. NGOs like the French Red Cross and Secours Populaire Français assist local governments by providing services to vulnerable populations. International partnerships with the World health Organization (WHO) and participation in European Union initiatives like Horizon 2020 also bolster France's heat resilience efforts.

France has achieved a significant reduction in heat-related mortality, with no extreme excess mortality observed during severe heatwaves since 2004. While these events have not matched the severity or duration of the 2003 heatwave, they have still impacted mortality and healthcare services. Public awareness campaigns have also been highly effective, with 75% of the population reporting they are well informed about heat risks. France has implemented innovative strategies, including the creation of cool islands in urban areas and localized heat action plans tailored to regional needs. Through ORSEC and communal safeguard plans, local governments have mobilized resources to protect vulnerable populations, ensuring effective heatwave response.

France's success in managing extreme heat, through national policy and localized action, demonstrates the importance of early warning systems, cross-sectoral collaboration, and strong governance.

COUNTRY HEAT POLICY OVERVIEW

India

India has implemented significant governance structures to address extreme heat, with a focus on early warning systems, public health management, and adaptation strategies.

India's efforts have resulted in a reduction of heat-related illnesses and mortality, particularly in urban areas, where lower-income populations are especially vulnerable. Governance is coordinated at multiple levels, involving national, state, and local governments.

The National Disaster Management Authority (NDMA) plays a central role in developing heat action plans (HAPs) and early warning systems, collaborating with state-level and district-level disaster management authorities. The India Meteorological Department (IMD) provides a five-day probabilistic heat early warning system, along with daily and seasonal forecasts. These warnings help regions prepare for heatwaves and protect vulnerable populations. The National Centre for Disease Control (NCDC), under the Ministry of Health and Family Welfare, leads health system capacity-building initiatives to manage heat-related illnesses. State and local governments, particularly in cities like Ahmedabad, implement localized heat action plans tailored to regional needs.

India's early warning systems are adapted to the country's diverse climate and linguistic landscape. State-specific approaches, such as translating warnings into local languages, ensure accessibility in urban and rural areas alike. Local governments collaborate with civil society organizations, such as the Natural Resources Defense Council (NRDC) and the Indian Institute of Public Health, to develop and implement heat action plans in cities like Ahmedabad and Jodhpur.

India also leverages public-private and nonprofit collaborations. Heat insurance pilots, targeting vulnerable populations like outdoor workers and women in low-income urban areas, have been launched with organizations such as the Self-Employed Women's Association (SEWA) and Mahila Housing Trust. Although challenges around sustainability remain, these initiatives provide financial protection during extreme heat. Additionally, cooling solutions like the Cool Roofs Initiative, which installs reflective materials on rooftops to reduce indoor temperatures, have been piloted in several states.

India has achieved notable successes in heat management, particularly in Ahmedabad, the first city to implement a heat action plan. Ahmedabad's HAP has significantly reduced heat-related illnesses and mortality and has served as a model for other regions. The scaling of heat action plans across the country has led to more scientific, evidence-based approaches. Early warning systems have expanded to cover more regions since 2015, providing impact-based warnings nationwide. Furthermore, multi-sectoral integration—spanning agriculture, water management, utilities, and transportation—reflects India's comprehensive approach to heat resilience.
India's innovative and collaborative efforts position the country as a leader in managing extreme heat. While challenges remain, particularly in ensuring the sustainability of heat insurance programmes and recognizing heat as a formal disaster.

India's focus on scaling its initiatives across states and sectors demonstrates its commitment to building robust heat adaptation strategies.

COUNTRY HEAT POLICY OVERVIEW

Senegal

Senegal has implemented various initiatives to manage extreme heat as part of its broader climate adaptation strategy.

The National Meteorological Agency (ANACIM) plays a central role in producing heatwave bulletins and forecasts to support local preparedness and adaptation measures. Since 2022, ANACIM has issued 35 heatwave bulletins, helping to inform the public about heat risks and guide preventive actions. Senegal's approach involves cross-sector coordination, with the meteorological agency working closely with the Ministry of Health, the Ministry of Environment, and civil protection authorities. These collaborations ensure a comprehensive response to heat risks, covering early warnings, public health preparedness, and emergency response efforts. The Ministry of Health also partners with ANACIM to run awareness campaigns that educate the public on the health risks associated with heatwaves and provide guidelines for protection.

Key initiatives include the regular release of heatwave bulletins developed using local climate data and global climate models. These bulletins allow timely interventions, helping to protect vulnerable populations. Public health campaigns have further strengthened Senegal's ability to reduce the health impacts of extreme heat.

Senegal's efforts are supported by key partnerships with international organizations, including the US National Oceanic and Atmospheric Administration (NOAA), which provides access to global climate models to improve forecasting capabilities. These collaborations enhance Senegal's local climate resilience efforts and allow the country to better predict extreme heat events.

Since the launch of its heatwave management initiatives in 2022, Senegal has issued 35 heatwave bulletins and conducted one pilot test. In November 2023 a heat early warning was issued through local health network, community radio, and local women organizations, among others.

A survey was conducted during the pilot: five students in two different high schools fainted due to extreme heat and many small businesses were closed due to extreme heat. Feedback from the population on the adaptation strategy and its impacts has allowed Senegal to better tailor warnings and advice in the bulletins, significantly improving public awareness and preparedness.

Cross-sector collaboration between health, meteorological, and emergency management agencies has been critical to the country's success in managing heat risks and protecting vulnerable populations.

COUNTRY HEAT POLICY OVERVIEW

Republic of Korea

The Republic of Korea has developed a comprehensive and multi-tiered approach to managing extreme heat, integrating national policies, institutional frameworks, local government initiatives, and community-based actions.

National frameworks such as the Climate Change Adaptation Plan and the Basic Plan for the Promotion of Climate Change Response guide efforts to address extreme heat as part of broader climate resilience strategies.

The Korea Meteorological Administration (KMA) plays a key role by issuing heatwave warnings and impact-based heatwave forecasts , using an updated alert system based on Daily Maximum Perceived Temperature, which takes humidity into account to better reflect health impacts.

Additionally, the Korean Disease Control and Prevention Agency (KDCA), alongside the KMA, published the first Climate Health Impact Assessment Report in March 2022. In this report, published every five years, heat-related deaths and illnesses are identified as key health indicators to be monitored.

Collaboration among key institutions enables a coordinated response to heat risks across sectors—including health, industry, livestock, agriculture, and aquaculture—each managed by distinct governmental bodies, and consolidated guidelines have been given. Healthcare preparedness has been strengthened with the publication of the Climate Health Impact Assessment Report, which monitors heat-related illnesses and deaths. Hospitals and healthcare centres, particularly those with emergency services, have improved their capacity to manage heat-related conditions. Additionally, the Ministry of the Interior and Safety, Republic of Korea, has called for meetings with other governmental institutions across different sectors.

Local governments, especially in urban areas like Seoul, lead heat mitigation efforts through urban cooling strategies, public awareness campaigns, and the expansion of green spaces. Initiatives include installing green roofs, promoting public transportation through the Climate Card programme, and constructing cooling stations in public areas to offer relief from heat.

Public-private partnerships have been instrumental in enhancing the country's resilience to extreme heat. The Seoul Metropolitan Government collaborates with private real estate developers to implement green rooftops across the city, while telecommunications company SK Telecom partners with KMA to send real-time heatwave alerts to millions of subscribers.

Currently, emergency information about heatwaves is being provided through the cell broadcast service in Korea. Hyundai Motor Company collaborates with local governments in urban cooling projects, such as installing cooling stations in public areas. These stations provide cool air and water, offering relief to residents and visitors during heatwaves. LG Electronics partners with Seoul National University Hospital to develop and distribute advanced cooling technologies for healthcare facilities, ensuring hospitals are equipped with energy-efficient air conditioning systems that improve patient care during extreme heat periods. These examples demonstrate the impact of leveraging resources and expertise to enhance resilience to extreme heat.

On the international stage, the Republic of Korea partners with organizations such as the World Health Organization (WHO) Asia-Pacific Centre for Environment and Health, the Green Climate Fund, and the International Vaccine Institute—all located in the country—to advance knowledge and technical capacity for climate resilience. These collaborations contribute to their leadership in responding to extreme heat.

Through its coordinated approach involving national agencies, local governments, public-private partnerships, and international collaboration, the Republic of Korea has strengthened its ability to manage extreme heat. Key achievements include the updated heatwave alert system, localized urban cooling projects, and strengthened healthcare preparedness, positioning the country as a regional leader in climate adaptation.

COUNTRY HEAT POLICY OVERVIEW

United Kingdom of Great Britain and Northern Ireland

The United Kingdom, through the collaborative efforts of the UK Health Security Agency (UKHSA) and the Met Office, has developed comprehensive strategies for managing extreme heat.

In England — one of the four nations of the UK — the Adverse Weather and Health Plan (AWHP) defines and guides planning and response efforts related to the health impacts of extreme heat and other adverse weather. The AWHP outlines a common framework for responding to adverse weather, including periods of high temperature, and defines the roles and responsibilities of the different delivery groups at the local, regional, and national levels. The AWHP is underpinned by four core pillars: the Plan itself; guidance; the supporting evidence base; and the Weather-Health Alerting system. Other UK nations, such as Scotland (Public Health Scotland), have recently published their own AWHP.

In England, two early warning systems operate to address the diverse impacts of extreme temperatures. The Heat-Health Alerts (HHA), part of the Weather-Health Alerting system, are issued by UKHSA and the Met Office for England to protect vulnerable populations and health and social care services with yellow, amber, and red alerts. The National Severe Weather Warning System (NSWWS), managed by the Met Office across the UK, issues amber and red alerts for broader public impacts in addition to health, including effects on sectors like transport and utilities. These systems are coordinated to ensure consistent public messaging, aligning HHA and NSWWS warnings when necessary for clear, authoritative communication on heat risks.

Public health campaigns play an integral role in the UK's strategy. The UKHSA's "Beat the Heat" and the Met Office's "Weather Ready" campaigns provide practical advice on how to stay cool during hot weather, with materials distributed to the public, particularly targeting high-risk groups. UKHSA and the Met Office, in collaboration with various partners, lead these awareness efforts across multiple communication platforms.

UKHSA coordinates with the Met Office, local governments, and emergency services to ensure a comprehensive national response to extreme heat. Local and national authorities are tasked with implementing action plans and providing critical services during extreme heat events.

The UK engages in partnerships with academic institutions, community organizations, and the private sector to bolster heat resilience. Public-private partnerships, particularly with utilities and infrastructure sectors, focus on energy efficiency and public health protection during extreme heat events.

The UK has seen measurable success in managing extreme heat, as evidenced by the response to the record-breaking 2022 heatwave. Despite the extreme conditions, over 1,000 fewer heat-related deaths occurred than historically expected for such record-breaking temperatures. After the event, a Met Office survey revealed that 98% of the public took some form of action in response to issued alerts and warnings during the record-breaking heat period. UKHSA's and Met Office initiatives, including early warnings and public health interventions, contributed to reducing heat-related illnesses and fatalities. The increased public awareness and improved coordination between health services and local authorities highlight the effectiveness of the planning and early warning systems.

COUNTRY HEAT POLICY OVERVIEW

United States of America

The United States has adopted comprehensive governance structures to address extreme heat, involving federal, state, local, and Tribal initiatives.

At the federal level, the National Integrated Heat Health Information System (NIHHIS) is an interagency effort initially formed by the National Oceanic and Atmospheric Administration (NOAA) and the Centers for Disease Control and Prevention (CDC). The mission of NIHHIS is to develop and provide actionable, science-based information to help decision-makers protect people from heat. Currently, NIHHIS coordinates more than 27 federal agencies. The U.S. Global Change Research Program (USGCRP) also manages a National Climate Assessment (NCA) that summarizes the impact of climate change on the US and includes chapters specific to extreme heat. Most recently, the Federal Emergency Management Agency (FEMA) has declared heat a priority and improved its guidance to help state-level emergency managers prepare for and respond to heat impacts.

As an innovative approach to improve heat governance, NIHHIS and NOAA collaborate with local governments and community-based organizations to host tabletop exercises that test and evaluate heat response efforts. These exercises bring together leaders from various sectors, including health departments and emergency management, to identify and refine strategies for enhancing heat resilience in their communities. This proactive, hands-on approach allows participants to simulate heat emergencies and collaboratively develop effective response plans tailored to local needs.

States like California, Arizona, New York, and North Carolina have developed specific heat action plans, and cities such as New York City (NYC), Los Angeles, Miami, and Phoenix have implemented heat response programmes focusing on public awareness, emergency response, and urban design modifications.

Public-private partnerships (PPPs) are integral to these efforts, with initiatives like Cool Neighborhoods NYC and Phoenix's HeatReady Initiative collaborating with private organizations, nonprofits, and academic institutions to enhance heat resilience. For example, the City of New York collaborates with private organizations and community groups through the Cool Neighborhoods NYC programme. This initiative focuses on increasing tree canopies, installing cool roofs, and educating residents about heat risks. Private companies contribute funding, technology, and expertise to support these efforts. Kaiser Permanente, a major healthcare provider, also works with local health departments and nonprofits to support community health initiatives addressing extreme heat. They fund programmes that provide cooling centres, hydration stations, and public education on heat-related health risks.

Key measures include Heat Alert and Response Systems (HARS), urban planning initiatives, public awareness campaigns, and the establishment of cooling centres and hydration stations. Additionally, ongoing research and data collection by federal agencies, academic institutions, and private organizations help refine adaptation strategies, while international collaboration ensures the sharing of best practices. These coordinated efforts protect public health, enhance urban resilience, and mitigate the impacts of extreme heat across the United States.

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CITATION

Global Heat Health Information Network, UNDRR, WMO (2025). Narrative Analysis: Case studies in heat resilience

LAYOUT

Maddie West

These case studies and analysis were developed by Duke University and commissioned by the Global Heat Health Information Network (GHHIN), United Nations Office for Disaster Risk Reduction (UNDRR) and the World Meteorological Organization (WMO), as a contribution to the United Nations Secretary-General's Call to Action on Extreme Heat (2024).

About the project

GLOBAL HEAT HEALTH INFORMATION NETWORK
WORLD METEOROLOGICAL ORGANIZATION
UNDRR UN Office for Disaster Risk Reduction
Duke NICHOLAS INSTITUTE for ENERGY, ENVIRONMENT & SUSTAINABILITY

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