Policy Brief

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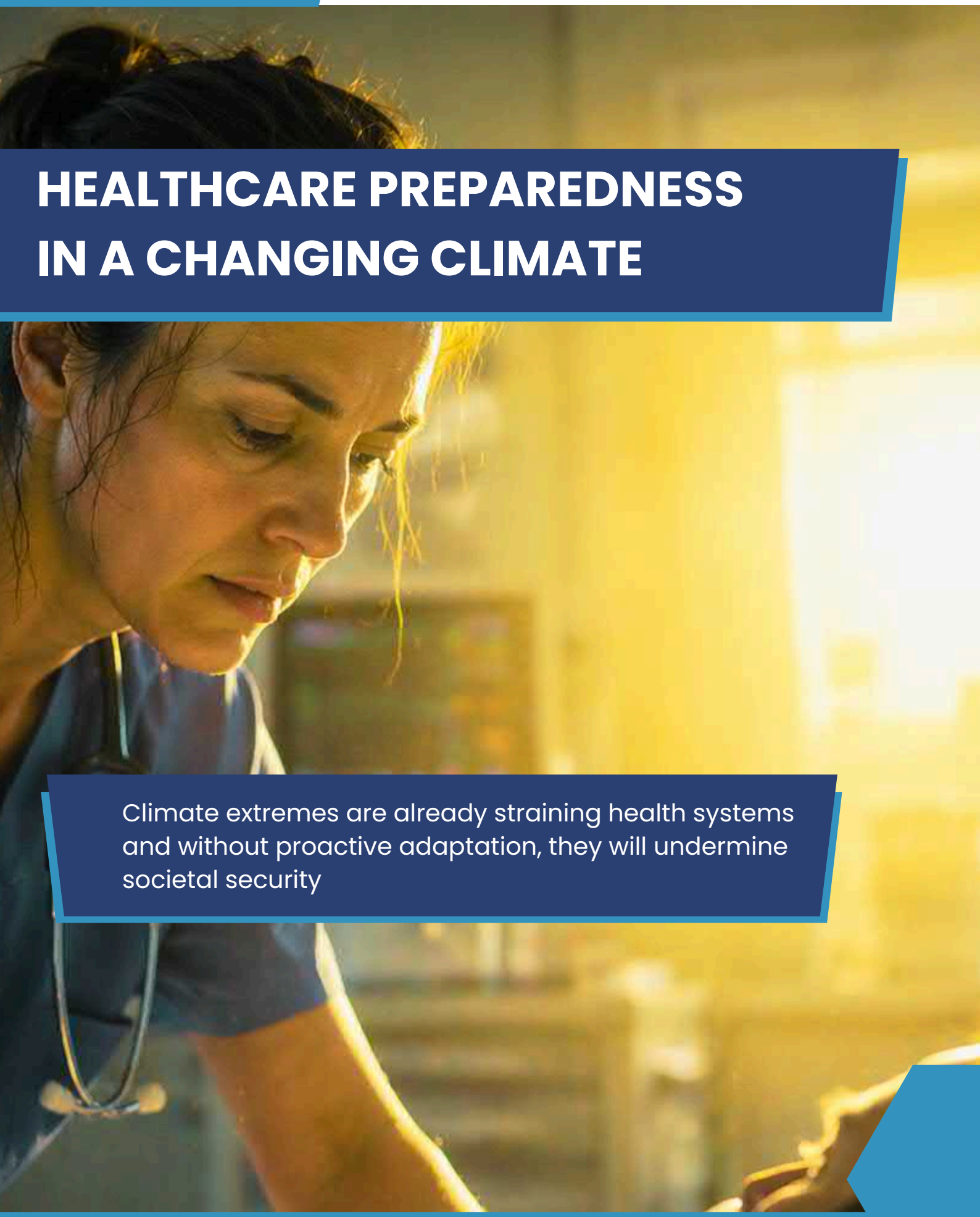
Swedish centre for impacts of climate extremes

HEALTHCARE PREPAREDNESS IN A CHANGING CLIMATE



Climate extremes are already straining health systems and without proactive adaptation, they will undermine societal security

June 2026

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HEALTHCARE PREPAREDNESS IN A CHANGING CLIMATE

INTRODUCTION

Climate change is increasingly straining health systems, both through changes in mean conditions and through sudden shocks that disrupt care delivery, damage infrastructure, and overwhelm capacity. These impacts extend beyond health systems, and can combine with other stressors to trigger broader societal instability.

Health systems are particularly vulnerable during extreme climate events. Facilities may become inoperable, supply chains can fail, and workforce capacity is stretched to its limits. In Sweden, these pressures are intensified by demographic and geographic factors, including ageing populations and geographically dispersed communities. In addition, crises often generate “aftershocks,” where delayed routine care leads to a longer-term health burden.

To address these risks, a shift is needed from reactive response to proactive risk management. This involves establishing an operational risk-intelligence cycle that links early warning to action, using impact-based forecasting to anticipate healthcare demand and scenario-based storylines to stress-test systems in a long-term perspective.

Strengthening preparedness, improving data interoperability within the health system, and enabling rapid recovery through accessible care pathways are central to building resilient health systems for a secure future.

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CLIMATE CHANGE THREATENS HEALTH SYSTEMS AND SOCIETAL PREPAREDNESS

Climate change is a major threat to current and future global security and human wellbeing, and it is already placing growing pressure on health and health systems today. Non-optimal temperatures alone are estimated to contribute to over 5 million deaths per year (1), but mortality captures only a fraction of the burden relevant to healthcare delivery and planning.

Moreover, individual extreme climate events can lead to sudden surges in healthcare demand. These can overwhelm emergency departments, stretch ambulance and intensive care capacity, interrupt continuity of care for chronic conditions and disrupt supply chains and primary care. A prominent example is the floods in Portugal in early 2026, when injury-related healthcare needs coincided with the total or partial inoperability of multiple health establishments due to structural damage, failures in water and electricity supply, difficulties in accessing facilities and a shortage of professionals.

Although Sweden has historically been perceived as relatively protected from climate-related health risks, it is already experiencing climatic shifts that affect health and health service delivery. These include more frequent heatwaves, rising risks of flooding and wildfires, and changing patterns of climate-sensitive infectious diseases. The Public Health Agency of Sweden has recognised that climate change brings new and changing health risks for the Swedish population (2).

The 2018 heatwave and wildfire season exemplifies how extreme climatic conditions can simultaneously strain emergency services, healthcare provision and critical infrastructure (3). Vulnerability is further shaped by demographic and geographic factors: around one in five people in Sweden is aged 65 or older, and geographically dispersed communities and long transport distances in rural areas can complicate emergency response and continuity of care during extreme events. In a changing climate, the overall climate-related health burden is expected to increase. For example, temperature-related mortality in Europe by the end of the century is projected to rise markedly, as the increase in heat-related mortality outweighs the decrease in cold-related mortality (4).

5M+ annual deaths linked to non-optimal temperatures

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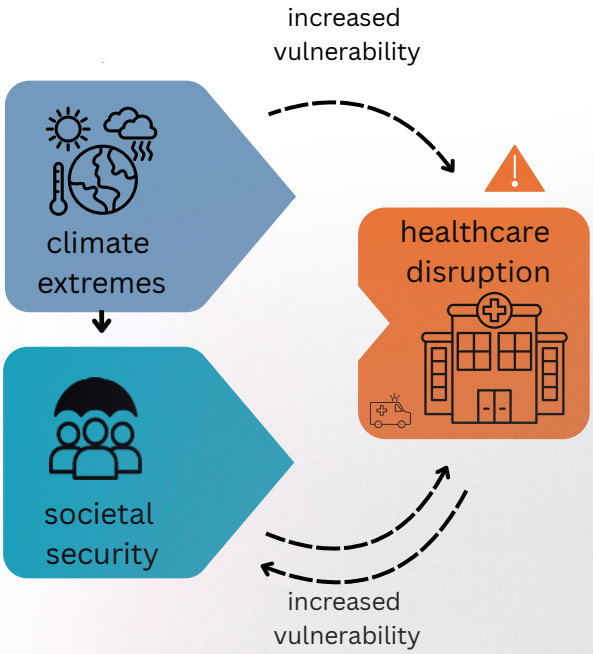
Crucially, we may see more frequent and more severe individual extreme events which will place health systems under unprecedented strain. Moreover, climatic factors may coincide with other stressors, for example of geopolitical nature, leading to polycrises with extensive impacts on health systems.

It is of paramount importance to minimise future climate change, but it is equally important to ensure that we safeguard public health and ensure the resilience of healthcare systems in face of the inevitable climatic changes due to past anthropogenic activities.

Achieving climate-resilient health systems is both a public health priority and a strategic investment in societal security and preparedness. When climate hazards increase morbidity, disrupt access to care, and widen inequalities, they can undermine livelihoods, social cohesion, and trust in institutions, factors that also shape security outcomes. Insecurity and conflict can also directly damage health infrastructure, restrict humanitarian access, and intensify vulnerabilities, creating a vicious circle between health burden and instability.

In keeping with this, climate change has been recognised by NATO as a risk multiplier that can contribute to humanitarian disasters, regional tensions and violence, leading to the recent foundation of a NATO Centre of Excellence for Climate Change and Security (5). Security and wellbeing are thus tightly intertwined: health is a cornerstone of societal resilience, and strained health systems can amplify broader instability.



Vicious circle between climate extremes, healthcare disruption and societal security

Declining cold deaths may be overtaken by rising heat deaths.

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A RESILIENT HEALTH SYSTEM BUILDS ON MULTIPLE DIMENSIONS

Climate-resilient health systems must be able to manage shocks through prevention, surge response, and post-shock recovery. A health system encompasses more than healthcare delivery. It includes public health and prevention, primary and specialised care, the health workforce, infrastructure and medical technologies, medicines and supply chains, health information systems, governance and financing. Because climate-related events can simultaneously affect several of these components, resilience must be built across the entire system.

First, prevention reduces the burden on healthcare services before crises occur. For example, public health measures, early warning systems and preventive care can limit health impacts and reduce the pressure placed on hospitals and emergency services.

Second, health systems must be able to absorb sudden shocks and respond to surges in demand. Climate-related crises often come as shocks, for example a severe heatwave leading to a sharp spike in temperature-related morbidity and mortality such as happened in France during the summer of 2003.

Surge response capacity depends primarily on two factors: workforce availability and access to essential supplies. The workforce is a binding constraint in any emergency and should be treated as a core security capability. Adequate staffing, psychosocial support and fatigue management help maintain services during prolonged crises and reduce the risk of burnout and turnover. Surge response also relies on secure access to medicines, protective equipment and essential medical consumables. This requires resilient supply chains and strategic reserves able to function during disruptions. The COVID-19 pandemic showed how rapidly shortages can emerge when global supply chains are strained.

Finally, a resilient health system must also be able to recover rapidly after crises. Highly disruptive events often result in the population delaying routine check-ups, screening, and chronic disease follow-up, creating a hidden “aftershock”. Moreover, a long recovery period is itself a vulnerability, as shocks can occur in sequence.

Health system resilience fails at its weakest link.

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RECOMMENDATIONS FOR A RESILIENT HEALTH SYSTEM IN THE CONTEXT OF A CHANGING CLIMATE

We propose to extend the Swedish Public Health Agency's current surveillance-based approach to climate-related health impacts into an operational risk-intelligence cycle that links early warning through impact-based forecasting and climate impact storylines to prevention, surge response, and recovery. This builds directly on recent research showing that we already have the means of producing skillful impact forecasts for climate-health outcomes (6) and that healthcare resilience requires context-specific, actionable future scenarios (7).

Climate-health early warning systems typically integrate meteorological and environmental monitoring with health-relevant thresholds and predefined response actions. Impact-based forecasting goes one step further, by translating hazards into quantitative health outcomes or service demand (e.g., ambulance load, emergency department visits and intensive care unit pressure), typically on timescales of days to weeks.

This enables timely activation of targeted prevention measures and implementation of surge protocols, including decisions on staffing, capacity escalation and supply mobilisation during shocks. Impact-based forecasts can also inform rapid post-event recovery by enabling early planning of targeted recall and outreach to minimise the "aftershock" of delayed care.

Storylines are plausible, context-specific future narrative scenarios of how the occurrence of a climate hazard may unfold and translate into health and health system impacts. They combine meteorological drivers with local exposure, vulnerability and service realities to stress-test plans for high-impact events and polycrisis conditions, and to identify vulnerable populations and system weak points (services, infrastructure, supply chains). Storylines serve a similar goal as impact-based forecasts, supporting prevention, surge response, and recovery, yet on a longer time horizon. Indeed, storylines can be used for long-term planning for the coming years or decades.

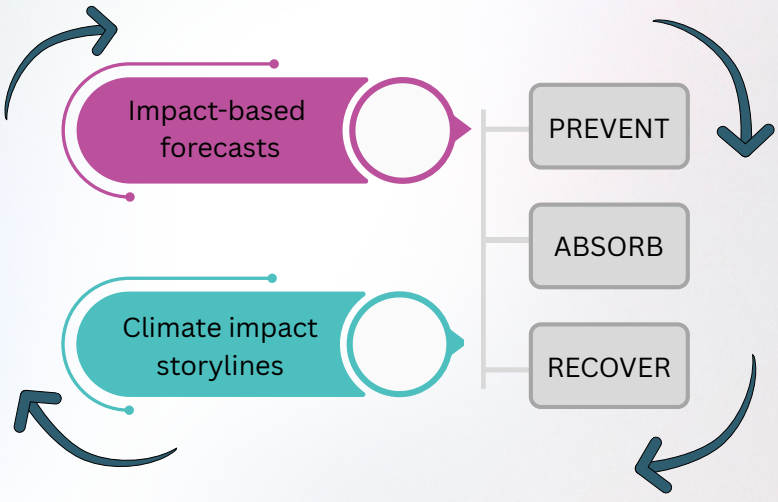
From data to decisions: implement impact-based risk intelligence cycle.

CONCLUSION

To make the above recommendations actionable, Sweden should pair the risk-intelligence cycle with predefined operational measures that can be triggered before, during and after climate-related shocks.

Examples include:

- Protected paid time for preparedness training and simulation, including IT outages during crises and extreme-weather protocols;
- Data interoperability for crisis operations to coordinate surge response in real time;
- Treating healthcare supply resilience as a preparedness capability (8) by mapping single points of failure (e.g., cold chain, sterile consumables, single suppliers);
- Rapid recovery of healthcare services through targeted recall and outreach, using primary care and pharmacies as accessible re-entry points into care.



Risk-Intelligence cycle to build a resilient health system

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This policy brief was prepared by Elena Raffetti and Gabriele Messori at the Swedish Centre for Impacts of Climate Extremes (climes) in June 2026, with the contributions of Sakıp Murat Yalçın, Sara Lindersson and Olof Mogren.

Climes is the Swedish Centre for Impacts of Climate Extremes, coordinated by Uppsala University in collaboration with Lund University and RISE. It advances inter-disciplinary research on how climate extremes affect human and natural systems by integrating physical, medical, social, and engineering sciences. Climes develops data, models, and scenarios to understand impacts and inform decision-making. Through research, training, and stakeholder engagement, it supports policies and practices that strengthen societal resilience and adaptation. The centre works closely with public agencies, industry, and international partners to translate scientific knowledge into actionable insights for managing current and future climate risks.

Climes is funded by the Swedish Research Council / Vetenskapsrådet.