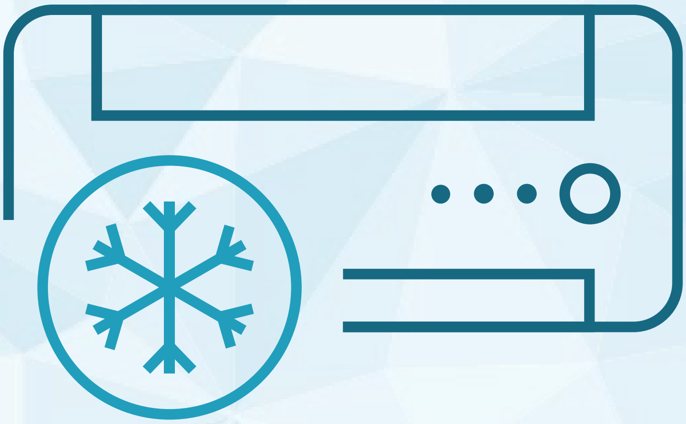
Cool Up
Upscaling Sustainable Cooling



EXTREME HEAT WHITE PAPER

Joining the Dots and Heat-Proofing the Future: A Cross-Sector Blueprint for Resilient Infrastructure

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Extreme Heat White Paper

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Executive Summary

Extreme heat—defined as prolonged periods of temperatures significantly above seasonal norms—is no longer a distant climate concern. It is a present and accelerating systemic risk. Unlike storms or floods, its impacts are often invisible until systems fail. Yet when temperatures soar, the consequences are immediate and far-reaching: power grids falter, transport networks buckle, cold chains collapse, and hospitals struggle just as demand for care peaks.

The frequency, duration, and intensity of extreme heat events have increased dramatically. In the 1960s, major US cities experienced an average of two heatwaves per year, each lasting three days[1]. By the 2010s, this had risen to six per year, lasting about four days, with the heatwave season extended by 46 days[2]. Projections suggest up to 57 additional hot days annually by 2100[3]. In 2024, the world recorded its hottest year, surpassing 1.5°C above pre-industrial levels for the first time[4]. Meanwhile, global demand for air conditioning is set to triple by 2050, driving up energy use and emissions[5].

Despite these trends, extreme heat remains one of the least understood and least addressed climate hazards. Its cascading effects threaten lives, infrastructure, and economies, yet it is rarely prioritised in national adaptation strategies.

This white paper presents a strategic framework for coordinated action. It is the outcome of a cross-sector roundtable held during London Climate Action Week 2025—"The Underexplored Gap: Multifaceted Risks Posed by Extreme Heat on Essential Infrastructure"—which convened leaders from government, healthcare, finance, engineering, insurance, and philanthropy. Their shared mission: to confront the hidden vulnerabilities of our systems and chart a path toward equitable, actionable adaptation.

"Heat has often been called the 'silent killer' and 'invisible threat'— I see it as the underexplored gap."
— Dr Nesen Surmeli-Anac, Guidehouse - Cool Up programme

The paper is grounded in the insights and perspectives shared during the roundtable. The figures and system maps presented were developed from these conversations, enhanced through AI-driven analysis, expert interpretation, and structured thematic coding[6] to capture the complexity of interdependencies and identify actionable pathways. The paper explores four critical dimensions:

- Why extreme heat is a systemic risk multiplier, not a standalone hazard
- How data gaps and fragmented metrics stall progress and investment
- Why the built environment is the frontline of adaptation
- What it will take to move from fragmented efforts to future-proof strategies

Developed for public sector leaders, investors, insurers, construction executives, and philanthropic stakeholders, this paper advocates a shift from reactive adaptation to proactive resilience. It calls for integrated action across policy, finance, and design to develop infrastructure capable of withstanding both current and future heatwaves.

Extreme heat is foreseeable, quantifiable, and manageable—but only through immediate, collective, and large-scale action.

Heat is rising. The time to act together—is now.

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[1] s41598-025-95097-5.pdf

[2] Climate Change Indicators: Heat Waves | US EPA

[3] Ten Years of the Paris Agreement: The Present and Future of Extreme Heat | Climate Central

[4] World Meterological Organization. 2025. State of the Global Climate 2024

[5] IAE. 2018. The Future of Cooling. Opportunities for energy efficient air conditioning. IEA, Paris https://www.iea.org/reports/the-future-of-cooling, Licence: CC BY 4.0.

[6] using Atlas.ti

1. Extreme Heat: A Threat to System Resilience

Extreme heat is not just a climate concern—it is a systemic risk that quietly erodes the foundations and primary functions of modern society. As climate change intensifies, heat is revealing critical vulnerabilities of healthcare, transport, energy, and cold chain systems, threatening the continuity of essential services and public health.

The repercussions of extreme heat are complex and interconnected. From the overheating of homes, workplaces and hospitals to the failure of cold chains and energy infrastructure, the consequences ripple across sectors. Urban centres frequently sit at the intersection of heightened risk and innovation, where the most severe impacts of extreme heat coincide with the greatest opportunities for transformative solutions.

Given that we already spend approximately 90% of our time indoors, a figure likely to rise as extreme heat events become more frequent, it is imperative to ensure that indoor environments are not only safe and healthy, but also resilient to escalating temperatures and heat-related threats.[7].

Cascading Infrastructure Failures

Extreme heat can trigger a domino effect of failures across interconnected systems. As stressors compound, the ability of essential services to function reliably is undermined, increasing vulnerability across society. Energy grids are particularly vulnerable: as heat drives up electricity demand for cooling, overloaded systems can result in blackouts. These blackouts then cascade, affecting hospitals, water treatment plants, and communication networks, further endangering public health and safety. Urban infrastructure is especially at risk due to the urban heat island effect, which amplifies temperatures and strains systems beyond their design capacity. As a result, cities are seeing more frequent and severe disruptions. This systemic fragility underscores the urgent need for climate-resilient infrastructure and coordinated emergency planning.

Impact on Healthcare, Cold Chains, and Emergency Services

Healthcare delivery is particularly at risk. Overheated hospitals, disrupted cold chains for medicines and vaccines, and overwhelmed emergency services can turn a heatwave into a public health crisis. When demand exceeds supply, a "fatal coincidence" occurs, calls spike and care systems overheat, turning access to treatment into a privilege rather than a guarantee. In the United States, extreme heat causes an average of 9,235 hospitalizations and 67,512 emergency department visits annually due to heat-related illness8. Vulnerable populations such as the elderly, chronically ill, and infants are especially susceptible to heat-related illnesses, placing further strain on healthcare systems. As the body's ability to thermoregulate declines with age, heat-related mortality for people over 65 increased by approximately 85% between 2000–2004 and 2017–20219. Since people with lower socioeconomic status often face poorer health and poorer quality housing, research indicates that emergency hospital admissions during extreme heat were highest in deprived areas[10.] Moreover, staff fatigue and infrastructure failures—like power outages—can compromise the quality and continuity of care during extreme heat events. During heatwaves, medical care utilization can increase by 3%–14% above baseline across a range of complaints. In the UK, during the 2022 heatwaves, a survey revealed that one in five doctors reported surgery cancellations due to extreme heat— primarily caused by staff and bed shortages, as well as overheating in surgical theatres[11]. Additionally, the extreme temperatures led to IT system failures at London's largest NHS hospital trust, affecting healthcare services across three hospitals[12].

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[7] Klepeis, N.E., et al. (2001). The National Human Activity Pattern Survey (NHAPS): A Resource for Assessing Exposure to Environmental Pollutants. *Journal of Exposure Analysis and Environmental Epidemiology*, 11(3), 231–252.

[8] Center For Disease Control. Heat & Health Tracker. Center For Disease Control 2022. https://ephtracking.cdc.gov/Applications/heatTracker/.

[9] Silent Killer: Understanding the Risks of Extreme Heat | Earth.Org

[10] Rizmie, D. et al. (2022). Impact of extreme temperatures on emergency hospital admissions by age and socio-economic deprivation in England. Soc. Sci. Med., Vol 308, 115193.

[11] GreenSurg Collaborative (2023). Elective surgical services need to start planning for summer pressures. Br. J. Surg., Vol 110, 508–510.

[12] Guy's and St Thomas' NHS Foundation Trust (2023). Review of the Guy's and St Thomas' IT critical incident final report from the deputy Chief Executive Officer.

“Over 65-year-olds are most vulnerable to consequences of overheating.”
— David Weatherall, BRE

Heat is underestimated as a Systemic Risk

Extreme heat caused 356,000 deaths globally in 2019, making it the deadliest climate-related hazard, yet public awareness remains low[13]. Despite its deadly and escalating impact, heat is not currently perceived as a catastrophic risk. As a result, stakeholders, including policymakers, planners, and communities, often lack awareness or training on heat risks and adaptation strategies[14]. There is also a lack of systematic education. Heatwave drills, school curricula, and public awareness campaigns are rare, leaving populations unprepared for extreme heat events. Moreover, strategic communication around heat resilience is not reaching the right audiences. Youth engagement, social media campaigns, and community-based outreach are underutilized. Additionally, vulnerable populations, including low-income households, the elderly, and residents of informal settlements, are often excluded from planning processes, further limiting the uptake and effectiveness of interventions. Without a shift in public consciousness and more strategic communication, heat will continue to be treated as an invisible threat, despite its growing toll on health, infrastructure, and productivity.

[13] Health in a world of extreme heat - The Lancet

[14] UK heatwave risk report. British Red Cross.

2. Unseen, Unmeasured, Unsolved

Extreme heat is a growing threat—but our systems are not yet equipped to respond. To build infrastructure that can withstand the heatwaves of today and tomorrow, we must first understand the systemic obstacles that stand in the way. The barriers are not isolated; they are tightly interwoven, reinforcing one another and compounding the challenges in ways that stall progress and deepen vulnerabilities. Yet, when it comes to implementation, they remain stubbornly siloed, undermining the potential for coordinated progress, slowing momentum, and creating critical gaps in resilience efforts.

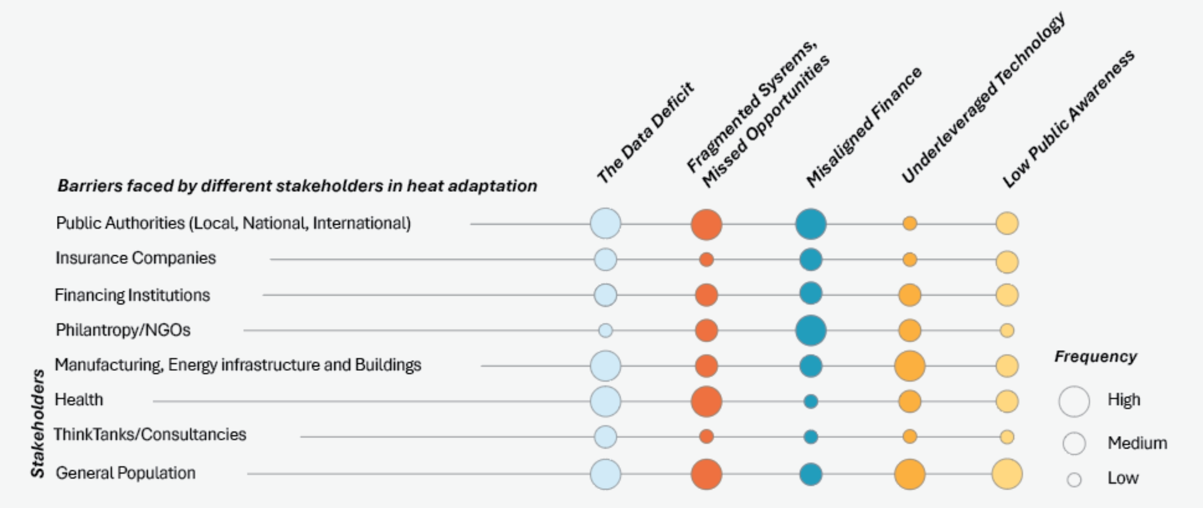

Figure 1: Frequency of barriers mapped to statements of participants in roundtable

Barrier 1: The Data Deficit

We cannot manage, or effectively invest in, what we cannot measure or monetise. From overheating in homes to health impacts and infrastructure strain, the consequences of extreme heat are clear—but the metrics are missing. Without standardised data on building performance, cooling access, and heat-related health outcomes, policymakers struggle to justify interventions, and investors lack the evidence to mobilise capital. Without robust data and monetisation of costs and benefits to the extent possible, even if in many cases this will mean science-based estimates rather than "precise" numbers, policy frameworks remain fragmented, and funding mechanisms fail to reach those most in need. This data gap leads to sub-optimal allocation of resources, as the true costs and benefits of action (or inaction) are not fully captured.

"We have a data gap for benefits or avoided costs delivered in the future. The challenge is how to quantify the real-world benefits of both passive and active cooling that drive investment and policy."
— Elizabeth Cooper, UK Department for Energy Security and Net Zero

Barrier 2: Fragmented Systems, missed opportunities

Responsibilities for climate adaptation are scattered across departments and sectors, with little coordination. Planning, health, energy, and housing operate in silos, resulting in disjointed policies and missed opportunities for integrated solutions. This fragmentation weakens regulation, slows implementation, and leaves vulnerable populations exposed.

"Government impact assessments often overlook the health system gains from cooling interventions—tracing these benefits is essential to justify investment and drive policy reform." – Jonas Hiller, Toni Piëch Foundation

Barrier 3: Misaligned Finance

Finance exists—but it's not reaching the right places. Passive cooling solutions and retrofitting strategies remain underfunded, not due to lack of need, but due to low demand, poor awareness, and complex access pathways. Without tools like one-stop-shops or bundled financing, even available funds remain untapped.

Barrier 4: Underleveraged Technology

Innovative cooling technologies and urban heat mapping tools are available, but adoption is slow. Lack of incentives, regulatory clarity, and integration into planning frameworks means that promising solutions remain stuck in pilot phases, unable to scale.

"There are a lot of promising cooling innovations with potential—but they're all at the early-stages and need capital to scale." – Alan Miller, Coolpact

Barrier 5: Low Public Awareness

Despite its deadly toll, extreme heat is still not perceived as a catastrophic risk. Public understanding is limited, and strategic communication is failing to reach key audiences. Without widespread awareness, behavioural change and community-level action remain elusive.

3. The Built Environment is the Frontline

Buildings are where heat is felt most acutely—and where solutions must begin. Our homes, schools, hospitals, and workplaces are often designed for past climates and ill-equipped for the heatwaves of today, let alone tomorrow. Critical infrastructure is equally at risk as extreme heat can buckle train tracks, strain power grids, lead to data center shut downs and even melt roads.[15] Critical infrastructure—which in the UK is officially defined as the facilities, systems, sites, people, networks, and processes essential to the functioning and security of the country—includes sectors such as energy, water, transport, communications, finance, health, food, civil nuclear, chemicals, emergency services, government, defense, space, and data centres. Disruption to these could result in loss of life, major economic damage, or compromise of national security. From homes and hospitals to schools and roads, the built environment must be reimagined to become the main part of the solution against rising temperatures.

Buildings Built for Yesterday's Climate

Globally, the vast majority of buildings were constructed before climate adaptation and overheating standards were widely adopted. By 2012, about 21% of people in the EU27 reported living in homes that were not comfortably cool during the summer, with significantly higher rates among those in the lowest income groups compared to those in the highest income groups in most countries16. A 2019 report by the UK Climate Change Committee found that one in five homes already dangerously overheats during heatwaves17, and this risk of heat-related death is projected to triple by 2050 if no action is taken. In addition, it is no surprise, that buildings account for almost one third of the UK's total greenhouse gas emissions and residential buildings alone account for approximately 20% of the UK's total emissions[18].

Many structures lack the thermal resilience needed to withstand today's heat extremes. High-rise flats, poorly ventilated homes, and office-to-residential conversions are particularly vulnerable, as their original designs often prioritized density, cost, or rapid conversion over climate adaptation.

Overheating is now a widespread issue, especially in low-income housing and social buildings, where residents often have limited options to escape the heat—such as a lack of access to air conditioning, green spaces, or even the ability to open windows safely due to security or air quality concerns.

Passive Cooling: Undervalued and Underused

Passive cooling strategies—such as natural ventilation, external shading, reflective surfaces, and the use of thermal mass—offer low-energy, high-impact solutions for maintaining comfortable indoor temperatures, often without the need for mechanical systems. Today, space cooling in the EU consumes approximately 80 TWh of electricity annually, according to a Guidehouse study. By 2050, an optimized uptake of dynamic solar shading could reduce the electricity demand for cooling by up to 60%[19]. In Saudi Arabia's desert climate, shading alone reduced annual cooling energy use by 6.6%[20], while simulations in Jeddah showed up to 37% savings when combined with other passive strategies[21].

Despite these benefits, passive cooling remains underutilised globally due to weak policy incentives and limited commercial interest. In many rapidly urbanising regions, building codes do not require or incentivize passive design, and developers often prioritize short-term cost savings over long-term resilience.

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[15] Sraddha Sabu. 2024. How is record heat affecting global infrastructure?. World Construction Network. August 30, 2024.

[16] Percentage of households unable to keep their home warm in winter and share of population living in a dwelling not comfortably cool in summer | Maps and charts | European Environment Agency (EEA)

[17] Risks to health, wellbeing and productivity from overheating in buildings July 2022

[18] Housing and net zero - House of Commons Library

[19] Solar Shading in Europe

[20] Nedhal, A.-T. Passive Design Strategies for Energy Efficient Buildings in the Arabian Desert. Front. Built Environ. 2022, 7, 805603.

[21] Aldossary, N.A.; Rezgui, Y.; Kwan, A. Domestic energy consumption patterns in a hot and humid climate: A multiple-case study analysis. Appl. Energy 2014, 114, 353–365.

Retrofitting: A Critical Opportunity

Given that 80% of the buildings that will be in use by 2050 already exist[22], retrofitting with low carbon heating and energy efficiency upgrades is crucial for reaching net zero. Retrofitting is one of the most effective ways to enhance heat resilience. However, uptake is slow, especially in informal settlements and older housing stock. Clear standards, accessible funding, and technical support are essential to accelerate retrofitting efforts and ensure that vulnerable populations are not left behind.

"We welcome the introduction of new building regulations and requirements for assessing overheating in new homes."
— David Weatherall, BRE

Designing for the Future, Not the Past

New developments must integrate heat resilience from the outset. This means embedding passive design principles—such as optimal orientation, natural ventilation, external shading, reflective materials, and the use of thermal mass—into every stage of planning and construction. Incorporating smart technologies, like automated shading, adaptive cooling systems, and real-time indoor climate monitoring, can further enhance a building's ability to maintain comfort during extreme heat events.

Certification schemes and updated building codes can drive this shift, ensuring that today's buildings are prepared for tomorrow's climate. Instead of continuing to rely on historic climate data for building design, as is still common practice in most countries, we need to start using future climate projections to ensure new developments are truly resilient. In addition, developing a dedicated "climate change" or "extreme heat" readiness label or criterion—potentially as part of established sustainable building certifications like BREEAM—could help drive the market toward buildings that are demonstrably prepared for future climate risks. Additionally, integrating resilience into urban planning—by increasing green spaces, promoting cool roofs, and designing neighbourhoods to maximize airflow—can help mitigate the urban heat island effect and protect entire communities.

"Increasingly, homes need to be assessed considering future climates."
— Jonas Hiller, Toni Pierch Foundation

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[22] The Chartered Institute of Building (HEA0034)

4. Strategies to Connect the Dots and Adapt: From Fragmented to Future-Proof

Tackling extreme heat demands a whole-system response; one that moves beyond fragmented, siloed efforts and instead connects the dots across sectors, disciplines, and levels of governance. The complexity of heat resilience means that no single actor or policy can deliver the necessary change alone. Progress depends on forging strong, multi-sectoral collaboration between healthcare system, energy infrastructure, city and building planning, finance, and beyond.

This section presents a strategic roadmap for coordinated action. The solutions outlined are designed to break silos, align incentives, and scale what works. They respond directly to the barriers identified earlier—data deficits, fragmented systems, misaligned finance, underleveraged technology, and low public awareness—and offer actionable pathways for policymakers, investors, industry leaders, and philanthropic stakeholders.

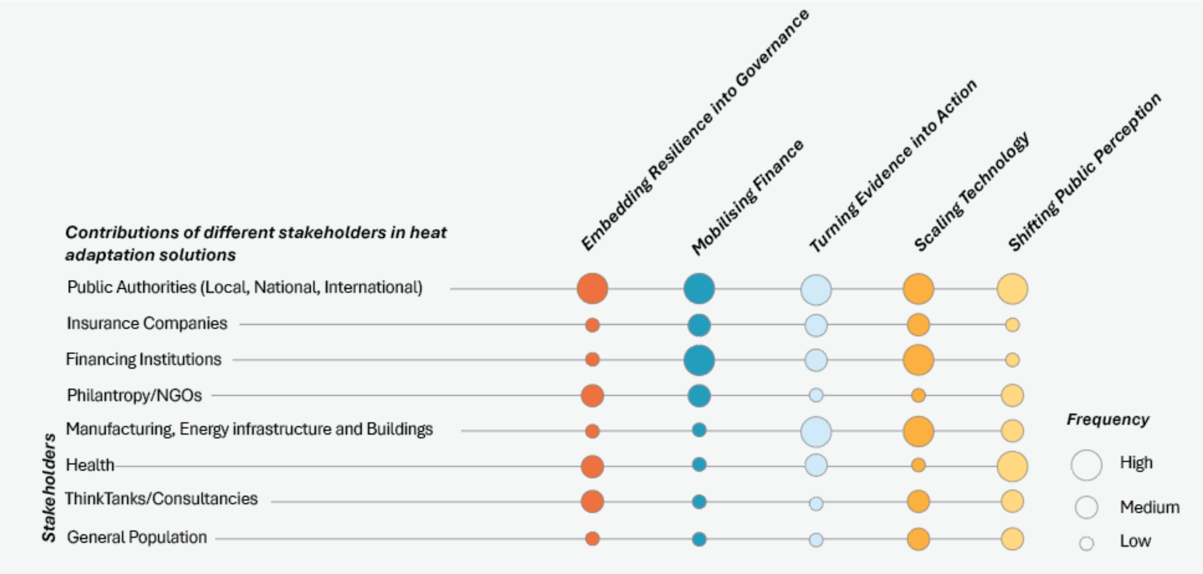

Figure 2: Frequency of solutions mapped to statements of participants in roundtable

Embedding Resilience into Governance and Policy

Governance challenges are among the most persistent obstacles to heat resilience. Fragmented responsibilities, outdated regulations, and siloed planning processes prevent coordinated action. But solutions are emerging that can realign institutions and policies with the realities of a extreme heat.

"Extreme heat sits at the intersection of health, energy use, and policy—embedding resilience into our frameworks offers an opportunity to align multiple goals, from decarbonisation to public health."
— Kate Duffy, UK Department for Energy Security and Net Zero

- **Establishing stronger cross-sectoral collaboration:** One of the most promising approaches is the establishment of permanent, cross-sectoral collaboration that brings together health, built environment, energy, and climate experts. These bodies can align strategies, funding, and timelines, ensuring that heat resilience is embedded across departments. Coordination platforms, digital or in-person, can facilitate real-time collaboration between government levels, sectors, and civil society. Appointing heat resilience coordinators within local governments can further institutionalize this work, ensuring continuity and accountability. Increasing capacity for local governments is crucial to effectively implement government strategies, energy plans and heat-health action plans[23] as well as increase stakeholder collaboration at the local and regional levels.

- **Developing a shared policy roadmap or action scenarios:** Co-developed roadmaps and scenarios, between public and private stakeholders, can clarify roles, investment priorities, actions to take for key stakeholders and timelines. These should be dynamic, reflecting evolving climate data and community needs. In addition, plans should consider systemic failures of critical infrastructure, such as train and underground disruption, road bucking and failure of networks and data centres and the resulting impact on public health. Maintenance needs, warning needs and disseminations plans should be included in roadmaps and scenarios.
- **Updating building codes and retrofitting standards:** Building codes should be updated to require overheating risk assessments and passive cooling measures, such as shading, ventilation, and thermal mass, in both new builds and retrofits. Retrofit standards are especially critical for informal settlements and vulnerable housing stock. Cooling-related standards such as Cooling equipment performance standards (like SEER, EER, COP ratings), Thermal comfort standards, Design standards for passive cooling (e.g. shading, ventilation, thermal mass) need to be modernized and updated to promote sustainable cooling solutions. New building sites should follow strict guidelines on cooling and heat management. Stricter requirements on overheating should be adopted for new homes and office-to-residential conversions. It is also crucial to develop certification schemes for sustainable buildings.
- **Creating innovation-friendly regulatory frameworks:** Governments should establish regulatory sandboxes to allow emerging technologies, such as radiative cooling and smart ventilation, to be tested in real-world conditions. This helps bridge the gap between innovation and regulation.
- **Designing inclusive policies for vulnerable populations**: Interdisciplinary policies should include both adaptation and resilience measures, which consider the most vulnerable populations. Policies must explicitly account for the disproportionate risks faced by low-income households, the elderly, outdoor workers, and residents of informal or poorly ventilated housing. This includes embedding equity considerations into building codes, funding mechanisms, and adaptation plans to ensure that resilience measures reach those most at risk.

Mobilising Finance for Scalable and Equitable Adaptation

While climate finance is growing, only a fraction is directed toward adaptation, and even less toward heat resilience. Often, when the funding is already there, it does not offer holistic support, is fragmented across sectors, or remains inaccessible to those who need it most. The issue is not just availability, but access, awareness, and the ability to quantify benefits.

- **Building one-stop-shops for access and uptake:** One-stop-shops are essential to bridge the gap between available funding and actual uptake. These hubs should offer integrated technical advice, financing options, and application support, especially for local governments and low-income communities.
- **Bundling financing and aggregating demand:** Bundled financing products that combine heat resilience with energy efficiency upgrades, such as insulation, shading, and efficient cooling, can streamline investment and appeal to both public and private funders. Demand aggregation models, which pool retrofitting needs across neighborhoods, can create economies of scale and attract institutional capital. Support programmes should cover heat resilience beyond energy efficiency, including simple passive cooling solutions, such as shades and shutters.
- **Establishing dedicated retrofitting and innovation funds:** Public-private financing vehicles should be created to support retrofitting, with concessional terms for low-income households. Innovation challenge funds can support early-stage sustainable and energy-efficient cooling technologies through

[23] WHO. 2021. Planning heat-health action

grants, venture capital partnerships, and demonstration projects. Results-based financing, where funding is tied to measurable outcomes like indoor temperature reduction, can help de-risk investment.

Philanthropy and private finance have a critical role to play. Yet only a fraction of their climate contributions is directed toward the critical infrastructure and built environment. By elevating buildings and public infrastructure in climate finance narratives, funders can highlight how they intersect with health, equity, and climate goals. Positioning heat resilience as a cross-cutting issue, relevant to critical infrastructure, well-being of societies, and public health, can unlock new funding streams. Philanthropies should be at the forefront of financing and dissemination efforts, putting pressure on policymakers to develop sustainable strategies and incentives.

Turning evidence into action through data and metrics

Effective adaptation requires evidence, but in the case of extreme heat, the data is often missing, fragmented, or disconnected from decision-making. There is limited and uneven information on building vulnerability, cooling performance, and health impacts, making it difficult to design targeted interventions or justify investments. The challenge is not just a lack of data, but a lack of standardized metrics, interoperable systems, and institutional mechanisms to translate evidence into action.

"Until we have clear, trusted metrics that signal what's coming, we won't see the shift we need. People can't act on what they can't measure."
– Alan Miller, Coolpact

"We need to embed spatial planning into our adaptation strategies—identifying priority areas and tailoring interventions to local conditions, because no two regions face the same risks."
- Laura Griffiths, BRE

- **Standardizing data collection and sharing:** Governments should establish protocols for collecting, reporting and consolidating data on indoor temperatures, cooling system performance, including energy consumption and emissions, and health outcomes during heat events. Only then can they understand how to mitigate the issue of extreme heat. These protocols must be consistent across regions and sectors to enable comparison and aggregation, including a shared set of metrics for evaluating the benefits of heat resilience (e.g. avoided deaths, energy savings, economic productivity). It is crucial to particularly focus on homes and residents in addition to non-residential buildings.
- **Building open data platforms:** Open data platforms can make heat-related information accessible to researchers, policymakers, and communities. These platforms should integrate building vulnerability, urban density, heat exposure, and intervention outcomes to support evidence-based planning. There is especially a need to coordinate between all organizations trying to quantify the impact of extreme heat and urban planners and across departments and levels within government institutions.
- **Integrating key metrics into policy evaluations:** Government impact assessments must include health and well-being outcomes, such as reduced hospitalizations, improved productivity, and avoided deaths, in connection with inside and outside temperatures. Without these metrics, the benefits of heat resilience remain invisible in cost-benefit analyses. Governments should also support research that tracks the long-term impacts of cooling interventions on health, equity, and infrastructure performance. Heat island effect maps, building stock databases, and socio-economic indicators should be used to identify at-risk areas and populations to offer targeted interventions. To support this, it is essential to quickly develop and implement clear KPIs for assessing the impacts of heat extremes, and to establish robust monitoring and evaluation systems that can track how well our infrastructure and policies are hedging against the negative consequences of extreme heat. Without data-informed policies, policymakers cannot develop standards and codes that increase compliance.

Scaling technology that works for people and the planet

Technology is a critical enabler of heat resilience, but only when it is accessible, integrated, and aligned with local needs. While promising solutions exist, they are often underfunded, poorly scaled, or disconnected from policy and infrastructure planning.

- **Subsidizing and demonstrating smart and passive cooling technologies:** Technologies reducing energy demand, especially passive cooling technologies reducing active cooling days, should be prioritized to decrease high energy costs endured by households. Smart thermostats, automated shading, and adaptive cooling systems should be subsidized, especially in vulnerable areas where heat exposure and energy poverty intersect. Public buildings such as schools and hospitals can serve as demonstration sites, showcasing the benefits of these technologies and helping build public trust. It is also important to highlight the need for strong examples and demonstration projects for both existing and new buildings, as effective cooling strategies will vary significantly across different climate regions. Beyond demonstration projects, innovators require financial support to scale up their initiatives. At the same time, passive cooling strategies, such as ventilative design, thermal mass, and shading, must be prioritized to reduce grid load and emissions. In addition to building-level measures, it is crucial to implement urban-scale strategies—such as expanding green spaces, increasing tree canopy, and redesigning city layouts—to reduce the urban heat island effect and create a more holistic approach to heat resilience. Additionally, as low-income households, social buildings and non-domestic buildings serving as public infrastructure could be among the most impacted due to high cost or inability to purchase cooling technology, they require access to subsidies for active and passive cooling solutions with high efficiency.
- **Investing in distributed energy systems to reduce grid pressure:** Rooftop solar, battery storage, and microgrids are essential to ensure cooling access during heatwaves, particularly in high-density or low-income areas where grid failures can be catastrophic. These systems decentralize energy supply, making them more resilient.

Making Heat Visible: Shifting Public Perception and Engagement

Despite its deadly impact, extreme heat is still not perceived as a catastrophic risk. Unlike floods or storms, it lacks the visual effect that drives public concern and political action. This perception gap undermines urgency, funding and implementation.

- **Shifting the narrative through strategic communication:** There is a need for targeted, emotionally resonant communication to make heat risks visible and relatable. Public awareness campaigns using storytelling, infographics, and real-life case studies can help translate abstract risks into tangible realities. Community ambassador programs can train trusted local leaders to disseminate knowledge and support behavior change.
- **Building heat literacy through education, drills and training:** Education is a powerful lever for long-term change. Heatwave preparedness drills, climate adaptation and heat risk modules can build long-term awareness once embedded into school curricula and vocational training programs. Certification programs for urban planners, health officials, and energy regulators can build professional capacity.
- **Empowering local communities:** Communication should be targeted at the most vulnerable populations, including older adults, outdoor and manual workers as well as low-income and marginalized communities. At the community level, microgrants can fund local initiatives like neighborhood shading, cooling shelters, or awareness events. Simplifying application processes and building trust through local partnerships can increase uptake and ensure uptake of interventions.

"To increase uptake, we need to work directly with communities at the micro level—and unite efforts across regions facing similar challenges to scale what works."
– Roxanna Slavcheva, WRI

The barriers to heat-resilient infrastructure are deeply interconnected, but so are the solutions. Financial tools must be paired with enabling policies, data must inform both design and decision-making, and community engagement must be embedded alongside technology. Only by connecting these dots across sectors, disciplines, and governance level can we move from fragmented efforts to systemic resilience.

5. Conclusion

Extreme heat is no longer a distant climate concern—it is a present and accelerating systemic risk. Its impacts are multifaceted, cascading across infrastructure, health systems, energy networks, and communities. Yet despite its growing toll, extreme heat remains one of the least understood and least addressed climate hazards.

Figure 3: Systems mapping for Heat Resilience: connecting the dots

This white paper has traced the contours of that risk, drawing on insights from cross-sector leaders to expose the hidden vulnerabilities in our systems and identify actionable solutions. The message is clear: fragmented efforts will not suffice. Heat resilience demands a coordinated, whole-system response—one that connects the dots between policy, finance, design, and community engagement.

The barriers are deeply interconnected: data gaps hinder planning, siloed governance slows implementation, misaligned finance leaves solutions unfunded, and low public awareness undermines urgency. But so too are the solutions. By embedding resilience into governance frameworks, updating building codes, mobilising targeted finance, and scaling passive cooling technologies, we can transform vulnerability into preparedness.

This is not merely a technical challenge—it is a strategic opportunity. Heat resilience aligns with broader goals of decarbonisation, public health, equity, and economic stability. It offers a chance to future-proof our infrastructure, protect our most vulnerable populations, and unlock new pathways for sustainable investment.

The knowledge exists. The tools are emerging. The momentum is building. What remains is to act—with clarity, courage, and collective purpose.

Extreme heat is foreseeable, quantifiable, and manageable—but only if we act now, together, and at scale.

The heat is rising. The map is in front of us. The task now is to draw the lines between the dots.