Community-Level Preparedness and Recovery for Increasingly Severe Weather

Introduction

Extreme weather events are growing more frequent and severe, and the most vulnerable communities are bearing the brunt of it. In the past five years alone, major weather disasters have claimed 2,000 lives and caused $121 billion in damages annually. With rising sea levels, temperatures, and precipitation events, communities across the Mid-Atlantic region are at heightened risk of floods, storms, extreme heat, and essential service disruptions. The 11 hottest years on record have all occurred since 2010, and 2024 was officially the hottest year ever recorded. Each month from May 2023 through the summer of 2024 broke global temperature records, culminating in July with what scientists believe hosted the hottest day in over 120,000 years.

High temperatures are not only breaking records but also straining systems by overwhelming public infrastructure, health services, and disaster response capabilities. Extreme heat is linked to cardiovascular failure, kidney disease, respiratory distress, premature births, cognitive decline, and mental health crises. Older adults, residents of under-resourced neighborhoods, individuals with preexisting environmental and health disparities, and outdoor workers face the greatest exposure to dangerous heat conditions. The health sector must prepare for a surge in socially nuanced, heat-related cases.

The Union of Concerned Scientists (UCS) has brought focus on the hazard of extreme heat as a financial burden to outdoor workers [1]. Missed workdays or injuries from dangerous working conditions both pose costs; UCS has emphasized this in their "Too Hot to Work" campaign [2]. Consumers, small business owners, and workers face financial risks as well.

As hotter temperatures and droughts disrupt staple crop supplies like corn and wheat, food shortages and price hikes hit households hard, making everyday essentials more expensive [1]. Small businesses in disaster-stricken areas are particularly vulnerable, as seen in Western North Carolina after Hurricane Helene, where costly infrastructure repairs burdened local owners. The fires in Lahaina caused widespread job losses, especially in the tourism and service industries, leading to significant economic instability. Meanwhile, infrastructure failures—from water crises in Asheville to power outages in Delaware and California—disrupted critical services, further complicating recovery for both residents and businesses.

The financial strain of extreme weather events is far-reaching and staggering. UCS noted that in 2024 alone, there were 27 separate billion-dollar weather disasters [1]. Global losses from climate-related events reached $320 billion, yet only $108 billion of that was insured. The US Department of Treasury concluded that extreme weather is projected to have cascading impacts from high to no insurance, mortgage delinquencies, and financial market disruptions. In cases like Hurricane Ida (2021), over 40% of homes were uninsured, leaving families to bear repair costs averaging $20,000 out-of-pocket. FEMA's assistance often falls short, with average grants of just $7,000, far below the $18,000 to $30,000 in out-

of-pocket costs that uninsured homeowners face after severe weather events. Renters and minority communities are particularly vulnerable, with insurance coverage rates often below 25%, and additional costs such as temporary housing or lost possessions further strain household finances.

The climate crisis also threatens the healthcare system, and with more than just increased emergency room cases. Survivors may face long-term health consequences such as mold exposure and waterborne illnesses from flooding, PTSD from wildfires and other natural disasters, and cardiovascular and respiratory illnesses from extreme heat. With every new disaster, the health care system could face a surge of patients surpassing capacity. Each subsection of the healthcare system – from Emergency Medical Services to Psychologists to administrators and beyond – will feel the heat.

These challenges are not distant threats. Climate disasters are unfolding right now, and every moment of inaction leaves more people vulnerable to the compounding risks.

In recognition of these realities, The Environmental Collaboratory at Drexel University hosted a regional convening focused on community-level preparedness and recovery. The following report presents the knowledge gathered from the preliminary survey, discussions, and workshops documented from the event. Each insight details the community-centered, cross-sectoral endeavor we must undertake to match the urgency of our efforts with the peril of our climate crisis. Hereafter, we present actionable steps our institutions can take to prepare our region for the next imminent weather disaster.

References:

1. Kumar, Chitra. (2025, January 31). Collaboration for Climate Resilience with Drexel Environmental Collaboratory [convening presentation]. 2025 Mid-Atlantic Regional Convening on Increasingly Severe Weather Preparedness, Philadelphia, PA, United States.

2. Dahl, Kristina, Rachel Licker. 2021. *Too Hot to Work: Assessing the Threats Climate Change Poses to Outdoor Workers*. Cambridge, MA: Union of Concerned Scientists. https://doi.org/10.47923/2021.14236

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Insurance and Financial Systems

"Insurance and Financial Systems" is a preparedness and recovery gap because current frameworks are not designed to account for escalating climate risks, leaving homeowners, renters, community institutions (e.g., hospitals, schools), businesses, lenders, municipalities financially exposed. Without granular data on how climate disasters impact property values, mortgage markets, and insurance availability, communities and policymakers are unable to plan effectively or equitably. As climate-related losses grow, so does the urgency for financial systems to adapt—yet gaps in regulation, data, and accessible resources persist.

Research/Data Needs:

- Tracking of declining property values, insurance gaps, and mortgage delinquencies in climate-vulnerable areas.
- Alternative mechanism for data collection and analyzing costs of severe weather events since the US Department of Treasury will no longer collect nor analysis such data (e.g., US Treasury Reports 2024/2025).
- ZIP code-level risk modeling to identify at-risk mortgage and insurance markets.
- Quantification of benefit-cost ratios for specific hazard mitigation measures.

Policy Needs:

- Regulatory standards (or non-regulatory standards) to assess and disclose climate-related risks in financial portfolios.
- Policies requiring integration of climate risk into insurance pricing and mortgage lending practices.
- Guidance for insurance providers to ensure availability and affordability of coverage in high-risk areas.
- Development of shared insurance risks and funding models, e.g., public-private mechanisms
- Regulatory incentives for risk reduction retrofits in at-risk properties.

Resource Gaps:

- **Financial Resources:** Funding research, modeling, and mitigation programs; support for underinsured homeowners.
- **Technical Resources:** Improved data collection tools, climate risk modeling software, enhanced public access to climate risk data.
- **Human Resources:** Experts in climate finance, insurance modeling, and equitable disaster risk reduction planning.

Key Collaborators & Partners:

- State Insurance Agencies, mortgage lenders and financial institutions
- Insurance providers and reinsurance firms
- Housing advocacy organizations and consumer protection groups
- Universities and think tanks focused on climate risk and housing markets

Public Health and Hospital Systems

"Public Health and Hospital Systems" is a preparedness gap because many healthcare facilities lack the resources, staffing, and planning needed to respond effectively to climate-related disasters. Disruptions to care during extreme weather can disproportionately harm medically vulnerable populations, especially in healthcare deserts and under-resourced communities. Strengthening coordination between hospitals, public health agencies, and emergency management systems is essential to ensure continuity of care and efficient allocation of medical resources before, during, and after emergencies.

Research/Data Needs:

- Assessment of hospital readiness for climate-related disasters.
- Mapping medically vulnerable populations and healthcare deserts.
- Data on staffing overlaps between Medical Reserve Corps, Red Cross Disaster Teams, Disaster Medical Assistance Teams, and their primary employers (e.g., hospitals, LTCs, EMS) to identify potential double counting of response capacity.
- Comparing care shelters vs. acute care for stable patients in climate emergencies.
- Integrating health and climate modeling linking health risks to climate disasters.
- Benefit-cost of specific hazard reduction steps in hospital settings.

Policy Needs:

- Regulations requiring continuity of care planning during extreme weather events.
- Integration of public health agencies in local and regional emergency planning.
- Guidelines for self-sufficiency of medical facilities during emergencies.
- Support to prepare medical personnel ahead of weather emergencies.
- Policies supporting hospital coordination with local emergency management and shelter systems to streamline resources based on acute vs. stable medical needs.
- A robust disaster preparedness plan outlining procedures for extreme weather events to ensure infrastructures respond quickly to medical needs.

Resource Gaps:

- **Financial Resources:** Funding for hospital infrastructure resilience upgrades, medical components of congregate care shelters, and mobile medical units. Sustainment of previous grant-funded programs proven effective during disasters.
- **Technical Resources:** Backup energy systems, telehealth capacity, EMR systems that integrate with regional emergency planning for real-time decision-making, tools to assess medical responder deployment readiness.
- **Human Resources:** Emergency-trained healthcare professionals, staffing to augment shelter-based medical care, pre-deployment preparation and support for health professionals responding to climate disasters.

Key Collaborators & Partners:

- Hospitals, community health centers, and local health departments
- Emergency medical services, public health agencies, and community OEMs/EMAs
- Red Cross, Medical Reserve Corps, and other disaster response teams
- State and local human services/social services agencies
- Shelter and congregate care providers

Heatwave Preparedness and Right to Cooling

"Heatwave Preparedness & Right to Cooling" is a critical preparedness gap because extreme heat—one of the deadliest climate risks—continues to disproportionately affect vulnerable populations without adequate systemic support. Underserved communities often lack basic cooling infrastructure, and there is no legal recognition of a right to cooling or consistent inclusion of extreme heat in emergency and recovery plans. Marginalized groups face barriers to energy access and heat-resilient housing due to high energy burdens, cost, language barriers, and renter status, while green workforce programs rarely offer stable, local employment or worker protections. Health systems, schools, and workplaces are often unprepared, lacking infrastructure and data systems to respond effectively to heat-related health risks for the elderly, those with chronic conditions, and unsheltered or outdoor workers. Additionally, fragmented and underfunded public services—such as cooling centers, mobile health support, and multilingual outreach—remain inaccessible to many of the communities most at risk, highlighting the urgent need for comprehensive and equitable interventions.

Research/Data Needs:

- Review and consolidate existing research on health impacts of extreme heat on vulnerable populations with focus on actionable interventions and recommendations
- Analysis of the usage and effectiveness of cooling interventions (vouchers, green infrastructure, etc.).

Policy Needs:

- Right-to-cooling policies (e.g., cooling vouchers, access to air conditioning).
- Building codes and zoning regulations that require heat-mitigating infrastructure.
- Funding home retrofit projects (e.g., Built to Last) for energy efficiency to reduce burden on lowest income communities.

Resource Gaps:

- **Financial Resources:** Funding cooling assistance programs, subsidies for home cooling improvements, investment in green infrastructure.
- **Technical Resources:** Energy-efficient cooling solutions, accessible distribution of cooling resources. Tools such as the University of Delaware's Heat Watch which highlights spatial areas of heat vulnerability and warning data with widespread access.
- **Human Resources:** Outreach staff for community engagement, heatwave preparedness educators.

Key Collaborators & Partners:

- Public health departments and environmental agencies
- Utility companies offering cooling assistance programs
- Housing and urban development organizations

University of Delaware Heat Watch: https://sites.udel.edu/climatechangehub/events-oldversion/wist-heat-watch-2023/

Built to Last: https://philaenergy.org/programs-initiatives/built-to-last/

Local Government in Emergency Preparedness Planning

"Local Government in Emergency Preparedness Planning" is a preparedness gap because many municipalities lack the capacity, funding, or training to adequately plan for and respond to disasters. Smaller towns often operate without dedicated emergency planning staff, leaving them vulnerable to increasingly severe weather events. Identifying how and where local governments are under-resourced is critical to ensuring effective, equitable emergency preparedness across regions.

Research/Data Needs:

- Assessment of current municipal engagement in emergency preparedness.
- Data collection of localized impacts from extreme weather events
- Best practices from highly prepared local governments.

Policy Needs:

- Local, state, or federal funding for municipal enhancement of emergency preparedness.
- Requirements for emergency planning coordination among adjacent local governments.

Resource Gaps:

- **Financial Resources:** Federal/state funding for emergency planning at the local level, incentives for municipal engagement; grants for community-based organization to build knowledge and capacity in communities on preparedness and recovery.
- **Technical Resources:** Training for municipal staff on disaster preparedness.
- **Human Resources:** Dedicated personnel for emergency planning in small towns. Resilience officers at a state level to engage with local communities effectively.

Key Collaborators & Partners:

- Local government councils and emergency management offices
- State and federal emergency preparedness agencies
- Community response organizations

Localizing Information

"Localizing Information" is a preparedness gap because preparedness planning does not currently incorporate the specific local challenges of vulnerable communities. Many communities lack access to relevant, real-time data reflecting their specific environmental risks and needs. For decision-makers and residents to effectively prepare for climate hazards, digital tools collecting and integrating hyperlocal data with community voices must be accessible and actionable. Localizing information means designing data tools to support equitable emergency preparedness and long-term resilience planning.

Research/Data Needs:

- Inventory of existing public city data being used in environmental dashboards (e.g., heat, flooding, energy use, pollution).
- Identification of gaps in available environmental data that communities find most urgent
- Review of existing dashboards and their impact on decision-making
- Collection of hyperlocal, community-generated data

Policy Needs:

- Guidelines for integrating community input into the design and development of public-facing dashboards.
- Protocols that protect community-collected data and promote data sovereignty.
- Support for participatory planning processes in climate resilience and emergency preparedness initiatives.
- Policies that fund community engagement in environmental data collection and interpretation.

Resource Gaps:

- **Financial Resources:** Grants to support grassroots data collection efforts, funding for community-based organizations to lead or co-lead dashboard and mapping design and implementation, and budgeting for maintaining and updating these dashboard/mapping efforts over time.
- **Technical Resources:** User-friendly digital tools for communities to interact with, tools for real-time data integration from both institutional and community sources, and platforms that allow for interactive visualizations and feedback loops.
- **Human Resources:** Community engagement specialists to facilitate participatory design, GIS analysts and data scientists with experience in community-engaged research, and local residents trained in data collection.

Key Collaborators & Partners:

- City agencies that manage environmental and infrastructure data (e.g., Office of Sustainability, Office of Innovation and Technology).
- Community-based organizations with ties to neighborhoods most affected by climate risks.
- Academic institutions and researchers offering technical expertise in participatory design, GIS, and public health.
- Philanthropic partners or foundations focused on climate justice

Inclusion of Vulnerable Populations in Emergency Planning

"Inclusion of Vulnerable Populations in Emergency Planning" is a preparedness gap because emergency systems often overlook the specific needs of people with disabilities, older adults, communities most vulnerable to the shocks of extreme weather, and immigrant or refugee communities. These populations face disproportionate risks during severe weather events yet are rarely represented in the design or implementation of preparedness strategies. Without data-driven approaches and intentional inclusion, emergency planning continues to leave behind those most affected.

Research/Data Needs:

- Analysis of demographic information connecting vulnerable communities/populations to corresponding representation in local emergency planning personnel
- Analysis of past emergency responses and gaps for people with disabilities to identify areas of insufficiency and infrastructure failings.
- Create localized lists of community organizations and individuals with disabilities for emergency preparedness coalitions to invite as a regular practice.
- Studies on how immigrant and refugee communities are impacted by severe weather emergencies.

Policy Needs:

- Requirements for representatives of vulnerable communities - such as disabled and non-English speaking individuals - in emergency planning bodies.
- Legal frameworks for compensating community representatives.

Resource Gaps:

- **Financial Resources:** Funding for outreach programs, stipends for community representatives, grants for accessibility improvements.
- **Technical Resources:** Tools for accessible communication and inclusion strategies.
- **Human Resources:** Staff to conduct outreach and manage inclusion efforts.

Key Collaborators & Partners:

- Disability rights organizations and advocacy groups, including those focused on hearing and seeing disabilities
- Emergency management agencies
- Local community-based organizations – such as those for older adults - or assisted living community leadership

Strengthening Community Partnerships for Disaster Response

"Strengthening Community Partnerships for Disaster Response" is a preparedness gap because grassroots organizations are often the first to respond in emergencies, yet they lack consistent funding and recognition within formal disaster frameworks. Many communities face barriers in navigating federal aid systems like FEMA and PEMA, which hinders equitable recovery. Research is needed to evaluate community-led models and develop policies that center local knowledge, streamline access to aid, and improve coordination between government agencies and trusted community partners.

Research/Data Needs:

- Evaluation of community-led disaster response models.
- Identification of barriers to accessing FEMA/PEMA aid.

Policy Needs:

- Simplified application processes for disaster aid.
- Increased direct funding for grassroots organizations.

Resource Gaps:

- **Financial Resources:** Increased federal and state funding for local disaster response, flexible grant funding for community-led initiatives.
- **Technical Resources:** Multilingual communication platforms for streamlined aid application processes.
- **Human Resources:** Community liaisons to bridge government and local response efforts.

Key Collaborators & Partners:

- FEMA, State and local emergency management agencies
- Grassroots and community-led organizations
- Public health and social service agencies

Intergovernmental Coordination in Emergency Communication

"Intergovernmental Coordination in Emergency Communication" is a preparedness gap because inconsistent messaging across jurisdictions can delay evacuations, confuse the public, and worsen outcomes during disasters. Communities with different risk profiles and communication needs require tailored, real-time alerts—something many current systems fail to deliver due to technical, jurisdictional, and cultural disconnects. Research is needed to analyze past failures, develop interoperable communication tools, and build coordinated, multilingual messaging protocols that can be trusted across state and local boundaries.

Research/Data Needs:

- Analysis of past communication failures during disasters.
- Best practices in interstate emergency messaging.
- Risk profiles for different communities
- Database of frequently flooded locations
- Comprehensive mapping of climate-related risks
- Localized mapping that is accessible to the public

Policy Needs:

- Standardized emergency communication protocols across jurisdictions.
- Depoliticization of emergency response messaging.

Resource Gaps:

- **Financial Resources:** Investment in emergency communication infrastructure, funding for multilingual and accessible messaging systems.
- **Technical Resources:** Interoperable communication platforms across agencies.
- **Human Resources:** Personnel to manage real-time emergency messaging coordinated between counties and with local cultural and spiritual leaders for more effective communication

Key Collaborators & Partners:

- State and local emergency communication agencies
- Media outlets and digital communication firms
- Schools, religious organizations, and community centers
- Webinars and partnerships with local universities to provide crucial training and information

Evacuation Planning & Public Awareness

"Evacuation Planning & Public Awareness" is a preparedness gap because many communities lack clear, accessible, and coordinated evacuation strategies—especially for carless households, people with disabilities, and those unfamiliar with local routes. Limited modeling of traffic patterns and infrastructure constraints further complicates safe and timely evacuations during extreme weather events. Research is needed to identify best practices, improve route planning tools, and build widespread public understanding of evacuation protocols.

Research/Data Needs:

- Traffic pattern modeling for emergency evacuation.
- Case studies on successful evacuation strategies.

Policy Needs:

- Regulations for coordinated municipal evacuation plans.
- Requirements for transit accessibility in evacuation routes.

Resource Gaps:

- **Financial Resources:** Funding for public awareness campaigns, grants for transit agencies to support evacuation efforts.
- **Technical Resources:** GIS mapping tools for evacuation route planning, emergency transportation coordination.
- **Human Resources:** Staff to facilitate emergency drills and train community members.

Key Collaborators & Partners:

- Local transit agencies and transportation departments
- Emergency responders and disaster management teams
- Employers, schools, and community organizations

Accessible Emergency Messaging & Multilingual Support

"Accessible Emergency Messaging & Multilingual Support" is a preparedness gap because language and accessibility barriers can delay life-saving information during disasters, leaving many communities at heightened risk. Existing emergency systems often fail to provide timely, clear communication to non-English speakers and individuals with hearing or visual disabilities. Research is needed to evaluate past failures and develop inclusive, multilingual, and accessible messaging systems that reach all residents equitably.

Research/Data Needs:

- Assessment of language barriers in past emergency responses.
- Effectiveness of multilingual messaging strategies.

Policy Needs:

- Mandates for multilingual emergency alerts.
- Requirements for inclusive emergency communication systems.

Resource Gaps:

- **Financial Resources:** Grants for multilingual translation services, investment in accessible emergency messaging systems.
- **Technical Resources:** AI-based translation tools for real-time emergency messaging.
- **Human Resources:** Community leaders and cultural liaisons to improve emergency outreach.

Key Collaborators & Partners:

- Local governments and emergency management agencies
- Community leaders from non-English-speaking populations
- Organizations focused on hearing and seeing disabilities
- Media outlets specializing in multilingual broadcasting
- Environmental advocacy organizations

Land-Use & Infrastructure Planning

"Land-Use & Infrastructure Planning" is a preparedness gap because land use planning and building codes have been raised as critical issues to reduce risk to communities from extreme weather, such as from floods and wildfire (heat related issues are separately addressed above). As extreme weather intensifies, the absence of regionally aligned planning creates systemic risks that no single municipality can address alone. This fragmentation leads to inefficient infrastructure investments, missed opportunities for cost-sharing, and increased vulnerability to climate impacts.

Research/Data Needs:

- Climate impact projections for uncoordinated vs. coordinated planning.
- Case studies on successful planning models, criteria and tools to address extreme weather impacts, flooding and wildfire, with a focus on the most vulnerable communities.
- Data on infrastructure risks due to extreme weather impacts inefficiencies due to fragmented land-use planning.

Policy Needs:

- Establish minimum requirements for key risk mitigation, e.g., building in flood and fire prone areas
- Broaden the mandates for regional planning to incorporate extreme weather mitigation measures and community consultation.
- Establish incentives for municipalities to collaborate on shared infrastructure projects.

Resource Gaps:

- **Financial Resources:** Grants for coordinated infrastructure projects, state/federal funding for inter-municipal collaboration.
- **Technical Resources:** Expertise in translating extreme weather risks to model governance and policy development.
- **Human Resources:** Dedicated staff for extreme weather regional planning initiatives.

Key Collaborators & Partners:

- County governments and regional planning commissions
- Municipal leaders and infrastructure agencies
- Environmental Justice, Environmental, planning advocacy organizations