



Bridging community resilience and local planning for climate justice

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ABSTRACT

As the effects of climate change increase, and as the federal government deprioritizes climate action, local governments must grapple with the complex challenge of enhancing resilience. Despite the importance of local-scale planning and finance for equitable climate resilience, the knowledge needed to support such efforts is poorly defined. We outline four challenge areas and corresponding priority considerations: capacity and governance, adaptation and recovery, funding mechanisms, and data and methodological needs. By strengthening knowledge and partnerships in each of these areas, scholars, policymakers, and practitioners can better support communities to respond to and recover from the effects of a changing climate.

1. Introduction

As record-breaking heat, wildfires, and floods escalate the damage and associated cost of climate change, current disaster

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mitigation and recovery systems in the United States are failing to keep up. Private insurance companies that cover substantial proportions of disaster recovery are increasingly refusing to cover homes (Kamisher et al., 2023). Although every level of government is faced with decisions on how to better protect their communities, action by local government, where public discourse is often the most contentious, but shared values are most likely to be held, will undoubtedly be key. Local governments seeking to ensure and enhance their resilience face competing priorities, from redesigning infrastructure to land use planning and other risk-reduction measures. At the same time, they must grapple with how to fund these efforts, including navigating a complex web of federal, state, and private grants, loans, insurance, and other finance mechanisms. The role of local governments is especially important in the current landscape where climate action has been dramatically deprioritized and the availability of future federal disaster aid is in question (Welch, 2025).

Community-informed, equity-minded, empirical research, policy, and education efforts can assist local governments in making and acting on these planning and financial decisions yet, to date, the necessary considerations for such cross-cutting efforts are poorly framed. Here, we present a framework outlining four critical challenges facing cities and local communities and identify their corresponding priority areas to inform local finance and planning for climate resilience: capacity and governance, adaptation and recovery, refining funding mechanisms, and data and methodological needs (Fig. 1). By strengthening knowledge and partnerships in each of these building blocks of community resilience, scholars, policymakers, and practitioners can better partner with communities to ensure that they are equitably equipped to respond to and recover from the effects of a changing climate. Importantly, efforts in the research, policy, and education arenas in this area are deeply interconnected. Effective local finance and planning solutions for local climate resilience will require intentional partnerships and an iterative approach that can respond to learnings, tools, and community priorities as they emerge.

2. Capacity and governance

2.1. Challenges

U.S. local governments control many of the fundamental instruments for promoting climate resilience, such as tax policy, budgeting, infrastructure finance, and land use planning. However, more immediate needs often get in the way of communities optimizing these instruments for long-term resilience. Local decisions about where development occurs, and under what parameters, determine the exposure of private and public assets to disasters and climate risks (Burby et al., 1999; Hino et al., 2023). In part, the political economy of development in the U.S. – that is, the way we currently finance, tax, and govern development – often privileges short-run gains in development over long-run gains in safety and resilience. In high-risk areas, private sector and mixed private–public institutions like insurance are faced with choosing between raising pricing on homeowners or declining to write new policies. As insurance becomes unavailable in some areas, the lack of private protection will create further challenges for both households and local governments.

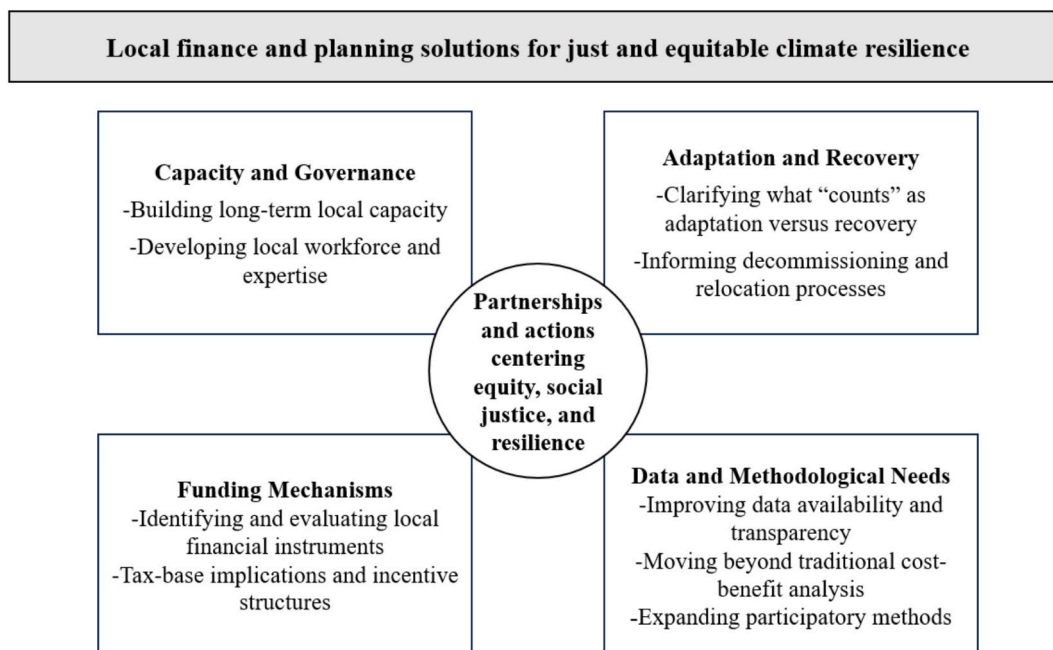


Fig. 1. Key components of an action agenda to inform local finance and planning for just and equitable climate resilience. Priority areas of consideration include capacity and governance, adaptation and recovery, funding mechanisms, and data and methodological needs. Across all priorities, partnerships and actions must center equity, social justice, and community resilience.

Many local governments also lack the human and financial resources to facilitate better decision-making for longer time horizons, which constrains local action and exacerbates inequalities in hazard exposure. Advancing local adaptation requires time and expertise (local government capacity), whether in planning, regulatory design and implementation, or grant writing to secure state and federal resources. Many such federal programs require local cost-shares that simply cannot be met by lower-resourced communities. Often capacity begets capacity, and jurisdictions with local officials who know how to navigate program requirements are more likely to be able to leverage these opportunities. Local governments with resources can outsource the grant application process to consulting groups, which can further result in funds supporting those with the greatest ability to compete rather than the greatest need. The Inflation Reduction Act Climate Ready Workforce initiative by NOAA and Sea Grant is an effort to build local capacity in coastal areas. However, it relies on the existence of jobs and a growing employment sector, and many government agencies are unwilling or unable to grow their staff long-term. Capacity building is a dimension of the White House's National Climate Resilience Framework, but how it will be addressed remains to be seen (The White House, 2023).

2.2. Priority areas

Research to inform policy on workforce development and resilience expertise to increase local capacity, especially in under-resourced but hazard-vulnerable communities, is critical. There are important questions about how to address capacity differences that exist and persist. Critical questions to be addressed include: How can adaptation planning, implementation, and access to funds be equalized across communities with different capacities in the short term, and how can capacity be increased in the longer term? What are the trade-offs between growing government capacity and growing private sector capacity to address resilience? What regulatory mechanisms might increase capacity without further burdening already under-resourced communities?

There is a strong nexus between land use planning and government administration when considering the effects of climate change (Shi and Varuzzo, 2020). Communities are not prepared for this new horizon of climate effects and decision-making actions, lacking both processes and technical expertise. Questions such as: How can communities adequately plan for fiscal stress and what administrative capacities are needed? How can communities embed engagement in their processes? Perhaps most critical is the need to better understand how to empower communities for adaptive learning and governance (Susskind and Kim, 2022). Local governments need to understand how to best experiment and how to adapt to fast-changing environmental conditions. Finally, technical capacity can be enhanced by identifying ways in which silos of expertise within local governments can be better coordinated such that solutions in one domain (e.g., transportation) are reflective of the problems in another (e.g., flooding hazards) (Bulkeley, 2010).

3. Adaptation and recovery

3.1. Challenges

Even with sufficient resources, local communities may have trouble discerning between adaptation and recovery (Wang et al., 2016). Some federal programs such as the Community Development Block Grant (CDBG) make a distinction, but there are no clear criteria or protocols differentiating the two. In some cases, there are efficiency gains to integrating recovery, maintenance, and adaptation, but such potential gains are poorly defined and under-identified. For example, is routine maintenance of stormwater systems eligible for adaptation funding, or is it only eligible if it enhances the system to account for increased rainfall due to climate change? If a flooded building is elevated when being rebuilt, does it count as recovery or adaptation? More generally, how significant should the avoided future damage be from an activity for it to be considered adaptation and who makes this decision? These questions are not academic semantics: in addition to finance restrictions and grant eligibility, they have implications for how projects are designed, their desired outcomes, and the communities (present or future) that are considered.

3.2. Priority areas

Research should contribute to clarifying activities that count as adaptation to better inform adaptation planning and action by policymakers and practitioners. Defining also means measuring and evaluating the effectiveness of projects based on historically-avoided damages and expected future-avoided damages. Despite some success in estimating avoided damages from historical adaptation, many empirical challenges remain, such as defining an appropriate counterfactual group (or baseline) to evaluate projects against (Carleton et al., 2022; Deschênes and Greenstone, 2011; Haasnoot et al., 2020; Heutel et al., 2021; Hsiang and Narita, 2012). Additional research is needed to measure adaptation. This will help in creating projections of expected avoided loss for investments being made now and in the future (Arnott et al., 2016; Owen, 2020; Peterson St-Laurent et al., 2022; Singh et al., 2022; Wagenaar et al., 2019).

There are major questions about how, when, or even if local governments should make decisions about decommissioning and retiring infrastructure (such as flood- or erosion-prone roads) or entire communities (as in Valmeyer, IL; Pattonburg, MO). For example, towns, counties, and states lack the resources to adapt their entire road networks but also lack decision-making processes to determine which roads to prioritize for adaptation. Community decommissioning and relocation efforts will be especially complicated for underserved communities. The process of decommissioning of infrastructure and even entire communities (rather than a single endpoint) must be better understood, including equity implications. This work must be done in partnership with communities facing potential questions of relocation and decommissioning.

4. Funding Mechanisms

4.1. Challenges

All levels of government face rising disaster costs for emergency management, recovery programs, and cost-saving mitigation activities. Recent federal and state investments in disaster assistance and mitigation through the Infrastructure Investments and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) have funneled additional funding into federal and state programs, but even these investments don't meet the scale required to address the mounting frequency and severity of disasters. Significant questions remain about how to meet this financial gap.

Property tax is one important local funding stream but can create disincentives against certain resilience efforts such as relocation and buy-outs, while incentivizing development in high-risk areas (Husted and Nickerson, 2019). Without additional incentives, local governments are not likely to take adaptive action that will reduce their tax bases. Unfortunately, research has also demonstrated that current governmental approaches to financing infrastructural adaptations and restorations increase inequality by failing to ask those who contribute most to climate change to pay for its damage. For example, flood insurance requirements on Alaskan Native villages and coastal Gullah Geechee towns ask communities who have contributed little to climate change to pay for its deleterious effects. Despite the known challenges of funding adaptation, response, and resilience, very little research has been done to identify and evaluate alternative approaches.

4.2. Priority areas

Better tracking and reporting on adaptation investments could provide localities, states, and the federal government with evidence that upfront investment in adaptation reduces risk and lowers costs in the long term. Improved transparency and sharing of data across levels of government could create a fuller picture of spending and allow governments to direct funds in a more effective, informed manner. This, in turn, could help inform decisions about what actions should be paid for by different entities as well as how can (significant) ethical considerations be integrated into funding decisions (Chu and Cannon, 2021; Pelling and Garschagen, 2019). More centralized sources of funding might create more cross-subsidization across households and communities, and might also provide greater support for low-capacity communities (Collins and Gerber, 2008; Disaster Recovery: Efforts to Identify and Address Barriers to Receiving Federal Recovery Assistance, 2021; Howell and Elliott, 2019). Research is needed to evaluate these outcomes. There is a need to better understand both the equity issues associated with local finance instruments and how to address costs of adaptation and recovery commensurate with the contribution to climate change. When funds are available, how can they be deployed equitably and effectively?

New revenue sources and incentive structures should be explored for incentivizing resilience and redistributing tax burden. For example, what would a system look like that taxed properties based on their contribution to climate change (beyond just market value)? Research is also needed to better understand how reduced insurance unaffordability and availability in some locations could increase burdens on local populations and governments, especially as some people choose to relocate while others are left behind. An additional question is related to how climate adaptation should be funded, i.e. what actions should be paid for by a private entity, the local government, the states, or from federal funding. Different funding regimes create different incentive structures for the stakeholders, which in turn, affects the level and efficacy of adaptation across geographical scales.

5. Data and methodological needs

5.1. Challenges

Addressing data and methodological needs can strengthen the evidence base for understanding and addressing the issues raised in this paper. While there have been significant efforts to create more reliable datasets and databases on disaster and climate change damages, significant limitations remain including access to data that has longer historical components, is disaggregated at lower spatial scales, and has frequent observations. SHELDUS, for example, is a commonly used dataset for disaster damages but has known limitations including pervasive, non-random missing data (Gallagher, 2021).

The data landscape is also largely missing measures of nonfinancial damages and losses such as loss of cultural heritage, livelihood practices, and social networks. This is especially important as cost-benefit analyses are still used to inform adaptation and resilience planning, but analyses that solely depend on market values can result in decisions that do not reflect the values of communities, and the cumulative burden – from missed schooling to mental and physical health impacts – that climate hazards have on individuals. Another challenge that exists is the lack of clear metrics for assessing climate justice. Agencies at local, state, and federal levels often use overlapping metrics to assess disadvantage and vulnerability (for example, CDC SVI,¹ EJScreen,² SoVI,³ and, more recently, FEMA's Community Disaster Resilience Zones). Such metrics generalize vulnerability broadly but lack context-specific information.

¹ Centers for Disease Control and Prevention Social Vulnerability Index (CDC SVI).

² EJScreen is an environmental justice (EJ) mapping and screening tool developed by U.S. Environmental Protection Agency (EPA).

³ The Social Vulnerability Index for U.S. (SoVI).

5.2. Priority areas

A need exists to improve measurement and reporting of disaster and climate change damages, as well as develop new indicators that allow research to measure the efficacy of policies, adaptations, and planning decisions. However, the solution is not as simple as more and better data. Importantly, as research in this area advances, we need to understand how to better translate scientific findings into actionable strategies and practical information that can be easily accessed by local policymakers and practitioners.

Developing policies that focus on understanding what historically marginalized communities need and want in terms of resilience and adaptation requires meaningful community engagement. The co-production of knowledge is an effective way to help ensure policies, plans, and reach of development goals are equitable and just (Mills et al., 2023). Understanding how to integrate new collaborative approaches with community partners to help identify challenges, barriers, and knowledge gaps, and co-produce actionable solutions is critical. Monitoring the effectiveness and equity of future policies will also require new measurement approaches and data sources to track both costs and benefits (monetary and otherwise) of policies and their recipients.

6. Concluding comments: Thinking beyond the single disaster

Most disaster research and policy responses focus on the effects of singular, rapid onset, major natural disasters, which result in immediate adverse, visible outcomes for individuals and communities. Less obvious are the cascading or creeping effects of disasters and climate change that occur over time. These include changes in morbidity, job security, demographics, and community cohesion. Policy responses exist for rapid onset events, and research points to the importance of federal aid in recovery, but much less is known about how to address slow-onset effects of climate change and repeating hazards (Deryugina et al., 2018; Gallagher et al., 2019; Gallagher and Hartley, 2017). This is, in part, because slower onset events garner less media and political attention and are perceived as being less urgent.

Under climate change, hazards such as hurricanes are expected not only to become more severe, but are also predicted to become more frequent, occur in new places and at different times of the year, and co-occur with other hazards (Pörtner et al., 2022). This became apparent most recently when Hurricane Helene and Hurricane Milton struck Florida and the U.S. East Coast within two weeks of one another. Much less understood are economic and social impacts of repeat disasters, including smaller-scale disasters or slow-onset environmental events, such as severe drought. For example, one recent study found that smaller isolated natural disasters have substantially larger impacts on financial hardship than major disasters because they are associated with less government aid (Johar et al., 2022). Another recent study found repeated exposure to hurricanes is not associated with more acclimation and resilience over time but rather adversely impacts mental health among a representative sample of Florida residents (Garfin et al., 2022). Knowledge gaps also exist around compounding events (e.g., COVID-19 or geopolitical conflicts) that could further exacerbate disaster impacts and with which federal hazard policy is not designed to deal.

All of the challenges raised in this paper must therefore be considered for not only sudden-onset major disasters but also for smaller, repeating disasters and slow-onset changes to local environments. Understanding how communities evolve under the effects of repeated disasters, and the implications for both short and long-term planning and fiscal strategy at the local level is critical. Better understanding of resilience and hazards across spatial and temporal scales, especially in the face of a changing policy, regulatory, and insurance landscape, can better inform and promote adaptive action.

An overarching challenge for future research, policy, and implementation in this space is that, due to the local nature of the risks, values, and preferences, solutions will need to be highly localized. The climatic, social, and political landscapes (including the ways that current landscapes have been informed by historic practices) of communities are never the same. This paper highlights several urgent areas for targeted partnerships between researchers, policymakers, communities, and practitioners to inform just and equitable local responses for climate resilience. To develop knowledge and actions in this important area, a broad range of local case studies and examples co-produced with affected communities, along with multi-location, longitudinal, and comparative studies will be necessary. These efforts can be enabled by sustained local, regional, and cross-regional partnerships and broad information sharing.

CRedit authorship contribution statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

No data was used for the research described in the article.

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