

A Working Paper by Academy Fellows of the  
NATIONAL ACADEMY OF PUBLIC ADMINISTRATION

# A Strategy of Place-Specific Data, Governance, and Financing: For a Climate Resilient Nation



October 2024

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The views expressed in this policy brief are those of the authors. They do not necessarily reflect the views of the Academy as an institution.

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October 2024  
Printed in the United States of America

*Cover Photo Source:*

Visual Creator. (2024). Climate-Ready Nation. Created on October 16, 2024.

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## Acronyms and Abbreviations

<b>Acronym or Abbreviation</b>	<b>Definition</b>
Academy	National Academy of Public Administration
CIP	Center for Intergovernmental Partnerships
CliMa	Caltech, MIT, and JPL
DMDU	Decision-Making Under Deep Uncertainty
FEMA	Federal Emergency Management Agency
GAO	Government Accountability Office
IDSS	Impact-based Decision Support
IPCC	Intergovernmental Panel on Climate Change
MAR	Modernization and Associated Restructuring
NWS	National Weather Service
WRN	Weather-Ready Nation

## Introduction

The frequency and intensity of extreme weather events in a changing climate present elected and appointed leaders in each level of government and all sectors with a call to action for prevention, transformation, and recovery. Almost the entire population of the nation has been affected by these events and is looking for assistance in dealing with their impacts. Within each of these events, the details of specific localities require a tailored response for that geographic area, emphasizing the importance of local knowledge and related actions to ensure they are ready for and properly respond to oncoming extreme events. This paper presents the lessons learned from the success of the ongoing effort to build a Weather-Ready Nation (WRN) and recommendations for the next administration and leadership throughout the country to deal with the challenges associated with the warming climate and the links to increasingly more extreme weather and water events affecting the United States and surrounding areas.

The National Weather Service (NWS) 's success in gaining the trust of the nation's population in linking weather, water, and short-term climate forecasts to all government and public safety officials over the past decade through the provision of Impact-based Decision Support Services (IDSS) is built upon the trusted engagement at each level of government through all sectors of the country ([Uccellini and Ten Hoeve, 2019](#)). Changes in climate have increased the frequency and intensity of extreme weather events in the last two decades, exposing all the states in the nation to increased threats of and vulnerability to extreme weather and water events that are occurring with increasing frequency across the entire country.

The success of the WRN illustrates the Federalist Papers' argument that the federal system, working with the multiple levels of government, can effectively deal with the nation's problems in mitigating the impacts related to extreme events. The success of WRN offers a set of best practices for future intergovernmental problem-solving. The initiative not only achieved its goal of preparing all Americans for impending changes in the impact of extreme weather but also gained the nation's population's trust in using this assistance to ensure every community is ready for and responds to oncoming extreme events.

## Background

Extreme events are real-life system stress tests that reveal recurrent and increasing vulnerabilities, and place-specific investment needs. Hurricane-related storm surges occur in eastern and gulf coastal areas, most wildfires occur in forested areas in western states, tornados predominantly affect the country's middle, and higher temperature and problematic atmospheric river water events are happening nationwide. Meanwhile, the changing climate is raising the baseline system stress level on top of these extreme events, causing disruptions in the geographic area's performance and further stretching limited financial resources. Event details in each location require a tailored response applicable and equitable to that area, emphasizing the importance of local knowledge, involvement, and transformational investment.

This paper builds on the success of the 'Weather-Ready Nation' initiative over the past decade and insights gained from a three-year study conducted by the National Academy of Public Administration's (the Academy) Standing Panel on International Affairs comparing what countries worldwide have done to begin developing a framework for this challenge.

The findings in this case illustrate Madison’s argument that formal and informal rules of participants from different geographies with differing political dynamics can be an essential tool for effective Federalism. No single government acting alone can deal with the consequences of these events. Larger and smaller areas bring different dynamics, capacities, and resources that, if partnered through formal and informal rules, solve problems. Governance is critical to addressing recovery from extreme weather events. The Academy, chartered by Congress to advise Congress and the nation on governance issues, stands ready to assist the incoming administration and states in evolving the intergovernmental administrative program described in this paper to address the challenge of extreme events in a changing climate.

## **Can the Weather-Ready Nation Paradigm be Applied to a Changing Climate Resilient Nation?**

The WRN effort, launched in 2014 by the National Weather Service of the Federal government, was built off a successful NWS Modernization and Associated Restructuring (MAR) planned in the 1980s and successfully implemented by the beginning of the 21<sup>st</sup> century ([National Research Council, 2012](#); [National Academy of Public Administration, 2013](#)). Even with a successful modernization, the NWS and the larger weather enterprise came to realize in the first decade of the 21<sup>st</sup> century that the science and technology advances built into the NWS modernization were not sufficient to address the societal needs of the American public in the face of the more extreme weather and water events. The NWS, working in partnership with the Emergency Management community at every government level, came to recognize the essential need to develop a trusted and collaborative relationship to ensure forecasts and warnings from the NWS and larger private-public enterprises would be designed and assessed to strengthen their capacity to support critical decisions by the emergency managers and public safety officials at all government levels, with a recognition that the decisions to prepare for and respond to oncoming extreme weather and water events preparations were 90% local and 5-10% state and federal. The basis for the success of the new collaborative intragovernmental paradigm was the development and consistent provision of “Impact-based Decision Support Services” (IDSS) to all government levels well before, during, and after (to support recovery efforts) an extreme event ([Uccellini and Ten Hoeve, 2019](#)). The importance of IDSS to the success of the WRN effort is represented by the fact that the provision of IDSS was included within the NWS mission statement in 2021, recognizing that the mission of the NWS employees to save lives and property does not end with the provision of forecasts and warnings but requires the linkage with emergency managers and public safety officials across every government level throughout the United States ([Uccellini and Ten Hoeve, 2019](#)).

The NWS changed its approach to providing forecasts and warnings to adopt a more collaborative team approach that brought many partners and others within the weather enterprise into its internal discussions about the best strategies for forecast and warning issues related to essential decisions across those areas that would be affected by an oncoming event. Furthermore, the Weather-Ready Nation Project has enrolled over 13,500 WRN Ambassadors that involve organizations such as non-profits, government agencies, private sector meteorological and safety/response organizations, and commercial, religious, and other organizations that mobilize to serve the cause of public safety across their communities, and states in the face of an oncoming event. Combining the expertise from the multitude of organizations across a broader geographical area and relying on the local knowledge, responsibilities, and unified action engendered by the collaborative and more transparent range of actions and decisions created the capacity to

implement the short-term mitigation actions required to prepare for and respond to the oncoming extreme events to save lives, mitigate property loss and accelerate recovery times to the increasingly extreme weather and water events.

The 'Weather-Ready Nation' initiative has significantly reduced the loss of lives and assisted in immediate public safety recovery. However, long-term recovery from these extreme events has become increasingly expensive and lagging. What is becoming increasingly apparent is that communities will now have to adapt using transformational investment to recover socially and economically from increasingly extreme and dangerous weather and water events fueled partly by the warming climate and oceans. Underscoring the crucial role the change in climate plays in dealing with extreme weather events that foster the need to relook at their infrastructure needs as they face the increasing awareness that mitigation is insufficient to address long-term needs.

## **Increasing Vulnerability to Extreme Weather Events**

Over the past decade, the intensity and impacts of weather events, including higher temperatures, winds, rainfall, and storm surges, have increased (see, for example, the impact/likelihood matrix issued by the World Economic Forum in 2017), which now have weather and water events as the most likely and most extreme societal impacts. Adding to these concerns, the timing of the extreme portion of these events has also become more variable, as demonstrated by the intensity measures and timing of the most extreme portion of notable weather, including extreme rainfall rates and extensive flash floods, extreme heat, flash droughts, and extreme fire behavior. They create more risk and uncertainty in the short- and mainly long-term decision making processes. The intensity and path of Hurricane Helene show that short-term impacts are so severe and variable that improvements suggested for a Changing Climate Resilient Nation could assist. These characteristics of extreme weather and water events are pushing government officials around the globe to consider long-term changes needed to address deficiencies required to protect, alter the natural environment, or leave the area and how to pay for these changes. Adapting to climate-forced changes in extreme weather and water events is proving particularly challenging.

## **Increased Attention to Adaptation, Not Just Mitigation**

The more devastating impacts of the more recent extreme events, such as the two recent flash flood events in Ellicott City, MD (2016 & 2018); the flash-flood emergency across New York City with extreme rainfall rates (5 to 6" per hour) from remnants of Hurricane Ida (September 2021); and the multitude number of extreme fires in the western United States over the past ten years require longer-term transformation of affected areas beyond the mitigation approach of earlier "Weather-Ready Nation" responses. It requires a heightened focus on adaptation. The partnership lessons related to the WRN can help develop responses to the evolving vulnerability of extreme events if we recognize the difference between (1) the weather-ready mitigation required for public safety concerns and protecting the current built infrastructure and (2) the longer-term adaptation and related infrastructure changes needed to address more extreme weather and water events now occurring throughout the United States (and indeed the globe) due to the ongoing changing climate.

The possible variation in the types of intergovernmental and other responses needed for a prosperous "weather-ready nation" and a prosperous "climate resilient nation" is described in the

following table prepared by former National Weather Service leader Louis W. Uccellini, now at the University of Maryland.

Long-term investments are not undertaken without the authority to act, perhaps because the resources necessary to take these actions exceed state and broader regional capacity in politically feasible ways. Indeed, they may be beyond the capacity of government(s) at any level and require non-governmental, private-sector involvement. The worsening situation of extreme weather and water events calls for a new shared ratio of approach to decision making and provision of necessary resources for adequate preparedness and response among the levels of government. The ratio will vary based on the event's nature and the governmental units' functional capacity. It is likely that the government entities already grappling with the political and financial aspects of adapting to these extreme components most likely need to tap the private sector's capacity to succeed

The lack of progress in dealing with the long-term recovery of weather events, particularly extreme events, demonstrates that a new governance system is needed. An example is our experience of the last century with extensive fires in urban areas, causing insurance to be canceled, leading to the innovation of zoning nationwide. With insurance rates rising and now becoming unavailable in parts of California and Florida and insufficient government assistance, a new response capacity is needed. Learning from the success story of the partnership of the Weather-Ready Nation, a new web of alliances among levels of government and sectors in our society could be the innovation of this century.

Hidden economic costs of damage to property and disruptions to people are an increased transaction cost in our financial system. The accelerated growth rate of transaction costs from extreme weather and their impacts on national and regional economies is becoming an important policy issue. Disruptions in the lives of people reduce their productive capacity. The increasing

expenditures needed to recover and reinvent places take resources required to address our current social and economic needs. These impacts are reducing the productivity of our economy and contributing to slowing economic growth, adding a collective reason for responding to this challenge. In the places where these losses occur, identifying them and organizing ourselves to capture the benefits of reducing or even eliminating these losses can assist in financing the recovery.

## **Administrative Framework Needed for Transformational Decision making and Action**

To address the rising frequency and severity of extreme weather events, a joint group of Academy Fellows and outside experts from the Intergovernmental and International Standing Panels are working to consider how to create a Changing Climate Resilient Nation. What follows are specific recommendations for the next administration and leadership throughout the nation to deal with this Changing Climate Resilient Nation challenge. The recommendations are visualized as a three-legged stool, with the legs focused on data intelligence, governance, and funding, which, in combination, have the potential to achieve a Changing Climate Resilient Nation.

### ***1. Create a team of analysts and scientists led by the Weather Service with the predictive capacity to guide actionable preparedness and intervention in the impacted place.***

Change in the physics of the geography we live in is the starting point of our decision making on what strategy is most appropriate for a given location faced with the fundamental choice of withdrawing, altering the natural environment, or investing in infrastructure to harden or protect the area. A changing climate affects how water, the atmosphere, and land interact and how we evaluate them. To guide actionable preparedness and intervention where communities and regions don't just survive but adapt and thrive under changing climate conditions, there is a need for accessible, timely, and actionable climate prediction information in the places impacted by these extreme conditions. Changing baselines and extreme weather events are complex functional systems that more frequently do not occur in isolation: simultaneously involving multiple physical dynamics—wind, water, oceans, land, and temperature; and multiple programs—infrastructure, housing, economic development, land use, alteration of economic activity decisions; and changing socio-economic and governance arrangements. Present and future local geographic conditions, soil conditions, hydrology, vegetation, land use, and development can affect risk in addition to climate. Adaptation requires information on engineering, financial, socio-economic, and other potential solutions. Changes in climate and weather hazards in the geography we live in is the starting point of our decision making on what strategy is most appropriate for a given location faced with the fundamental choice of withdrawing, altering the natural environment, or investing in infrastructure to harden or protect the area.

Change in the environment creates increasing risk and uncertainty in our decision making process. Instead of relying on historical data, which are no longer good predictors of the future due to changing baselines, new approaches are being developed to overcome this problem. Over the past decade, Caltech, MIT, and JPL, partnering in the [Climate Modeling Alliance](#) (CliMA) have developed a new approach to address this problem. They have developed a new type of climate

model that combines traditional, physics-based elements with machine-learning elements for climatically important processes that cannot be simulated from first principles but can be learned from data. These innovations have been, for the first time, integrated into land, ocean, and atmosphere models and enable the data-based quantification of uncertainties in the models. This approach can be used as input to the current downstream analysis and modeling approaches that the Weather Service, states, and private organizations have developed. Creating climate analytics benefits from an ensemble of models, to broadly explore the space of possible climate outcomes. This approach can quantify the risk of weather and climate events that are needed for decision making for infrastructure planning, insurance, and finance. This capacity is needed for the multiple-sector funding strategy needed.

This approach captures the changes in the physics of the geography to be included in the forecasting needed for investment decision making on the infrastructure changes required for adaptation. Ultimately, the goal and benefit of implementing this recommendation is improving long-run forecasting that sufficiently reduces risks and uncertainties and enables forecasts to be used for planning, response, and investment decisions by individuals and public and private institutions. The decision making process must be sufficiently granular to “future-proof” private insurance and financing to support the multiple-sector funding strategy needed. Given the social, equity, economic, and environmental complexities and consequences, a team approach from scientists and practitioners is needed, like the lesson the Weather Service Weather-Ready Nation Initiative learned. Developing the confidence and trust of all the participants needed to make a transformational investment strategy work requires the willingness of leaders in all sectors of affected places to participate, which is the central lesson of WRN.

Some places may become dangerous and too expensive to inhabit, requiring some relocation and investment to support the place – such as buying out property, rebuilding new communities, etc. This will require difficult decisions about who pays. If updated flood or landslide risk maps properly reflecting climate change make someone’s house – and thus their life savings – worthless, do they get compensation? Congress has asked GAO to draft legislation to address this and other challenges created by this call to action. The legislation recommendations could be improved by considering the seminal lesson of the WRN by developing a place-based partnership that provides this information. Hence, it reflects local conditions but, more importantly, will be trustworthy. Co-production of details with the NWS and state and local communities will be necessary. [Decision making under deep uncertainty](#) (DMDU) developed by the RAND tool used to address landslides in Sitka, Alaska, might be helpful in this context. It supports “least regret” decision making and investments. This approach was used in the landslide work in Sitka, Alaska, where, for many communities, if outsiders generate maps of climate-induced risks, locals will reject them, partly because they distrust the information and partly because of the economic implications of the maps. In Sitka, Rand developed landslide risk maps with locals. The federal government then worked with locals to decide how to release the information. This approach avoided the trust problem that can arise when outsiders generate maps of climate-induced risks that locals then reject, partly because they distrust the information and in part because of the economic implications of the maps.

***2. Establish integrated place-based governance structures with multi-jurisdictional and fiscal authority to plan for, coordinate responses, make decisions, obtain funding, and oversee transformational investments for long-term recovery from extreme weather events and changing baseline conditions.***

This Academy working group and the United Nations (IPCC) identified governance as the major obstacle to addressing climate adaptation needs. The Academy's International Standing Panel's work noted that the primary reason for the lack of action in dealing with recovery from extreme weather devastation was the lack of an entity with the authority to lead, invest, and form long-term partnerships. This situation has been created by two dynamics: (1) the geography of extreme events does not match the geography of current government organization structures of government and (2) the problem-solving approach of the past created separate programs and districts for problems, creating a complex number of separate organizations acting separately rather than in coordination with each other, unable to tackle the complexity of the kind of problem-solving adaptation requires. The country has ninety-one thousand separate government organizations, making problem-solving for complex systems problems that require the integration of organizations, both public and private, problematic. Since no jurisdiction or sector in our society acting alone can undertake the long-term, transformational actions needed, and the current ones have static and mismatched scales, we need to organize and operate the organizations in our societies differently to address this challenge.

The geography of extreme events has one common problem: they are inconsistent with current governmental structures and official jurisdictional boundary lines. Most are larger than cities and counties, but some are parts of them. They are often multi-counties, multi-cities, and sometimes even multi-regions. They are also often interstate because of the flow of extreme weather events. The local and diverse nature of these events, their consequences, and the management's need call for a place-based approach. Yet this place-based approach must navigate and make coherent a variety of separate legal authorities vested in different levels of government. Many functions involved, e.g., land use, economic development, and housing, have been historically assigned to states and their jurisdictions. The federal government and states have authority in other functions, such as water and air quality, because they have cross-boundary, health, and safety implications. The data and knowledge required in decision making are from local sites and broader areas. Most significantly, financial resources and capacity are beyond the government's capacity at any level, requiring multiple governments and sectors' involvement, and a new governance approach will be required. This means we need placed-based governance structures that integrate the necessary authorities to make decisions and secure the resources to deal with extreme events.

Over the past three years, the Center for Intergovernmental Partnerships (CIP) has completed a report “[Climate Adaptation Governance and Financing](#),” exploring the financing and governance of adaptation, identified two states, Maryland and California, that adopted legislation granting [permissive authority](#) to jurisdictions to come together to create new legal entities to overcome these deficiencies, allowing public joint ventures integrating legal authorities within the impacted geographic areas. These entities are not new levels of government but are public joint/ventures of cities and counties, Tribal nations, and special districts in the affected areas needed to undertake an integrated investment program. Since each location is different, the law does not specify what is to be done but rather allows jurisdictions to design approaches that work for the specifics of their area. Such new entities have the authority to act, fund, and bundle assistance from other levels of government and other sectors. Maryland’s legislation creates new partnerships with non-profits that are undertaking similar approaches in impacted areas. The legislative program that the [GAO recommended](#) at the request of Congress could produce an easier way to establish these arrangements, including provisions to assist in creating inter-state decision making and implementation capacity. The Academy could serve as a catalyst in helping governors and the Conference of State Legislators to learn from these efforts to create the needed capacity throughout the country.

The legislative program [GAO recommended](#) also includes provisions when an extreme event impacts federal facilities and interests such as airports, ports, dams, communication systems, and defense installations. In these situations, cooperative agreements and partnerships will be needed to deal effectively with impacts, requiring participation by local, regional, or state actions. Likewise, Tribal Nations will need similar arrangements.

### ***3. Evolve from short-term financial government assistance to long-term multi-partner financing integrated into transformational investment programs at place-based scales.***

Given the magnitude of the investment needed to help impacted geography deal with changing climate conditions and extreme weather events, more effective ways to secure funding, financing, and insurance are required. The Federal Emergency Management Agency and other federal agencies currently provide short-term funding; without innovation in financing, the necessary actions for transformative investments will not be undertaken.

Flexible ways to bundle existing Federal and State grant programs without compromising accountability. The inter-agency coordination council recommended by GAO could explore mechanisms to achieve this flexibility. Future legislation to implement GAO’s recommendations may call for mechanisms to encourage federal agencies to partner in transformational local investment plans and encourage others to do the same. Kathy Stack, a member of the Intergovernmental Systems panel, has made a significant effort to develop recommendations, including draft text, for updates to the Office of Management and Budget’s government-wide regulations and guidance on grants administration. The project is recommending complementary updates to federal agency regulations and guidance. This modernization will remove barriers to blending and braiding funds while incentivizing grant recipients to create data and evidence infrastructure. Additionally, the project will recommend new stakeholder engagement processes

to ensure federal grants management policies and practices address the needs and concerns of state and local practitioners, front-line workers, and program clients across program silos.

Current revenue sources are not sufficient and additional resources will be needed from public and private sources requiring the use of credit-worthy forecasts and new authorities in recommendations (1) and (2) above to develop funding capacity based on capturing benefits from transformational investments. Creating a public-private/non-profit partnership model that offers longer-term assistance derived by using tax-increment financing and brings private financing through partnerships using public debt that have lower interest rates than private equity or mortgage funds could add additional funding. The California statute provides both these authorities. They can bundle all Federal, state, and local grants, licenses, and fees and issue nexus-based debt and have tax-increment authority. Making transformational investments will require integrated investments of multiple functions from many sources.

## Conclusion

As the number of places affected by extreme weather events is accelerating and are more dangerous and their long-term recovery lagging a new administrative structure is urgently needed. Thus far this year, over ninety percent of the nation's population has experienced these events, calling for a shared effort to establish recovery from these complex functional challenges. They affect the land and people of each place with different conditions and dynamics, and a one-size-fits-all approach will not work. ***The elements of the approach are first getting the local geography right, developing the data and analytical capacity to make decisions, creating new organizations with authority to deal with the land use and transformational investments needed, and bringing financial resources so that action can be undertaken.*** No single government or organization alone has the authority or capacity alone to address this challenge. The governmental structure of the United States is based on different levels of government having shared responsibility for the authorities and capacities needed to address the challenge. It is now time to form partnerships among all levels of government and all sectors to create a response to this call for action.



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