

Climate Information Needs for 5-10 Year Hazard Mitigation Planning Cycles

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Introduction

- Near-term changes in the characteristics of climate-related hazards are rendering some communities, infrastructure systems, and ecosystems highly vulnerable to extreme events.
- Communities and resource managers have assessed impacts of climate change for more than a decade and are now looking to mitigate emerging climate hazards.
- Decision makers need information to prioritize funding in 2 to 5-year budgets and implementation decisions for mitigation solutions on the 5 to 10-year time horizon.
- The white paper explores how NOAA research, operations, and facilities could be adapted to better support early identification, monitoring, and communication of emerging hazards and vulnerabilities in communities and ecosystems confronting near-term changes.

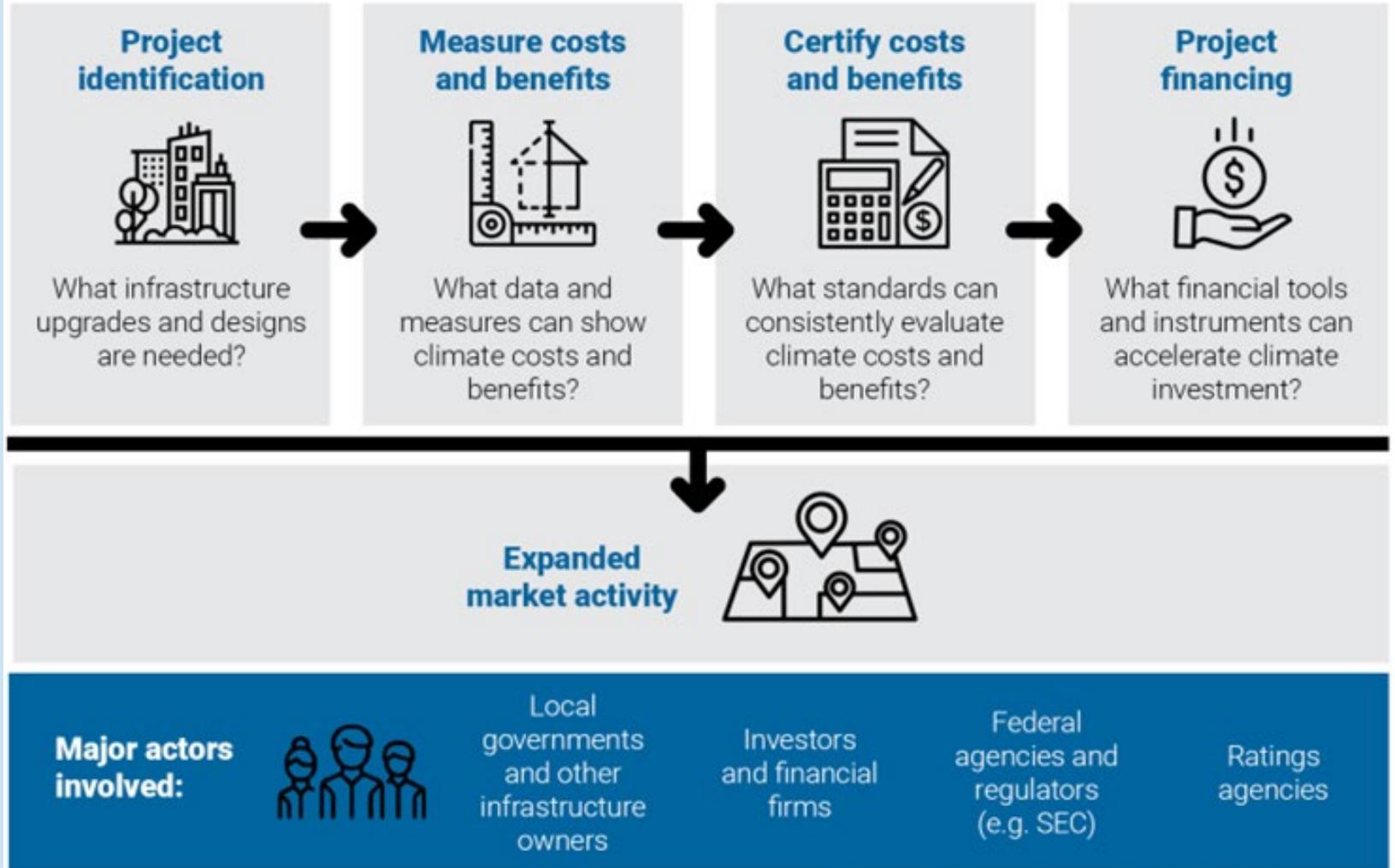
State and Local 5 to 10-year Climate Resilience Plans



Climate Resilience Projects Competing for Funding Need to be Backed by Data

Scaling investment in climate resilient infrastructure:

Major questions and actors involved in project development



Source: Brookings Institution.

B | Metropolitan Policy Program
at BROOKINGS

Focus Areas

- Drought
- Floods
- Extreme Heat
- Wildfires

Alignment with NOAA's Mandate

- Understanding and prediction of changes in climate, weather, ocean and coasts;
- Climate services which share that knowledge and information with others;
- Stewardship to conserve and manage coastal and marine ecosystems and resources

Alignment to NOAA's Programs

- Climate Ready Nation
- National Weather Service for operational weather forecasting
- National Centers for Environmental Information (NCEI) routinely generates a set of climate products based on recommendations from its regional centers and customer service centers.
- NOAA research centers and funded research programs such as the Climate Adaptation Partnerships (CAP) / Regional Integrated Sciences and Assessments (RISA)

Interviews

- **Drought:** the National Integrated Drought Information System; the National Drought Mitigation Center; the Geophysical Fluid Dynamics Laboratory
- **Flood:** the Texas Water Development Board; NOAA's National Water Center Office of Water Prediction; Robert K Hartman Consulting Services
- **Heat:** the Miami-Dade County Chief Heat Officer; Sacramento Municipal Utilities District; Multnomah County Health Department; CAPA Strategies; The Department of Natural Resources and Parks, the Environmental Health Division, EMS, and the Office of Emergency Management for King County, WA; the National Integrated Heat Health Information System
- **Wildfire:** the National Weather Service Analyze, Forecast & Support Office; California Fire and Resource Assessment Program
- **Cross-theme:** NOAA Senior Advisor for Climate; NOAA Climate Program Office; NOAA National Centers for Environmental Information

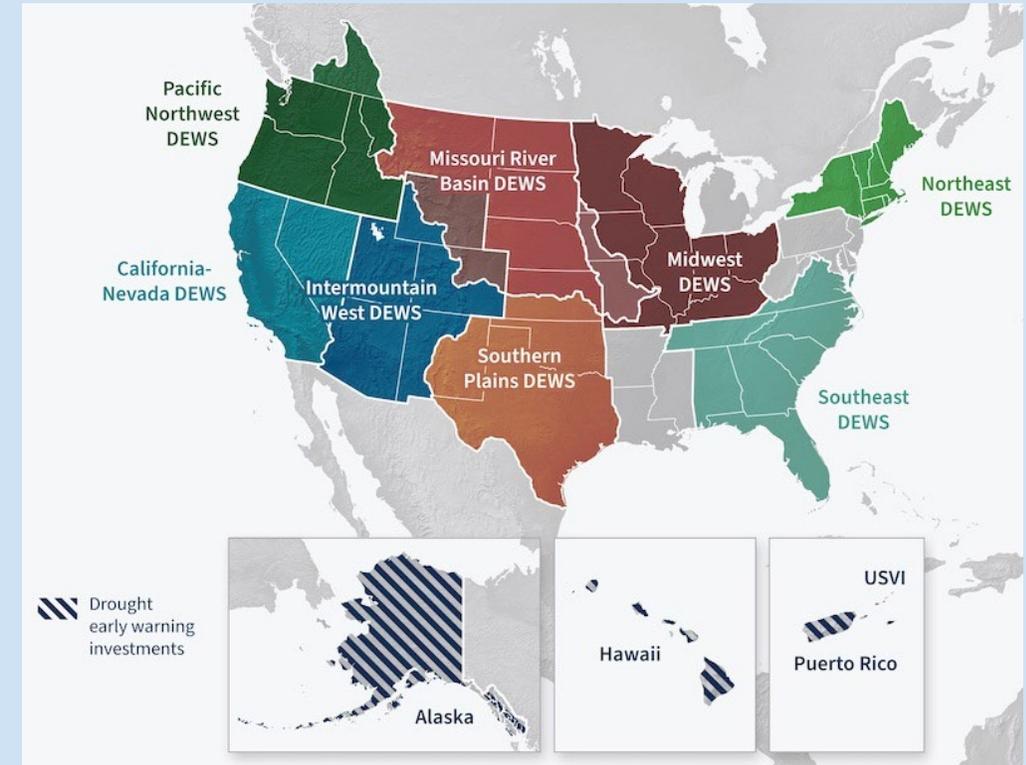
See Appendix A of the report for a detailed list of interviews

Key Questions

- How are long term changes in the characteristics of extreme hazard currently documented?
- What climate information would you have liked to have in advance of an extreme event?
- How is your organization/region planning for and addressing future hazards over the next 5 to 10 years?
- Who are your key stakeholders?
- What challenges are you/they encountering in developing and funding hazard mitigation programs and infrastructure?
- What additional NOAA products could support decision making by your organization/communities/federal partners?
- What aspects of the required NOAA products need research vs shovel-ready implementation?
- What upstream capabilities does NOAA need to invest in?
- What would be involved in transitioning related research to operations?

Drought Key Findings

- Emerging drought hazards including
 - flash droughts
 - warmer temperatures increase water demand
 - greater extremes (duration and magnitude)
 - precipitation deficits
 - long-term drought consequences such as tree mortality
- Shift from regional assessment to local drought mitigation and adaptation strategies
- Information needs of new drought mitigation infrastructure such as Managed Aquifer Recharge



Drought Recommendations

1. Develop nationally-available products to track decadal changes in drought patterns

- Develop operational products to measure the timing (frequency), pace (how fast onset and development occurs), magnitude of deficits and impacts, and spatial resolution of drought events
- Track changes in metrics by decade in response to continued warming
- Ensure that all capabilities are employed nationwide via the NIDIS program.

2. Enhance investments in forecasting emerging drought hazards

- Continue to enhance and expand forecasting across timescales from weather to seasonal timescales
- Use products to create greater awareness of emerging and developing drought risks, and for managing emerging drought mitigation infrastructure.

3. Enhance tools to support local drought mitigation planning

- Enhance tools and information delivery for drought mitigation planning, drought assessment (including measuring economic losses from loss of job opportunities, energy losses, and agency revenue losses)
- Support evaluation of pathways to adapt to changing drought characteristics with climate change
- Transition capabilities from research to practice via the NIDIS program

Flood Key Findings

- Emerging hazards including changing precipitation characteristics, earlier spring melt, coastal flooding
- NOAA Precipitation Frequency Atlas (Atlas 14) is a key resource for characterizing flood hazards but it is based on historical data and updated infrequently
- Lots of climate models and results with varying suitability for different applications, geographic and climatic settings but little NOAA guidance on what, where, and how to use
- Information and extension needs of emerging flood mitigation solutions such as retrofitting levees, Forecast Informed Reservoir Operations (FIRO) and Flood-Managed Aquifer Recharge (Flood-MAR) programs
- Forecast responsibilities of NOAA's River Forecast Centers end where tidal influences begin. No integration of coastal and inland flooding predictions.

Flood Recommendations

1. Develop decadal projections for flood mitigation planning.

Explore opportunities to routinely update characteristics of extreme precipitation and flood events with decadal climate predictions in support of forward-looking flood mitigation planning and infrastructure design.

2. Provide guidance for decadal projection of future hydrology.

Develop externally-focused guidance materials that synthesize current scientific knowledge and best practices for using climate projections to characterize future hydrology supporting decadal-scale decision making and infrastructure planning applications.

3. Enhance climate extension to the flood mitigation community.

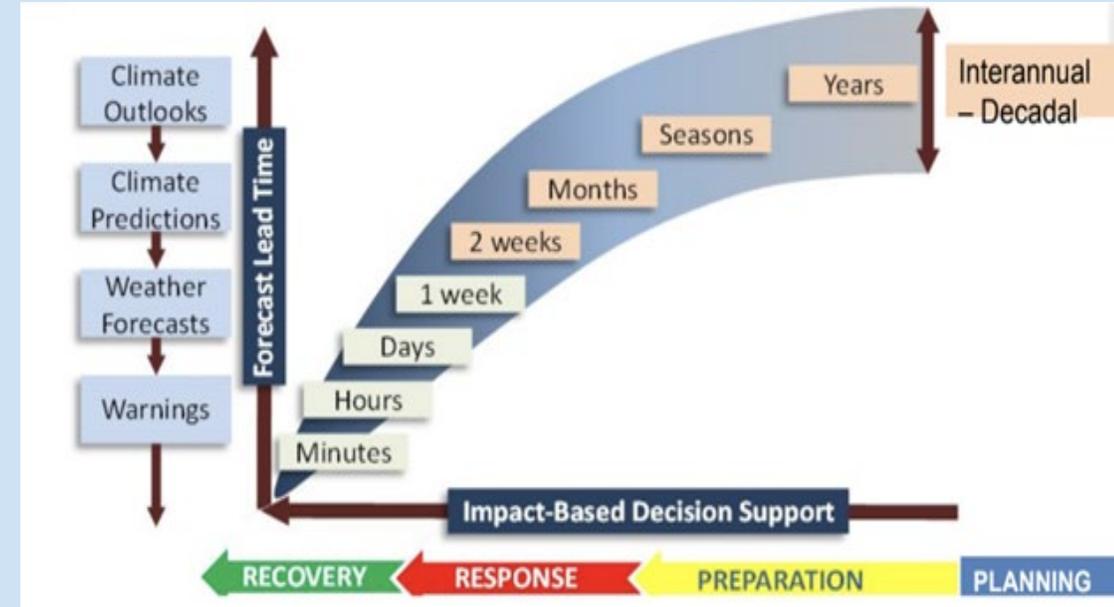
Enhance engagement of the River Forecast Centers in supporting long-range flood mitigation and climate resilience planning in the flood management user community through regional climate extension activities.

4. Integrate predictions of riverine and coastal flooding.

Develop operational capabilities to forecast combined riverine and tidal/storm surge supporting emergency response and resilience planning for coastal communities dealing with sea level rise.

Extreme Heat Key Findings

- Emerging hazards including warmer temperatures, long and more intense extreme heat events, high overnight temperatures
- New heat mitigation programs which focus on health and safety impacts, particularly for vulnerable demographics such as the aged, homeless, poor, and outdoor workers
- Significant local variations of heat extremes in urban areas based on building design, shade, and surface cover
- Need for a centralized source of information on heat hazards for mitigation planning



Extreme Heat Recommendations

1. Tailoring heat warnings to human health and safety.

- Make NOAA heat advisory / warnings for community and resident-specific health and safety outcomes
- Develop formal channels for interaction between NOAA forecasters and local safety officers
- Communicate any potential (even at low likelihood) for extremely anomalous heat events
- Continued strengthening of the NIHHIS program, including the relevant cross-agency collaborations and deepening engagement with state and local officials for heat planning and emergency response.

2. Support local planning decisions in urban environments.

- Support the development, deployment, and use of open-source tools, models and high-resolution data
- Support preparation for and mitigation of potential for neighborhood-level extreme heat in urban areas

3. Create a clear institutional mandate within NOAA for provisioning of forward-looking heat hazard information.

- Grant authority and resources for a NOAA program/office to provide forward-looking, quantitative, hazard information for heat hazards,
- Coordinate across relevant NOAA offices to develop a plan for
 - i) conducting and transitioning research for data product design, generation, and maintenance
 - ii) ongoing and reliable hosting of the dataset,
 - iii) making the data-product easily accessible, current, and usable for decision-makers.

Wildfire Key Findings

- Emerging hazards including increasing temperatures, intensifying drought cycles, excess fuels and tree mortality, and more destructive wildland fires, particularly in the western US
- Focus shifting to mitigation including investing in fuel treatments, create defensible spaces, smoke damage remediation, and hardening buildings and other facilities
- Local mitigation efforts need to manage the synergy between community protection, infrastructure damage, smoke exposure, and risks to water resources and forest resources
- Need for climate information to understand future changes in vegetation and fuel distributions, onset of wildfire, and fire behavior
- Need to understand impacts of smoke pollution from wildfires and fuel management activities on health, addressing both acute and chronic exposure

Wildfire Recommendations

1. Enhance assessment and mapping of wildfire risk to infrastructure and ecosystems.

Develop characterization of infrastructure and ecosystem risks—including loss of ecosystem services from compounded climate risks—to fully assess full impacts and support the development of climate-ready, fire adapted, communities.

2. Develop decadal projection maps of wildfire hazards, outcomes and emission.

Develop wildfire risk maps which integrate wildfire hazard potential, existing infrastructure and ecosystem vulnerabilities, antecedent and projected vegetation changes, and decadal climate projections to support decision making and adaptation actions in short (5-10 years) and mid (10-20) range planning efforts that support developing fire-adapted economies across the western U.S. and other fire-prone regions.

3. Expand climate data services for wildfire mitigation planning.

Expand development of climate data services for existing decision support tools for wildfire mitigation and planning and land management through engagement with existing multi-agency and partner initiatives such as the Wildland Fire Leadership Council (WFLC) and National Interagency Fire Center (NIFC) Predictive Services.

4. Expand prediction services for wildfire smoke exposure.

Expand research and development of products for characterizing smoke hazards from wildfire and integrating health impacts of chronic smoke exposure into wildfire mitigation and public health response planning activities.

Overarching Recommendation

- A clearly defined pathway process is required to document the process of engaging with decision-makers to identify the characteristics of needed climate products and transitioning conceptual climate products from research to operations.
- This pathway would include a process outlining key decision points and the role of research, product development, and data services teams.
- The process should be accompanied by a roadmap which is periodically updated to report climate research products that are successfully transitioned to operations, climate products in development, and to prioritize products for transition to operations.

Thank You!