Coastal Flooding in the Face of Climate Change: Understanding Constituent Needs

A Needs Assessment Funded by the NOAA Water Initiative

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Contents

Acknowledgments

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1. Executive Summary

Coastal regions are increasingly vulnerable to flooding. Leaders need a variety of services and information tools to help them make the decisions that increase a community's resilience to the combined hazards of storm surge, high tide flooding, and sea level rise.

To better understand these needs, two National Oceanic and Atmospheric Administration (NOAA) offices, the Office for Coastal Management and the Center for Operational Oceanographic Products and Services, joined forces to host five virtual workshops. The workshops targeted the following professional communities: planning; transportation and navigation; real estate and insurance; health and human services; and natural resource use and floodplain management. During the course of these workshops, nine cross-cutting themes emerged:

- **Enhanced Equity:** Climate change is a resource and equity issue at its heart. Equity-related topics raised ranged from inequitable financial support for adaptation work, barriers to engagement and funding based on income, post-disaster event inequality, and tribal areas not adequately incorporated in federal maps. Needs heard related to equity challenges demonstrate a push for further social science such including demographic studies to identify populations at risks and impacts.
- **Communication, Education, and Outreach:** Users need increased awareness of existing resources, and help to accurately, clearly, and creatively communicate flood risk with their constituents through simple terminology and graphics. This was repeatedly expressed with regards to interpreting changing science and national versus regional tool differences. Regarding communication, several respondents shared that resources to communicate sea level rise and flood risk to stakeholders in non-technical ways would be valuable.
- **Interagency Coordination and Collaboration:** Users need assistance keeping track of the myriad of entities, projects, and resources used to address coastal flooding. Without coordination between local, regional, and federal entities, users can become fatigued and confused by the perceived duplication of efforts such as a lack of clear distinctions of mapping efforts across NOAA, the Federal Emergency Management Agency (FEMA), and the U.S. Geological Survey.
- **High-Touch Decision Support Tool Assistance:** Participants voiced there are too many decision support tools with varying levels of complexity, intended audience and purpose. The result is "decision support tool fatigue," where the sheer volume of tools is overwhelming and challenging. The comment was made several times regarding a lack of understanding between state-specific and national-level sea level rise tools, which leads to confusion and inaction. High-touch technical assistance, where individuals are guided on navigating the decision support tool space and understanding which tool does what is important.
- **Improved and Updated Technical Data:** As the climate shifts, and science and technology advances, data needs to stay current. Users expressed a for sea level rise models that incorporate LIDAR elevation data, vertical land motion, and information specific to a region's

ecology and geography. Additional data needs included more real-time tide stations, products with storm scenarios, relative sea level rise information, and annual rainfall information.

- **Social Infrastructure Risk and Vulnerability:** Themes related to social, behavioral, economic, and cultural needs were revealed in the findings. Needs expressed throughout the listening sessions included social vulnerability metrics; infrastructure vulnerability; and additional research focused on social values, behaviors, and economics. Specifically, how to identify what diverse community members see as particularly valuable and how to use this information as an engagement strategy. Users shared a need to identify vulnerable infrastructure including transportation infrastructure, school and road closures, or other societal disruptions caused by coastal flooding.
- **Identify and Address Emerging Issues:** Climate change is ongoing, and as a result, there are coastal hazards not previously seen that need to be considered and additional professional groups to be engaged. Examples include incorporating climate data into federal transportation projects, as well as greater consideration for flooding impacts on public health such as flood-related indoor mold and septic impacts on drinking water.
- **Address Data Differences for Regions:** Participants shared that NOAA data are valuable for certain national and regional applications, but many locally relevant products developed outside NOAA provide greater value. While some geographic regions are data rich, others are lacking. Alaska and the Great Lakes regions were noted as places that lack important data and information which is an equity challenge.
- **Total Water Level Information**: Multiple professional groups emphasized a strong need for compound flooding information. This phenomenon occurs when two or more flooding sources occur simultaneously in a short time period such as combined impacts of high sea levels, heavy precipitation, storm surge and riverine flooding.

This report summarizes the information collected from the series of stakeholder engagement workshops. The information will help NOAA and others working on coastal management challenges to better understand needs and configure their products and services accordingly.

2. Methodology

As outlined in NOAA's FY22-26 strategic plan, NOAA provides data and services that help coastal people, economies, and ecosystems thrive. The changing climate has accelerated the need for these services. In 2016, NOAA developed the NOAA Water Initiative to improve the development and delivery of water-related products and services, particularly for flooding challenges. This report, *Coastal Flooding in the Face of Climate Change: Understanding Constituent Needs*, is part of this effort.

The information gathering effort followed a rigorous, systematic process that used several virtual workshops held with various constituent groups. Before undertaking the needs assessment, the NOAA planning team, consisting of representatives from NOAA's Office for Coastal Management and the

Center for Operational Oceanographic Products and Services, carefully selected the communities of interest based on agency priorities and initiatives. Each workshop shared the same objectives and overall structure, however, following the customer service approach defined in the NOAA Service Delivery Framework, the process was tailored for each target audience based on their prior knowledge of NOAA's services, the current relevance of coastal flooding to their work, and the number of registrants. Participants were recruited across a national scale and broad geographic distribution through existing networks and professional organizations. Workshops were conducted virtually at approximately three month intervals (Figure 1).

Components of each workshop included time to 1) better understand how participants use existing data, tools, and technical assistance resources in their decision-making processes; 2) increase awareness of NOAA coastal inundation tools and resources; 3) delve into how participants consider inundation risk on climate timescales (temporal periods of sub-seasonal, seasonal, annual, decadal and beyond) during their planning processes; and 4) identify knowledge gaps for decision-making based on inundation. With each workshop registration, participants were asked to share which resources they use to inform decisions related to coastal flooding at present.

Each workshop was held virtually, and ranged from 2 to 2.5 hours in length. At the start of each meeting, subject matter experts from the two organizations provided an overview of current and future coastal flood products from NOAA (Appendix A). Attendees then participated in a facilitated discussion either as a large group or in breakout groups using Google Meet or Padlet platforms, with a focus on identifying information needs. Upon completion, the results of each workshop were stored, archived, and systematically reviewed using a qualitative content analysis approach where common words and phrases were combined into themes.

Figure 1. Workshop timeline and registrants

3. Results

Through open-ended questions and responses, NOAA identified a wide range of information and tool needs from participants to address coastal flood risk. Each workshop had varying numbers of attendees and needs expressed. This section outlines key findings by workshop and overall themes that were repeated across the workshops.

Key Findings by Professional Community

Planners

Planning professionals were invited to a virtual workshop held on November 8, 2021. Participant recruitment was conducted using the Office for Coastal Management's regional network and partner connections including the American Planning Association, the National Estuarine Research Reserve System, and the National Sea Grant Extension network. Attending were 68 planning professionals from local, state, and federal government; private industry; academia; and non-profit organizations across a wide geographic range (Figure 2-3).

The questions and the top ranked responses from this group are summarized below.

What are your greatest concerns related to flood risk?

- Loss of property
- Loss of life
- Loss of ecosystems

How will you make your community more resilient to flooding?

- Relocate homes inland
- Buyout and preserve open space
- Increase funding for coastal resilience
- Receive bipartisan political support
- Prohibit future development

What do you need to know to make your community more resilient to coastal flooding?

- If/when sea level rise scenarios
- The ability to interpret data easily
- High resolution data on compound flooding (coastal and riverine)

During the analysis, overall needs from the discussion emerged and are summarized below.

Technical Information Needs

- Guidance is needed - there are too many tools
- More observations of water level and vertical land motion
- Ability to address inland and compound flooding
- Sea level rise scenario-based planning tools
- Greater understanding of national vs. state sea level rise projections
- More Alaska-specific information

Socioeconomic Information Needs

- Greater ability to integrate across products from different agencies through stronger collaboration
- Greater understanding of social vulnerability and demographic geospatial information
- Guidance on interpreting new data and science and assistance communicating changing science to the public
- A greater understanding of social vulnerabilities of different populations

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"We need to know where vulnerabilities are greatest, and in those locations, what are the capacities of the people living and working in those places… need to have some sense for the social costs of reducing vulnerability, and work proactively to address and mitigate those concerns (i.e., tax base, housing costs)."

"Greatest concerns with flood risk is that we will not do enough early to adapt and the most vulnerable communities will suffer inevitable impacts."

"(We need) layman's terms to explain why things changed to stakeholders would be helpful."

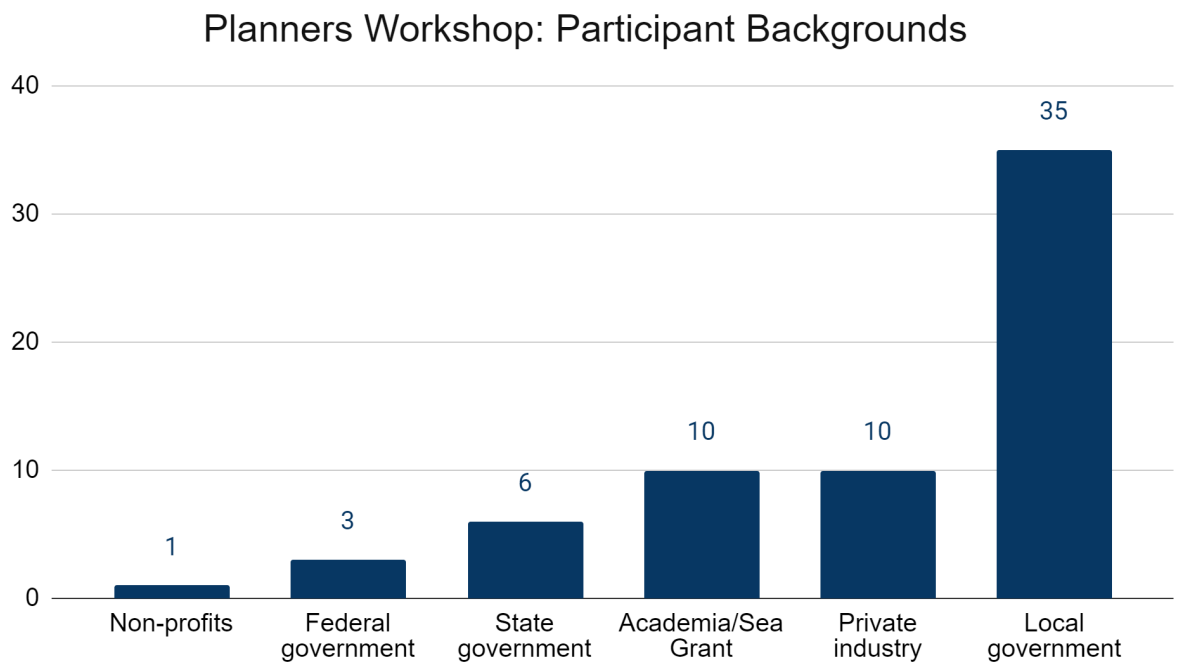

Figure 2. Professional affiliation (workshop 1)

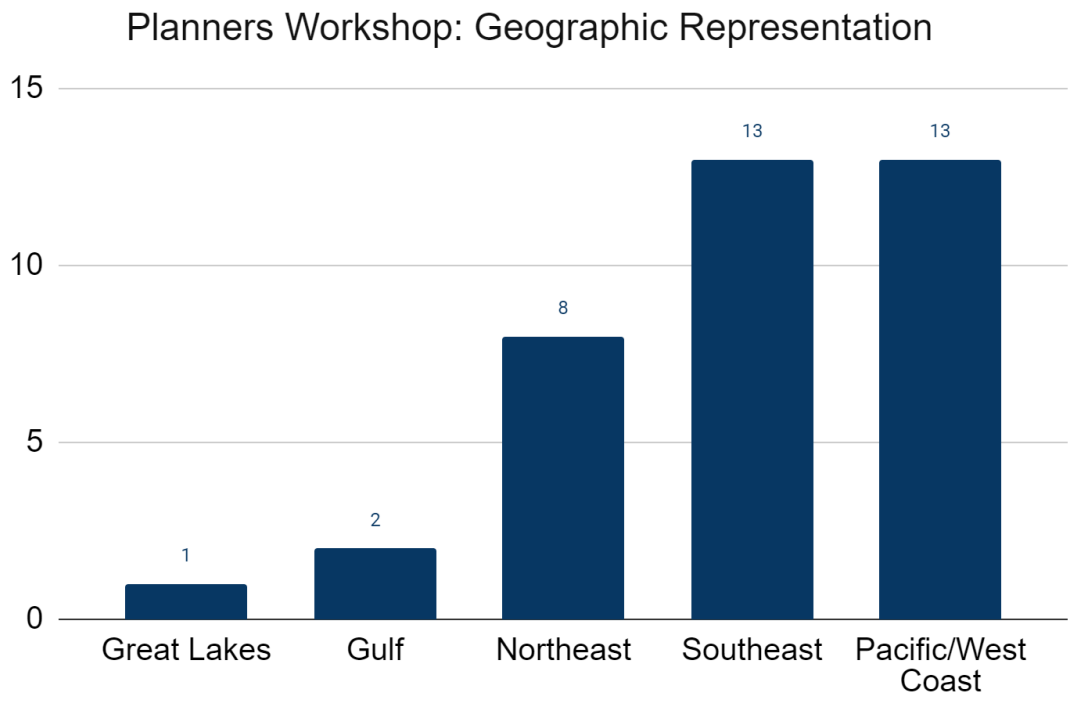

Figure 3. Geographic representation (workshop 1)

Transportation and Navigation Professionals

This workshop was held on January 25, 2022. Thirty-four professionals from the U.S. Department of Transportation, FEMA, U.S. Geological Survey, the Maritime Administration, NOAA Coast Survey, university representatives, private industry, state transportation professionals, and port managers joined (Figure 3-4).

In the course of the workshop, multiple participants stated they were unfamiliar with NOAA products and shared an interest in learning more. This lack of familiarity illustrated an important opportunity to build future relationships and plan strategic engagement with navigation managers and transportation professionals.

Participants expressed a need for more coordination and collaboration in product development activities, and requested help in identifying the right tool—and how to apply information—to support decision-making. When asked about goals for their work, a variety of topics related to future coastal transportation and navigation infrastructure challenges were raised, including concerns related to sediment control, future wharf designs, ferry terminal resilience, traffic disruptions from flooding, raising roadway profiles, and coastal airport impacts. When follow up questions asked what information

was needed to address these challenges, many participants did not respond or were unsure. This lack of response demonstrates a clear complexity and uncertainty with regard to these issues. The results of the registration form and the session dialogue illuminate the need for future discussion on this topic—with this sector and with other government agencies that work closely on these challenges.

The questions and the top ranked responses from this group are summarized below.

What are your goals for transportation projects as they relate to future flooding?

- Future wharf designs
- Resilience of ferry terminals
- Understanding flood-related traffic disruptions
- Water level information and assistance on raising roadway profiles without impacting nearby properties
- Mitigating current and future flooding for coastal airports

What are the key gaps you see in these NOAA products that would help you make more informed decisions regarding coastal flood risk?

- Sea level rise projections
- Precipitation and compound flooding information
- Incorporating high tide information into department of transportation tools
- Baseline infrastructure data

"How to realistically raise roadway profiles without impacting adjacent properties. How do we accommodate driveway tie-ins and slope tie downs with the raised profile?" -

"Mainstreaming climate data in process - ex. incorporate results from High Tide into FDOT's environmental screening tool"

"Baseline data, with respect to current infrastructure in the Great Lakes. How old is the existing infrastructure? What are the most vulnerable ports in the Great Lakes, given the age of infrastructure and risk of inundation?"

"How will future flooding impact level of service and traffic disruptions"

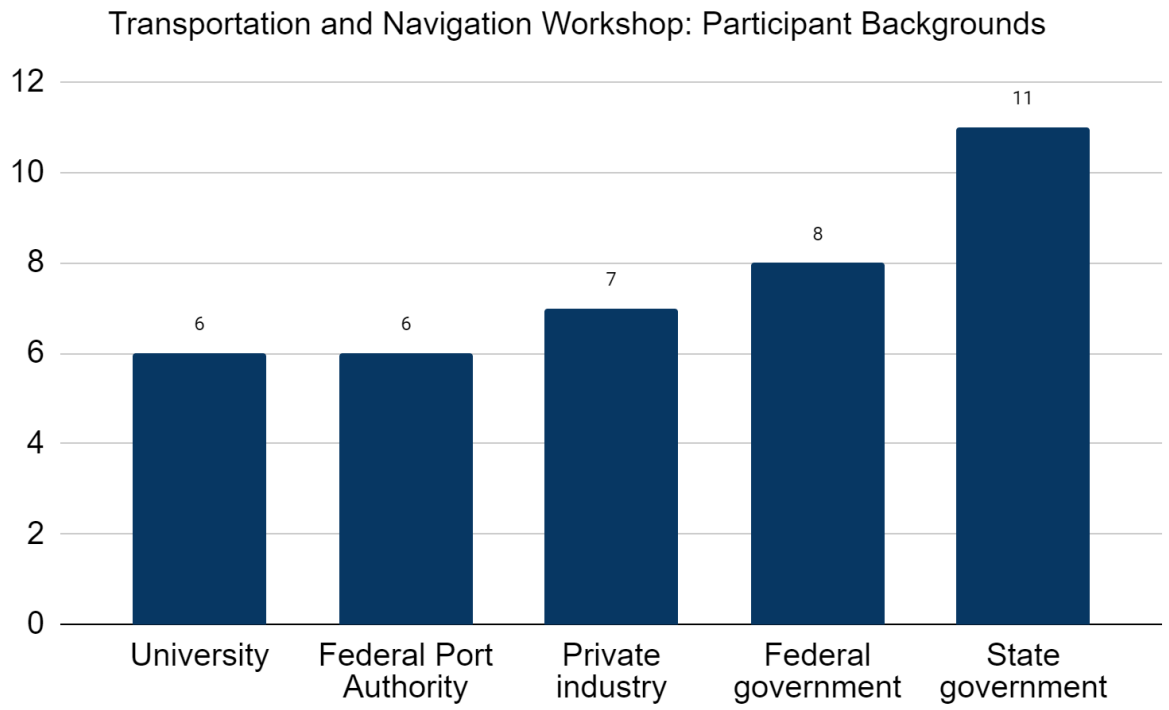

Figure 4. Professional affiliation (workshop 2)

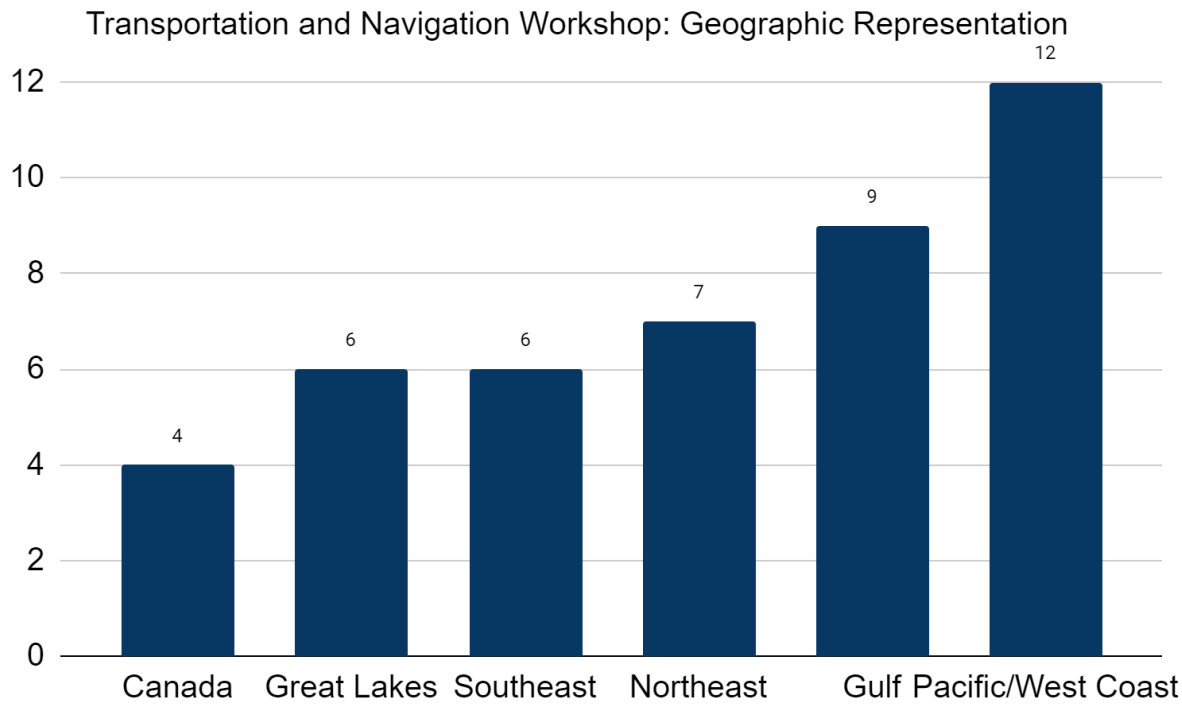

Figure 5. Geographic representation (workshop 2)

Realtors and Insurers

The third workshop with realtors and insurance professionals was held on March 22, 2022. Participants were recruited via NOAA's regional teams and partner connections. Forty-five individuals registered. The registration form asked participants to share how coastal flooding factors into their decision-making processes. Despite the high registration numbers, on the day of the session 15 people attended. Of those who participated, their affiliations included FEMA, the insurance sector, the realty sector, state government, and academia (Figure 6-7).

Overall, several attendees expressed strong interest in this topic and a desire to educate themselves and better understand flood risk decision support tools. However, many participants were silent or shared they had no prior knowledge of NOAA products, which also reveals an opportunity for future intentional relationship-building with this sector. Overarching themes from the information collected in this session include a need for simplified information with multiple learning options; a desire to understand and address equity challenges; and the limited ability of NOAA tools to apply to local populations.

The discussion point and the top ranked responses from this group are summarized below.

What key information and/or tools would help you better understand and communicate with your clients about flood risk?

- Simplified messaging on coastal flood risk with multiple learning options (mobile app, video, pictures, online tool)
- Better understand and address equity challenges of property owners
- Ability of NOAA tools to apply to local, underserved populations

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"I'm interested in a tool that simplifies access to information. The tools are all there, but figuring out how to give those tools to people in the insurance industry and find the right way they interact with a product is the challenge."

"Many in the insurance industry would rather watch a video than read. Perhaps have multiple learning options. Text, video, or call someone to help you plan to feel like you have an advocate."

"Second home owners often have the means to elevate, which protects their property. Cash buyers don't have to have insurance. We have tried to direct efforts to middle income residents and we're starting to make some headway... Funding is a barrier."

"[The NOAA tools are helpful in our area. But for the populations we are studying? No. They are people who have become displaced or are chronically homeless, transient or migratory. There are few tools nuanced enough to apply to these populations. Most seem to target properties or seem to primarily benefit property owners."

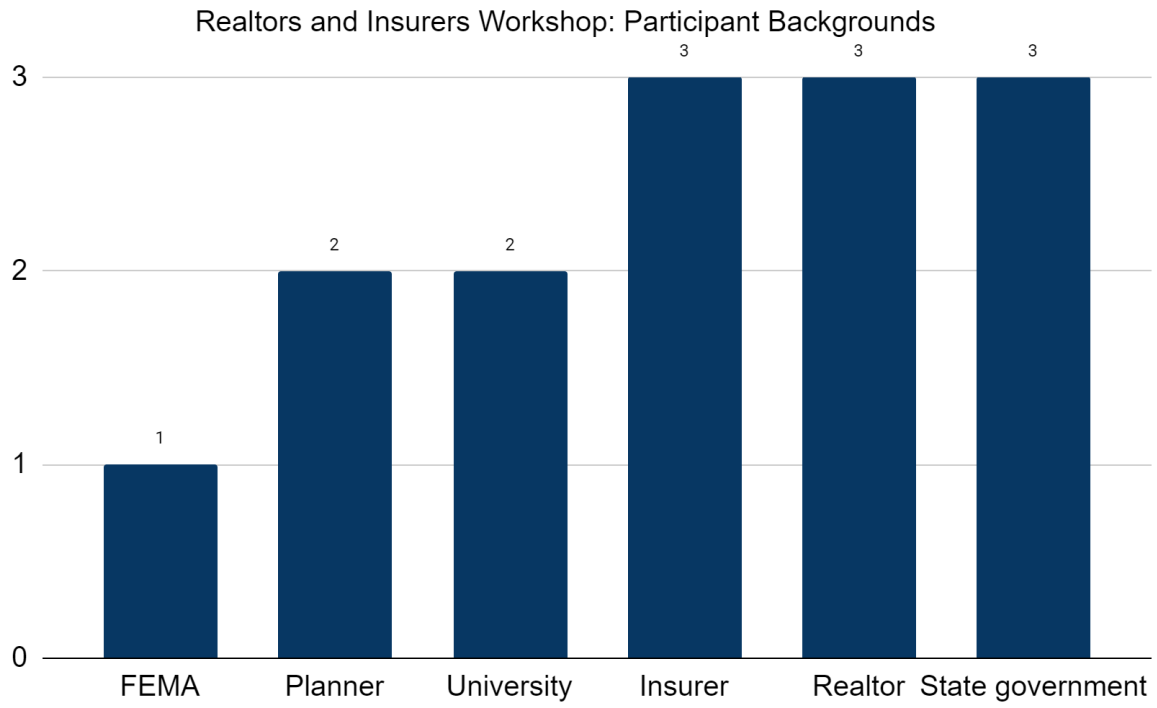

Figure 6. Professional affiliation (workshop 3)

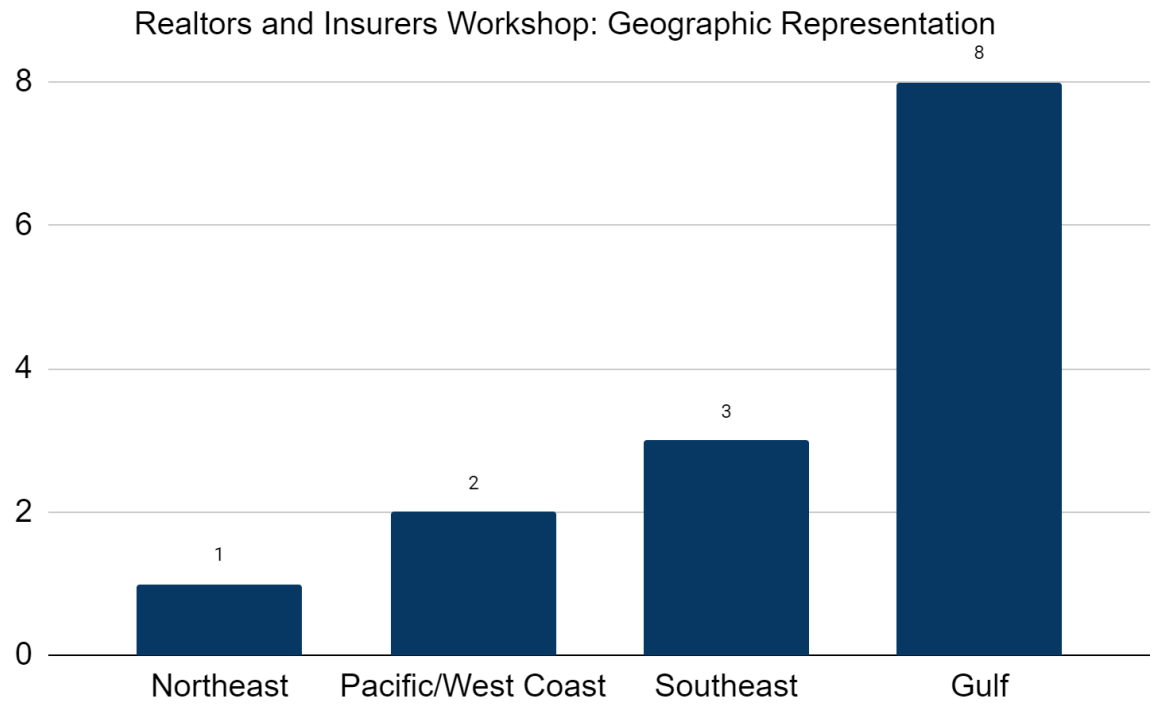

Figure 7. Geographic representation (workshop 3)

Health and Human Services Professionals

The fourth workshop, for health and human services professionals, was held on May 22, 2022. Recruiting participants for this session was challenging despite casting a large net given the non-traditional nature of this group. Eleven participants joined, of those who participated, their affiliations included Sea Grant, academia, U.S. Geological Survey, EPA, and local health specialists (Figure 8-9).

The small nature of this group allowed for a rich and focused discussion with a free flowing conversation. Participants shared challenges related to public health and future coastal flooding. Topics included barriers for low income communities to receive pre- and post-flooding event information, impacts on public transportation, churches and houses experiencing mold growth, drinking water impacted by flood waters, and education disruptions from school closures.

Attendees said their experiences show the general public does not engage well with technical data or map-based products, and suggested alternative communication approaches, such as virtual reality or disseminating information through public libraries, may be required. Additional discussion centered on performing social science-based research to identify the needs of diverse and underserved community populations.

"*Churches are community centers. When severe events happen, mold is a concern in people's homes (and churches). It is a problem in normal conditions, nevermind the mold from flooding and its health repercussions. Suspect the community doesn't have the support it needs from the insurance agency. The insurance industry is seen as aiming to refute claims from flooding/ mold."*

"Information is not necessarily present in communities of color and disadvantaged communities. Those neighborhoods suffer from poor air quality and effects from the coastal water's flooding frequency. Includes tides, high rain waters, and toxic water releases. We are lacking the tools on knowing what to do when people aren't able to leave a devastated/affected area."

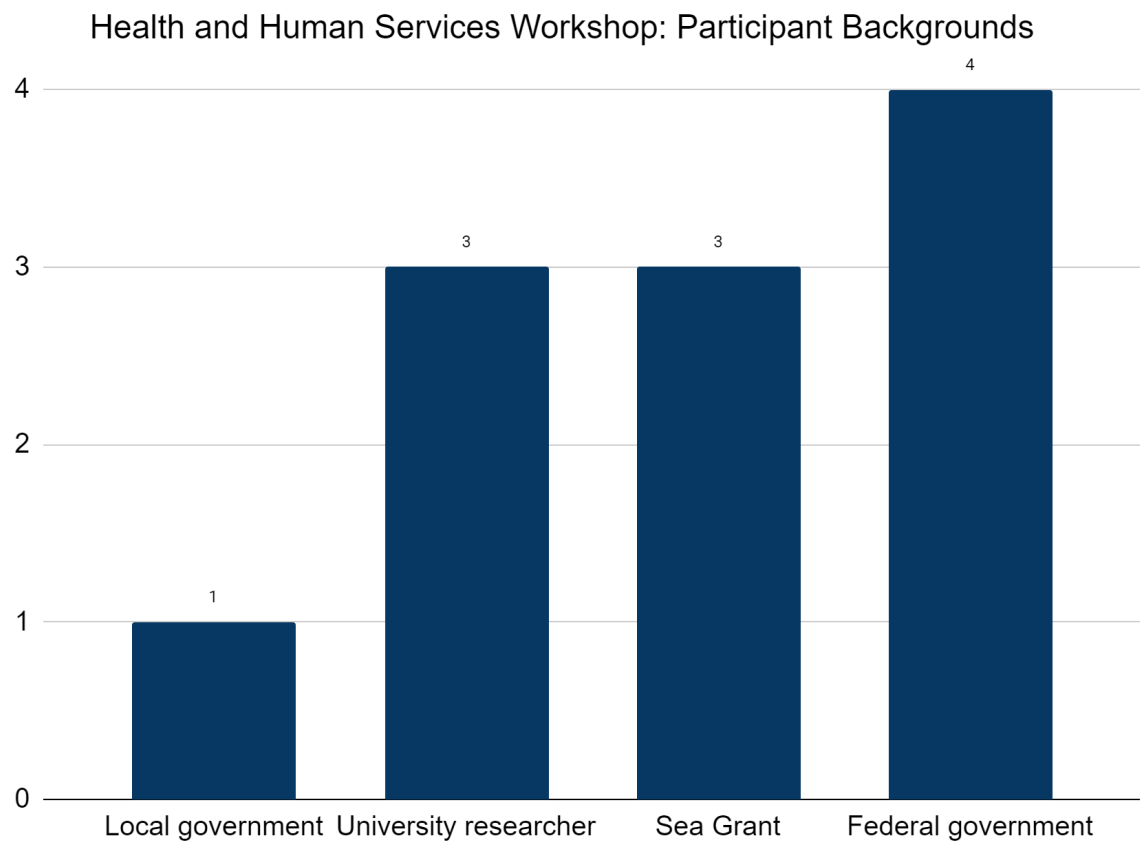

Figure 8. Professional affiliation (workshop 4)

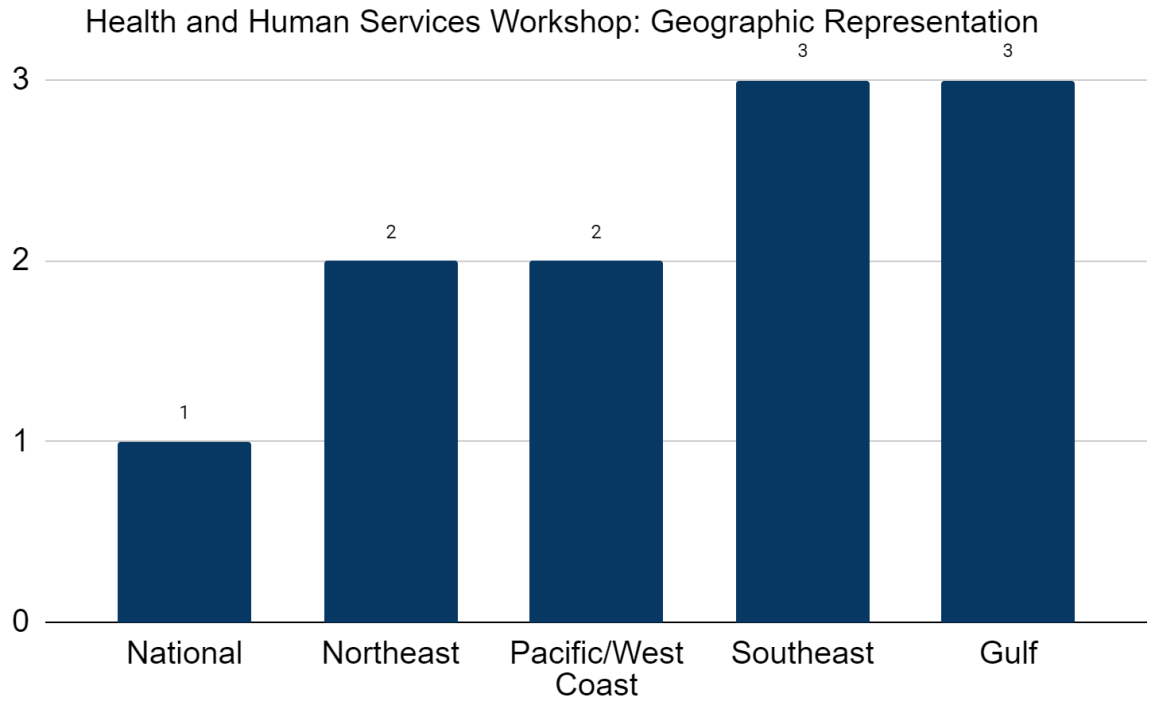

Figure 9. Geographic representation (workshop 4)

Natural Resource and Floodplain Managers

On June 27, 2022, the fifth workshop was held, featuring those who work within the fields of natural resource and floodplain management. Participants were recruited through NOAA networks, Digital Coast partners, and at the Association of State Floodplain Managers' annual conference. Fifty-nine participants joined. Their affiliations included Sea Grant, academia, U.S. Geological Survey, coastal zone management programs, county planners, local floodplain managers, private industry, and state government (Figure 10-11). Participants shared challenges related to future coastal flooding in their regions. In addition, participants shared a variety of tools and resources they use to inform coastal flood decisions (Appendix B).

The discussion point and the top ranked responses from this group are summarized below.

What key information and/or tools would help you better understand and communicate with your clients about flood risk?

- Greater information on sea level rise projections
- Further collaboration across various scales of government
- Compound flood hazard information to understand impacts from multiple sources

- Updated NOAA Atlas-14 data
- Tools specifically for municipal governments
- Understanding of septic system impacts from flooding
- Assistance balancing competing economic development interests
- Information to understand the complexity of Great Lakes water levels
- Accessible, mobile-friendly GIS products and services

"Putting profit and pro-development over floodplain management. One of the problems is that government officials are going to overlook floodplain mgmt. and put regulations in place to manage it because it interferes with money and property. People want those properties on the beach. We have to find the balance between giving people what they want and explaining that they don't really want to be right on the beach in case of a hurricane or some similar event."

"We have different sources from agencies on SLR. It would be good to have more collaboration between agencies. It would be good to have a defined, detailed source of info that we carry into arc rather than saying agency A predicted this, agency B predicted this, and agency C predicted this. Comprehensive collaboration between agencies would be good. Communities have different access to maps … some communities need access to more detailed information"

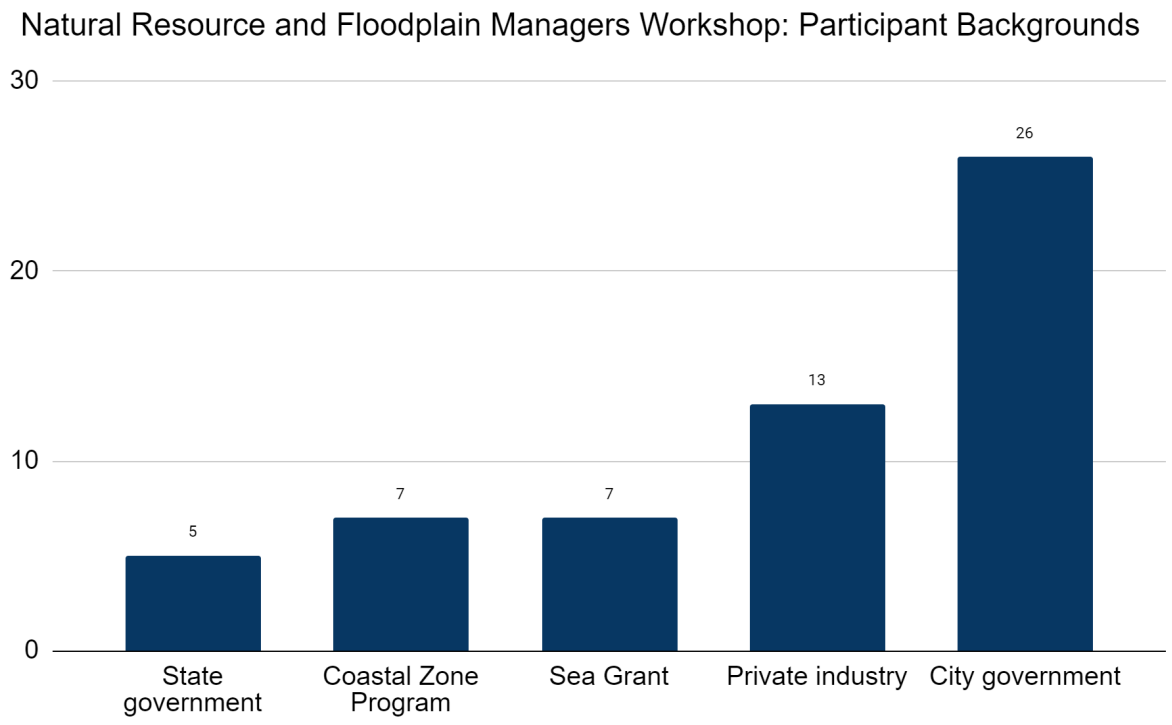

Figure 10. Professional affiliation (workshop 5)

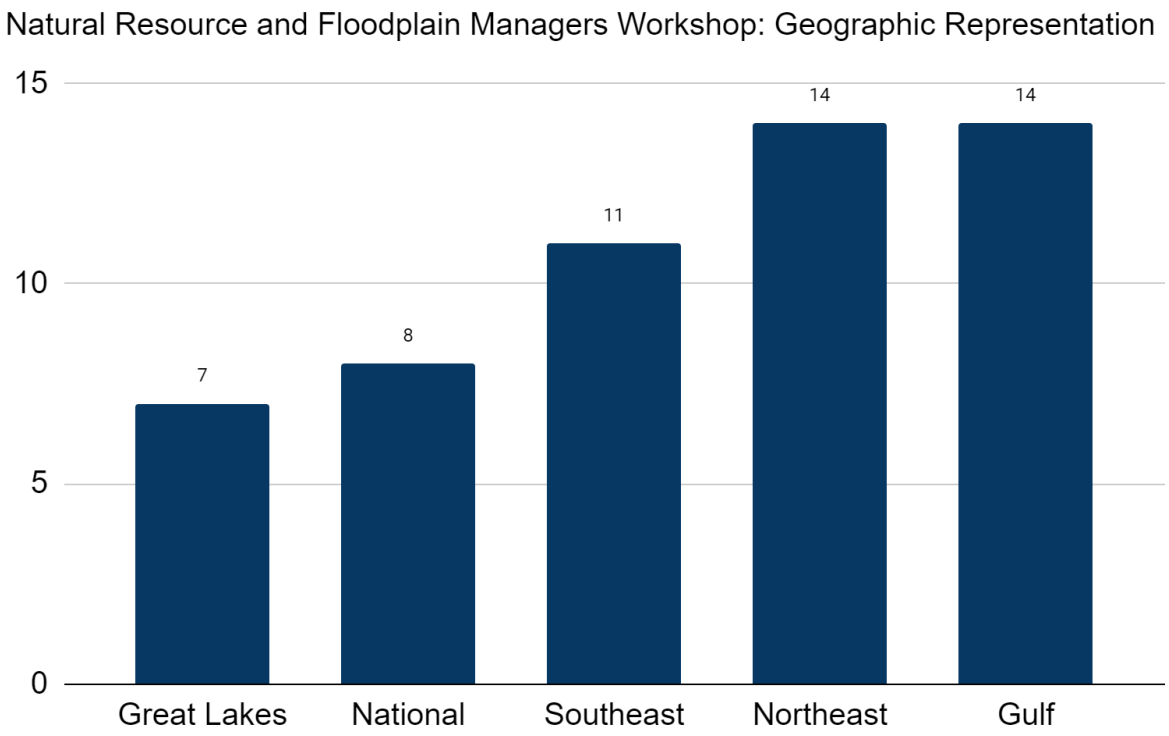

Figure 11. Geographic representation (workshop 5)

Key Findings Across Workshops

From these workshops, NOAA identified a range of participant information and tool needs. While there were some distinct requirements from each sector, there was a substantial amount of repeated needs expressed across sectors. This section of the report categorizes the commonalities and defines the cross-cutting themes that emerged. These have been grouped into nine cross-cutting themes.

- **Enhanced Equity:** It is widely recognized that underserved and underrepresented communities are often the most vulnerable to coastal hazards and flood risk because they are often the least prepared. Greater understanding of the demographic information research of a community can help identify those most at risk and potential impacts. Topics raised in the workshop ranged from inequitable financial support for adaptation work, barriers to engagement and funding based on income, post-disaster event inequality, and tribal areas not incorporated appropriately in federal maps. Needs heard related to equity challenges demonstrate a push for further social science including demographic studies to clearly identify populations at risks and impacts.

- **Communication, Education, and Outreach:** Workshop participants said they need increased awareness of existing resources, and help to accurately, clearly and creatively communicate flood risk with their constituents through simple terminology and graphics. This was repeatedly expressed with regards to interpreting changing science and national versus regional tool differences. Regarding communication, several respondents shared that resources to communicate sea level rise and flood risk to stakeholders in non-technical ways would be valuable.

- **Interagency Coordination and Collaboration:** Many government entities have similar scopes of work but don't always effectively coordinate and collaborate. Participants said they need assistance keeping track of the myriad of entities, projects, and resources useful for addressing coastal flooding. For example, a lack of clarity on the distinctions of flood mapping across NOAA, FEMA and the U.S. Geological Survey was raised by participants. Collaboration, integration, and assistance working across local, regional, and federal entities is key.

- **High-Touch Decision Support Tool Assistance:** Participants voiced there are too many decision support tools with varying levels of complexity, intended audience and purpose. The result is "decision support tool fatigue," where the sheer volume of tools is overwhelming and challenging. The comment was made several times regarding a lack of understanding between state-specific and national-level sea level rise tools, which leads to confusion and inaction. High-touch technical assistance, where individuals are guided on navigating the decision support tool space and understanding which tool does what is important.

- **Improved and Updated Technical Data:** As the climate shifts, and science and technology advances, data needs to stay up to date. Data of a high enough resolution to use on a local level, and incorporate compound flooding information, were some data needs expressed. Several also said they needed sea level rise models that incorporate LIDAR elevation data, vertical land motion, and information specific to a region's ecology and geography. Additional data needs included more real-time tide stations, products with storm scenarios, relative sea level rise information, and annual rainfall information.

- **Social Infrastructure Risk and Vulnerability:** Themes related to social, behavioral, economic, and cultural needs were revealed in the findings. Needs expressed throughout the listening sessions included social vulnerability metrics; infrastructure vulnerability; and additional research focused on social values, behaviors, and economics. Specifically, how to identify what diverse community members see as particularly valuable and how to use this information as an engagement strategy. Users shared a need to identify vulnerable infrastructure including transportation infrastructure, school and road closures, or other societal disruptions caused by coastal flooding.

- **Identify and Address Emerging Issues:** Climate change is ongoing, and as a result, there are coastal hazards not previously seen that need to be considered and professional groups to be engaged. Examples include incorporating climate data into federal transportation projects, as well as greater consideration for flooding impacts on public health such as flood-related indoor mold and septic impacts on drinking water.

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- **Total Water Level Information**: Multiple professional groups mentioned a need for compound flooding information. This phenomenon occurs when two or more flooding sources occur simultaneously in a short time period such as combined impacts of high sea levels, heavy precipitation, storm surge and riverine flooding.

4. Conclusions and Recommended Next Steps

Higher storm surge, rising seas, increased precipitation events exacerbate flood risk in coastal regions. To help communities take action and adapt to increased coastal flooding, coastal science entities need to understand what information communities and various professional sectors most need now and in the future. This project helps address this gap and shares some of the information needed of five coastal stakeholder groups. The nature of needs assessments and NOAA's emphasis on the service delivery framework shows that user engagement is a continual process. Open and repeated communication, collaboration, and continuously evolving data and information is key for informing climate adaptation decision support tools and building a more resilient society as a whole.

Many of the needs identified and outlined in this needs assessment are not new, but their continued appearance shows a need for additional work. Some unique needs were also identified and point to a growing need for further social science research and information sharing. Many issues may seem unrelated, yet climate and weather are inextricably intertwined with social and equity issues. These findings represent an initial step in identifying next directions to pursue. Ideas for possible areas for future assessment are provided below. In addition, this assessment is one of the initial efforts to use NOAA's service delivery approach for implementing the Bipartisan Infrastructure Law and other forms of climate-related legislation.

The priorities and needs synthesized in this report are the product of a series of five virtual workshops with coastal stakeholders. Acknowledging that this report captures the needs and perspectives of a particular set of a small representation of professionals at a particular moment in time is important. Project limitations include uneven sample sizes, limited project resources, and the virtual-only engagement options due to the pandemic. As NOAA moves into next steps and the next era of climate science, there is a need to understand current service challenges, which includes finding ways to provide service that reaches all stakeholders at all spatial scales. For this challenge, it is important to recognize those with existing relationships at local scales and engage with these "boots on the ground" representatives to better serve local populations. One example of this is NOAA's support of a forthcoming Coastal Resilience to Inundation community of practice to support and encourage a cadre of adaptation and resilience professionals, providing needed coordination for effective engagement with tools, products, and services to address inundation. The Bipartisan Infrastructure Law has provided resources to launch this community of practice as a critical mechanism for engaging on the ground practitioners in designing inundation related products and services as new data and modeling are produced.

Recommendations for Future Study

- **Research emerging topics.** Opportunity for future needs assessments to focus on emerging topics identified in this report, including social science research related to the intersection of climate, flooding, health, socioeconomic vulnerability, and social inequity.
- **Underserved populations.** Opportunity to work more closely with those who already work with NGOs, academia and other professional organizations to help translate scientific information and creatively communicate with diverse and underserved audiences.
- **Review needs assessments**. Opportunity for meta-analysis of previous NOAA Water Initiative and partner needs assessments to compare and identify cross sectional areas on coastal flood risk for additional research.
- **Outreach, education and engagement.** Opportunity to expand the use of NOAA tools and services by working to build awareness and conduct meaningful engagement with professions such as realtors, public health and transportation communities.
- **Coordination.** Opportunity to help constituents by working with other agencies to avoid what seems to the consumer like a glut of tools and information they are unsure how to use. This includes linking new external tools shared by participants to NOAA's Digital Coast and other platforms.

For those interested in establishing a partnership or learning more about this report and the questions it brings to light, please contact project leads from NOAA's Office for Coastal Management (Brenna Sweetman- Brenna.Sweetman@noaa.gov) and NOAA's Center for Operational and Oceanographic Products and Services (Cayla Dean- Cayla.Dean@noaa.gov).

5. References

A Model of Service Delivery for the NOAA Water Initiative

Coastal Flooding and Inundation Information and Services at Climate Timescales to Reduce Risk and Improve Resilience

Executive Order: Advancing Racial Equity and Support for Underserved Communities through the Federal Government

Fifth National Climate Assessment: March 2022

NOAA FY22-26 Strategic Plan: Building a Climate-Ready Nation

NOAA Water Initiative Vision and Five Year Plan

Appendix A – NOAA Tool Resources

- The Digital Coast. A NOAA-sponsored website focused on coastal communities. The site provides data, tools, and training. The focus: making communities more resilient.
- NOAA Sea Level Rise Viewer and the NOAA Lake Level Viewer. Used to view sea level rise and potential coastal flooding impact areas.
- Inundation Analysis Tool. Documents the frequency and duration of high water levels.
- Adapting Stormwater Management for Coastal Floods. Used to address current and future impacts on stormwater management.
- Coastal County Snapshots. County-level data combined and provided via easy-to-understand charts and graphics. Used to create printable handouts that help articulate a community resilience message.
- Map of NOS coastal stations. Used to view local tides and currents.
- Physical Oceanographic Real-Time System (PORTS®). Collects and disseminates observations (water levels, currents, salinity, bridge air gap, meteorological parameters, etc.) mariners need to navigate safely.
- Coastal Inundation Dashboard. Provides real-time and historical coastal flood information at select locations.
- Sea Level Trends. Uses tide gauge measurements to document local relative sea level trends.
- Extreme Water Levels. Use of tide gauges to measure storm tides, which are a combination of the astronomical tide, the storm surge, and limited wave setup caused by breaking waves.
- 2022 Sea Level Rise Technical Report. Most up-to-date sea level rise projections available for all U.S. states and territories.
- State of High Tide Flooding and Annual Outlook. Visualization tool and report that displays information on increasingly common high tide flooding, often referred to as “king tides,”

"nuisance," or "sunny day" flooding.

- Application Guide. A companion to the 2022 Sea Level Rise Technical Report. Developed to help people use the data in the technical report to make their communities more resilient. will help coastal communities plan for significant sea level rise.
- High Tide Bulletin. Shows when regions around the nation may experience higher than normal high tides. Bulletins are updated quarterly.

Appendix B. Tool Resources Shared by Workshop Participants

Throughout the workshops, participants provided additional resources they found useful. The list is provided below.

- Peer-to-Peer Case Study – Flood awareness for Realtors
- Virginia Commonwealth Center for Recurrent Flooding Resiliency (CCRFR) GIS-based community mapping tool to log flood issues and community assets
- Virginia Beach Sea Level Wise Story Map
- Queen Anne's County Maryland Sea Level Rise and Vulnerability Assessment
- University of Washington's Climate Impacts Group
- North Carolina Flood Risk Map Viewer / North Carolina One Map
- First Street Foundation's Risk Factor Tool
- New York City Flood Hazard Mapper
- Delaware Flood Planning Tool
- Indiana Department of Natural Resources Floodplain Portal
- Coastal New York Future Floodplain Mapper
- Mycoast.org
- North Carolina Institute for Climate Studies
- Interagency Sea Level Rise Scenario Tool
- Climate Central Global Sea Levels
- Reducefloodrisk.org
- Floodsmart.gov
- Inspect2protect.org
- Pinellas County's Floodplain Maps