

ASSESSMENT OF COASTAL MANAGEMENT NEEDS FOR FINANCING ADAPTATION AND RESILIENCE

Synthesis of Existing Resources, Funding Options, Stakeholder Input, and
Recommendations

Final Report

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Executive Summary

NOAA's Office for Coastal Management (OCM) supports and collaborates with its partners to build and enhance coastal adaptation and resilience in coastal and Great Lakes tribes, territories, and states. The ability of local and regional entities to implement short- and long-term adaptation and resilience measures hinges in large part on their capacity and ability to secure adequate funding. As the scale of coastal adaptation and resilience needs grows, communities—particularly historically under-resourced and underserved communities—may struggle with identifying, quantifying, and prioritizing such needs and identifying and accessing reliable, affordable funding.

OCM and its federal, state, regional, non-profit, and other partners have generated hundreds of tools, trainings, and other resources designed to connect eligible assistance recipients with available funds. However, these resources may not be sufficient to overcome the barriers posed by numerous and sometimes competing state and local priorities; significant staffing, technical, and other resource capacity issues; and political, organizational, and other constraints. These barriers to action can ultimately limit the reach and effectiveness of such resources. Likewise, these barriers may also prevent communities from identifying and accessing the myriad federal, non-profit, or local sources of funding available for coastal adaptation and resilience.

In 2018, OCM initiated an effort to assess the landscape of available funding programs and mechanisms for coastal adaptation and resilience, and related resources. Stakeholders provided direct input on the challenges and opportunities associated with funding coastal adaptation and resilience measures and provided recommendations for improving federal program design and cross-agency coordination, enhancing availability of downscaled data and targeted technical assistance, addressing capacity and resource constraints and equity concerns, and more. This report synthesizes the findings from this project and provides recommendations for follow-on actions OCM can take to address these findings and stakeholder input.

1. Introduction

NOAA's Office for Coastal Management (OCM) and its regional, state, tribal, federal, and non-profit partners have worked closely with coastal managers across the country to develop climate adaptation plans and provide broader planning, implementation, and other support to build community resilience. Local, regional, and state, territory, and tribal measures to enhance resilience have ranged from short-term responses to immediate threats to long-term adaptation strategies in response to gradual changes. While there are studies on the costs and benefits of adaptation options and various tools to help inform government investments, there is no comprehensive inventory or guide for local or regional entities to select appropriate funding options and financing strategies.

The financing world is constantly evolving new products and retiring others. The range of funding and financing options,¹ from grants and low-interest loans to more innovative private-public partnerships and bonds, presents an ever-changing and complex array of choices. In initial internal communications conducted between June and September 2018, NOAA customers indicated that these opportunities and mechanisms are not well understood, and may be inaccessible to coastal managers, particularly in small to mid-sized (by population) communities, rural areas, and tribal communities. Research and interviews conducted for this project between 2018 and 2022 indicated that such concerns persist.

In some coastal and Great Lakes communities, investment in adaptation and resilience measures remains limited or non-existent or is largely reactive, in response to a catastrophic event. Lack of funding is a frequently cited barrier to comprehensively assessing needs and to conducting planning, design, cost-benefit assessment, and implementation activities associated with adaptation and resilience efforts. At the same time, it has been estimated that such investment can save communities \$6 for every \$1 spent through grants from agencies including the Federal Emergency Management Agency (FEMA), Department of Housing and Urban Development (HUD), and Economic Development Administration (EDA).²

Understanding funding and financing options at the time adaptation and resilience planning is undertaken, and then incorporating financial strategies into the adaptation planning process, will help ensure that recommendations are implemented.

This report synthesizes findings from an assessment of current resources available to OCM partners on identifying, accessing, and using funding and financing for coastal adaptation and resilience efforts; a review of federal and other funding and financing programs and mechanisms to support such efforts; and 36 interviews capturing input from nearly 50 OCM partners. The purpose of this report is to identify opportunities and challenges associated with identifying and accessing appropriate funding and financing programs and mechanisms, the extent to which existing resources are adequately supporting

¹ Funding refers to money that is provided or generated for a specific use or purpose and does not need to be repaid. Financing refers to money or capital obtained or received, often by a lending agency or other financial institution, that is repaid. Funding may be used to repay financing.

² Multi-Hazard Mitigation Council. 2019. Natural Hazard Mitigation Saves. National Institute of Building Sciences, Washington, D.C. Available on-line at: https://www.nibs.org/files/pdfs/NIBS_MMC_MitigationSaves_2019.pdf

funding and financing of coastal resilience efforts, and recommendations for OCM to address identified challenges and limitations and support partners in building on existing opportunities and successes.

This assessment takes a broad approach to coastal adaptation and resilience, considering any efforts related to enhancing the ability of natural or built systems and societies to recover from, adapt to, or prepare for the adverse impacts of climate change or other short- and long-term extreme events. These efforts may include infrastructure investments, planning, outreach and engagement, and more. This assessment also considers adaptation and resilience across all sectors.

2. Project Approach

Identification of Resources and Funding Programs and Mechanisms

From Fall 2018 through early 2019, NOAA contractor ERG conducted a literature search for existing resources that OCM partners could conceivably access and use to:

- Understand the array of funding mechanisms and programs that could fund coastal adaptation and resilience efforts
- Determine the most appropriate funding and financing mechanisms or programs to address a specific need, including understanding the relative challenges, benefits, cost, risks, and other considerations associated with using a specific program or mechanism
- Identify requirements, best practices, and other key information for applying for or otherwise accessing these funding and financing mechanisms or programs
- Connect with experts, peers, or other stakeholders to learn more about best practices and opportunities for funding coastal resilience efforts
- Learn about real-world applications of funding and financing programs and mechanisms for coastal adaptation and resilience

ERG identified gray and peer-reviewed literature, as well as existing clearinghouses or on-line databases that house relevant resources. Compiled findings are included in Appendix A. Note that while ERG conducted a limited additional search in Fall 2021 and intermittently added resources to the spreadsheet between 2018 and 2021, the search was not substantially revisited after it was initially completed.³ Additionally, the search was not intended to be exhaustive. Rather, the resources are intended to be representative of those available to OCM stakeholders.

Identified resources came largely from the following sources:

- Federal programs that provide funding for coastal adaptation and resilience efforts
- Non-profit organizations and private foundations that provide funding, education, technical assistance, or other support for coastal adaptation and resilience efforts
- Other private entities that are engaged in coastal adaptation and resilience funding

³ The project was originally scheduled to conclude in February 2020. However, due to delays associated with Information Collection Request (ICR) development and approval, the project concluded in February 2022.

ERG also compiled information on selected federal, non-profit, and private funding programs that can be used to fund coastal adaptation and resilience measures. The search for these programs targeted the same sources as identified in the list above, and the same considerations related to the timeframe in which the resources search was initially conducted and revisited apply.

Due to the scope and budget of the project, ERG did not search for resources or funding programs that are funded and managed by or are otherwise targeted to single states, tribal or indigenous communities, or territories. Additionally, the compilation of funding programs does not reflect funding appropriated or anticipated under the 2021 Infrastructure Investment and Jobs Act (IIJA), 2021 American Rescue Plan Act (ARPA), or 2020 Coronavirus Aid, Relief, and Economic Security (CARES) Act.

Appendix A includes the resources and programs identified, by entity and topic. As noted previously, these compiled programs and resources are intended to be representative of the types of funding available to coastal entities and do not represent the full catalog or spectrum of available resources and funding.

Stakeholder Interviews and Informal Discussions

Following the compilation of resources and funding programs, ERG conducted one-hour interviews with NOAA partners engaged on coastal adaptation and resilience. Partners represented local, state, tribal, federal, non-profit, and private entities. NOAA and ERG identified interviewees through a multi-step process.

First, NOAA provided a list of potential interviewees and summaries of previous conversations relevant to this effort to ERG. Next, ERG reviewed the list provided by NOAA, and categorized interviewees according to sector and region (western, northeast/mid-Atlantic, Gulf/southeast/Caribbean, Great Lakes, Alaska, Hawaii/Pacific Islands, national, and international). Based on identified gaps, and additional knowledge of interviewees who could provide valuable contributions to the research, ERG then provided additional recommendations. NOAA and ERG reviewed and further refined the list of proposed interviewees based on NOAA recommendations and input, ultimately creating a list of 91 candidates.

From the list of 91 potential interviewees, NOAA and ERG used the following criteria to select 51 individuals designated as “high priority” interviewees:

- Regional representation
- Affiliation
- Expertise and experience (i.e., known successes or challenges funding adaptation or resilience projects and/or known expertise in the fields of coastal adaptation and resilience or finance)
- Relationship with NOAA or ERG team that would facilitate scheduling and conducting an interview

ERG developed an interview guide, including standardized interview questions (Appendix C). ERG also developed an Information Collection Request package that was approved by the Office of Management

and Budget (OMB) in August 2021. Following ICR approval, ERG contacted “high priority” interviewees and additional interviewees and conducted virtual interviews via Microsoft Teams between September and December 2021. Two ERG team staff members participated in each interview and developed a written interview summary⁴. ERG conducted a total of 36 interviews. In five cases, more than one individual participated in the interview, for a total of 46 participants. Table 1 below summarizes interview participants by sector and region.

Table 1: Summary of Stakeholders Interviewed by NOAA Region and Affiliation

Interviewee Affiliation	NOAA Region						National	Total
	NE/Mid-Atlantic	Gulf/SE/Caribbean	Great Lakes	Western	Alaska	Hawaii/Pacific Island		
Federal	-	-	-	-	-	-	1	1
State, Tribe, Territory*	6	6	2	4	1	2	-	21
Local	1	1	2	10	-	-	-	14
Non-profit, NGOs, private	3	2	-	-	-	-	5	10
Total	10	9	4	14	1	2	6	46

*Includes individuals associated with Sea Grant programs and state university-based programs

Prior to initiation of this research effort, NOAA collected feedback received via ongoing, ad hoc conversations with OCM partners. This feedback was used to inform and validate findings from the stakeholder interviews and compilation of relevant resources and funding programs and mechanisms. NOAA and ERG also presented on this project at the 2019 National Adaptation Forum in Madison, Wisconsin, the 2020 Social Coast Forum in Charleston, South Carolina, and other venues, and received stakeholder input that informed this research.

3. Findings and Outcomes

Resource Overview

The search for resources and funding programs identified more than 120 relevant resources and 90 funding programs. As noted previously, this is not an exhaustive list. Rather, these resources and programs are intended to be representative of the broader universe of resources and programs available to state and local coastal managers. Findings from the initial review of these resources and funding programs were cross-referenced with informal feedback NOAA received via ad hoc conversations with OCM partners prior to initiation of the project, interviews, and feedback received in response to public presentations on this project.

Generally, the content, purpose, and focus of the resources can be characterized as follows:

⁴ The input provided by interviewees has been anonymized in the body of this report.

- Topic-specific resources (e.g., stormwater and green infrastructure, land conservation, buildings). These resources provide a targeted view of topic-specific adaptation and resilience measures and funding sources. However, their specificity may inhibit a more holistic and integrated approach to funding adaptation and resilience that addresses and leverages cross-cutting needs.
- Databases or clearinghouses of adaptation and resilience resources and funding opportunities. While these on-line libraries are resource-rich, the volume of content may be overwhelming for a community with limited resilience and resilience finance experience. Filtering content to find that which is most relevant can be time consuming.
- Location-specific case studies and reports on opportunities or success stories for resilience finance. These present useful real-world examples and lessons learned that stakeholders interviewed for this effort indicated they benefit from. However, case studies may be limited in their utility by specificity of location and circumstance, and by recency.
- Resources on specific financing mechanisms (particularly newer or emerging mechanisms, e.g., forest resilience bonds, re-insurance, catastrophe bonds) and programs. Most funding programs (especially federal programs) have developed extensive guidance, FAQs, case studies, and other resources intended to facilitate and promote program access.

A high-level assessment of these resources, and input from interviews and ad hoc conversations indicates that there are limited frameworks for local engagement and investment around adaptation and resilience that are practical for smaller, under-resourced communities with limited capacity. Additionally, there are limited frameworks focused on prioritizing and maximizing the value of resilience- and adaptation-related investments. The same is true for frameworks that identify practical approaches to initiating and integrating more common planning processes, such as integration of capital improvement planning and climate action planning. Furthermore, funding may not be the focus or a central component of these frameworks.

Resources on accessing funding often presume a minimum level of capacity, staff and financial resources, and internal expertise that under-resourced, small, rural, or other communities or stakeholder entities may lack. This effort identified limited resources providing actionable information on financing adaptation and resilience with immediate and practical relevance to small to mid-sized communities that may face more immediate and competing financial and political demands.

The focus of the resources compiled is largely on infrastructure. Research and funding opportunities are more limited for human impacts, e.g., changing disease vectors, psychological impacts, impacts to public health services. Similarly, the focus of many of the resources and funding programs is physical risks, versus transition risks (e.g., transitioning to a low-carbon economy), which is considered a key component for adaptation from a financial and regulatory perspective. Finally, on-line resources are limited in their ability to meaningfully connect stakeholders (particularly in small, tribal, rural, or under-resourced communities) with funding opportunities.

[Funding and Financing Mechanism and Program Overview](#)

Accessible funding and financing mechanisms for coastal adaptation and resilience are briefly summarized in Table 2, below.

Table 2: Potential Funding and Financing Mechanisms for Adaptation and Resilience Measures⁵

Funding Mechanism	Description
Loans	Federal, state, or other loans require repayment. Depending on the source and borrower profile, loans may be issued at below market rate and may include additional financial incentives to ensure affordability, such as principal forgiveness or a zero or negative interest rate.
Bonds: Tax-exempt municipal bonds	Issued by local or state governments <ul style="list-style-type: none"> ● General obligation bonds are backed by the issuer ● General revenue bonds are backed by a revenue stream, such as water utility revenue
Bonds: Private activity bonds	Issued by local or state governments for a project being undertaken by a private entity. Private activity bonds may be tax-exempt, with restrictions.
Bonds: Green, impact, catastrophe, and resilience bonds	<ul style="list-style-type: none"> ● Green bonds are issued to fund environmentally beneficial projects and therefore may be particularly appealing to certain investors ● Environmental or social impact bonds, for which investor payouts are dependent on the funded project meeting pre-established goals or milestones. ● Resilience bonds and catastrophe bonds are insurance-linked securities. Catastrophe bond issuers receive payouts if an event (e.g., hurricane) occurs. Resilience bonds are a form of catastrophe bonds, but the value is generated through a “rebate” realized by the insurance savings associated with a project that incorporates resilience elements. Both have had very limited real-world use.
Grants	Issued by local, state, tribal, federal, non-profit, private, and other entities and do not require repayment. However, they may include a requirement that the recipient match a certain percentage of the funding received.
Fees	Fees can be related to property ownership and use, development services, non-property related, associated with a public service, or non-property or service related. Examples include stormwater fees, developer fees, gas fees, and inspection or permitting fees.
Taxes	Tax revenue for resilience may be derived from property taxes, income taxes, or specialized taxes. Additionally, tax increment financing, traditionally associated with urban redevelopment, could be used for infrastructure, redevelopment, and other activities relevant to resilience.
Assessments	Special assessment districts can be created to levy charges on real estate parcels that are receiving direct benefits from public projects.

⁵ Adapted and condensed from: Resources Legacy Fund and AECOM. 2018. Paying for Climate Adaptation in California: A Primer for Practitioners. Available on-line at: <https://resourceslegacyfund.org/wp-content/uploads/2018/11/Paying-for-Climate-Adaptation-in-California.pdf>

The assessment of funding programs conducted for this project indicates that state and local coastal managers have access to a wide array of programs that vary significantly in terms of scope, purpose, eligibility, and funding availability. Across the federal government, available funding is anticipated to increase significantly under the current Administration, with a renewed and heightened emphasis on addressing adaptation and resilience needs. While existing programs may include provisions to target support to under-resourced, rural, and environmental justice communities, the Biden Administration is placing heightened emphasis on ensuring that additional funding is targeted to these communities, supported by improved cross-government coordination on this issue.

This assessment, including stakeholder input, pointed to limited meaningful interconnection and coordination between funding programs, particularly at the federal level. This constrains opportunities to seamlessly access and combine multiple funding sources, which is typically necessary for larger-scale projects and to address cross-sector needs with one or a limited number of funding sources. Specificity of many of the larger funding programs to one sector may also inhibit cross-sector collaboration, even if the funding program includes the eligibility and flexibility needed to address resilience across multiple sectors at once (e.g., Department of Transportation grants addressing transportation and stormwater infrastructure).

Additionally, the lack of connection and coordination across programs means communities need significant capacity to undertake multiple, time-intensive application processes, potentially simultaneously, and to meet different reporting and other requirements following award. Accessing multiple programs is further complicated by the fact that key terms and concepts, including “resilience,” may not have an established or consistent definition across programs.

4. Interview Synthesis

This section summarizes challenges, opportunities, and lessons learned that interviewees identified. Specific, anonymized interviewee feedback is included throughout to highlight specific input.

Challenges

Most interviewees noted a significant gap between funding needed and funding available for coastal adaptation and resilience planning, implementation, outreach, capacity building, and related efforts. Interviewees also noted the challenges of quantifying the gap, particularly for regions or communities that do not have an existing pipeline of projects and do not have the capacity to conduct regular capital improvement planning, needs assessments, or similar efforts. Understanding and quantifying the needs of these communities was cited as a major limitation to addressing the funding gap and access to funding. Interviewees also noted the challenge of justifying the need for funding to close a gap that has not been quantified.

Local constraints on funding coastal adaptation and resilience include limited local revenue streams, which are often earmarked for specific community services. Communities may also lack the ability to take on new debt or pursue more affordable loan or grant financing. Additionally, many communities are facing the need to replace multiple large pieces of infrastructure at the same time, such as culverts, sewer systems (separate and combined), and flood control structures, among others. The scale and complexity of need can be daunting.

...[our] coastal zone is so developed that thinking about the solutions become[s] insanely overwhelming. Everyone defaults to two options: retreat or spending billions to protect and keep water out. Because the scale is huge, and the scale of solutions are so huge, people just stop in their tracks. There's not enough imagination to think that the issue is addressable. But it is a misconception that you have to address everything all at once. (State interviewee)

Another consistent theme is that ability to access funding varies significantly, depending on geographic, socioeconomic, and other factors. Interviewees noted that small to mid-sized rural, tribal, and under-resourced communities in particular struggle to access funding despite facing the same or greater hazards and challenges than the larger communities. Limitations on access to funding for these communities was attributed to resource, capacity, communication, and organizational constraints at the federal and state levels, as well as the local levels (as discussed later in this report).

However, interviewees from larger, well-resourced communities also noted the significance of the funding gap and the challenges in accessing and working with particular funders. These interviewees noted that they have struggled to secure enough funding to implement large-scale resilience or adaptation projects. When funding is available, it may not be sufficient to scale projects to their full potential.

...NOAA shouldn't think of the states individually, but think about [regions and communities] that have a handful of employees, and one person who has 20 percent of their time dedicated to resilience...What information do they need? New York City funds their own panel on climate change and has multiple departments with climate in their mission statements. Stop emphasizing them and focus on small/mid-size communities in desperate need of information. These communities are almost afraid of trying something new. We need to make it painfully easy for small and mid-sized communities to increase resilience. (Federal interviewee)

There seems to be more infrastructure and resilience funding at the federal level, but it's got to filter down to the local level. Money flows like a funnel that is constricted by capacity to receive and manage funds. (State interviewee)

Interviewees noted that in many cases, communities see adaptation and resilience-related investments as competing for funding with other community needs, including education, emergency response, transportation, water infrastructure, and more.

Interviewees provided mixed feedback on whether resilience is treated as an inherent component of broader infrastructure and other long-term investments. While the federal perspective may be that adaptation and resilience are inherent components of any infrastructure or similar project, this view is not yet widespread across all regions of the country. Interviewees noted that communities were more likely to have integrated resilience considerations into planning and investments if such a requirement had been implemented by a state legislative body, if the community had experienced or is experiencing

climate-related impacts, or if a local champion was actively facilitating and identifying or providing funding for such activities. Where adaptation and resilience are not yet treated as an integral consideration to planning and implementation, investments may also be more reactive to emergency events, rather than proactive.

Some interviewees noted that resilience investments are being made to protect communities for which managed retreat is an unfortunate but likely more beneficial investment in the long term; however, willingness to discuss managed retreat openly as a strategy is very limited. Furthermore, while well-resourced communities may make investments that are maladaptive in the long-term based on political will, under-resourced and small communities often face the added challenge of having little to no long-range planning processes in place to begin with.

The top threat in the state is flooding...The magnitude of the issue is great; the rate of sea level rise is twice the global average. Yet the state is creating greater exposure and vulnerability by developing in the flood-plain. A lot of communities will go away or turn into barrier islands. There is not widespread acceptance for the need for managed retreat—we are still trying to adapt. There is not a lot of funding available for buyouts, which will become an issue as sea level rise advances. (State interviewee)

At a national scale, interviewees expressed concerns that federal funding decisions tend to favor certain regions (e.g., east coast, rather than west coast) or certain projects that are considered a higher national priority (e.g., disaster recovery versus salmon restoration). In these cases, the interviewees expressed that their needs may never seem worth addressing, from the funder's perspective. Some interviewees also noted that greenhouse gas and climate mitigation are prioritized over resilience.

There are certain kinds of resilience and adaptation projects that are attractive to funders. Shiny climate tools or guidance are what funders like to fund. We have so many tools! Shovel ready projects are easy to fund. What's harder to find funding for is relationship building, collaboration, and projects that recognize linkages between human and ecological dimensions. Tools only work when you have extension personnel or others who can help walk through them and understand them. (State interviewee)

It's harder to get funding to address the human elements of this work. Technical sources are easier to chase down...This is true across the federal government and philanthropy – they want to invest in new and shiny and not in maintaining what we already have. We need to build people to do this work, especially a more diverse group of people... (Local interviewee)

One interviewee also noted that private landowners and private developers may be ineligible to receive resilience funding and may also be looking at investment on a much shorter timescale, which drives less motivation for action on longer-term climate impacts.

Most of the need for resilience building is on private property, and most of the funds can only be used on public property. It's possible that some national funds could fund local or regional cost-shares, but that's a big disconnect right now. (State interviewee)

Programmatic Requirements and Coordination

Interviewees noted that definitions and requirements for obtaining funding are not aligned across federal programs. For example, there is no common definition of “resilience” in use across federal funding programs, and efforts to align federal strategy and funding around resilience have been stymied by administration changeovers. There are also somewhat artificial distinctions made between program focus (e.g., adaptation vs. resilience) and the types of projects that each program targets and prioritizes for funding.⁶

The funding that we're giving is a band-aid. It's not actually tackling the core program. I'm a local practitioner so the reality is that there's no difference between climate, equity, adaptation, etc. They're all very intrinsically linked. It's artificial to make these [distinctions]. We're cutting the cake too thin. (Local interviewee)

Additionally, the definition of “coastal” is not consistent across funding programs and was noted by some interviewees as being too restrictive. Multiple interviewees noted that inland communities bear the impact of what happens on the coast (e.g., flooding, sea level rise, saltwater intrusion) and should not be summarily restricted from receiving “coastal” funding.

Lack of funding for or ineligibility of certain project phases, components, or activities was noted as a significant challenge, particularly lack of funding for pre-planning activities, permitting, operations and maintenance, technical assistance, long-term staff positions, public outreach and education, and land acquisition. These restrictions were cited as further impeding resource-constrained applicants from being able to identify and plan an appropriate project, implement the project as designed, and ensure that long-term outcomes and benefits are realized.

A challenge with long-term maintenance is that we cannot legally commit funds past a 2-year horizon. That would require continually seeking appropriations from the legislature, which is not sustainable. (State interviewee)

Additionally, multiple interviewees noted that federal funding programs and project permitting requirements typically do not encourage or support natural-based infrastructure projects or multi-

⁶ The ability of federal agencies to better align programs goals and definitions may be constrained by the statute authorizing the program. Therefore, more meaningful alignment may require Congressional action.

benefit projects. This may also have the effect of discouraging potential assistance recipients from considering these types of projects, even when they are more beneficial.

Nature-based projects or multi-benefit projects get too complicated for a lot of people. People look for the easiest ways to get the permits instead of truly incorporating nature-based resilience planning. There are exceptions. (State interviewee)

... some of the processes for creating natural infrastructure and restoring the natural environment are expensive and complicated. Through pending legislation, there's a lot of money potentially available along these lines, but there's not a lot of money to provide services to write permits...to get things done. Permitting processes were designed for gray infrastructure. Some of these provisions don't fit natural infrastructure (especially self-maintaining infrastructure like an oyster reef). (Non-profit interviewee)

Interviewees frequently noted that application processes for non-profit, private, federal, and other grant and loan programs are resource- and time-intensive. In some cases, these requirements could be considered extreme relative to the maximum amount of funding awarded. As a result, the award process becomes self-selecting in that funding largely goes to applicants that can meet all requirements of the process, rather than those with the greatest need.

The length of time between preparing and submitting an application for funding and award of funding was frequently cited as a challenge to project timelines. Additionally, individual funding programs may be on a different schedule for request for proposal (RFP) release, award, etc., making it hard to align funding from all sources. Interviewees also noted experiences with awarded grant funding expiring while waiting for local permitting to proceed.

Match requirements were noted as a constraint by nearly all interviewees. Interviewees noted that many communities are already resource-restricted, and requiring matching funds excludes many communities from applying. While programs often reduce match requirements for applicants that meet certain criteria, match still places under-resourced communities at a significant disadvantage and can exacerbate inequity in funding distribution. Similarly, funding programs that encourage but do not require match still put some communities at a disadvantage, as applicants that do provide a match are still treated more favorably.

It takes an amazing, creative grant writer and manager to try to get the match for big projects. Planning is one thing. Implementation is unwieldy... (State interviewee)

The scale of funding available was also noted. While grants are a common funding option, grant programs typically do not provide up-front funding and do not provide the level of funding needed to support larger-scale projects.

Interviewees also cited lack of clarity around roles and responsibilities, specifically the role of the federal government versus state or tribal government in identifying how to improve access to funding and identifying the pipeline of eligible needs for small, rural, and under-resourced communities.

The overarching theme is that the agencies want to get funding into rural and disadvantaged communities that lack capacity. Is it the role of coastal programs to do stick and brick projects, or is our role more in the role of helping communities identify, prioritize, and apply for those projects – not necessarily fund them? This would be great to figure out. At the federal level, until these niches and agency roles are made clear, it makes it more confusing on the local level. (State interviewee)

Multiple interviewees noted that the benefit-cost analysis (BCA) frameworks for U.S. Army Corps of Engineers, Federal Emergency Management Agency (FEMA), and other funders do not adequately account for environmental and social value and eliminate the possibility of obtaining funding for low probability but very high-risk events. Interviewees also expressed that conducting BCAs is extremely resource intensive. Concerns regarding BCA requirements are discussed further under Section 5, Recommendations.

One interviewee representing a tribal community noted that there is significant sensitivity and concern around how information required as part of the application and reporting processes are maintained and used and expressed concern that tribes are ineligible for key funding opportunities.

Finally, interviewees noted that most funding programs are extremely competitive. Unique and innovative projects may be most appealing to funders, but it is difficult for smaller communities in particular to conceive of a new project approach that distinguishes their application from many others.

Data Availability and Accessibility

Interviewees noted the lack of data available to many communities to assess needs and identify, design, and implement solutions. Funders may favor applications that are backed up by quantitative data that demonstrate the need for, and the benefit of, the proposed solution. Finally, interviewees noted that states may use data (e.g., sea level rise curves) that differ from the data the funders and federal government are using. This can create questions and inefficiencies in data used for project planning, and data used to demonstrate a specific funding need. Interviewees also cited the lack of funding available specifically to improve access to data.

We're...dealing with archaic technology. We're using early 2000s technology to do land use planning. I'm operating from maps from 1980. I use these maps to make important land use decisions. We can't even load Google Earth on our monitors...We don't have anything in the code that captures climate change or coastal resiliency. Nothing is digitized. I have to use what's inventoried and documented by the county. Our county doesn't have the capacity to deal with climate change. (Local interviewee)

Data availability was noted as a particular concern by interviewees representing tribes, territories, and Alaska and Hawaii. Interviewees cited lack of downscaled data to anticipate, plan for, and address—through federal or other programs—some of the most critical climate threats facing these regions.

Conversely, interviewees also noted that where data (and resources) are available, communities may not have the technical expertise or capacity to access and use that data to drive decision-making, including decisions around funding. Additionally, interviewees noted that it can be hard for capacity-constrained communities, states, and organizations to navigate available data and resources and understand which are most valuable to them.

The biggest challenge is that there are almost too many data sources. Knowing where to go to find something is difficult and knowing what's considered the best available data source for a topic/hazard can be extremely challenging. Even within the state, different agencies use different resources. Funders may want you to use one tool instead of the other, but you may not know. (State interviewee)

Capacity

Communities may not have the networks, resources, or capacity to become aware of funding opportunities. Interviewees commonly cited the lack of in-house technical capabilities to identify needs, identify and pursue appropriate funding programs or mechanisms, and conduct project planning and design activities that are necessary to develop more targeted and robust funding applications. Listservs and relationships with partners such as Sea Grant were cited by community-level interviewees as valuable sources of information on funding opportunities.

Many local staff are serving multiple roles and have limited time and bandwidth to proactively search for new opportunities. One interviewee noted that their success rate in securing funding is approximately ten percent. Interviewees representing a well-resourced community note that they could fill two or three full time equivalent positions solely dedicated to search and apply for grants, if they had the resources.

Communities may also lack capacity or expertise specifically for grant writing, and for appropriately managing awarded funding, including complying with all reporting requirements. Additionally, limited funding and capacity for planning, design, and permitting also means that under-resourced and smaller communities do not have a pipeline of shovel-ready projects that funders may prefer or require.

Funding programs are situated well for communities that have projects designed. The gap is that there's lots of money being pumped into these programs, but there isn't the personnel and assistance program infrastructure to get programs ready for funding...It's important to invest in what we've already established in communities to get projects ready for funding programs. Land acquisitions, setbacks, other more creative solutions don't fit in well – the cost-benefit isn't there. (State interviewee)

Successful collaborations happen when you have a solid project in mind, or you have an existing success that you need to expand/continue, and you find funding that can fit it. When we chase money, those

partnerships and efforts are a lot more tenuous because they've been designed not based on the local communities but by the desires of the funders. (State interviewee)

Equity

Interviewees noted that funding opportunities and associated requirements are not always designed to meet the needs of certain communities or sub-populations. This issue was noted particularly in reference to small, rural, tribal and indigenous, and island communities. Program eligibility requirements may be intentionally or unintentionally restrictive for these communities.

Multiple interviewees representing tribal and Pacific Island perspectives noted that funding opportunities do not always align with local needs. In these cases, it is not worth the potential applicant's time and resources to apply for the funding opportunity, even if they are eligible. In some cases, tribes (federally or non-federally recognized) may also be ineligible for funding.

Funding programs and maximum funding amounts may not be set to recognize how much more resource intensive it is to address coastal resilience in rural and island communities (for example, due to the cost of materials, logistical challenges with accessing and transporting materials, and a constrained local workforce, as well as more complex weather dynamics), and the unique and heightened impacts of climate change such as extreme weather, erosion, and coastal inundation on island communities.

One of the biggest opportunities we have is National Fish and Wildlife Foundation funding, but it doesn't work for [our state] because it's focused on revitalizing... Communities live within intact wilderness already...I've worked with some tribes from Guam and Hawaii and the Marshall Islands. There are a lot of similarities in those places and in [our state]: extreme weather, erosion, coastal inundation issues. It's difficult to build and access materials in these regions and find funding that actually works in these places. (State interviewee)

Multiple interviewees noted that "wealth follows wealth." That is, those entities that have the resources to develop strategic and competitive applications are more likely to receive funding. However, climate hazards disproportionately impact already underserved and under-resourced communities. Retaining the existing funding application framework and competitive process can exacerbate inequity in the market and place these communities at a further disadvantage.

Most federal agencies want to fund later in the project (e.g., after 35% complete). Given the speed of climate change, planning lead time, and restoring shorelines, federal agencies would do well to fund first dollar planning efforts. Many jurisdictions don't have the planning dollars to be awarded federal funds from programs like [Building Resilient Infrastructure and Communities]. (Local interviewee)

Political and Organizational Constraints

While interviewees noted that the reality of climate impacts appears to be increasingly acknowledged across communities and regions that have historically been more skeptical, some interviewees noted

continued political resistance to explicitly investing in climate adaptation and resilience and integrating resilience considerations into long-term planning processes.

Resilience is starting to be part of the planning efforts. For local government in more rural areas, they don't have the capacity to think about this stuff. State transportation departments are thinking more about it and are starting to incorporate it. There have been so many severe storms in the Gulf region that people have been forced to think about it. (Non-profit interviewee)

Some interviewees also noted that turnover or political transitions at the local, state, and federal level have in some cases slowed, stalled, or otherwise impeded coastal resilience efforts. Interviewees representing a state coastal management program noted that their program is strengthened or weakened during political shifts. This uncertainty flows down to the local level and makes planning difficult for communities. Political boundaries can also limit the opportunities for and outcomes of regional collaboration.

When there's a political boundary that extends beyond the budgetary boundary, it can run counter to networks, diversity, redundancy, and resilience opportunities that larger counties [in our state] have. With coastal-wide projects, the political and socioeconomic differences...can be significant. Developing coalitions can be difficult. (State interviewee)

State legislative decisions around funding for resilience can also have long-lasting positive or negative consequences. At the federal level, interviewees noted the impact of abandoned initiatives to enhance cross-agency coordination on supporting and funding resilience activities. Interviewees also noted that in some states, agency operations are significantly siloed, impeding collaboration, integration, and leveraging of resources.

We are very siloed...The Emergency Management Department...is under one secretary and the Floodplain Management staff and Transportation are also under different secretaries. Achieving collaboration under these silos is very difficult. A regional agency like ours allows us to have a tight web of connections internally, but we also individually have our own networks that allows us to know who to talk to. Our job is different than localities and at the state level. We have a long way to go. (State interviewee)

Everyone is planning in isolation. We all have a natural hazard mitigation plan, but we don't have overall coastal objectives. It would be great if a federal partner like NOAA stepped in...to mentor and facilitate the development of collaborative writing for these plans. Identify the low-hanging fruit, bring in subject experts, and identify statewide goals that would benefit us as a group. Little projects need to add up into something greater. (Local interviewee)

Agencies have their own sources of information on funding and may not be sharing them across organizational boundaries. (State interviewee)

Finally, several interviewees noted that depending on the level of government, and the role and authority of that governmental entity in the particular state, focus and action on investing in coastal resilience may vary. This was particularly noted in reference to county governments. Interviewees noted multiple constraints associated with county governments, including that: some recent federal (ARPA) funding was distributed to counties, but county governments do not have decision-making power in some states; county managers are focused on short-term priorities, driven by election cycles; counties may not have much infrastructure that they own or manage; and limited capacity in general.

One interviewee also noted that in some states, local health departments have been assigned responsibilities for addressing impacts from climate change. These departments have limited capacity, particularly given their responsibilities in responding to COVID-19 in recent years. Some states have also pushed additional responsibilities for climate change response to emergency managers. Public health and emergency management professionals may not have the training to understand and address concerns with climate change and have competing responsibilities and limited resources. These entities also typically do not have an opportunity to connect directly with entities like NOAA and may not be getting adequate information from their state. Therefore, adaptation and resilience needs may in some cases be going unaddressed, or the responsible entities may not know where to begin with identifying needs and securing funding to address them.

Best Practices and Lessons Learned

Interviewees noted the following best practices and lessons learned from their experiences identifying, pursuing, and securing funding for coastal resilience efforts.

Collaboration

Most interviewees noted the importance of collaboration and coordination, early and often, whether at the state or local level. Interviewees also noted that when funders coordinate and collaborate, funding recipients benefit as well. Interviewees recommended seeking out opportunities to collaborate, leverage funding, and identify opportunities to address multiple challenges (and generate multiple benefits) with a single project or effort.

Looking at issues regionally can help to bring new partners to the table and alleviate the burden for local municipalities. (Private sector interviewee)

Interviewees from some state coastal management programs noted the value of establishing or, for applicants, taking advantage of “one stop shops” (for example, centralized funding applications for multiple state programs) or to help applicants brainstorm planning needs and funding streams.

Interviewees also noted the value of regional projects and not allowing geographic and political boundaries to stand in the way of opportunity, where possible. Interviewees provided multiple examples of innovative and forward-thinking planning districts, councils of government, metropolitan

planning organizations, and similar regional entities identifying broader-scale opportunities for enhancing coastal resilience, establishing local funding mechanisms (e.g., for land acquisition), and connecting potential partners. External organizations can also help build local capacity to write grant applications, obtain data needed to strengthen a funding application or target a funding proposal, or provide other education and technical assistance that will help communities secure funding.

We work very closely with our Metropolitan Planning Organization...We've been working closely with them on how to do resilience and long-term transportation planning. This is fairly cutting edge since the model can affect scoring of individual projects. Being able to collaborate with NOAA and the Federal Highway Administration is a huge opportunity to bring in money. There is so much money in transportation. (Local interviewee)

We are working with local soil and water conservation districts, looking at innovative public private investments to bypass state purchasing process using pass-through grant awards to a third party that uses their own processes to implement projects. We're trying to find efficient ways to disburse funds to people who can move quickly. How can you put together a public/private long-term investment strategy to maintain infrastructure over time? (State interviewee)

We think about scale a lot. Wildfires are a regional-scale risk – they spread easily. Thinking of this as a regional problem helps create economies of scale, enabling us to think about additional stakeholders who might be willing to come to the table. If we're talking about a problem that can affect a lot of people, it's a regional risk where agencies are concerned at the federal, state, and local level. This approach alleviates the burden of several municipalities handling this on their own. (Private sector interviewee)

Interviewees also noted the importance of having an individual or organizational champion, and of involving those who will be impacted by and benefit from the work—community members (who, particularly in the case of under resourced and underserved communities, would ideally receive a stipend or compensation for their involvement) and community-based organizations.

It's essential to have people who are impacted by this work to be engaged. Being engaged gives community members excitement; they're overwhelmed to be part of the experience. (Non-profit interviewee)

...we try to make sure that community organizations that are normally more financially constrained are built into funding. So, if we go after a \$100,000 grant for a 2-year project, I'd love to see that the people writing RFPs provide funding for community engagement and involvement...Having researchers and others applying for RFPs who are non-locals can cause strains on communities because they request a lot of time, effort, and attention without compensating them directly. (Non-profit interviewee)

Funding Timeline and Vision

Interviewees recommended having a clear project vision prior to pursuing funding. Funders are more likely to fund a well-defined project, rather than one with disjointed elements. Ideally, applicants may also have demonstrated success that can be expanded on or continued. However, this may be challenging for resource-constrained applicants who are still in the very early stages of adaptation and resilience efforts.

Obtaining funding can be a time consuming, long-term effort that requires focus, energy, and patience. Project timelines should account for this. Applicants should be flexible and be prepared to go through multiple rounds of unsuccessful applications or grant application revision processes. Applicants must also be prepared to provide continuous and well-planned public education and engagement to show the community why this work is important and why funds are needed. Again, this can be challenging for resource-constrained communities, and is an area in which additional support is needed.

To the extent possible, state, regional, and local entities should collaborate to build a project pipeline. This can be challenging when communities do not have a capital improvement plan or similar plan identifying capital and other needs, but interviewees identified multiple state-funded efforts to assess specific project needs. In Washington, the state's Resilience Action Demonstration project conducted an inventory of community needs, surveying 175 project opportunities. This effort also involved an evaluation across state programs to identify commonalities in grant criteria and synthesize findings into guiding principles for project design.

One interviewee recommended designing projects to be self-sustaining, from a funding standpoint, and to minimize the amount of management needed. Setting aside funds up front can help cover long-term operations and maintenance and ensure that the project and its funding are not vulnerable due to political changes.

Innovation

Interviewees identified numerous sources of funding that may not be commonly used across the country. For example, interviewees recommended looking for opportunities to partner with private organizations for projects. In many cases, interviewees expressed that the private sector (corporations) are often absent from conversations about coastal resilience even if they benefit from or rely on being situated in a coastal community. However, many corporations are setting increasingly ambitious corporate social responsibility and climate goals. This provides an opportunity to generate additional funding and partnerships for resilience projects.

The most useful area is not some fancy financial vehicle, but private property owners along the coast joining with public entities to protect their own resources. [A chemical manufacturer] has big...plants along the coast that are vulnerable. They are working with a whole section of shoreline to pay for protection that protects them and may protect adjacent areas. In the downtown...development, they're putting bikeways along shorelines. That provides an amenity to the community and protects physical plants. To me, these projects have more cooperative coastal protection and have more potential than dreaming up financial vehicles to get private investment into what are really public works projects. (Non-profit interviewee)

Interviewees representing community development financial institutions (CDFIs) noted that these entities can serve as trusted partners to help communities access and combine innovative financing options with long-term, low-cost capital. One CDFI representative interviewed noted that while their CDFI is still working to move into the resiliency space, CDFIs are very open to collaboration between community members and subject experts to expand their investments. CDFIs are ideally positioned to help smaller, more resource-constrained entities.

One interviewee identified transportation funding as a significant, but often untapped source of funding for broader coastal resilience efforts, and regional-scale resilience planning in particular. The IIJA will further increase the amount of Department of Transportation funding available.

Other innovative mechanisms that interviewees identified included outcomes-based financing, such as environmental impact bonds, which ensures that partners are paying for project outcomes rather than projects themselves, and self-sustaining funds. For example, new revolving funds capitalized by state or federal government resources could be used to fund mitigation activities.

5. Recommendations for NOAA/OCM

This section summarizes recommendations provided to OCM by interviewees on additional resources, technical assistance, training, and other support that could facilitate understanding of, access to, and use of funding programs and mechanisms. ERG has developed a targeted list of recommendations for OCM that follows those provided by interviewees.

Technical Assistance and Training

Interviewees recommended identifying more opportunities to provide a direct federal presence at the local level. One interviewee noted that in their state, Sea Grant has become a recognized authority at the county and local level. Extension agents jointly compensated through Sea Grant and the county entity provide scientific, technical, and policy advice to supplement project contractor support. A second interviewee suggested setting up regional consultant teams that can work with communities, similar to the Silver Jackets Program concept.

[The extension agent model] helps alleviate capacity constraints that exist. It would require scaling up but would be a way to reduce new-person onboarding and other associated capacity issues experienced across the country. For projects that need experts for two or three months out of the year, extension agents are good people to plug in. (State interviewee)

One interviewee suggested facilitating opportunities or convenings in which potential applicants could discuss and present proposed projects and associated goals and objectives, and how to align and match them to funding sources. Alternatively, NOAA could provide a liaison who would be regularly available to serve this function. This recommendation was intended to address the concern that the funding environment currently is too opportunistic, leading to project proposals that may not be strategically aligned with community goals.

Recommendations also included providing circuit rider support (no- or low-cost, local, on the ground technical and other assistance), grant writing support, support for National Environmental Policy Act

(NEPA) compliance and permitting with installation of nature-based solutions and green infrastructure, and general capacity building support for small communities. Regarding grant writing support and training, an interviewee suggested providing more webinars on grant opportunities, featuring grantees who have secured funding to explain how they successfully navigated the process.

We've tried to build capacity among staff. We're moving along, but underserved areas should house experts in the regional office – environmental engineers, communication experts who could help us package tools, or GIS experts could help us move quickly. (State interviewee)

It would be helpful if NOAA could provide expertise through a resilience officer in select areas that service many tribes. Resilience is becoming one of the biggest issues of our time. (State interviewee)

One interviewee expressed the need for more peer-to-peer information exchanges, and recommended providing funding to existing, regional information exchange networks.

Regional and statewide collaboratives have sprouted around the country. We're fortunate to have the Georgetown Climate Center running a peer support group with bimonthly calls for these collaboratives. All are effective at coordinating across governmental layers and connecting people to actionable information. As a whole, these networks are not consistently funded...The federal government should consider these as an asset to broaden the funnel - these organizations can serve to receive and disseminate grant funds. (State interviewee)

Similarly, interviewees noted that NOAA should seek opportunities to solicit input on funding and resource needs directly from and disseminate funding information directly to regional and local entities, rather than assuming that this information is being collected or disseminated by the state. One interviewee noted the value of a bottom-up approach when working with communities to address their needs. That is, ground support in the realities in which the community is working, rather than from the perspective of the opportunities that federal funding programs and resources offer.

Another interviewee noted the particular importance of tribal engagement, to understand their unique needs. Another interviewee suggested training for and engagement with community-based organizations and community leaders on how to interact with residents and community members to understand needs and build support for resilience initiatives.

Loop in tribes at the beginning of the conversations. They're often asked at the last minute to show up to speak or present. If tribes are addressed through a top-down approach, it doesn't encourage relationship building. (Tribal interviewee)

One interviewee noted the need for assistance with broader education and recommended that NOAA provide support to facilitate public education and convenings and training on actionable, real-world resilience strategies.

Recommendations for OCM:

- Conduct targeted engagement sessions with stakeholders representing tribal, indigenous, rural, under-resourced, and underserved community perspectives.
- Ensure adequate integration of real-world case studies and perspectives in trainings going forward, particularly representation from smaller, underserved, tribal and indigenous, and other historically underrepresented perspectives. Identify opportunities to compensate these representatives/stakeholders for their time.
- Assess existing partnerships and networks to ensure adequate representation of local perspectives.
- Identify opportunities for in-person, small group or one-on-one technical assistance sessions, charettes, or other practically-focused engagement to support use of existing NOAA or other widely available tools or frameworks. The purpose can include: assessing local vulnerabilities, develop targeted projections, begin quantifying needs, identifying and prioritizing needs, and collecting information and data to support funding applications.
- Coordinate with federal partners to identify analogous models of circuit rider-type assistance or other on the ground support (e.g., Silver Jackets) to provide continuous, targeted support to underserved communities.
- Identify opportunities for short- or long-term contractor support for state programs to enhance capacity for technical assistance, improve organizational efficiency, support funding application review, and other related efforts.

Tools and Data

Interviewees generally expressed that while NOAA and other entities have provided valuable tools, it may be hard for all communities to understand how to use the tools, or the tools and data may not be designed to meet their specific needs. Interviewees recommended limiting development of additional tools in favor of providing on the ground technical assistance or similar, targeted support. Should NOAA develop additional tools, interviewees recommended that any tool be accompanied by targeted training to ensure their use and applicability, and that tools be developed with direct input from the stakeholders they are intended to target. One interviewee also suggested streamlining the NOAA website to be less overwhelming to users, though no specific recommendations were provided, and the interviewee did not identify whether some NOAA webpages or resources were more overwhelming than others.

It is too hard to find funding for really useful products, and products are only useful if the people are there to help you understand them. Support more outreach and collaboration-building opportunities rather than more tools. If you're going to be funding tools, have robust outreach and extension plans for the use of the tools. (State interviewee)

University of Delaware recently completed a study showing that existing federal and state tools for flooding and sea level rise weren't getting used by municipalities due to capacity issues. They are currently developing a workshop with funding from NOAA's Atlantic regional team to engage private sector consultants to demo the tools so that they can in turn use them with municipalities they serve.
(State interviewee)

Multiple interviewees also recommended development of materials that can be used to demonstrate the value of investment in resilience to stakeholders, including the public, developers, and other public and private entities. Specific suggestions are included in the list of recommended resources at the end of this subsection.

Having information available to educate developers would be great to share with them. The more that I can show them ongoing cost savings and benefits to the environment, the better. The last thing they want are more restrictions or codes. (State interviewee)

Similarly, an interviewee recommended development of simple, one-page documents that can frame resilience projects and green infrastructure in ways that resonate with the community, and to clearly articulate what will be lost if resilience projects are not funded and implemented. This would be particularly valuable in demonstrating to private landowners the extent of the problem and potential losses they are facing due to shoreline changes, coastal habitat loss, erosion, sea level rise, and coastal flooding.

Science communications needs to tap into each demographic group and tap into their interests. What are the consequences of not doing resilience projects? I don't mind scaring them a bit. (State interviewee)

One interviewee expressed a need for an outside entity to conduct an economic impact analysis on climate in their state (without having to apply for and manage a grant to have this analysis conducted).

Additional recommendations for resources included:

- Case studies that profile examples of how to fit together multiple pieces of funding for coastal resilience projects. These case studies should identify the key players who contributed funding and contributed to project success and articulate the successes and challenges that other communities could learn from.
- Guidance on approaches for integrating resilience into budgeting and long-term financial planning exercises.
- Examples or best practices on how to develop legislation (e.g., flood disclosure legislation) that promotes resilience practices and helps drive funding for resilience.

- Guidance on how to measure metrics for resilience so that communities can assess whether methods are effective and demonstrate the ability to measure and quantify outcomes for funding application purposes.
- Profiles of the types of projects that funders are looking to support.
- Information from non-governmental insurance and investment organizations on what states and communities need to know about liability and risk, i.e., what fiscal impacts will climate change have on these communities and on the states' ability to issue bonds, and on bond ratings.
- One-page informational handouts that provide a high-level introduction to NOAA, and how NOAA can help emergency managers.

Recommendations for OCM:

- Develop customizable templates for communicating the value of investments in adaptation and resilience to decisionmakers and other local stakeholders.
- Set up a dedicated space on the NOAA website to provide streamlined, essential resources and education to stakeholders with limited resources, capacity, and experience with assessing and funding adaptation and resilience needs. Expand “entry points” to Digital Coast resources (e.g., What Do You Need to Do Today questions) to reflect needs expressed by interviewees.
- Develop a resource or training to directly connect long-term planning efforts like capital improvement plans with adaptation and resilience planning. Consider opportunities to support capital improvement plan development.
- Develop a resource that integrates examples of commonly funded projects from across funding sources, rather than highlighting projects funded by a single funding source.

Data Availability and Management

While interviewees broadly expressed that needs for practical, on the ground support are greatest, and additional federal tools or resources may have limited utility, interviewees did consistently express a need for downscaled data or other targeted, quantitative data that can help stakeholders to identify and prioritize targeted needs and strengthen funding applications. In the absence of these data, stakeholders—particularly those in smaller and more remote communities—do not have the information needed to identify their most urgent needs, formulate a targeted project or projects that will address those needs and that are grounded in the best available science and data, identify the most appropriate funding program or mechanism to address the targeted need, and develop a compelling funding application.

Specific data needs identified included more frequent updates to Atlas 14. Interviewees also noted that some data and tools are not relevant to their specific regions yet are still used to drive decision making. They also noted that federal agencies use different data and models to drive their decision making and to set priorities that impact funding or conduct duplicative activities in parallel; there are opportunities to better align data across agencies.

We often see that NOAA science or NOAA-backed science is brought to other agencies. These frameworks help build comfort and fluency among the other agencies that the information at hand is reliable. NOAA work leads to so much more at other agencies. We need NOAA to do more of this – to be an outspoken ally in this work. (Non-profit interviewee)

There's a lot of duplication within the federal agencies. We need to come up with a framework for habitat mapping and other parameters across states. States are mapping shoreline structures independently - what methods are they using and what federal datasets are they using? What are the baselines? What information is readily available and how can they help us identify the unique needs of the states? (State interviewee)

Interviewees also noted the value of establishing a framework for how states collect data (e.g., shoreline mapping methodologies) and what federal datasets are being used to drive project decisions and what projects might receive funding. This also needs to be coordinated across federal agencies and state coastal management programs.

One interviewee suggested developing a strike team to identify data gaps in coastal communities that might be resulting in inaction or decision paralysis, and ultimately, unmet need. For example, when considering saltmarsh loss and shoreline change, etc., what key information do local stakeholders need to enhance coastal resilience? Then, these stakeholders need support in obtaining data and transforming that information into actionable project plans that can be funded. This information should also be accessible to states.

Recommendations for OCM:

- Review existing tools for relevance and scale of data to small, remote, and island communities.
- Catalog data gaps and variations in state approaches to data collection. Identify responsible entities for addressing data gaps, or existing tools (beyond OCM and NOAA) that may address gaps. Deploy targeted technical assistance to support regional or localized data collection and analysis support.
- Compile recent needs assessments conducted by state or regional entities (e.g., Washington State). Conduct targeted, structured needs assessments in states or regions identified as high priority.
- Develop targeted classroom training on use of existing tools to identify and prioritize coastal adaptation and resilience needs. Ensure classroom training includes peer-to-peer learning opportunities.
- Facilitate cross-office and cross-agency dialog on federal datasets used to drive funding decisions and opportunities for enhanced coordination and consistency.

Funding Program Requirements

Regarding improving accessibility and reach of existing funding programs, interviewees provided numerous recommendations, including broadly reassessing whether funding should be competitive and if so, at what level, and reassessing eligibility.

BRIC is building a lot of interest at the local level. [Our] Emergency Management Agency is pushing \$5 to \$6 million in non-competitive funds coming to the state. Towns are only competing against other towns in the state. This is opening the opportunity for hazard mitigation projects...[and] helps the communities

think of projects they would actually do, because they may have a chance at securing funding. (State interviewee)

An interviewee also recommended first conducting a broader assessment of regional needs and the state or regional landscape in which decisions around resilience funding are being made, then assessing opportunities for funding (rather than the other way around).

NOAA has never provided a consistent framework for state-by-state technical assistance. We need to make sure that technical staff come into a state and understand what data we're using and what extension activities look like. NOAA should take the opportunity to do this. You can't serve up the same products at a regional scale and expect them to be used on a local level. (State interviewee)

Multiple interviewees suggested scaling the complexity of application processes to the size of the award, though some recognized the difficulty in eliminating standard requirements from federal loans and grants. One interviewee also recommended bundling federal awards to a trusted partner who can lower the barriers for communities to access funding.

As noted previously, interviewees also strongly recommended revisiting project eligibility, and evaluating timing of funding awards in the context of other programs commonly used for similar purposes. Interviewees recommended funding first-dollar planning efforts and providing pre-award assistance that municipalities can easily access to complete a funding application. Additional training and opportunities for consultants to support communities is also needed so that communities can access the data, tools, and information needed to complete grant applications. One interviewee noted the need to recognize the value of traditional environmental knowledge in funding requests.

Interviewees also broadly expressed support for reducing or removing match requirements, and noted the need to reevaluate FEMA, U.S. Army Corps of Engineers (USACE), and HUD BCA requirements. These recommendations noted both time, resources, and experience needed to conduct the BCA and how current BCA frameworks are not designed to reflect the true value of resilience projects. One interviewee noted that BCA should be derived from data and awareness around inequity and should include a holistic approach, including environmental and social benefits with associated dollar values. This interviewee also noted that NOAA is well-positioned to recommend a more holistic BCA framework that considers the needs of underserved.

The cost-benefit analysis for BRIC is very difficult. You need technical skills. If the government paid for technical assistance for this application, that would be great. (Local interviewee)

Every one of the last year's BRIC awardees had to hire a consultant to do the BCA for them, which is inaccessible for most communities. (Non-profit interviewee)

We need a leader at the federal level to say the way the government does BCA is broken, and we have identified a fix...a holistic approach that includes environmental and social benefits and associated dollar values. These BCAs result in more wealth to white places by ascribing value based upon value. If NOAA knows about ecosystems, understands systems thinking, and can consider non-human value, they would be in a position to recommend a holistic BCA that changes system by ascribing wealth to BIPOC/lower income American communities... (Private sector interviewee)

We have to look at future flood risk and have a probabilistic model to look at repetitive storms increasing over time with sea level rise and look at associated damages for future years...We have to use a 7% discount rate, which has nothing to do with inflation. The discount rate warps the avoided damages making it harder to achieve a federal interest. When we try to get BRIC funding to address seismic issues, they're a low probability/high damage event. That keeps those projects from hitting the BCA requirement to determine federal interest. It's a problem for almost every city. (Local interviewee)

Recommendations for OCM:

- Communicate feedback on non-NOAA funding programs to federal partners; review recommendations to determine which could be feasible without Congressional action/statutory revisions.
- Coordinate a cross-agency dialog on limitations BCA requirements place on project eligibility and competitiveness and opportunities for federal or other support to conduct BCAs, particularly for resource or otherwise capacity-constrained funding applicants.
- Assess how traditional environmental knowledge is treated in the context of funding applications.
- Document and disseminate successful state, regional, or other models and approaches to streamline access to funding, including bundling projects, adjustments to or alignments of funding cycles, introduction of a common application for multiple programs, etc. Quantify the benefits of these efforts.

Federal Coordination

Interviewees recommended improved coordination across federal agencies, including: strategic alignment around federal responsibilities on coastal resilience, establishment of a collaborative framework for priority setting, and developing a shared language and partnership on funding for specific projects. Federal agency missions range from homeland security to environmental management. Many communities face multiple hazards (e.g., flooding and earthquakes). While coastal resilience projects can have multiple benefits that address numerous and diverse agency priorities, there are strong federal institutional barriers in place that have limited productive agency partnerships to date. However, adaptation and resilience action at scale require a concerted multi-agency approach to address multiple hazards; the opportunities exist to do so. Interviewees noted that NOAA and OCM's collaborative spirit ideally positions the office to address these challenges.

As noted previously, interviewees recommended developing common definitions of "coastal," "resilience," and other key concepts that drive funding program priorities, eligibility, and project scope. At the same time, interviewees also emphasized the need for federal agencies to make funding

decisions that better reflect the diversity and disparity in needs in communities across the country. One interviewee recommended that NOAA consider a locally-focused approach to funding, education, and other support for coastal resilience efforts, a theme that is repeated across many of the recommendations below.

Recommendations for OCM:

- Identify and prioritize strategic opportunities to enhance cross-agency partnerships between funding, education, and technical assistance programs that support coastal adaptation and resilience activities.
- Document where definitions of “coastal,” “resilience,” “adaptation,” and other key terms have been established through OCM and other NOAA funding programs, how these definitions vary, and potential impacts on local adaptation and resilience efforts.

6. Summary of Funding Sources and Mechanisms, Projects, and Resource Networks

This section summarizes information provided by interviewees regarding the sources of funding they identified as contributing to coastal adaptation and resilience efforts, examples of coastal adaptation and resilience projects undertaken with local, state, federal, and other funding, and resource networks used.

Funding Sources and Mechanisms

Interviewees noted use of the following funding sources and mechanisms.

- *Federal Sources*
 - Department of Homeland Security
 - FEMA
 - Building Resilient Infrastructure and Communities Program
 - Hazard Mitigation Assistance grants
 - National Flood Insurance Program
 - HUD
 - Community Development Block Grant program
 - National Disaster Resilience Competition
 - Department of Commerce
 - EDA (programs not specified)
 - NOAA
 - Coastal Zone Management Act Section 306 and 309 funding
 - National Sea Grant College Program
 - National Coastal Resilience Fund (through NFWF)
 - Emergency Coastal Resilience Fund (through NFWF)
 - Regional Integrated Sciences and Assessments Program
 - Department of Defense
 - USACE
 - Continuing Authorities Program
 - Pilot Projects Pursuant to Section 1122 of the Water Resources Development Act of 2016

- Defense Community Infrastructure Pilot Program
 - Readiness and Environmental Protection Integration Program
 - U.S. Department of Transportation
 - Low- or No-Emission Grant Program
 - Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Program
 - U.S. Environmental Protection Agency
 - Diesel Emissions Reduction Act (DERA)/Volkswagen Settlement Funding
 - Five Star and Urban Waters Restoration Grant Program
 - Indian Environmental General Assistance Program
 - National Estuary Program grants
 - San Francisco Bay Water Quality Improvement Fund
 - State Revolving Fund Programs
 - Wetland Program Development Grant Program
 - Department of Interior
 - Bureau of Indian Affairs (programs not specified)
 - Bureau of Ocean Energy Management
 - Gulf of Mexico Energy Security Act funding
 - National Park Service (programs not specified)
 - U.S. Fish and Wildlife Service (programs not specified)
 - U.S. Geological Survey (programs not specified)
 - U.S. Department of Agriculture
 - Natural Resources Conservation Service funding
 - U.S. Department of Energy
 - SolSmart Program
- *Foundations/Non-Profit Organizations*
 - Cleveland Foundation
 - Environmental Defense Fund
 - Ford Family Foundation
 - Foundation for Louisiana
 - Greater New Orleans Foundation
 - Kresge Foundation
 - McKnight Foundation
 - Meraux Foundation
 - National Academy of Sciences
 - National Science Foundation
 - National Fish and Wildlife Foundation
 - The Nature Conservancy
 - Robert Wood Johnson Foundation
 - Rockefeller Foundation
 - Smithsonian Institution
 - Walton Family Foundation
- *Private Entities*
 - Community Development Financial Institutions

- Private landowners
- Private corporations/funding sources
 - Deepwater Horizon Oil Spill Trust (BP)
 - Dominion Energy
 - Dow Chemical Corporation
 - Key Bank
 - Norfolk Southern Corporation
- *Local Sources*
 - General funds
 - Taxes
 - Fees
 - Dues
 - Real estate assessments
 - General obligation bonds
 - Environmental impact bonds
 - Resilience bond (California)
- *Other Sources*
 - Blue carbon credits
 - Parametric disaster insurance (international)

Interviewees also identified state-specific loan and grant programs that funded coastal resilience efforts, as well as the use of ARPA and Coronavirus Aid, Relief, and Economic Security Act (CARES) Act funding.

Funded Projects

Coastal resilience efforts cited by interviewees ranged from natural and built infrastructure, to resource development, to stakeholder education and engagement opportunities. Examples of funded projects include but are not limited to:

- **Monitoring and implementation**
 - Dune, floodplain, coral reef, wetlands, marsh, oyster eel grass, and salmon habitat restoration
 - Living shoreline installation
 - Seawall installation, design, and monitoring
 - Beach nourishment
 - Stormwater infrastructure improvements
 - Land acquisition and conservation
 - Installing and collecting data from highway flood sensors
 - Planting trees in areas with low canopy coverage
 - Planting food forests (fruit and nut trees) for neighborhoods
- **Planning and studies**
 - Comprehensive plan
 - Local and regional resilience evaluations and plans
 - Capital improvement plan
 - Green infrastructure master plan
 - Coastal master plan

- Estuary management plan
- Vulnerability assessment of ecological infrastructure
- Valuation of ecosystems and habitats
- Flooding impacts analyses
- Flood risk assessment
- Infrastructure risk assessment
- **Tools, data, and mapping**
 - Incorporating erosion into the state sea level rise viewer model
 - Database of potential resilience projects
 - On-line information-sharing and networking hub
 - Visual app and virtual reality goggles to show sea level rise
 - Aquatic vegetation mapping
- **Outreach and engagement**
 - Community training to promote participation in the Community Rating System (CRS)
 - Developed curriculum and activities to get students involved in citizen science monitoring
 - Community listening sessions on needs and vulnerabilities
 - Art installations to inform the public about coastal hazards.
- **Resource and guidance development**
 - Guidance for coastal communities on how to incorporate nature-based solutions
 - Living shorelines design guidelines for urban waterfronts
 - Guidance on engaging socially vulnerable populations in resilience project

Networks and Resource Providers

Interviewees noted the following entities as being particularly valuable in providing resources, opportunities for networking and exchanging information with peers, and facilitating opportunities for collaboration and on-the-ground work. Note that the list below is influenced by the geographic location of interviewees and is not a comprehensive inventory of such networks and resource providers nationally.

- **National**
 - American Society of Adaptation Professionals
 - Association of National Estuary Programs
 - Climate Adaptation Science Centers
 - Coastal States Organization
 - Georgetown Climate Center
 - National Adaptation Forum
 - National League of Cities
 - Pew Research Center
 - Reef Resilience Network
 - Resilient Nation Partnership Network
 - Rural Economic Development Initiative (REDI)
 - Sea Grant
 - Urban Sustainability Directors Network
- **Northeast/Mid-Atlantic**

- Coastal Adaptation Workgroup (New Hampshire)
- Coastal Resilience Federal Installation Partnership Subcommittee (Virginia)
- The Island Institute (Maine)
- Gulf of Maine Research Institute
- Maine Climate Change Adaptation Providers Network
- Mid-Atlantic Coastal Acidification Network
- Resilient and Sustainable Communities League (RASCL)
- Virginia Conservation Network
- **Gulf of Mexico/Southeast/Caribbean**
 - Climate Strong Islands Network (see also Hawaii/Pacific)
 - Louisiana Climate Initiative Task Force
 - Southeast and Caribbean Disaster Resilience Partnership
 - Southwest Florida Regional Resiliency Compact
 - United South and Eastern Tribes (USET) Office of Environmental Resource Management
- **Great Lakes**
 - Great Lakes Climate Adaptation Network
 - Michigan Green Communities
- **West**
 - Alliance of Regional Collaboratives for Climate Adaptation
 - California Coastal Commission
 - California Green Cities Network
 - Central Coast Climate Collaborative
 - Ocean Protection Council
 - San Francisco Bay Joint Venture
 - San Francisco Estuary Partnership
 - Southern California Wetlands Recovery Project
 - Washington Coastal Hazards Resilience Network
 - Washington Shoreline and Coastal Planners Group
- **Hawaii/Pacific**
 - Climate Strong Islands Network (see also Caribbean)

Appendix A: Compiled Resources and Funding Programs
Appendix C: Interview Guide