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Facilitating Climate Adaptation: The Resilience Adaptation Feasibility Tool (RAFT) Framework

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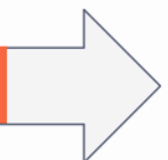
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Abstract

There is a disconnect between the urgency of responding to the threats posed by climate change and the existing resources, technical capacity, and political will necessary to engage in resilience planning and climate action. A variety of frameworks for bridging these gaps exists but few have emerged through an iterative process of piloting and refining strategies to bridge these gaps on the ground. The Resilience Adaptation Feasibility Tool (RAFT) framework builds upon decades of experience designing and implementing community engagement processes and offers an alternate model for advancing resilience and climate adaptation planning that leverages social learning to build consensus around shared values and community priorities. This paper documents the RAFT process, situates it within the context of climate adaptation planning research, and articulates its specific strengths as a flexible and portable model for engaging the public in preparing for climate change impacts.

Keywords: resilience, climate change, adaptation, community engagement

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Introduction

Planning for climate resilience is a relatively recent phenomenon in the United States (Lambrou et al. 2022; Woodruff et al. 2022). While local governments have been leaders in responding to the threats posed by climate change (Nordgren et al. 2016), there is growing consensus that they need clearer guidance for implementing the strategies and principles articulated in climate adaptation plans (Hughes 2015; Woodruff and Stults 2016). There is a disconnect between the urgency of responding to the threats posed by climate change and the existing resources, technical capacity, and political will necessary to engage in resilience planning and climate action. Virginia is one of nine states that “do not directly delegate police power to local governments” leaning more heavily on what has become known as Dillon’s Rule which suggests that only those powers expressly granted by the state may be exercised (National League of Cities 2020). It has been argued that this interpretation of the authorities of local governments with respect to state legislatures limits the ability of local governments to experiment and innovate in a variety of policy areas (Parlow 2007). A variety of frameworks for bridging these gaps exist, but few have emerged through an iterative process of piloting and refining strategies to bridge these gaps on the ground. By contrast, the Resilience Adaptation Feasibility Tool (RAFT) framework builds upon decades of experience designing and implementing community engagement processes, and offers an alternate model for advancing resilience and climate adaptation planning that leverages social learning to build consensus around shared values and community priorities. This paper documents the RAFT process, situates it within the context of climate adaptation planning research, and articulates its specific strengths as a flexible and portable model for engaging the full community—and as broad a spectrum of the public as possible—in preparing for climate change impacts.

Defining and Assessing Coastal Resilience

The threats posed by climate are especially serious and immediate in coastal areas. As the planet warms, sea level is expected to rise inundating important ecosystems (e.g., salt marshes and estuaries), displacing entire neighborhoods and perhaps whole cities, compromising critical infrastructure, and forcing a renegotiation of society’s relationship with the ocean. Sea level rise is largely driven by melting ice from glaciers and polar ice sheets as well as thermal expansion, which is the physical process by which water molecules literally expand when heated. Sea level rise exacerbates tidal flooding (Dahl et al. 2017)—which is often described as “nuisance flooding” due to its regular occurrence but less significant effects—and can also negatively affect both groundwater supply and septic systems in more rural areas. Climate change is also expected to contribute to more frequent and more intense storms (e.g., hurricanes) and a hypothetical Category 1 hurricane that makes landfall in Virginia is estimated to place at least 23,232 single-family homes at risk with an estimated reconstruction cost of over \$5.9 billion (Insurance Information Institute 2022). The initial phase document of the Virginia Coastal Resilience Master Plan (VCRMP) was released in December 2021 and defines resilience as “the capability to anticipate, prepare for, respond to, and recover from hazards to minimize damage to social well-being, health, the economy, and the environment,” a definition adopted from the U.S. Global Change Research Program (Commonwealth of Virginia - Office of the Governor 2021) and one of the goals outlined in this statewide planning framework is that every locality in the coastal regions of Virginia will participate in the RAFT process (p. 69).

Community Engagement in Resilience Planning

Although public participation and community engagement more broadly are cornerstones of effective and ethical community planning practice, prior research has shown that these aspects are often neglected or under-developed (Boswell et al. 2019). In some cases, engagement efforts are perfunctory and may be viewed by all involved as an “empty ritual” rather than as a mechanism for better understanding the experiences and priorities of the public. Meaningful participation by the public in planning and decision-making lends legitimacy to the outcomes of those processes and may help to make implementation more likely (Arnstein 1969). A recent evaluation of resilience policies enacted in the 101 largest cities in the United States found that “outreach and engagement policies such as public participation and collaboration are the least common” and roughly one-third of the sample had no outreach or engagement policies at all (Woodruff et al. 2021).

The RAFT as a Planning Framework

The RAFT framework emerged from a partnership between three academic institutions—the Institute for Engagement & Negotiation (IEN) at the University of Virginia, the Virginia Coastal Policy Center at William & Mary Law School, and the Virginia Sea Grant Climate Adaptation and Resilience Program based at Old Dominion University—that began in 2015. The RAFT partners developed the framework with the assistance of an advisory committee, and launched a pilot project to test it in three Virginia coastal localities in 2017 (Andrews et al. 2021). Emphasizing collaboration and a community-driven approach to resilience, the RAFT offers a model for bridging some of the most widespread gaps in resilience planning in the United States that has been refined and proven through several applications since 2015. The RAFT has been designed in such a way that it can be used in a variety of places, from sparsely populated rural communities to cities with hundreds of thousands of residents. One of the aims of this paper is to outline a strategy for extending the RAFT so that it can be applied within inland communities that face threats from climate change impacts but that are not subject to coastal hazards like sea level rise, while leveraging the framework’s community engagement and empowerment strengths.

Goals of the RAFT

The RAFT was developed in response to two challenges that limit efforts to address climate impacts in coastal Virginia and beyond. The first of these is that politicians tend to be myopic in that it is difficult and unusual for them to look beyond election cycles and their own time in office. It takes strong political will to confront tomorrow’s threats with today’s tax revenue. The second motivation was to synthesize the array of data and research related to coastal resilience in a way that better aligned with existing planning and decision-making processes. Stated differently, “elected officials could not connect longitudinal studies and models with simple steps that could be taken during their short-term planning horizons while in office” (Andrews et al. 2021, p. 25).

The RAFT Process

The RAFT process consists of three phases spread over an 18-month period. Before initiating the process, the RAFT team partners with the relevant regional planning district commission to obtain their support for conducting the RAFT in their region, as well as their recommendations for any

customization of the RAFT process to accommodate the specific needs and context of the region. After that, as shown in Figure 1, Phase 1 involves compiling, reviewing, and assessing relevant planning documents, ordinances, programs, and reports to characterize the existing state of coastal resilience within the participating localities, and summarizing those findings in what is called a RAFT Scorecard. The assessment is verified by the appropriate staff of each participating locality, and members of the RAFT team present the Scorecard results to the elected officials of each locality.

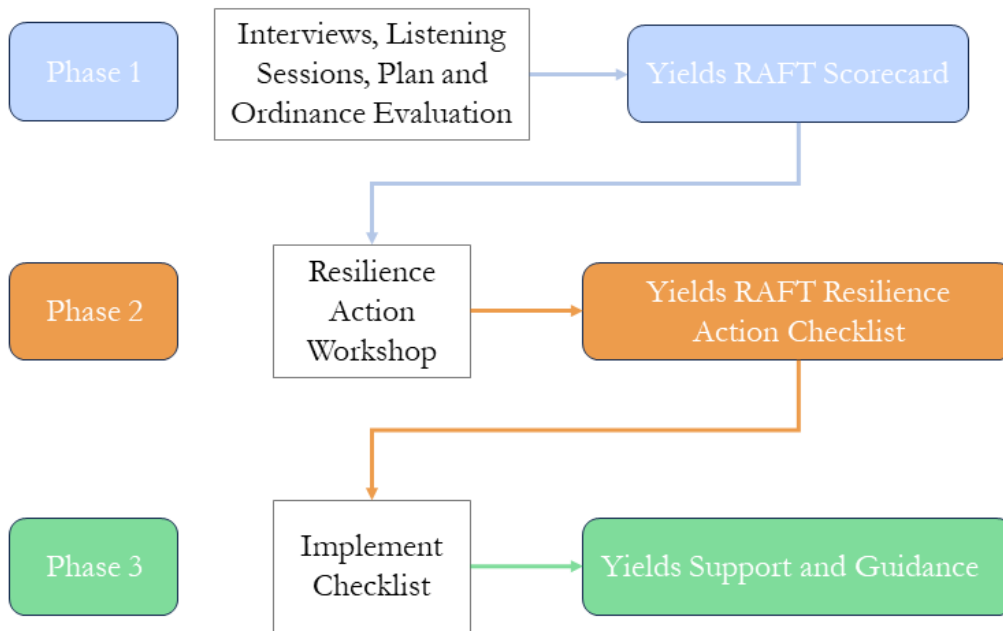


Figure 1: Overview of the RAFT process.

Simultaneous with the quantitative assessment conducted through the scoring process, the RAFT team conducts a qualitative assessment of each participating locality by conducting interviews and listening sessions with community service providers. The goal is to understand how community leaders view challenges, strengths, and opportunities for building resilience. The information gathered from that effort is incorporated into the next phase of the process, which involves holding a regional workshop with elected officials, local government staff, residents, businesses, community-based organizations, and other stakeholders from all of the participating localities in that region to: (1) present the Scorecard findings for all of the localities, enabling both a regional and a local overview of resilience efforts; (2) discuss and prioritize ways to enhance resilience, including a list of opportunities compiled by the RAFT team from the locality Scorecards, qualitative assessments, Hazard Mitigation Plans and other sources; and (3) create a Resilience Action Checklist (RAC) of interventions to be pursued over the coming year in each locality. During this workshop, members of the RAFT team facilitate the collaborative development of the RAC by break-out groups for each locality and help ensure that the RAC contains items that are both meaningful from a resilience perspective, yet feasible given the existing planning and regulatory environment, fiscal conditions, etc. A key task for participants in the Phase 2 workshop is to prioritize items on the RAC and to identify 3 to 5 items to immediately pursue over the subsequent year. The final phase of the RAFT process involves implementing the Resilience Action Checklist with regularly-scheduled meetings of local leaders called and facilitated by members of the RAFT team, who monitor progress and who offer

assistance as needed. Not all items on a Resilience Action Checklist may be completed during the year of implementation assistance, but the goal is to achieve as much progress as possible and to connect the community to other helpful resources including state agencies and technical assistance at universities.

The RAFT Scorecard

The notion of a “coastal resilience report card” that could be used to advocate for action and to raise awareness about the threats posed by climate change is at the heart of the RAFT (Andrews et al. 2021, p. 25) but functionally, the Scorecard is a diagnostic tool. By documenting the existing regulatory scaffolding and assessing planning capacity with an eye toward identifying both “low hanging fruit” and long-term strategies, the Scorecard brings an inductive orientation to climate resilience that is more responsive to local needs and grounded in the realities of the local context. In its current form, the Scorecard considers five categories or dimensions of coastal resilience—*Policy, Leadership, and Collaboration; Risk Assessment and Emergency Management; Infrastructure Resilience; Planning for Resilience;* and *Community Engagement, Health and Well-Being*. For the locality being reviewed, a maximum of 20 points can be assigned for each of these five categories for a maximum total score of 100 points. Localities achieving a score below 50 are considered to exhibit “Low Resilience” while “Moderate Resilience” (i.e., the locality is actively involved in resilience planning but there are opportunities to strengthen resilience) ranges from 50 to 74 points and “High Resilience” is defined as 75 to 100 points.

As shown in the appendix, each of the five Scorecard categories is further disaggregated into five components comprised of four specific scoring metrics, each worth one point (i.e., four scoring metrics x five components x five categories = 100 points). For example, the *Policy, Leadership, and Collaboration* category consists of a *Locality Leadership and Planning for Resilience* component with four intelligible indicators that prompt a yes/no response from the reviewer. These indicators focus on the internal workings of local government and ask whether roles are clearly defined, training related to coastal resilience is provided for staff and elected officials, and regular meetings are occurring among key actors. Another component consists of four indicators related to emergency management and response while a third focuses specifically on participation in the National Flood Insurance Program’s Community Rating System. Evidence of various forms of collaboration with relevant regional and state agencies as well as an “adaptive management” component complete the five components of the *Policy, Leadership, and Collaboration* category. The concept of adaptive management has a long history in the ecology and natural resources management literatures (e.g., Holling 1978) and has been appearing in climate change research for over two decades (e.g., Lee 1999). In the context of the RAFT Scorecard, it refers to systematic monitoring and revision of plans and ordinances in response to new information, the best available science, or changing conditions—evidence of learning and responsiveness on the part of local government.

The *Risk Assessment and Emergency Management* category has components and accompanying indicators that address exposure to coastal flooding and storms, identification and engagement of vulnerable populations, risk assessment for businesses and economic assets, hazard mitigation planning, and emergency management. One of the fundamental questions of risk assessment and vulnerability mapping is what is considered an asset? This component of the Scorecard explicitly mentions “cultural, historic and economic assets” and devotes four indicators to the identification and mapping of vulnerable populations and four indicators to the business sector vis à vis flooding and coastal

storms.

Rather than integrating physical infrastructure and green infrastructure into the *Risk Assessment and Emergency Management* category, the Scorecard treats it separately in the *Infrastructure Resilience* category. The four components of this category focus on stormwater management, transportation, water and sewer service, critical infrastructure—including medical facilities, emergency shelters, electrical grid, etc.—plus green infrastructure or natural and nature-based features (NNBF). The use of NNBF is increasingly favored by regulatory agencies and is often embedded in the requirements of climate resilience funding. One example is the Community Flood Preparedness Fund program administered by the Virginia Department of Conservation and Recreation. As explained by Bridges et al. (2015), both natural features like undisturbed wetlands and nature-based features like living shorelines that “mimic characteristics of natural features but are created by human design, engineering, and construction to provide specific services” (p. 3) provide ecosystem services that can help to mitigate the negative impacts of climate change, thereby enhancing resilience. They therefore should be understood as complementary.

The fourth category, *Planning for Resilience*, is wide-ranging but includes components related to budgeting (e.g., Capital Improvements Plans), long-range planning (e.g., Comprehensive Plans), development ordinances, incentive programs to facilitate the achievement of resilience goals¹, and natural resources preservation. It is this category that engages most directly with the local regulatory framework and questions related to planning capacity. The RAFT Scorecard overlaps conceptually with several other frameworks that aim to evaluate consistency and coordination across plans and regulations. Among these is the Plan Integration for Resilience Scorecard (PIRS) outlined by Berke et al. (2015) that originally mirrored the risk assessment task from the Federal Emergency Management Agency (FEMA) hazard mitigation planning workflow—i.e., define and map the planning area and hazard zones, then determine and map vulnerability. The third phase of the PIRS framework involved the review and scoring of relevant plans using a coding scheme of -1 (policy increased physical or social vulnerability), 0 (policy does not affect vulnerability), and +1 (policy decreased physical or social vulnerability). One of the primary goals was to determine if local plans (e.g., a county comprehensive plan and regional transportation plan) were operating at loggerheads in relation to advancing resilience goals. By scoring all policies in a range of relevant plans, these kinds of inconsistencies could be identified and resolved. More recently, the PIRS framework has been expanded to address heat exposure (Keith et al. 2022) and wetlands loss (Yu et al. 2023).

The final category, *Community Engagement, Health and Well-Being*, emphasizes public participation, awareness raising about coastal hazards, and active cultivation of grassroots leadership, as well as highlighting threats to several pillars of community resilience. Access to food, medications, and healthcare can be disrupted for days during a hurricane, for example, and the RAFT Scorecard includes four indicators that ask whether plans are currently in place that address the provision of these critical resources in general and to vulnerable populations in particular. This portion of the Scorecard also notes whether partnerships beyond local government have been formed to support access to food, medications, and healthcare during an emergency and whether the public has been given information on how to do so. In addition to the physical safety of residents, the Scorecard also includes indicators related to mental health (e.g., “deaths of despair”) and the identification of “trusted messengers” who are capable of acting as liaisons with vulnerable populations.

¹ Examples include discouraging development in areas prone to flooding and preserving natural features.

Smaller and more rural localities are less likely to engage in resilience planning (Keenan 2018) in part because they tend to lack the level of financial resources and staff that characterize large cities (e.g., Boston, Chicago). However, because the RAFT Scorecard results are not a culmination, but rather a point of departure for dialogue with local leaders about what is feasible and what aligns with local priorities, the RAFT is able to foster climate resilience planning in communities that span the urban-rural continuum. In addition, the RAFT team provides scheduling and administrative support for the regular meetings of locality implementation teams, thereby supplementing the small staffs and minimal resources of many rural localities. When small towns and rural communities lack the extensive planning and regulatory apparatus of their larger counterparts, the results of evaluative tools can have the unintended consequence of discouraging action to enhance climate resilience. Because the capacity to engage in resilience planning at the level outlined in the RAFT Scorecard varies, it is exceedingly important that the RAFT team manage expectations such that the Phase 1 results do not dampen enthusiasm for this important work.

History and Evolution of the RAFT

The RAFT was piloted in three communities beginning in 2017—the City of Portsmouth in Hampton Roads (pop. 94, 838 in 2017²), the Town of Cape Charles on the Eastern Shore (pop. 1,012 in 2017¹), and Gloucester County in the Middle Peninsula (pop. 37,295 in 2017³). Subsequent implementations occurred during 2018 and 2019 that included ten localities located along Virginia’s Eastern Shore (see Figure 2 and Figure 3), followed by the Northern Neck and Middle Peninsula regions.

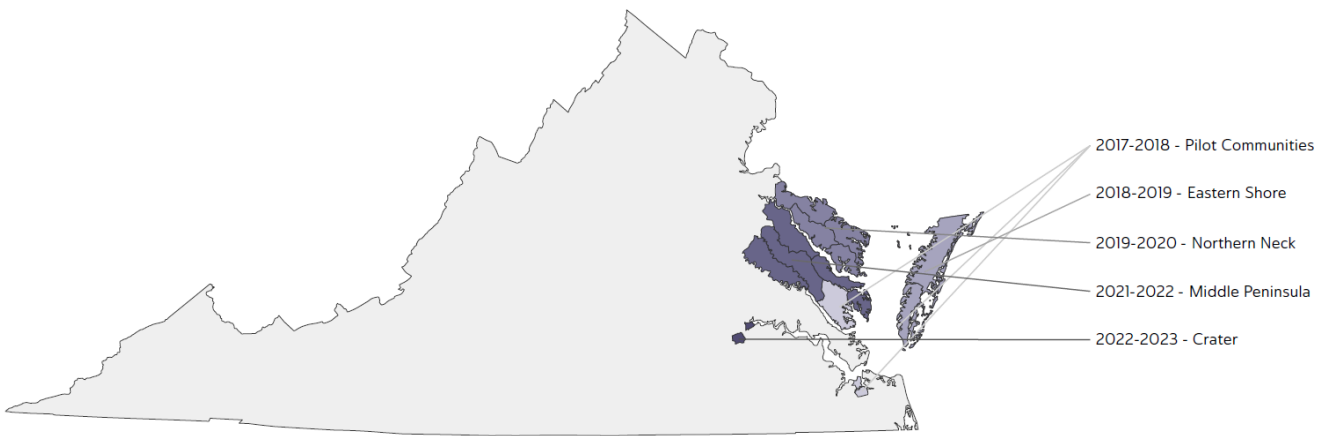


Figure 2: Location of RAFT Implementation Communities—Small Scale (Image: Ari Bell).

Because the initial focus of the RAFT was sea level rise (SLR) and coastal flooding, the bulk of these materials focus on these climate-hazards; but beginning in 2022, the RAFT team turned its sights inland and began working to expand the geographic and substantive scope of the RAFT. The cities of Hopewell and Petersburg are part of the Richmond Metropolitan Statistical Area (MSA) and are

² U.S. Census Bureau (2020). “Annual Estimates of the Resident Population for Incorporated Places in Virginia: April 1, 2010 to July 1, 2019 (SUB-IP-EST2019-ANNRES-51).”

³ U.S. Census Bureau (2020). “Annual Estimates of the Resident Population for Counties in Virginia: April 1, 2010 to July 1, 2019 (CO-EST2019-ANNRES-51).”

members of the Crater planning district commission (PDC), which is the regional planning organization serving this portion of Virginia. The RAFT implementation phase began there in February 2023, but because Hopewell and Petersburg are located inland, the climate hazards that emerge as the process moves forward will not center on sea level rise. Instead, a more expansive understanding of resilience has so far characterized meetings between the RAFT team and local stakeholders. For example, in Petersburg, increasing access to parks and greenspace that provide relief from urban heat as well as recreational opportunities, expanding mobility options for lower-income residents to increase their access to jobs and needed services, and diversifying the City's economic base so it can better withstand times of stress have been identified as priorities for increasing the community's overall resilience alongside more conventional resilience goals like protecting critical infrastructure.

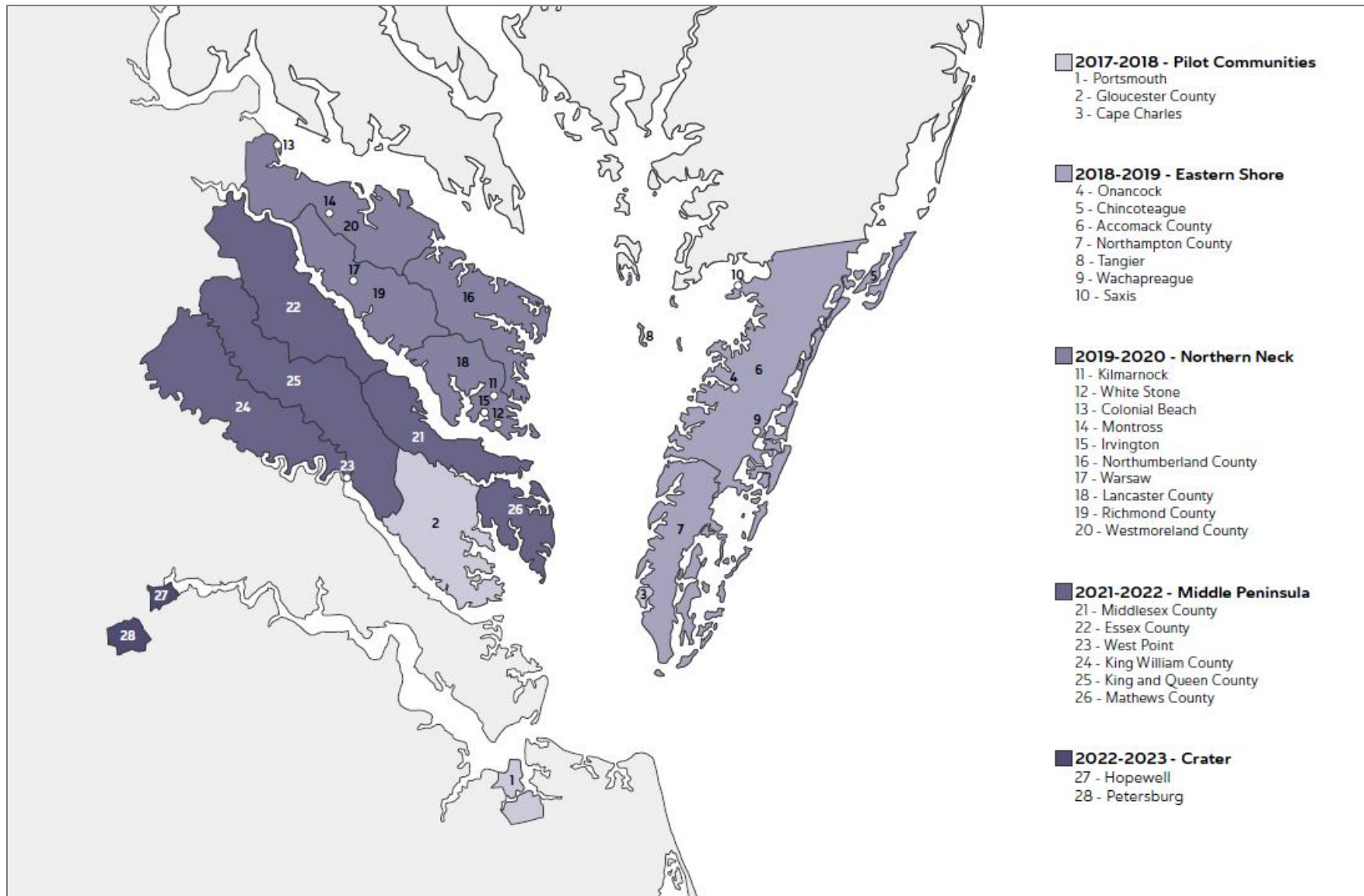


Figure 3: Location of RAFT Implementation Communities—Large Scale (Image: Ari Bell).

Locating the RAFT—Resilience Planning Frameworks

Several frameworks have been presented to help communities structure and begin working toward climate resilience. There is considerable overlap between hazard mitigation planning and climate resilience, with the latter having been more explicitly incorporated into recent federally mandated planning guidelines established by the Federal Emergency Management Agency (FEMA). Similarly, a concerted effort has been made to centralize and “surface” the many resources and best practices that have emerged from FEMA and other federal agencies. The U.S. Climate Resilience Toolkit and its Steps to Resilience (StR) framework points out the need to bridge silos and more effectively disseminate knowledge to support local resilience initiatives. In addition to federal and state governments, universities have also played an important role in supporting and structuring these efforts, as exemplified by the Action-Oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT) framework. The following section of this paper highlights three alternative frameworks, then describes how the RAFT draws upon the strengths of each to forge a different paradigm for resilience planning—one that centers facilitation and community engagement as a means of leveraging and reconciling both professional expertise and the lived experience of residents and other local stakeholders.

Hazard Mitigation Planning (FEMA)

The Disaster Mitigation Act of 2000 (DMA) required that all local governments in the United States adopt hazard mitigation plans approved by the Federal Emergency Management Agency (FEMA) in order to be eligible for federal pre- and post-disaster mitigation funds. The possibility of experiencing a disaster without financial support from the federal government can be a significant motivation for local governments to engage in hazard mitigation planning. In fact, an estimated 85 percent of the U.S. population lives in communities with a current hazard mitigation plan in place as of June 30, 2023 (FEMA 2023a). Since 2015, state governments have been required to include the anticipated effects of climate change in their hazard mitigation plans in an effort to compel and “mainstream” preparation for the threats posed by a changing climate (Stults 2017).

While there is obvious overlap between hazard mitigation and adaptation planning, “climate change results in spatially dispersed and systemic impacts, while natural hazards are generally localized, episodic events”, magnifying spatial and temporal uncertainties (Bedsworth and Hanak 2010, p. 480). Effective climate adaptation planning requires an acknowledgement that future conditions are likely to be significantly different than past conditions, yet risk assessment for hazard mitigation planning has traditionally been based on historical trends and recorded events. Some jurisdictions have integrated their climate adaptation planning activities into more established and prescriptive multi-hazard mitigation planning initiatives (e.g., Baltimore, Maryland), while others have opted for a standalone plan that centers on the specific challenge of anticipating the impacts of climate change (e.g., Santa Monica, California). There is evidence that plans with a narrower focus perform better than broad, multi-hazard plans (Lyles et al. 2018), which underscores the value of explicitly preparing for climate impacts in a manner that is coordinated with, but distinct from hazard mitigation planning.

There are clear similarities between the well-established FEMA prescription for how to prepare a hazard mitigation plan and frameworks that have emerged to guide climate resilience planning (Stults 2017; Matos et al. 2022). FEMA’s *Local Mitigation Planning Handbook* (2023b) provides a framework for

developing a hazard mitigation plan that is likely to pass regulatory review and receive federal approval consisting of four steps and nine tasks. Step 1 involves assembling the people (e.g., planning team, cross-jurisdictional coordination) and resources (e.g., data, meetings logistics) needed to complete the plan. Step 2 is devoted entirely to conducting a risk assessment, while Step 3 focuses on developing a mitigation strategy after reviewing community capabilities (e.g., planning and regulatory; administrative and technical; financial; and education and outreach). The final step centers on plan adoption and implementation. While the framework is graphically displayed as a linear process, FEMA guidance explains that the process is meant to be iterative, especially given the requirement for updating approved hazard mitigation plans every five years. The current version of the *Local Mitigation Planning Handbook* released in May 2023 differs from the previous version published in March 2013 in a few notable ways. First, the current version explicitly engages with climate change in a more extensive manner than the one-half page it garnered in the 2013 version (see pages 5-8). In addition to climate action and climate adaptation plans listed alongside comprehensive plans as key mechanisms for mitigation planning, the current *Local Mitigation Planning Handbook* includes numerous statements like “climate change is causing more frequent and intense events” (p. 53) and presents a brief case study of a climate resilience plan from San Francisco as an example of how a single plan might combine natural hazards and climate change. The handbook defines resilience as the “ability of a community to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions” (p. 136). Similar to the more intense focus on climate change, the most recent version of the *Local Mitigation Planning Handbook* engages with the equity implications of hazard mitigation beyond the identification of vulnerable populations. The word “equity” appears in the 2023 version 50 times, versus zero instances in the 2013 *Local Mitigation Planning Handbook*; and the current version also includes an explanation of what procedural, structural, and distributional equity mean in the context of hazard mitigation and how these principles should inform the development of plans.

Steps to Resilience (StR)

The U.S. Climate Resilience Toolkit (CRT) was launched in 2014 and represents the first attempt to coordinate and package the tools, data, and case studies that had been created by multiple federal agencies into a single, centralized platform. The Steps to Resilience (StR) framework is central to the CRT and offers practical guidance for communities, but when it was originally released it did not explicitly mention equity or environmental justice as factors to be weighed alongside “financial costs, environmental or social impacts, esthetics, or other value systems” (Gardiner et al. 2019, p. 481). The StR defines resilience as “the capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption” (CRT 2023a) and perhaps this understanding of resilience is one of its limitations. In fact, one of the enduring critiques of resilience as a compass for planning has been that there is often too much emphasis on returning to conditions that prevailed before a disaster or other disruption. When we understand resilience as “a refinement of actions to improve performance without changing guiding assumptions or the questioning of established routines” (Pelling 2011, p. 23), we reify the status quo. Without an examination of underlying conditions or interrogation of current practices, adaptation strategies may overlook or reinforce existing inequitable conditions. The current version of StR has evolved in response to critiques such as those offered by Gardiner et al. (2019) but also now places greater emphasis on synthesizing knowledge and bridging silos among federal agencies. For example, the U.S. Department of Transportation has used the technique of pairing assets with hazards that could affect them as a strategy for catalyzing and focusing discussions among stakeholders related to vulnerability of

transportation assets. This approach has been integrated into the first of the five steps presented as part of the current StR framework.

One of the strengths of the StR framework has been its use of short videos that explain each of its five steps in detail using accessible language. The first of these steps—Understand Exposure—involves conducting an inventory of assets in the planning area in addition to the hazards faced by those assets. This echoes the first step of FEMA’s hazard mitigation planning model, although StR defines assets as “the tangible and intangible things people or communities value” (CRT 2023b) and takes an inductive approach to identifying them:

*“Identify your assets by asking questions such as: What features, services, and opportunities **make this a good place to live and work?** What neighborhoods, historic sites, schools, tourist attractions, or retail centers **make this place special?** Consider physical, social, and economic assets across your location.”* (CRT 2023c)

By contrast, FEMA offers a more narrowly prescribed definition of assets (i.e., the people, structures, facilities, and lifelines⁴ that have value to the community). In addition to direct links to relevant data sources from agencies like the National Oceanic and Atmospheric Administration (NOAA), the StR framework is closely coupled with case studies that illustrate how communities around the United States have approached each of the five steps. One of these case studies describes how the potential effects of drought and flooding on agricultural production in the U.S. Corn Belt were summarized and shared with farmers and crop advisors as part of the foundational work of building climate resilience. A distinction is made between climate stressors (e.g., more intense rainstorms) and non-climate stressors (e.g., expansion of impervious surfaces with respect to flooding), which is valuable when the time comes to develop a course of action because climate stressors and non-climate stressors are likely to have different “levers” or mechanisms for intervention.

Step 2 focuses on vulnerability and risk assessment with sensitivity, adaptative capacity, and exposure as the determinants of vulnerability to a particular climate-related hazard (Adger 2003). Based on the assessment of an asset’s sensitivity (i.e., the degree to which a system, population, or resource is or might be affected by a hazard) and adaptive capacity (i.e., ability of a person, asset, or system to adjust to a hazard, take advantage of new opportunities, or cope with change), a vulnerability rating of “Low”, “Medium”, or “High” is assigned for each entry in the list of asset-hazard pairs from Step 1. Then, this vulnerability assessment is used to characterize risk—which reflects both the magnitude of negative impacts **and** the likelihood of occurrence, based on predictions of future climate conditions—faced by each asset.⁵ Once the vulnerability and risk assessments have been completed,

⁴ Community lifelines are “the most fundamental services in the community that, when stabilized, enable all other aspects of society to function” and include communications, health/medical, and transportation (FEMA 2023b, p. 1).

⁵ Prior to the release of the updated *Local Mitigation Planning Handbook* in 2023, one of the clearest distinctions between hazard mitigation planning and climate adaptation or climate resilience planning had been how the likelihood of occurrence aspect of risk was conceived. Earlier versions of the official FEMA guidelines relied on “backward looking” approaches for understanding risk that implicitly assumed that future climatic conditions would be similar to historical climatic conditions. For example, current research indicates that the ubiquitous 100-year floodplain maps used to regulate development and to communicate flood risk are outdated in many areas today and will become increasingly biased as the climate continues to change (Hart et al. 2019). However, the line between hazard mitigation and climate resilience planning has blurred considerably now that FEMA is explicitly engaging with climate change as such and referencing “forward looking” data as the basis for risk assessment in its most recent handbook.

the recommended strategy from the StR framework is to address the assets with the greatest level of risk first.

The third StR step emphasizes the generation of ideas, review of case studies from other communities, and a deliberative process where participants consider potential solutions and perhaps revisit the overarching resilience goals. Notably, this step assumes an open and inclusive decision-making process, but provides little concrete guidance on how to create and sustain this critically important component. The extent to which professional facilitation is needed and strategies for encouraging public participation are largely absent. However, there is a downloadable spreadsheet with a list of potential stakeholder groups to begin the outreach and engagement process.

Step 4 of the StR—Prioritize and Plan—is fundamentally about synthesizing the outcomes of the preceding steps and charting a path that maximizes the likelihood of reducing risk across the most threatened and important assets. This is where factors like budget constraints, limits of implementation authority, and staffing levels are used to further refine and crystallize which actions should be prioritized. Benefit-cost ratios are one of the tools that may be used during this step, but the most powerful tool may be the matrix provided that asks stakeholders to consider the following outcomes and to rate each of the potential solutions that emerged from Step 3 as “Not Feasible”, “Potentially Feasible”, or “Feasible”:

- Ability to Increase Resilience
- Economic Feasibility
- Low Environmental Impact
- Ability to Implement

This matrix facilitates discussion and refinement of priorities and tradeoffs in the face of the unique constraints that each community must consider and operate within when planning for climate resilience. It also makes it easier to identify solutions that deliver benefits that exceed their costs (No Regrets), are low cost but could have potentially large benefits under a changing climate (Low Regrets), enhance climate resilience while delivering other benefits (Win-Win), and are useful for dealing with uncertainties associated with longer-term climate change (Flexible) as articulated by Berke (2014).

The final step—Take Action—offers suggestions for implementation, monitoring, and regular revisions to climate resilience initiatives that emerge from the StR process. Resources and case studies designed to de-mystify these less glamorous aspects of planning are presented, including a toolkit for engaging residents through citizen science campaigns (e.g., crowdsourced temperature collection to map heat islands).

The StR framework and the broader U.S. Climate Resilience Toolkit bring a wealth of existing data, tools, and best practices together in one centralized location where communities can quickly learn about climate change impacts that are expected to affect them and begin marshalling a response. Both tools and case studies can be filtered by region and corresponding StR step, which helps to further increase the legibility and likelihood that these resources will be discovered and adapted to fit local needs.

Action-Oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT)

A third framework for climate resilience planning that serves as a useful contrast for the RAFT was developed by researchers at Old Dominion University (ODU) in Virginia and aims to push beyond conventional forms of public participation and stakeholder engagement. The Action-Oriented Stakeholder Engagement for a Resilient Tomorrow (ASERT) framework, first piloted in 2016, centers geospatial data visualization, participatory mapping, and gamification as tools for achieving more active and meaningful stakeholder engagement (Yusuf et al. 2019). Geospatial data are integral to ASERT and the ODU researchers trace this in part to structured public involvement (SPI), which has been widely applied in the context of transportation planning (Bailey and Grossardt 2010). SPI integrates facilitation, local knowledge, professional expertise, and technologies like interactive polling within a collaborative decision-making process. During the pilot for the framework in Hampton Roads, Virginia, the ASERT researchers used ESRI mapping software to both collect information from participants (e.g., location and importance of community assets using Survey 123) and to present those collective insights and place them in context (e.g., relating a coherent narrative through a Story Map). This bi-directional exchange of knowledge helps to ensure that the research is grounded in and reflective of the priorities of residents and other stakeholders, while offering an accessible mechanism for sharing the results of the project with the public. There is also an element of gamification with stakeholders using Nintendo Wii video game controllers during public engagement events to actively explore the impacts of sea level rise under different scenarios.

The ASERT framework aligns closely with the current version of the FEMA hazard mitigation planning process and the StR framework. It leverages participatory mapping and tools like ESRI software to identify community assets and challenges, introduces information on strategies that have been successful in other contexts, then creates a space for discussion and deliberation about which resilience actions should be prioritized and implemented (Yusuf et al. 2019). However, in contrast to the StR framework, ASERT is targeting a broader audience of “policymakers, planners, community leaders, and others” with an explicit goal of facilitating multi-sector collaboration (Yusuf et al. 2019). Notably, the ASERT framework was used for the community outreach component of the award-winning Sea Level Wise Adaptation Strategy developed by Dewberry consultants in partnership with the City of Virginia Beach (City of Virginia Beach 2020).

The RAFT as Community-Based Adaptation

Several characteristics distinguish the RAFT from the preceding examples as a framework and paradigm for climate resilience planning. First, the RAFT recognizes the value that a trained and experienced facilitator can add to resilience efforts. The RAFT team plays a vital convening and facilitation role throughout the 18-month process, compiling information from local government staffs and translating research to action, but also shepherding the infusion of local knowledge and priorities within the context of a larger, deliberative process. As a result, the RAFT is a process that cannot be hurried and that does not bend to the timelines of academic researchers nor local elected officials. Because expectations are established at the outset, the engagement can unfold organically and in a way that is responsive to the often unique conditions on the ground. Further, the RAFT recognizes that existing plans, regulations, and development management ordinances directly shape where people, infrastructure, and community assets are located, and therefore represent contributors

to vulnerability as well as potential levers that can be used to advance climate resilience. Because the RAFT proceeds from an evaluation of relevant plans and ordinances it immediately begins formulating a picture of how the existing landscape of vulnerability came to be and reveals potential solutions. The systematic nature of the RAFT Scorecard ensures that vulnerable populations are not overlooked and that necessities like food and medical care (e.g., FEMA’s Community Lifelines) do not fall through the proverbial cracks.

However, it could also be argued that the RAFT incorporates the key strengths of each of the three alternative frameworks discussed. The FEMA handbook is principally a prescription for local governments to follow so that hazard mitigation plans are more likely to meet the requirements of regulatory review and gain approval. The “carrot” of state and federal funding has shaped hazard mitigation planning in a powerful way and contributed to its spread over time. This influence, along with the emphasis on plan evaluation that emerged from studies of land use planning in the 1990s (Kaiser et al. 1995; Baer 1997) can be clearly seen in the RAFT Scorecard. A rigorous assessment of existing plans and development regulations allows the RAFT team to begin understanding what is possible in the near-term to advance climate resilience goals—and perhaps to conform with state or federal planning mandates. Appendix A contains a sample of the RAFT Scorecard that includes the individual indicators and an explanation of how to perform the scoring as well as how to interpret the scores.

Similarities with the Steps to Resilience (StR) framework include an emphasis on case studies from past implementation efforts as a source of actionable insight. Although more limited in scope than the repository of state and federal resources available with the U.S. Climate Resilience Toolkit, the RAFT website includes direct links to tools, risk maps, and case studies that have been produced through previous implementations (see Figures 2 and 3). A series of case studies from the 2019-2020 RAFT implementation in Virginia’s Northern Neck region are available on the Institute for Engagement & Negotiation (IEN) website and provide background on each of the ten participating jurisdictions (IEN 2023a). In contrast to the StR case studies, the RAFT community case studies provide direct access to the Scorecard, Resilience Action Checklist, and maps showing the results of the vulnerability assessment aspects of the process for each community in a uniform way. These case study pages provide multiple examples of how the different phases of the RAFT process (Figure 1) were conducted as well as how the key products of each phase (e.g., Scorecard, RAC) complement one another to support collaborative climate resilience planning. Along with the written summary, presentation slides, and video recordings of the Phase 2 meetings, the case study materials offer a tangible blueprint for climate resilience work that does not gloss over the nuts-and-bolts of facilitation and engagement that often determine success.

Universities are important intermediaries when it comes to climate resilience, as evidenced by the ASERT framework discussed above. In the United States, trust in government continues to erode (Pew Research Center 2022), and when coupled with the erratic leadership on climate at the federal level, the importance of grassroots advocacy and local action increases dramatically. Like the ASERT framework, the RAFT seeks to expand the reach of climate resilience planning to include constituencies and voices beyond the “usual suspects” of local government staff, environmental advocacy groups, and more affluent households. The RAFT Scorecard includes multiple indicators that specifically center vulnerable populations and encourage their active participation. The RAFT Resilience Action Workshop is designed to encourage inclusive and collaborative deliberation that

makes use of professional expertise and the lived experience of residents and other local stakeholders. Acting as a liaison between university and the community is one of the most impactful characteristics of frameworks like ASERT and the RAFT precisely because crafting a successful response to the challenges of climate change and the specific threats posed to a given community requires the knowledge, resources, and capabilities of both. What separates the RAFT in particular from the other three examples discussed above is its emphasis on integrating the technical and regulatory aspects of planning with the social and deliberative aspects of climate action. This allows the RAFT to support and empower communities by using its members' knowledge and experiences to “shape planning solutions” (Lieberknecht 2022). The RAFT is a much more resource- and labor-intensive process than most resilience-building efforts, because it reaches into the grassroots of communities to obtain and incorporate input from a broad swath of residents.

Lessons from Expanding and Adapting the RAFT

In a separate pilot project in 2023, UVA researchers and IEN staff adapted aspects of the RAFT and a self-scoring process developed by the RAFT team, the Planning for Resilience Evaluation and Prioritization (PREP) Tool⁶ (RAFT 2021), to support inland flood resilience planning efforts in southern Virginia. The study region included the City of Martinsville, the Town of Halifax, and the Town of South Boston, with the Southside Planning District Commission as the primary partner. The goals of that project were to better understand how the RAFT and PREP Tool may need to change as they began to be deployed outside of the coastal zone and to develop a “roadmap” for the three study localities to create a resilience plan that meets the regulatory requirements of the Virginia Community Flood Preparedness Fund Grant program. After compiling comprehensive plans, floodplain ordinances, and zoning codes from the participating localities, a set of indicators was developed based on the criteria established by the Virginia Department of Conservation and Recreation (DCR) for proposals requesting flood resilience funds (Virginia Community Flood Preparedness Fund Grant Program) that also incorporated elements of the RAFT and PREP Tool. This plan and ordinance review instrument is available in Appendix B and adopts a plan evaluation scoring system (Berke et al. 2015) to identify areas of strength and potential gaps between the documents considered and the review criteria.

As a result of the plan and ordinance evaluation work performed, a few overall trends emerged:

- The plans reviewed incorporated current data and drew upon a strong evidence base. These plans often described historical flood events as context for present-day flood risk and flood impacts, however, projections of future flooding are typically not part of these documents. This may be due to a lack of access to or awareness of resources that estimate future flood risk and represent an opportunity for strengthening the locality plans as they exist today. Perhaps not surprisingly, the regional hazard mitigation plans engaged with flooding and flood

⁶ The PREP Tool was created in 2021 by students at the Virginia Coastal Policy Center (VCPC) at William and Mary's Law School and the Institute for Engagement & Negotiation (IEN) at the University of Virginia. The RAFT is a partnership between IEN, VCPC, and the Institute for Coastal Adaptation & Resilience at Old Dominion University (RAFT 2021, p. 2).

resilience in a much more comprehensive manner and each exhibits a clear connection to flood control and resilience, which is one of the core criteria established by DCR.

- All plans reviewed clearly made use of the best available science to inform decisions, incorporating data and scientific analyses.
- Regulations that are more specific better address the assessment questions (i.e., align with DCR regulatory review criteria).
- Generally, the plans reviewed scored well on the criteria related to clearly articulated timelines for implementation and cross-jurisdiction coordination.
- Zoning ordinances are the most comprehensive and readily available regulatory instrument for advancing flood resilience.
- Alignment with the equity criteria outlined by DCR as part of its requirements for resilience plans could be improved by incorporating assessments of socially vulnerable populations (e.g., define and map) and discussing how past inequalities may contribute to present-day patterns of uneven flood risk (as well as strategies for addressing these disparities). While there was often evidence of public participation in the planning process with documentation of community engagement efforts, more explicit efforts to bring vulnerable community members into the planning process would better align with these required DCR review criteria.
- The evidence supporting nature-based infrastructure as a tool for flood mitigation was quite strong in all the plans. However, there may be additional opportunities to educate residents about the benefits of natural resource protections and to better integrate green infrastructure (e.g., open space requirements) into existing land subdivision ordinances.

Helping local governments to understand how existing plans and ordinances can be strengthened and better aligned with the requirements of an administrative review was an important outcome of this project, but not the sole objective. In order to effectively plan for flooding, localities need to have adequate staffing, training, and other resources in place to support their work. These “soft capacities” were evaluated through: (1) an online survey of local government staff and elected officials conducted in the summer of 2022, (2) a virtual focus group meeting held in November 2022, and (3) a series of five key informant interviews conducted during January and February of 2023.

Based on the online surveys, virtual focus group engagement event, and key informant interviews, it was determined that the financial resources to support flood resilience planning and flood mitigation work are rarely sufficient to fully address realities that participating localities face. Respondents to the local government staff survey indicated that funding was the most significant barrier to flood resilience by a wide margin followed by the demands on staff time (e.g., police, public works) and additional government expenses (e.g., overtime pay) when floodwaters impact roads.

In addition to the scarcity of funding, staffing levels in many localities within the study area are not adequate. Local government organizations have seen numerous retirements over the past few years, but it has often been a challenge to fill vacant positions. A reduction in local government staffing levels has also meant an effective increase in workload for staff members that remain, which makes training new hires difficult from a time allocation perspective. However, it should be noted that despite these challenges, all participating jurisdictions have a designated Floodplain Administrator and two of these three individuals either participated in the November 2022 engagement event or completed the

online survey. Further, the existence and adequacy of succession plans is not reflected in the planning documents reviewed and may be internal to each locality. However, local government staff from all three jurisdictions indicated during the November 2022 event that there is an awareness of their importance, but succession plans are not widely available in local government outside of the Standard Operating Procedures (SOPs) for police and fire personnel. When longtime employees retire, they often take valuable institutional knowledge with them that is difficult to capture. The results of the plan and ordinance evaluation (i.e., inspired by the RAFT Scorecard) and the assessment of “soft capacities” were presented to the local partners along with a stakeholder map with the assumption that the localities and regional planning organization will use these resources as input to a more robust engagement process in lieu of a RAFT-style Resilience Action Workshop and implementation period.

This pilot project was not a comprehensive implementation of the RAFT process and these deviations may have ultimately limited the effectiveness of the work. Because this project was conceived as research, a considerable amount of time and effort was devoted to gaining Institutional Review Board (IRB) approval for the online surveys, focus groups, and interviews. IRB review is foundational to conducting research in an ethical manner (e.g., principles like informed consent) and is required if the intent is to publish, but it also serves as an example of how the timelines and priorities of university researchers often do not align with those of local government. In the case of this pilot, the standard 18-month process was compressed into a one-year target, which meant substituting surveys, focus groups, and key informant interviews for the longer deliberative process that brings stakeholders together to hear and be heard. Further, the focus groups and interviews were conducted via Zoom, which is convenient for some stakeholders (e.g., local government staff) but may be a hardship for residents with unreliable internet connections or inflexible work hours. In retrospect, this pilot lacked the sustained engagement with these communities that would have typically been part of the full RAFT implementation process. There is simply no substitute for visiting a place, meeting with stakeholders face-to-face, building trust, obtaining recommendations from stakeholders for additional community leaders to invite to join the process in order to get the fullest representation possible, and discovering shared values over time. Future efforts to extend the RAFT inland should not shorten the 18-month timeline that has proven successful since 2017 and should avoid sacrificing the in-person, deliberative activities that characterize Phase 2 of the process (Figure 1).

In addition to the pilot project in southern Virginia, the RAFT also was expanded in January 2023 to more fully address social equity issues. In working with localities in the Northern Neck, the RAFT team had observed that many of the grassroots service organizations worked on a regional basis, in this case across both the Northern Neck and Middle Peninsula of Virginia, and that the resilience challenges identified by these organizations with the most vulnerable populations were not bound by political boundaries. With funding from the Jesse Ball duPont Fund, responding to the expressed need for coordinated, collective, and integrated action across these two regions, the RAFT team added a Regional Resilience Equity Workgroup encompassing ten counties in the regions that participated in the RAFT. The Workgroup created a space where community service organizations can collaborate; identify priority risks and share information on the resilience needs of underserved and vulnerable members of the community; and above all, take coordinated action to address these needs. Membership included the planning district commissions, indigenous Tribes, state agencies, non-profit organizations, and resource councils. In order to enable focused discussions, the Workgroup was divided into six subgroups to address their highest priority resilience needs for vulnerable populations: Economic Development & Living Wages, Healthcare & Mental Wellbeing, Food Security, Affordable

Housing & Shelters, Transit, and Programs for Youth & Families. The Workgroup process reaffirmed a number of important concepts, including that resilience should be a community-wide discussion, with decisions made with the fullest input and participation possible; and that it takes concerted effort, time and resources to build relationships and trust and obtain broad community input and participation. The Workgroup priorities also made it clear that core socio-economic needs, so often overlooked in resilience planning, must be addressed in climate adaptation efforts in order to foster and advance climate equity.

The intense level of effort required to conduct the scoring, the interviews and listening sessions for the qualitative assessments, the community development of resilience action priorities, the implementation support for a year, and the Regional Resilience Equity Workgroup, requires a level of funding sufficient to support adequate staffing at the three university partners. The RAFT is not funded by the state government; it comes from a variety of sources, so finding adequate, consistent funding has been and continues to be a challenge for the RAFT team.

Discussion and Conclusions

Building upon on the success of federally mandated hazard mitigation planning offers one path forward for elected officials, advocacy groups, and residents interested in normalizing planning for climate resilience. However, climate change has been politicized in the United States, which hampers federal action while making climate resilience planning at the local level even more urgent. The jarring oscillations on climate policy that have occurred at the federal level over the past two Presidential Administrations offer a prime example of the tension between representative democracy and maintaining a sustained commitment to mitigating and adapting to a changing climate. While the current level of political polarization shows no sign of abating in the near-term, grassroots approaches that leverage the skills and experience of professional facilitators while drawing upon and reinforcing social connections, working through community-based organizations (e.g., churches), and educating the public about climate change impacts are one mechanism for insulating resilience planning from the vagaries of state and national politics. The Resilience Adaptation Feasibility Tool (RAFT) process offers a proven model for local climate resilience planning that leverages the expertise and resources of universities without diminishing the principles of democratic governance or ignoring the need to make these processes more inclusive and equitable.

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Appendix A
RAFT Scorecard

1) LOCALITY LEADERSHIP, POLICY, AND COLLABORATION

1.1 LOCALITY LEADERSHIP AND PLANNING FOR RESILIENCE

/ 4 Points

Collaboration among local government decision makers, officials, departments, academia, and NGOs is important in planning for coastal resilience. Effective collaboration requires identifying local leaders and organizations, establishing the roles of such leaders and organizations, and providing leadership training and educational resources.

Points	Scoring Metric	Notes
	a. Leadership roles are identified for staff and/or elected officials important for planning for resilience. If staff is limited or nonexistent, the locality has tasked someone with handling resilience efforts for the community.	
	b. Training and education events are held for elected officials specifically on resilience issues.	
	c. Training and education events are held for locality staff, or if staff is limited or nonexistent, training of whomever has been tasked with handling resilience efforts for the community.	
	d. Locality staff and/or elected officials, or whomever has been tasked with handling resilience efforts for the community, are meeting at least once per quarter to coordinate planning specifically on resilience issues.	

1.2 LOCALITY LEADERSHIP AND RESPONDING TO EMERGENCY

/ 4 Points

Collaboration among local officials and relevant stakeholders is equally important in responding to a coastal hazard. An organized, coordinated response to a coastal hazard requires identifying stakeholders, establishing roles, creating plans, and publicizing information.

Points	Scoring Metric	Notes
	a. Locality has identified stakeholders who will require emergency response including socially vulnerable populations.	
	b. Locality has established internal emergency response roles (e.g., standing committees, staff titles), and these staff and partners participate in at least one training each year.	
	c. Locality collaborates on resilience planning with the stakeholders who will need emergency response and has provided the public with opportunity to give input from lower income vulnerable populations.	
	d. Locality has a means of communicating these plans to the public during a coastal storm hazard event.	

1) LOCALITY LEADERSHIP, POLICY, AND COLLABORATION

1.3 LOCAL COLLABORATION WITH STATE AGENCIES AND REGIONAL PDCs

/ 4 Points

Coastal resilience issues go beyond political boundaries; therefore, localities benefit from regional collaboration. Regular communication between local, multi-jurisdictional, and state officials encourages sharing of information and ideas. Collaboration should include working with agencies that serve socially vulnerable communities. Localities are part of a Planning District Commission (PDC), which coordinates many activities.

Points		Scoring Metric	Notes
		a. Locality staff and/or officials engage with regional and state agencies on resilience-oriented issues.	
		b. Locality participation in local and regional resilience-oriented committees and initiatives to serve socially vulnerable populations.	
		c. Locality elected officials participate on relevant local and regional resilience-oriented commissions.	
	\$\$\$	d. Locality staff work to identify funding opportunities and priorities to address resilience issues at the regional and state level.	

1.4 ADAPTIVE MANAGEMENT

/ 4 Points

Adaptive management involves updating ordinances and plans for coastal resilience based on new findings and emerging strategies. Use of data, scientific analyses, and new information is important to inform local policies to prepare. Adaptive management means incorporating lessons learned from research that informs best methods for addressing the needs of socially vulnerable populations.

Points		Scoring Metric	Notes
		a. Locality incorporated new data, scientific analyses, and approaches to resilience, within the last five years into the Floodplain Management Ordinance.	
		b. Locality incorporated new data, scientific analyses, and approaches to resilience, within the last five years into Zoning Ordinance.	
		c. Locality incorporated new data, scientific analyses, and approaches to resilience, within the last five years into Site and Subdivision Ordinances.	
		d. Locality incorporated new data, scientific analyses, and approaches to resilience, within the last five years into its Comprehensive Plan.	

1) LOCALITY LEADERSHIP, POLICY, AND COLLABORATION

1.5 The NFIP's COMMUNITY RATING SYSTEM

/ 4 Points

Communities wishing to go above and beyond the minimums of the National Flood Insurance Program can choose to participate in the Community Rating System (CRS). Participating communities implement higher standards of floodplain management, and, in return, residents are eligible for flood insurance premium reductions. Localities can do many things to improve their scores. For more information, see FEMA's CRS website or the Wetlands Watch website on the subject.

Points		Scoring Metric	Notes
	CRS	a. Locality has achieved a CRS Score of 9 or higher.	
	CRS	b. Locality has achieved a CRS Score of 8.	
	CRS	c. Locality has achieved a CRS Score of 7	
	CRS	d. Locality has achieved a CRS Score of 6 or lower.	

TOTAL SCORE FOR SECTION 1:

/ 20 POINTS

2) RISK ASSESSMENT AND EMERGENCY MANAGEMENT

2.1 FLOOD EXPOSURE AND VULNERABILITY ASSESSMENT:

/ 4 Points

Localities should conduct and use an assessment of their flood exposure and vulnerability in developing policies and programs. Localities should be knowledgeable of their flood risks, raise awareness in the community about vulnerable areas, help target action to assist the most threatened areas and reduce possible damage, and save costs by being preemptive not reactive.

Points		Scoring Metric	Notes
	CRS	a. An exposure and/or vulnerability assessment is completed, mapped and updated within the last five to seven years, available at the locality level, and (as evidence of being used) referenced in locality policy making.	
	CRS	b. Sources of flooding for both tidally-driven and precipitation-driven events are identified and updated within the last five years.	
	CRS	c. Flooding for different return period storm events is identified and mapped.	
	\$\$\$ CRS	d. Additional vulnerabilities (see above), including cultural, historic and economic assets, are identified and updated within the last five years.	

2.2 RISK ASSESSMENT FOR VULNERABLE POPULATIONS:

/ 4 Points

Localities should conduct risk assessments of their socially vulnerable populations. These populations include those in areas of high poverty, the elderly, caregivers, veterans, homeless, transient or nomadic communities, children and youth, physically or mentally disabled people, medically fragile people and non-English speakers. Because these populations may not have resources to change their level of vulnerability, it is vital for localities to identify these populations, ways to reduce their risk, and create plans for assistance during and after coastal hazard events. Localities need to conduct outreach to vulnerable populations.

Points		Scoring Metric	Notes
	CRS	a. Locality has identified vulnerable populations that are subject to flooding and coastal storm hazards.	
		b. Locality has engaged vulnerable populations and provided them with meaningful information (e.g., in their own language, relevant to their circumstances) relating to their vulnerability to coastal storm hazards.	
		c. Locality has worked with vulnerable populations to increase their emergency preparedness and evacuation plans so they know their risk and know what steps should be taken during and after an event.	
		d. Locality partners with organizations that provide assistance to vulnerable populations before, during and after coastal storm hazards, including food banks or pantries with refrigeration units and backup generators.	

2) RISK ASSESSMENT AND EMERGENCY MANAGEMENT

2.3 BUSINESS AND ECONOMIC RISK ASSESSMENT:

/ 4 Points

Localities need to identify local business and economic vulnerabilities to coastal storm hazards. Businesses are differentially affected by these hazards and attention should be paid to making sure that businesses that serve vulnerable populations are considered. Including business and economic vulnerability in a risk assessment and emergency management is important for resilience and recovery after a storm event.

Points	Scoring Metric	Notes
\$\$\$	a. Locality has included the business sector in its assessment and mapping of coastal hazard vulnerability	
\$\$\$	b. Locality has engaged economic development department and/or independent chamber of commerce in locality hazards mitigation and/or resilience planning.	
\$\$\$	c. Locality and/or business associations have programs for small businesses, particularly businesses that serve socially vulnerable populations, to encourage each business to be prepared for an emergency and plan for business continuity.	
\$\$\$	d. Locality emergency management communicates with business sector in the event of severe weather emergency or evacuation.	

2.4 HAZARD MITIGATION:

/ 4 Points

The Hazard Mitigation Plan (HMP) is required by state code as a condition of emergency assistance. In the coastal region, it is important for the HMP to specifically address coastal storm hazards by identifying what locality resources and areas are at risk, to enable the locality to take actions to reduce future risks. Furthermore, having an HMP is essential to be eligible for certain grants and funding related to coastal storm hazards.

Points	Scoring Metric	Notes
	a. The locality's HMP specifically addresses coastal resilience.	
	b. The locality is engaging in regional coordination for Hazard Mitigation through a regional plan.	
	c. The locality's HMP details how the locality collaborates with VDEM, DCR Floodplain Management or SHMO.	
	d. The locality's HMP is approved by FEMA, was developed with meaningful public engagement with socially vulnerable communities and is formally adopted by locality governing body.	

2) RISK ASSESSMENT AND EMERGENCY MANAGEMENT

2.5 RESIDENT EMERGENCY PREPAREDNESS:

/ 4 Points

Well-organized emergency preparedness plans save lives and property and help ensure that localities can act in sufficient time. They contribute to faster and more efficient post-hazard recovery. Preparedness for vulnerable populations includes ensuring that residents have the opportunity to learn swimming and water safety skills. Communities should consider participating in regional, national, or state-wide outreach events such as Hurricane Preparedness Week.

Points		Scoring Metric	Notes
	CRS	a. Locality has a current resident emergency preparedness plan, updated within the last five years, which identifies resident emergency preparedness risks and needs, including knowledge of water safety.	
	CRS	b. Locality conducts community outreach at least once a year to inform residents about community emergency preparedness.	
	CRS	c. Locality engages resident groups, including schools, hospitals, and other groups, in testing preparedness through emergency drills, disaster simulations, and planning workshops.	
	CRS	d. Locality has implemented early warning signals/systems/emergency warning tools for its residents, particularly those most vulnerable.	

TOTAL SCORE FOR SECTION 2:




/ 20 POINTS

3) INFRASTRUCTURE RESILIENCE

3.1 STORMWATER INFRASTRUCTURE:

/ 4 Points

Stormwater management is regulated by state law, which requires localities either create and operate a stormwater management program or request the state to operate its stormwater management program. Local ordinances must comply with the Virginia Stormwater Management Act and regulations, as well as the Virginia Erosion and Sediment Control Law. Additional stormwater management and flood risks are typically handled at the local level through environmental regulation, site plan approval, and subdivision approval. Localities that go beyond the minimum state requirements are better able to manage stormwater and increase their resilience to coastal storm hazards. Stormwater infrastructure may include use of bioswales, dry ponds, retention basins, rainwater management systems, low impact development, rainwater collection and management systems, green infrastructure, rooftop gardens, and green and open spaces.

Points		Scoring Metric	Notes
	\$\$\$ 	a. Locality offers at least one official incentive for private property activities that manage stormwater.	
		b. Locality funds stormwater management projects through stormwater utility fees, user fees, grants, or other creative funding mechanisms.	
		c. Locality implements one or more stormwater BMPs on public property for educational demonstration, as shown by signage, tours, or other information.	
		d. Locality stormwater policy goes above and beyond the minimum state requirements.	

3.2 CRITICAL TRANSPORTATION INFRASTRUCTURE:

/ 4 Points

An evaluation of critical transportation infrastructure allows a locality to understand its capacity and preparedness for coastal storm hazards. Although most localities do not manage their own roads, as this is handled at the state level, they nevertheless do have the ability to identify their transportation needs and priorities.

Points		Scoring Metric	Notes
		a. Locality has identified critical transportation infrastructure and assessed its vulnerability within the last five years.	
		b. Locality has developed a plan to protect critical transportation infrastructure within the last five years.	
		c. Locality has a plan available and has informed residents which critical transportation infrastructure to utilize in the case of coastal storm hazards.	
		d. Locality has a contingency plan for critical transportation infrastructure. This plan has been created and/or updated in the past five years.	

3) INFRASTRUCTURE RESILIENCE

3.3 WATER SUPPLY AND WASTEWATER MANAGEMENT SERVICES:

/ 4 Points

Communication and coordination between a locality and its municipal water utility and wastewater utility enable a coordinated, cohesive, and synchronized response to a coastal storm hazard.

Points	Scoring Metric	Notes
	a. Locality conducts an assessment of its drinking water supply and wastewater management, both public sources and private well owners, to identify vulnerabilities to coastal storm hazards.	
	b. Locality water supply plan addresses coastal flooding and hazard events to assure safe drinking water supply and water conservation.	
	c. Locality conducts a resident education program on safe drinking water to assure post-event public health and safety.	
	d. Locality communications with municipal water and wastewater utility, to manage ongoing challenges to safe water, including during and after a storm, Alternatively or additionally, the locality has established methods of communication with private well and water system owners, to ensure all are informed about how they can increase their water system resiliency.	

3.4 CRITICAL INFRASTRUCTURE FOR EMERGENCY SERVICES:

/ 4 Points

An evaluation of critical infrastructure for emergency services including shelters, emergency facilities, medical, electrical, and other essential services that allows a locality to understand its capacity and preparedness for coastal storm hazards. Critical infrastructure ensures that socially vulnerable populations, not just those who can afford it, will have access to quality drinking water, electricity, food, and shelter.





Points	Scoring Metric	Notes
	a. Locality identifies critical infrastructure for emergency services and assessed its vulnerability within the last five years.	
	b. Locality has a plan to protect critical infrastructure from storms within the last five years, including outreach to private well and private water system owners about how they can protect and increase their water system resiliency.	
	c. Locality informs residents which critical infrastructure they should use during coastal storm hazards.	
	d. Locality has a contingency plan for continuing services. This plan has been developed or updated in the last five years.	

3) INFRASTRUCTURE RESILIENCE

3.5 NATURAL AND NATURE-BASED FEATURES:

/ 4 Points

Natural and nature-based features (NNBF) are features that define natural coastal landscapes and are either naturally occurring or have been engineered to mimic natural conditions. Examples include beaches and dunes; vegetated forest buffers, salt marshes, freshwater wetlands, and submerged aquatic vegetation; oyster reefs; and barrier islands. Green infrastructure (GI) is similar and complementary, and uses vegetation, soils, and other elements and practices to restore some of the natural processes required to manage water and create healthier urban environments. At the city or county scale, green infrastructure is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, stormwater management systems that mimic nature soak up and store water. Both NNBF and GI may be undertaken by a community in a variety of ways.

Points		Scoring Metric	Notes
		a. Locality has identified natural and nature-based features that are protective and can assist with coastal resilience.	
		b. Locality has developed plans and policies that use natural and nature-based features to enhance coastal resilience.	
		c. Locality is implementing projects that are in accordance with the plans and policies developed to utilize natural and nature-based features to increase coastal resilience.	
\$\$\$		d. Locality offers incentives for the use of natural and nature-based features to increase coastal resilience.	

TOTAL SCORE FOR SECTION 3:

/ 20 POINTS

4) PLANNING FOR RESILIENCE

4.1 BUDGET, FUNDING AND STATE & FEDERAL ASSISTANCE:

/ 4 Points


Coastal hazard mitigation efforts, when properly funded, can reduce or prevent damage and decrease costs from storm damage. To ensure proper funding a locality can budget for mitigation efforts, assess the potential economic impact from a coastal storm hazard, and identify sources of funding for mitigation projects.

Points		Scoring Metric	Notes
		a. Locality has incorporated into its Capital Improvement Plan (CIP) funding for coastal resilience. Projects could include upgrading critical infrastructure, water and wastewater systems, and/or food and health systems, with priority for needs of vulnerable populations.	
	\$\$\$	b. Locality has conducted an economic impacts assessment of coastal storm hazards.	
		c. Locality has identified specific actions for coastal resilience (pre/post-flooding mitigation) in Hazard Mitigation Plan.	
	\$\$\$	d. Locality has identified funding for non-CIP coastal resilience projects, including priority needs of vulnerable populations impacted by coastal storm hazards.	

4.2 COASTAL RESILIENCY IN COMPREHENSIVE PLAN:

/ 4 Points

A comprehensive plan is a locality's vision for future land use, development, adaptation, and resilience. Coastal resilience can be addressed in comprehensive plans by incorporating elements such as green infrastructure, open space preservation, infill development, the National Flood Insurance Program (NFIP), the Community Rating System (CRS), and stormwater management. The ideal comprehensive plan identifies equity and the need to identify and support socially vulnerable populations as a priority for resilience, as well as a priority preference for restoration, green infrastructure and connectivity.





Points		Scoring Metric	Notes
		a. The comprehensive plan discusses how community engagement around coastal resilience informed the plan.	
		b. The comprehensive plan includes clear discussion of coastal resilience and coastal storm hazards and incorporates assessments to inform the development of policies to reduce vulnerability to coastal storm hazards.	
		c. The comprehensive plan includes goals and objectives for preserving and protecting natural resources that mitigate coastal storm hazards.	
		d. The comprehensive plan addresses impacts on critical infrastructure and essential services from coastal storm hazards, particularly for impacts affecting socially vulnerable populations.	

4) PLANNING FOR RESILIENCE

4.3 LAND USE ORDINANCES:

/ 4 Points

A locality's land use ordinances (such as zoning, subdivision, and floodplain) should enact the locality's vision and policies laid out in its comprehensive plan. Land use ordinances can be used to conserve and protect natural resources, ecosystems, agricultural lands, and areas vulnerable to flooding. Localities are required to enact Chesapeake Bay Preservation Act ordinances and going beyond these ordinances provides greater resilience.

Points		Scoring Metric	Notes
	CRS 	a. Locality land use regulations protect areas vulnerable to flooding by limiting development inside the floodplain or encouraging development outside the floodplain.	
	CRS 	b. Locality land use regulations protect areas vulnerable to flooding by setting higher standards in existing flood zones or by designating additional flood zones beyond those designated by FEMA.	
	CRS 	c. Locality land use regulations protect areas vulnerable to flooding by setting buffers, including open space.	
	CRS 	d. Locality land use regulations protect areas vulnerable to flooding by using setbacks to protect flood-prone areas.	

4.4 INCENTIVES FOR COASTAL RESILIENCE:

/ 4 Points

Incentive programs encourage infill development and protect open spaces, while protecting flood-prone areas and critical ecosystems. Incentives should be developed with community input, with particular attention to consulting agencies and organizations working with or providing services to lower income and vulnerable populations as well as agencies and organizations working to build community resilience.



Points		Scoring Metric	Notes
	\$\$\$	a. Locality offers an incentive for achieving coastal resilience goals such as discouraging development in areas prone to flooding; protecting critical ecosystems; encouraging sustainable development; improving resilience in high-risk areas; and preserving natural assets.	
	\$\$\$	b. Locality offers a second incentive for achieving the goals listed above.	
	\$\$\$	c. Locality offers a three or more incentives for achieving the goals listed above.	
	\$\$\$	d. Locality develops incentives in consultation with agencies and organizations working with socially vulnerable populations.	

4) PLANNING FOR RESILIENCE

4.5 NATURAL RESOURCE PRESERVATION:

/ 4 Points

Natural resources are important to the locality's economy, environment, and quality of life. Natural resources also can help protect against coastal storm hazards and minimize damage from coastal storm events. The preservation of these critical natural resources is paramount to providing resilience for a coastal locality during these events. These actions should go beyond the required Chesapeake Bay Preservation Act Ordinance.

Points	Scoring Metric	Notes
CRS 	a. Locality has identified and mapped natural resources that are important for broad ecosystem health and which are at risk of being lost due to flooding and coastal storm hazards.	
CRS 	b. Locality has developed plans and policies that preserve and restore natural resources to increase coastal resilience.	
	c. Locality has programs with residents, civic organizations, and nonprofit organizations to educate community about the natural resource preservation plan and engage them in helping to implement the plan.	
	d. Locality is funding actions that implement the natural resource preservation plan.	

TOTAL SCORE FOR SECTION 4:

/ 20 POINTS

5) COMMUNITY ENGAGEMENT, HEALTH, AND WELL-BEING

5.1 PUBLIC INVOLVEMENT IN RESILIENCE PLANNING:

/ 4 Points

For community resilience, it is important to use meaningful engagement strategies where residents are able to provide feedback and suggestions through meetings, workshops, and surveys. To reach people of color and the elderly, media and social media that serves these populations is effective. Public engagement enables residents and other stakeholders to provide input to the locality. Better informed residents are better able to ensure their locality remains resilient to coastal storm hazards.

Points		Scoring Metric	Notes
		a. Locality has a written policy regarding the role of residents and businesses, schools and educators, institutional, nonprofit, faith-based communities veterans, and other stakeholders in coastal resilience.	
	CRS	b. Locality has staff dedicated to public engagement on coastal resilience, including a standing committee that addresses coastal resilience as part of its work.	
	CRS	c. Locality holds at least one public meeting per year, including one in vulnerable resident areas to address coastal resilience issues and posts the results of the public meetings. For 75-150,000, at least two such public meetings per year; for 150,000+ at least three per year.	
	CRS	d. Locality informs and engages vulnerable population about coastal resilience by using website, social media, media serving people of color and minorities, and faith-based organizations to enable them to provide suggestions about issues and strategies.	

5.2 PROVIDING COASTAL RESILIENCE INFORMATION TO THE PUBLIC:

/ 4 Points

The public needs free and open access to information related to coastal resilience and planning. Information sharing allows residents to understand their risks and the importance of resilience. Information should be shared easily and presented in a manner which is clear and easy to understand, and easy to access in ways that reach different populations in the community.

Points		Scoring Metric	Notes
	CRS	a. Locality provides to the public localized user-friendly information on coastal resilience, in digital and non-digital formats and in multiple languages where appropriate based on demographics.	
	CRS	b. Locality provides to the public localized user-friendly information to the public on coastal resilience, on a website (e.g., interactive maps).	
	CRS	c. Locality provides localized user-friendly information on coastal resilience in public spaces (e.g., public offices or library).	
	\$\$\$	d. Locality provides the public with localized, user-friendly information about economic costs and risks associated with coastal storm hazards.	

5) COMMUNITY ENGAGEMENT, HEALTH, AND WELL-BEING

5.3 CITIZEN LEADERSHIP & VOLUNTEER NETWORKS FOR COASTAL RESILIENCE:

/ 4 Points

Developing resident leaders and strong volunteer networks are important aspects of building a locality's health and wellness resilience. Leaders can be responsible for informing residents, expressing resident concerns, and assisting with local preparedness. Leaders can be called on during emergencies to assist residents in need and to assist with post-hazard recovery. Communities can build this capacity by offering volunteer opportunities to cultivate experienced, local responders.

Points	Scoring Metric	Notes
	a. Locality supports and invests in community-led initiatives on coastal resilience.	
	b. Locality offers training opportunities and education opportunities for resident leaders or volunteers to educate residents on what they can do to increase their resilience on individual properties or in neighborhoods.	
	c. Locality supports resident leaders or volunteers in community education and outreach efforts about coastal resilience by providing them with materials, speakers for gatherings, or support for resident action projects.	
	d. Locality highlights the work of resident leaders or volunteers in supporting and advancing coastal resilience, on its website, through social media, Facebook, awards, or other means.	

5.4 RESILIENT SYSTEMS TO PROVIDE FOOD, HEALTH, AND MEDICINE:

/ 4 Points

If a community's food, health, and medicine systems are not resilient before a storm, then the community may face a substantially longer recovery. Food, health, and medicine systems must be sustained before, during and after storm events, and are dependent on critical systems, including transportation and utilities. Lower-income and minority populations often already struggle to access food, health, and medicine, and are among the vulnerable populations during a coastal storm hazard.

Points	Scoring Metric	Notes
	a. Locality has emergency plans for provision of food, health, and medicines to residents, through its comprehensive, hazard mitigation, or other plans.	
	b. Locality has plans for providing food to vulnerable populations, areas for improvement, developed partnerships to address needs, and provided information on how to access food during emergencies and storms.	
	c. Locality has plans for providing healthcare to vulnerable populations, areas for improvement, developed partnerships to address needs, and provided information to residents on how to access healthcare during emergencies and coastal storms.	
	d. Locality has plans for providing medicine to vulnerable populations, areas for improvement, developed partnerships to address needs, and provided information to residents on how to access medicine during emergencies and coastal storms.	

5) COMMUNITY ENGAGEMENT, HEALTH, AND WELL-BEING

5.5 PHYSICAL AND MENTAL HEALTH FOR SOCIAL EQUITY IN COMMUNITY RESILIENCE: / 4 Points

To ensure that socially vulnerable and underserved populations do not experience disproportionate impacts from flooding and coastal hazards, a locality needs to be able to predict how its residents may fare during a coastal storm hazard event, and then help those who are most vulnerable. One key measure that can be useful to localities in this effort is the metric for “deaths of despair”— or the prevalence of suicide, cirrhosis of the liver, and overdoses – which can serve as a proxy for the locality’s physical and mental health, as persons who are suffering from depression and addictions are less likely to be able to respond effectively during a flood or other coastal hazard event. A locality with good physical and mental health will be better able to respond effectively to new or changing conditions as well as to recover from stressful events.

Points	Scoring Metric	Notes
	a. Locality maintains data on community physical and mental wellbeing and challenges through specific metrics, such as the metrics for “deaths of despair” (suicide, cirrhosis of the liver, overdoses).	
	b. Locality has met at least once annually with community partners to identify “trusted messengers” for communicating with vulnerable populations.	
	c. Locality has identified, or maps its vulnerable neighborhoods, and has done this in partnership with NGOs, faith- based organizations, and its health and community services board.	
	d. Locality has a plan with these NGOs, faith-based organizations, and health and community services board that helps its physically and mentally challenged vulnerable populations prepare for coastal flooding events, and that provides assistance to them during and after these events.	

TOTAL SCORE FOR SECTION 5: / 20 POINTS

Appendix B
Plan and Ordinance Review Instrument

Each of the plans and ordinances identified were independently scored by two reviewers. The three possible scores for each plan or ordinance element are as follows:

- 0** means no evidence of the indicator,
- 1** means the indicator was suggested/inferred/identified but not in detail, and
- 2** means the indicator was more fully described.

Those individual scores and averaged scores were reported in the tables below and are intended to highlight aspects of the plans and ordinances that directly align with a set of indicators based on the criteria established by the Virginia Dept of Conservation and Recreation for proposals requesting flood resilience funds (Virginia Community Flood Preparedness Fund Grant Program). This instrument also draws upon indicators from the RAFT Scorecard and the PREP Tool.

Table B-2: Ordinance scores.

	Reviewer 1	Reviewer 2	Reviewer 1	Reviewer 2	Reviewer 1	Reviewer 2
	Locality 1		Locality 2		Locality 3	
Is there a ZONING ordinance?						
Is there a floodplain district designation as part of the zoning ordinance or as part of a separate floodplain ordinance?						
Are homes, permanent structures, and critical infrastructure prohibited in the floodplain district?						
Are homes, permanent structures, and critical infrastructure limited or subject to restrictions in the floodplain district?						
Does the ordinance establish setbacks and/or buffers that protect flood-prone areas outside of the FEMA-designated Special Flood Hazard Area?						
Does the ordinance place limits on how much of a lot or land parcel may be covered by impervious surfaces?						
<i>Reviewer Mean Score</i>						
<i>Ordinance Mean Score</i>						
Is there a SUBDIVISION ordinance?						
Does the subdivision ordinance refer to flood risk or flood mitigation?						
Does the subdivision ordinance contain specific requirements intended to reduce or eliminate flood risk when a proposed subdivision is designed and platted (e.g., street design to avoid flooding)?						
Does the subdivision ordinance encourage the use of green infrastructure and/or NNBF in new developments?						
Does the subdivision ordinance refer to other relevant ordinances or policies (e.g., zoning or floodplain ordinances)?						
<i>Reviewer Mean Score</i>						
<i>Ordinance Mean Score</i>						

Is there an EROSION AND SEDIMENT CONTROL ordinance?						
Does the ordinance contain requirements related to changes (i.e., pre-development and post-development) in peak runoff rates after the proposed project is completed (e.g., estimated change in stormwater runoff)?						
Does the ordinance contain requirements related to the preservation or restoration of wetlands?						
Are there requirements for the creation and maintenance of stormwater management facilities or stormwater control devices as part of the site plan?						
Does the erosion and sediment control ordinance refer to other relevant ordinances or policies (e.g., zoning or floodplain ordinances)?						
<i>Reviewer Mean Score</i>						
<i>Ordinance Mean Score</i>						