

Setting the Scene: Using Visualization for Effective Coastal Community Resilience Planning

Submitted to:

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A handwritten signature in dark blue ink that reads "Sarah Crowell". The signature is fluid and cursive, with the first name "Sarah" and the last name "Crowell" clearly distinguishable.

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NOAA Coastal Management Fellowship Application for 2019 – 2021

Background and Introduction

The New York State Coastal Management Program (CMP) has operated under the auspices of the New York Department of State (DOS) since its federal approval in 1982. Although the DOS Division/Office name has undergone many changes over its 36 year history, the CMP responsibilities have remained constant. The CMP is now housed in the DOS Office of Planning, Development & Community Infrastructure (OPDCI) and healthy and resilient coastal ecosystems and economies are its primary focus.

To advance the resilience capacity of coastal communities along the Great Lakes OPDCI has developed a community-driven resilience planning process. The overarching goals of the resilience planning process are to: 1) identify actions that will increase community resilience; and, 2) build local capacity, empowering coastal communities to take the lead in local and regional implementation of identified resilience actions. The resilience planning process relies on effective, sustained, and diverse citizen participation, and is tailored, as appropriate, to reflect the challenges faced by and the needs and goals of coastal communities. Specifically, OPDCI staff is partnering with coastal communities to identify community assets, use scenario planning to assess communities' capacity to respond to future change, and identify implementable projects, strategies, and policies that build social, ecological, and economic resilience.

In order to responsibly develop and strengthen New York's ocean and lake-based economy, OPDCI is leading the State's offshore planning efforts. OPDCI partners with stakeholders and federal and state agencies to collect, analyze, and visualize spatial data to characterize natural resource and human use distributions; integrates spatial data and stakeholder input to identify appropriate development opportunities in the Atlantic Ocean and Great Lakes of Erie and Ontario; and, launched an online mapping application to make all of the spatial data the Office uses publicly accessible, currently over 700 datasets.

OPDCI has a long and strong history of helping the State respond to storm events, from ice storms to Hurricane Irene, Tropical Storm Lee, Superstorm Sandy, increasing extreme summer rain events and last year's high water event on Lake Ontario. The Office provides recovery and resilience planning expertise to communities affected by those events. We will continue to be called upon by state agency partners, such as the Governor's Office of Storm Recovery and NYS Office of Emergency Management, to provide technical and planning support.

Goals and Objectives

Develop a Scenario Planning tool(s) that will support three goals: community and regional resilience planning; Local Waterfront Revitalization Planning (LWRP); and, improved federal consistency review.

- **Goal 1 – Support Community and Regional Resilience Planning:** Develop scenario planning tools that allow for visualization of future conditions and effects of a suite of resilience measures on those future conditions. Scenario planning may include the use of virtual reality (VR) or augmented reality (AR) to simulate future scenarios.
 - Objective – research available technology, including VR, AR and any other emerging technology that may lend itself to development of a New York-centric scenario planning tool;
 - Objective – a recommendation report on scenario planning tool to be developed;
 - Objective - identify parameters that users will be able to input into the scenario planning tool;

- Objective – develop interactive scenario planning tool that enables communities to simulate and analyze future conditions (e.g., climate projections), deal with uncertainty, identify thresholds at which ecosystem services become reduced or lost, and evaluate the effects of proposed resilience measures (e.g., construction of a living shoreline);
 - Objective - allow visualizations of future conditions – from interactive maps to immersive VR/AR simulations.
- **Goal 2 – Support Local Waterfront Revitalization Planning:** Provide visualization tools that will allow communities to consider options during the development of a comprehensive Local Waterfront Revitalization Programs (LWRP) to improve public access, encourage coastal economic growth and sustainability and protect waterfront natural resources.
 - Objective – develop desktop and mobile mapping apps that can be downloaded on “smart” devices to allow community leaders and planners to visualize and identify:
 - potential risk to existing waterfront assets to assist in identifying resilience measures to protect existing and plan for future resilient,
 - public access points such as waterfront walks, kayak launches, recreational fishing access points, etc.
 - Objective – develop educational packets/online modules that will help the public understand complex ecosystems, such as infographics that communicate the services ocean ecosystems provide to New Yorkers and/or interactive “stories” that allow users to immerse themselves in a topic (e.g., benthic habitats offshore New York).
- **Goal 3 – Support Federal Consistency Review:** Provide ability to visualize effects of federal and federally permitted actions on New York’s coastal resources.
 - Objective – develop interactive scenario planning tool that enables New York State Coastal Management Program federal consistency reviewers to simulate and analyze future conditions and evaluate the effects of proposed projects (e.g., construction of a bulkheads, seawalls, coastal energy projects, etc.);
 - Objective - allow visualizations of future conditions – from interactive maps to immersive VR/AR simulations on mobile smart devices.

Milestones and Outcomes

The following milestones and outcomes have been developed to provide a general timeline and outcome schedule for the Coastal Fellow (Fellow) project. Based on the Fellow’s skill set, training needs and meetings with their core advisory group, the milestones, outcomes and anticipated completion dates may be modified as the project develops.

Certain activities, such as participating in meetings and planning sessions and providing technical feedback to groups charged with resilience planning, will occur throughout the fellowship. Thus, the Fellow will have the opportunity to develop long-term working relationships with a wide array of groups and industry professionals. The Fellow’s supervisor and mentor will work with the Fellow in developing a project plan, which will generally follow the milestone outcome schedule below:

- August – September 2019 Begin fellowship. Orientation at the Department of State. Subject area background research and review.
- September 2019 – March 2020 Identify need and propose method for developing scenario planning tool(s); research available technology, including VR, AR and assess feasibility; begin tool development.
- January-June 2020 Work with Ocean & Great Lakes resilience, coastal planners, consistency and Geographic Information Gateway (Gateway) development teams to identify needed functionality in scenario planning/visualization tools; research and design scenario planning tool(s).
- June-December 2020 Work with Gateway development team to develop scenario planning tool(s).
- January-August 2020 Pilot testing of scenario planning/visualization tool(s) for each Goal focus area, i.e. resilience planning, LWRP development and federal consistency review.
- September 2020 – March 2021 Refinement and improvements of scenario planning tools based on pilot testing
- March - August 2021 Lead public demonstrations of completed tools.

Project Description

OPDCI is responsible for managing the State’s federally approved Coastal Management Program and as the State’s planning agency is instrumental in helping communities plan for their future. The most recent tool OPDCI made available to New York communities is the Geographic Information Gateway (Gateway), which is described below. This project will involve working closely with the Gateway development team to outline and design functionalities required to leverage the Gateway in developing scenario planning tool(s) that will allow users to visualize future conditions. Tools such as these will transform the Gateway into a platform that uses Virtual Reality (VR) and/or Augmented Reality (AR) supporting decision-making. The scenario planning tools can be used in-person or webinar-based, desk-top or mobile smart devices. Scenario planning tools will be used to foster understanding of effects of extreme weather events (e.g. storm surge, sea level rise, extreme rainfall events, etc.) on community infrastructure and assets, allow the user to visually see the effects of potential resilience projects during extreme weather events. This capability could provide potentially critical context to New York’s resilience planning processes.

The project will also expand the scenario tool(s) functionality for use by communities developing Local Waterfront Revitalization Plans and for use by the Office’s federal consistency review professionals. Scenario planning tools will help communities visualize component projects identified as they develop their LWRP and federal consistency reviewers would be able to “see” what a proposed project would look like at the proposed location.

Visualization tools will be developed to be downloaded to “smart” devices. These apps will allow for onsite use of VR/AR technology. As is often the case with new technology, opportunities not previously foreseen become apparent as the development and use of the technology evolve. We fully anticipate additional types of scenario planning/visualization technologies will be identified during the development process and look forward to the unique perspective and innovative ideas a Fellow will bring to this project.

Finally, the project will result in the development of engaging, interactive scenario planning and educational tools, which will consist of communication and visualization techniques that help the public distill, understand, and relate to complex issues related to resilience and local community waterfront planning. The Fellow will work closely with OPDCI's resilience planning and LWRP teams to identify the needs a given tool would serve, define the tool's audience and scope, and gather, analyze, and synthesize the necessary data and information to ensure the tool(s) conveys information in an accurate and compelling manner. The Fellow will lead the selection, development, and testing of educational and scenario planning tools. The Fellow will be encouraged to explore innovative communication approaches that are widely accessible - from decision-makers to the general public. Examples of communication approaches include, but are not limited to:

- integrating VR technology to generate place-based visualizations that enable communities to visit remote locations and/or conceptualize future conditions, and;
- developing participatory activities that allow stakeholders to simulate future scenarios, assess the scenarios' effects from different perspectives (e.g., as a business owner, as an emergency responder, as a homeowner), and identify policies and projects that support sustainable economic growth and increase resilience.

Throughout the entire project, the Fellow will work closely with and be supported by the OPDCI Gateway development team, the Gateway development contractors, and OPDCI Ocean & Great Lakes staff, planning staff, and federal consistency review staff with significant opportunities for project management.

Work to be Built On

In 2006 New York passed the Ocean and Great Lakes Ecosystem Conservation Act. This law called for incorporation of Ecosystem-based Management principles into state decision making. One of the requirements of the legislation, (Environmental Conservation Law, Article 14) was to "...create an ocean and coastal resources atlas to make information available to the public and decision makers;". DOS developed a web-accessible mapping interface that made geospatial information related to ecosystem-based management available to the public and decision makers. The site operated from July 2008 until September 29th, 2015 when it was replaced by OPDCI's Geographic Information Gateway (Gateway).

The Gateway (<http://opdgig.dos.ny.gov/>) is a state-of-the-art, award-winning online mapping application providing public access to data, real-time information, interactive tools, and expert knowledge relevant to the OPDCI's activities throughout New York State. Interactive map viewers enable users to easily download, visualize, and explore geographic data. A Latest Conditions page provides access to real-time information across the State, such as water quality, tide levels, and beach conditions. Also included on this site are illustrated stories, which highlight case studies, showcase community success stories, and demonstrate how the Office uses available geographic information to improve planning and decision-making. The Gateway's suite of information and tools serves as a valuable resource for New York communities, an educational resource for schools and universities, and a guide for the responsible development of the State's resources.

Currently the Gateway focuses on the following program areas within OPDCI, the Atlantic Ocean, Great Lakes, South Shore Estuary Reserve, Waterfront Revitalization, and Climate Change and Resilience with additional data holdings centered around Long Island Sound and the Mohawk River Watershed. Two major functionalities related to collection/creation of recreational use data were added to the Gateway recently: harvest of social media posts related to recreation, and; a recreational use crowd-sourcing app downloadable

to mobile smart devices called RecIT. These were guided and designed as part of a past Coastal Fellow project. There is a draft work plan to update and expand the Gateway which includes development of more focus areas related to OPDCI programs, creation of more “stories,” such as a marine mammal story for the Atlantic Ocean focus area and shipwrecks of the Great Lakes and freshwater dune/barrier/lagoon system stories for the Great Lakes focus area, and new functionalities including more robust search functionality, and developing tools using data from the Gateway and using VR/AR capabilities to provide scenario planning/visualization to expand experiential and learning tools.

This Fellow project is an outgrowth and increase in functionality/build out of tools based on the framework and data available through the Gateway. The Fellow’s activities will focus on the following three project goals previously described:

- Support Community and Regional Resilience planning;
- Support Local Waterfront Revitalization Plan development, and;
- Support federal consistency review.

A number of project deliverables are expected to result from this fellowship, including:

- o A report with recommendations for scenario planning/visualization best practices, processes, tools and integration into our program.
- o Desktop scenario planning tool(s) (using VR/AR or similar technology)
- o Mobile app(s) that will allow for VR/AR visualization on a smart device (e.g. Google Cardboard).
- o Educational guidance, written, online, presentation, in use of the scenario planning tools.

The Fellow will advance resilience planning, storm event preparedness and spatial planning through development of scenario planning tools, and other geospatial decision support tools. From this project, the Fellow will gain a number of technical and policy-related skills that include organizing and analyzing geospatial data, VR/AR visualization techniques, GIS mapping and analysis, resilience and offshore planning policy and shoreline management strategy recommendation development, problem solving, and how to synthesize, visualize, and communicate complex coastal issues and concepts. The Fellow will be provided an opportunity to network with numerous State stakeholders, such as State agencies and non-governmental organizations. The Fellow will also have a unique opportunity to work with numerous federal agencies in addition to NOAA, including the Bureau of Ocean Energy Management (BOEM), the Federal Emergency Management Agency (FEMA), the US Geological Survey (USGS), the US Army Corps of Engineers, and possibly the Department of Housing and Urban Development.

Work in the Office is exciting and varied, the Fellow can also expect to work on or be involved with other projects and initiatives such as: assist with the Mid-Atlantic Ocean Data Portal management; assist with Gateway management; Mid-Atlantic Regional Council on the Ocean (MARCO) and Ocean and Great Lakes priority projects; work on a NYS Port & Marina Infrastructure database; participate in development of the Governor’s Office initiative to develop a New York-centric Environmental Justice online mapping application.

The ideal Fellow will have excellent organizational skills; proficiency in resilience measures and coastal processes; understanding and interest in coastal community planning, GIS skills including collection, organization, and development of geospatial data; GIS mapping and analysis experience; excellent visual design aesthetic, flexibility and ability to learn quickly; and, an interest in working through a stakeholder-based process to identify means to visualize alternatives. The Fellow should also possess a strong sense of

creativity and self-direction. A Fellow with experience in web development and statistical analysis and programming using open-source languages (e.g. R, Python) would be especially desirable. While the Fellow's primary responsibility will be to address the goals outlined in this proposed project, she/he will work closely and collectively with her/his supervisor and mentor, members of the Gateway development team, and various others to ensure that adequate support and feedback is provided.

The Fellow will work closely with staff whose specialties range from planning to science to landscape architecture to modeling, providing the Fellow with an opportunity to consider resilience planning from a diversity of perspectives. The Fellow will benefit from being in the unique position of acting as a bridge between these perspectives.

Fellow Mentoring

The Fellow will be a member of the New York State Department of State, Office of Planning and Development and Community Infrastructure (Office). Staff within this Office are responsible for administering the state's federally approved Coastal Management Program and have a variety of expertise related to coastal management and can offer support and advice based on years of experience. Office staff are currently engaged in a number of activities within the following program areas: local and regional planning, resilience planning, federal coastal consistency, watershed planning, Regional Economic Development, climate change & resilience, offshore planning, Brownfield Opportunity Areas and Downtown Revitalization. While interacting with all Office staff, the Fellow will primarily be working with Office staff on the Gateway development team and the Ocean & Great Lakes resilience team and will be supervised by the Director of the Ocean & Great lakes Program, Mike Snyder.

The mentor for the Fellow will be the Office's Deputy Director for Development, Jeffrey Herter. With guidance and direction from the supervisor and mentor, a project plan will be developed for accomplishing the goals and objectives of the fellowship. However, goals and objectives set forth for this effort will require a team-based approach to guide and provide feedback to the Fellow on this project. Therefore, from commencement of work through the project completion, the Fellow will work in a networked manner. In addition to the supervisor and mentor, the Fellow will have the opportunity to work with staff throughout the Office.

The Fellow will participate in and represent the New York Coastal Management Program at various meetings, conferences and workshops, including but not limited to: interagency meetings, office staff meetings, and regional resilience planning sessions. This will allow the Fellow to build a broad understanding of how coastal management is implemented at the state and regional level, while focusing on the specific issues of expanding resilience and planning tools. The Fellow will become involved in activities, which will further his/her professional development (e.g. special short-term coastal projects) depending on desire and project progress.

Project Partners

Through this project, the Fellow will have the opportunity to develop professional working relationships with a variety of groups and individuals currently engaged in resilience and offshore planning and adaptive shoreline management and living shorelines, community planners and federal consistency review professionals in New York. In addition to the Office, Gateway team, and the Gateway development contractors (Stone Environmental), the Fellow will have the opportunity to work with local waterfront communities, other state agencies including the Department of Environmental Conservation (DEC), the Office of General Services (OGS – responsible New York-owned lands), New York State Energy and Research Development Authority (NYSERDA), Governor's Office of Storm Recovery (GOSR), Office of

Parks Recreation & Historic Preservation OPR&HP) etc. and federal agencies other than NOAA, such as the US Army Corps of Engineers, BOEM, FEMA, and USGS.

Cost Share

The New York State Department of State, Office of Planning & Development will provide the Fellow with a work area complete with a personal computer with Microsoft Office, ArcGIS, and a telephone. The Fellow will be set up with a State ID to gain access to state buildings, a State e-mail account, and access to network data drives. The Fellow will also have access to shared printers, office supplies, mailing, secretarial support, necessary training and pool resources that include Office laptops and projectors, and other specialty software for presentation and document design needs.

The Office has received NYS Division of Budget approval to expend the required cost share of \$15,000 non-federal fellowship match over 2-years.

Strategic Focus Area

Although this project has components that relate to all three focus areas, this project is directly related to “Healthy Coastal Ecosystems” and “Resilient Coastal Communities”. The Fellow will work with the OPDCI Gateway development team to: 1) develop scenario planning tool(s) (using VR/AR or other related technology); 2) develop mobile app(s) that will allow for onsite visualization using smart devices, and; 3) create educational tool(s) (including story maps and potentially using VR technology).

Further, the proposed project incorporates the following goals and objectives identified by NOAA for the coastal fellowship:

Healthy Coastal Ecosystems

- Increase and enhance opportunities for the public, students, and teachers to experience, understand, and appreciate coastal resources and make informed environmental decisions.
- Support coastal and ocean resource managers through cooperative funding, data, information, tools, training, technical assistance, analysis, and exchange of best practices to strengthen ecosystem policies, build capacity, and implement prioritized management efforts.

Resilient Coastal Communities

- Increase public awareness of coastal hazards and actions that can be taken to reduce the loss of life and property.
- Build capacity to pursue strategies such as hazard preparedness, mitigation, and post-hazard redevelopment planning by providing an integrated suite of data, information, training, technical assistance, cooperative funding, and policy tools to coastal communities.
- Identify and engage partners in maximizing the understanding, visualization, and application of risk-wise strategies.

Vibrant and Sustainable Coastal Economies

- Promote policies and practices that foster trust, transparency, predictability, and efficiency in government decision-making for coastal and ocean uses.
- Assist coastal decision makers in conserving active and passive recreational uses and in preparing for existing and emerging coastal and ocean uses by providing socioeconomic data, information, visualizations, technical assistance, funding, and tools.
- Understand, quantify, visualize, and communicate ecosystem services of key natural areas along the coasts to inform decision-making.