

Tapping Crowd-Sourced Information to Improve Healthy Coastal Ecosystems and make New York Coastal Communities more Resilient: Expanding the New York Geographic Information Gateway (Gateway), a Tool for the Public and Decision-makers

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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 33 year history, the CMP responsibilities have remained constant. The CMP is now housed in the DOS Office of Planning & Development (OPD) and healthy and resilient coastal ecosystems and economies are its primary focus.

To advance the resilience capacity of coastal communities along the Great Lakes and South Shore of Long Island, OPD is leading 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 the 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, OPD 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, OPD is leading the State's offshore planning efforts. OPD 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, recently built an interactive website to make all of the spatial data the Office uses for offshore planning publicly accessible.

OPD 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 and increasing extreme summer rain events. 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

Expanding New York's Geographic Information Gateway (Gateway)¹ with functionality and tools that will support three goals: community and regional resilience planning; offshore planning in the Atlantic Ocean, Long Island Sound and in New York's Great Lakes; and, providing assistance to the Governor's Office of Storm Recovery and NYS office of Emergency Management during and after storm events.

¹ <http://opdgig.dos.ny.gov>

- **Goal 1 – Support Community and Regional Resilience Planning:** Develop mapping tools that allow for the collection of community information via remote participatory Geographic Information System (pGIS) sessions and user-generated information through mobile devices. Develop scenario planning and educational tools, which may include the use of virtual reality (VR) to simulate future scenarios and make remote ecosystems publicly accessible.
 - Objective – develop “wiki-mapping” tools that enable users to easily contribute data to a mapping interface delivered via the Gateway, OPD’s interactive mapping and public outreach website.
 - Objective – develop mobile mapping applications (apps) that can be downloaded on “smart” devices to enable the creation of crowd-sourced datasets, such as the identification of community assets and locations/facilities subject to repetitive inundation or loss from extreme weather events. Identifying important social, ecological, economic, and infrastructure community assets is the first step in OPD’s resilience planning process.
 - Objective – develop interactive scenario planning tools that enable 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). Examples of interactive scenario planning tools include a community-driven framework for creating future scenarios, role-playing activities that enable stakeholders to experience a future scenario(s) from different perspectives, and visualizations of future conditions – from interactive maps to immersive VR simulations.

- **Goal 2 – Support Offshore Planning:** For each area offshore New York - the Atlantic Ocean, Long Island Sound, and Great Lakes - provide a means to collect information on human use activities in the offshore environment. Provide experiential learning tools for the public and decision-makers that will help develop empathy for ecosystems and their components.
 - Objective – develop mobile mapping apps that can be downloaded on “smart” devices to enable the creation of crowd-sourced datasets, such as recreational fishing, boating, and diving experiences. For example, using the mobile app, users can log an event (“I caught this awesome fish”) at a specific location and append supplemental information (images, descriptions, etc.), which will then be synthesized by OPD, added to the Gateway, and used to support planning efforts.
 - 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 Storm Event Response and Recovery:** Be prepared to provide informational support to state agency partners during and after storm events.

- Objective – develop mobile mapping apps that can be downloaded on “smart” devices to enable creation of crowd-sourced datasets, such as inundation conditions or tracking of marine debris.

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:

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|----------------------|---------|--|
| ➤ August – September | 2016 | Begin fellowship. Orientation at the Department of State. Subject area background research and review. |
| ➤ September – March | 2016-17 | Identify need and propose method for developing an educational tool; research available technology, including VR, and assess feasibility; begin tool development |
| ➤ January-June | 2017 | Work with Gateway Development Team to identify needed wiki-mapping functionality for the Gateway’s mapping interface; research and design wiki-mapping tools |
| ➤ June-December | 2017 | Work with Gateway Development Team to research mobile apps; identify need and define purpose and audience; begin designing interface |
| ➤ March - September | 2017 | Test and refine educational tool; work with Gateway Development Team to develop scenario planning tools |
| ➤ July – December | 2017 | Lead pilot testing of wiki-mapping tool by organizing pGIS sessions for data collection |
| ➤ January-August | 2018 | Pilot testing of mobile app to collect user- |

		generated data; refine app interface design based on user feedback
➤ June-August	2018	Lead public demonstrations of completed tools

Project Description

OPD is the State’s planning agency and has been instrumental in helping communities plan for their future. The most recent tool OPD made available to New York communities is the Gateway, which is described below. This project will involve working closely with the Gateway Development Team to outline and design the functionalities required to add a map interface to the Gateway that allows users to contribute their own data interactively. This wiki-style mapper will transform the Gateway into a platform that supports a two-way flow of information, encouraging public participation and leveraging local knowledge. The wiki-mapping tools can be used via in-person or webinar-based pGIS sessions to collect valuable community and offshore user information. Information collected will be used to foster user-driven science, identify community assets, and better understand how New York’s offshore resources are being used – all of which are critical components of New York’s resilience and offshore planning processes.

The project will also expand the Gateway’s ability to collect user-generated information by developing mobile apps that can be downloaded to “smart” devices. These apps will allow for the efficient collection of crowd-sourced information that will provide invaluable geographic data for offshore and resilience planning activities and response and recovery efforts. At this time we envision the following information can be collected via crowd-sourced applications: community assets and repetitive loss properties/infrastructure to supplement information collected through the pGIS process for use in resilience planning; recreational fishing, boating and dive sites for use in offshore planning efforts; and, real-time inundation recording and marine debris tracking for storm event response and recovery. 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 crowd-sourced geospatial information 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 offshore planning. The Fellow will work closely with OPD’s resilience and offshore planning 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 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: evolving the Gateway's public outreach tools;² 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 OPD Gateway Development Team, the Gateway development contractors, and OPD planning 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 OPD's Geographic Information Gateway (Gateway).

The Gateway (<http://opdgig.dos.ny.gov/>) is a state-of-the-art website providing public access to data, real-time information, interactive tools, and expert knowledge relevant to the OPD'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 two program areas within OPD, the Atlantic Ocean and Climate Change and Resilience. There is a draft work plan to update and expand the Gateway which includes development of more focus areas related to OPD 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 under-development Great Lakes focus area, and new functionalities including more robust search functionality, wiki-mapping capabilities to capture crowd-sourced information and exploring the possibilities of adding VR capabilities to expand experiential and learning tools.

The Fellow's activities will focus on the following three project goals previously described:

- Support Community and Regional Resilience Planning;

² For an example of existing public outreach tools on the Gateway, please see: <http://opdgig.dos.ny.gov/#/storyTemplate/3>

- Support Offshore Planning, and;
- Support Storm Event Response and Recovery.

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

- An interactive online mapping interface with wiki-mapping tools.
- Mobile app(s) that will allow for the collection of crowd-sourced information.
- Scenario planning tool(s) (potentially using VR technology)
- Educational tools(s) (including story maps and potentially VR technology)

The Fellow will advance offshore and resilience planning and storm event preparedness through development of pGIS interactive mapping functionality on the Gateway, user-driven data collection apps, 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, GIS mapping and analysis, offshore planning policy, resilience planning policy and shoreline management strategy recommendation development, problem solving, and how to synthesize, visualize, and communicate complex coastal and offshore 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.

The ideal Fellow will have excellent organizational skills; an in-depth knowledge of offshore planning (aka CMSP), resilience measures and coastal processes; prior GIS skills including collection, organization, and development of geospatial data; GIS mapping and analysis experience; flexibility and ability to learn quickly; and, an interest in working through a stakeholder-based process to identify, locate, characterize and prioritize key offshore use areas. 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 (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. While interacting with all Office staff, the Fellow will primarily be working with Office staff on the Gateway development team and will be supervised by a co-manager of that Team, Liz Podowski King, a former Coastal Fellow.

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 on the Gateway. 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 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 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), 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 will cover the required cost share to total \$15,000 of 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 OPD Gateway development team to: 1) develop an interactive online mapping interface with wiki-mapping tools; 2) develop mobile app(s) that will allow for the collection of crowd-sourced information; 3) develop scenario planning tool(s) (potentially using VR technology), and; 4) 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

- Build innovative natural and social science research capacity, products, and applications that reflect user-driven science, and synthesize, visualize, communicate, and transfer research results to strengthen policies and decisions, and effectively manage coastal and ocean resources.
- 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.
- Develop and support coastal observing networks and provide integrated data, tools, and information to decision makers for understanding, visualizing, and communicating the state of the nation’s coastal and ocean natural resources, including thresholds at which ecosystem values and the services provided become reduced or lost.

Resilient Coastal Communities

- Foster user-driven science and assessment efforts to enhance understanding of natural, social, and economic impacts of coastal hazards and climate change, and the approaches needed to adapt to and communicate about these threats.

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.