Maryland Sea Grant: Climate Integration Specialist Recommendations

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This memo presents recommendations for Maryland Sea Grant (MDSG) to support the integration of climate science in state-to-local decisions in Maryland. The recommendations are based on an assessment of stakeholder needs, an analysis of regional scientific expertise, and interviews with key stakeholders and climate specialists in other states.

KEY POINTS

- There is a need for a climate extension specialist in the region who can translate and contextualize climate impact science to support community-scale decisions.
- Building bridges between the resilience silos to create a broader network, developing a climate niche, and developing a market for climate services will be key to the specialist's success.
- In addition to the climate extension specialist, there are opportunities for strategic deployment of funding, resources, and network building activities that could accelerate progress for near-term MDSG strategic priorities on coastal climate resilience.

MARYLAND CLIMATE RESEARCH PRIORITIES

Stakeholder science needs were identified through both a document analysis of stakeholder focused documents and individual or group semi-structured interviews (n = 28 total individual participants) with stakeholders and climate extension specialists in Maryland and surrounding states. Near universally there was agreement than there is a need for better science translation services to support climate-resilient decisions. This translation is not in the form, necessarily, of decision support tools, but was articulated more in terms of effective communication and experts to engage at the science-policy interface. How to support this need is discussed further in the sections on Networks and Engagement and Climate Extension Specialist. Research needs identified through the document analyses is presented in the Stakeholder Needs section.

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Multiple interviewees emphasized the importance of starting with decisions and bringing relevant science to support those decisions. Several also highlighted access to major climate impact data, which is either customized for use in decisions or where access to an expert to help contextualize the the information, would help wade through what seems like an overwhelming amount of information but never exactly what is needed. As one interviewee stated, there is a lot of information that already exists and limited capacity for most municipalities to identify and to synthesize the relevant science. Thus, contextualizing information for the relevant timeframes, usually a 30 year mortgage cycle or less, is a key role for a climate specialist.

In addition to expressing a need to support evidence-based decisions, there were several topical areas that were highlighted as important foci of coupled research and engagement to support high priority decisions occuring in Maryland. These priorities include foci on impacts, decisions, and socio-environmental systems.

- Focus on a particular climate impact and support a range of decisions.
    - Key Maryland climate stressors include sea level rise, heat, nuisance flooding, and
    - storm flooding. These impacts affect a range of decisions and the emphasis could be determined through strategic focus on particular decision-making approaches, locations, or sectors.
- Focus on municipal decisions and science needed to support these decisions and the ways to integrate climate into existing planning and decision requirements frameworks.
    - The main existing mechanisms where climate could be incorporated into existing decision processes include Comprehensive Planning, Hazard and Mitigation Plans, Planning and Zoning, and Capital Improvement Projects. Additionally, there are community incentive programs, such as the Community Rating System (CRS)[2], which can support capacity building and adaptation projects that will increase hazard resilience.
    - Two approaches that may be helpful in supporting these planning efforts that were highlighted by interviewees would be to update the FEMA flood maps so that they better reflect local conditions. And to use this coupled with other information to conduct a vulnerability assessment, perhaps using VCAPS, that is more closely tied with implementation and action.
    - Over time, it would be useful to explore multi-jurisdictional solutions that will strengthen regional resilience and to identify entry points for planned community migration options.
- Focus on watershed planning and the intersection of climate and water quality.

[2] https://www.fema.gov/national-flood-insurance-program-community-rating-system

    - Given the recent ruling that climate can be incorporated into Chesapeake Bay TMDL[3], there are questions and opportunities to consider how this will be incorporated into the Watershed Implementation Plans (WIP) and associated best management practices (BMP) actions. Given that many communities are already struggling with meeting nutrient reduction targets, figuring out BMP efficiency for stormwater given future climate impacts (e.g., localized flooding), including incorporation of extreme precipitation impacts and economic analyses, to assess return on investment (ROI) would be useful for many Maryland jurisdictions. Agriculture BMPs is also an open question, but it is likely better handled by agriculture extension.
- Focus on socio-economic analyses to support decisions.
    - Several interviewees highlighted the importance of socio-economic consequences. The specific analyses are decision-dependent, but there might be an opportunity to partner with economists and decision scientists to support general or generalizable approaches that will improve decision quality.
- Focus on ecosystem management and impacts, both the incorporation of green infrastructure solutions in cities as well as protection and land conservation of natural areas.
    - There were research questions focused on making the case for green infrastructure solutions for coastline resilience as well as inland stormwater systems. There are unresolved questions related to the effectiveness of these systems, which is important for assessing tradeoffs between structural and non-structural infrastructure solutions.
    - Additionally, there were statements about assessing anticipated migration of key ecosystems, such as wetlands. Understanding migration patterns expected in the next 30-50 years would allow for consideration of policies, expansion of Open Space, and strategic purchasing decisions to ensure that there is not a net loss of systems because of a lack of migration corridors.
- Focus on fisheries and aquaculture impacts given climate change.
    - The implications of climate impacts, such as acidification, are still uncertain for the Chesapeake Bay and key fisheries metrics, such as species stocks. Additional information would support decisions for these systems, commercial and recreational fisheries, and aquaculture sector.

It is impossible for one person or one program to address all these focus areas. Thus, it would be useful to narrow priority approaches or topic areas that will allow for specialization and deeper investments where implementation and action may be more feasible on shorter time scales. As a result, several interviewees highlighted the importance of demonstration projects to show

[3] https://insideepa.com/daily-news/officials-agree-weigh-climate-change-issues-chesapeake-bay-tmdl

decision-makers solutions and effective planning processes. One such demonstration project is the Deal Island Peninsula Project[4]. This project was effective in understanding community values and an individual, citizen-level perspective on change and resilience. It would be useful to consider other demonstration projects that highlight opportunities for municipal and community level planning and actions. An example of such an effort is the design collaboratory focused on producing adaptation designs, strategies, and tools to support two communities outside of Norfolk, VA[5].

Other topics mentioned by one stakeholder, but did not constitute majority opinion, include the intersection of climate and human health, insurance and reinsurance decisions and implications, climate greenhouse gas reduction program adoption, and metrics for success of resilience efforts.

The specific topical focus should be chosen as a result based on the expertise of the best person for the climate specialist position given the criteria. All things equal, someone who has expertise in flooding and community decision-making addresses challenges faced in both the Eastern Shore, Western Shore and inland counties as well as a key climate impact of concern to municipalities in Maryland.

In addition to topical areas, there were strong sentiments about the types of populations that ought to be supported. There was agreement that communities needed to be part of the solution, but that it might be useful to revisit the target populations. Specifically, interviewees highlighted that, many of the resilience efforts have been focused on urban areas because of the numbers and density of people and properties that are affected by climate impacts. However, there needs to be increased attention is needed for rural areas and underserved communities who have less access to university and other planning services. Pragmatically, this means that with limited resources, there should be a stronger focus on Eastern Shore communities or marginalized communities in Western Shore counties. There are inroads via MDSG extension to working in the Eastern Shore that could be capitalized on while new relationships are built with high priority populations. Additionally, there is a limited window of time to develop solutions given the projected land loss in the next 30 years.

As stated by one of the interviewees, "Environmental issues are social justice issues." If we are not addressing these challenges jointly we are not addressing the whole problem.

NETWORKS AND ENGAGEMENT

The Maryland, and the Chesapeake Bay watershed more broadly, is region that has well-established organizations and stakeholder networks. The challenge, however, is that these established entities are siloed. There is a need to break down the resilience silos to better connect existing networks.

[4] https://www.dealislandpeninsulaproject.org/
[5] http://wetlandswatch.org/design-collaboratory/

Coupled with this there is a need to build capacity and connections between communities and academic scientists. These relationships, in part because of the professional incentives for engagement, would benefit from an extension specialist who understands the science and the potential policy leverage points at the Federal, state, and local levels.

The stakeholders and communities would benefit from an extension specialist who can manage relationships. There is increased attention to community engaged research; thus, it is important to minimize stakeholder fatigue, assure researchers do their homework on stakeholder needs, and that attention and research support are distributed amongst communities. The stakeholder needs assessments (see section below), including the author/organization analysis, provide useful starting points for understanding stakeholder stated needs to support evidence-based decision-making. The stakeholder needs assessment was how South Carolina identified the key stakeholders in their region and recruited participation for their once every 2 years Carolinas Climate Resilience Conference.

Finally, because change is occurring rapidly along the Eastern Shore of Maryland, one of the recommendations to engage community members, and document change is to develop a story or memory map.[6] Memory maps document community change for the locations and infrastructure the community members view as important. It may be a way of starting conversations with certain populations or sub-populations whose voices have been marginalized to better understand what they view as important in their community. This process of listening and understanding could, over time, lead to opportunities to better and engage and build capacity to support resilience efforts within their community. It could also be developed in collaboration with historians and artists, who would provide a different perspective of community change and resilience.

STRATEGIC DEPLOYMENT OF FUNDING AND SUPPORT

One of the most important mechanisms that MDSG possesses to shape regional scientific priorities and move science to action is through its grant program, workshop funding, and graduate fellow support.

It may be useful for a 2-year or 4-year time period to make strategic investments for a significant proportion of funds to focus on particular research topics. Concentration of resources for a period of time would allow for a deeper view of multiple aspects of the same coastal resilience challenge. A year before the request for proposals is released, MDSG could convene experts and stakeholders together to discuss research ideas. Multiple funded projects on a particular topic or in a particular location would create a cohort of researchers who could be convened once a semester (3 times per year) to coordinate research and explore synthesis across projects. One of the PIs could be selected,

[6] e.g., https://www.annapolis.gov/1324/Weather-It-Together-Story-Map

and provided a small additional increase in their funding, to coordinate across PI teams; this is a model used commonly by NASA for mission-focused proposal calls.

Several stakeholders recommended that MDSG incentivize multidisciplinary research that is focused on addressing community defined decision-needs with more money and potentially more time because team science, especially with new collaborations, requires more time for effective integration and synthesis. To motivate these collaborations, research opportunities should be focused on challenges faced by Maryland communities that require a multifaceted approach. Additionally, the extension specialists may be able to help facilitate the connections between academics and communities, similar to the role played by the climate specialists in South Carolina.

Workshops can be strategically deployed to bring scope community challenges and bring academics together to address the scientific challenges with planning, implementation, and evaluation. It may be useful to explore a community led and focused approach, similar to the American Geophysical Union Thriving Earth Exchange (AGU TEX)[7]. This approach could also be used to incentivize and explore collaboration across jurisdictions. In addition to funding the workshop, I recommend funding 2 weeks of time to support planning and development of products by the workshop lead or co-leads. This incentivizes the production of products after the workshop and allows for inclusion of academics and stakeholders who do not have the ability to volunteer more than a day or two of work time.

Graduate student funds could be strategically deployed to bump-up strategic priorities. This approach would replace the competitive process and would be used as an incentive for investment for research in certain topic areas, locations, or with vulnerable populations. It may also allow for the graduate student cohort to work together with the PIs on a synthesis product, allowing them to also build skills in team science, multidisciplinary synthesis, and community engaged research.

Finally, there is a mismatch of professional incentives and funding for science to support decisions and implementation of those decisions. Communities need to be more than just case studies for academics. It might be worth exploring some funding that would help to bridge these gaps, in part through implementation of demonstration projects. Demonstration projects were highlighted by several stakeholders because of their utility for being able to "show and tell" examples to decision-makers. Additionally, these could be field sites that would allow for scientific assessments of efficiency rates over time. Projects that seek to include both scientific and implementation objectives may need to be achieved through funding bump-ups or matching funds that facilitate both goals.

[7] https://thrivingearthexchange.org/

CLIMATE EXTENSION SPECIALIST

There was general consensus that a climate extension specialist would fill a currently unmet state need and be useful investment by MDSG. Specifically, there was universal agreement that there is need to more effectively translate existing climate science and impacts and contextualize the information, with uncertainty, to support coastal community resilience decisions. Additionally, many interviewees stated that there was a need to manage the interface between academics and community decision-makers so that projects met the goals of both groups. Thus, climate extension specialists would fill a critical unmet need because they are boundary spanners.

This job is not for everyone. There was agreement that it was more important to get the right person than the right expertise. It is necessary to have someone with an "extension personality" who is comfortable in both the science and policy worlds and can communicate effectively in both spheres. They need to translate science to support action without advocacy. They need to be able to engage in municipal planning processes and be comfortable learning the tools for incorporating climate into these processes (e.g., vulnerability assessments, SLR strategies). They need to be a systems thinker who understands the interconnections between science, policy, and people in coastal Maryland communities. They need to be a team builder and a team player. Building relationships and trust is critical to the specialists success. And finally, within the climate extension space they need a specialization. It is impossible to cover all potential decision foci; thus, carving out a climate niche can better support communities and develop a more specific market for extension support. Training via Sea Grant academy was stated as helpful for quickly learning the Sea Grant culture. There is also discussion of developing an informal mentoring/training network of climate extension specialists (which may be only internal or also include experts hired outside of Sea Grant). The latter may be jump started by having conversations with other Sea Grant colleges to see if each would be willing to chip in $5K to formalize this network, which could more quickly on board climate extension specialists and facilitate cross state learning and experimentation.

Activities that are commonly undertaken by climate specialists include attending lots of meetings, giving audience- and decision-specific talks, translating uncertain science for users and decisions, and leveraging additional funds to support evidence-based action. Skills in evaluation can be a useful research activity to rigorously assess the programmatic goals and accelerate learning and improvement for implemented projects. Which means that it is necessary to create a space for failure, learning, and improvement. Professional evaluation metrics should not be based solely on the success of an initiative because it skews data collection, rewards safe bets, and disincentivizes strategic experimentation.

To facilitate the success of the climate extension specialist, it is important to identify at least one early win project that they can lead or be a part of team that will allow them to quickly build

relationships with key stakeholders. The specialist can build on these early successes in future years. All of the climate specialists interviewed, identified this recommendation as one of the catalysts to their success in pursuing more risky projects or those with a longer payoff time once they were established. Thus, it would be useful to identify existing MDSG extension projects where a more explicit consideration of climate would improve the planning and decision-making. This will help to get over the dreaded hurtle about where to begin and prioritize when there are so many needs and opportunities, but not necessarily the demand.

Additionally, efforts, such as the Casual Climate Group, could be built out into a signature program, similar to the Virginia Sea Grant Forums that have both facilitated learning about key climate topics, allowed for informal networking between academics and practitioners, and is now self-funded through sponsorships. These have also facilitated collaborations between academics and communities that led, in part, to several of the research and implementation grants in the Norfolk area.

For the job interview, South Carolina Sea Grant asked each of the candidates to do an exercise that was similar to what the specialist would be asked to do in their role. Specifically, they were asked to write and do a short briefing on a climate-related topic (e.g., sea level impacts). This helped to narrow the field of candidates to those that understood the science, could communicate clearly, and understands a risk-based framing.

Though this position is currently set up solely through MDSG, it might be useful over time (and ideally as a program builds) to consider positions that are jointly funded with the university or particular university centers and initiatives. These are facilitated through a memorandum of understanding (MOU) and have worked well to promote program building and grant writing when there are common goals for both organizations where a shared position makes sense.

5-year Plan and Goals for Climate Extension Specialist

The goal for a climate extension specialist is to build a market for climate extension. Maryland already has state-level climate policies and initiatives that provide top-down support. And coastal communities are already experiencing negative impacts from sea level rise, flooding, and heat, creating an opportunity to consider these impacts more explicitly in planning and implementation activities. Key to creating such a market will be developing a signature program that helps to build networks, support decision-informed science, and research-to-action at the community to state level.

Within 5 years it is reasonable for a climate extension specialist to facilitate work in several coastal communities, feeding into their planning and decision processes. Additionally, they ought to be a recognized expert on climate vulnerability along the coast and able to help communities work

towards climate-resilient solutions that they deem are in their best interest. They should have a good handle on both the scientific funding landscape as well as funding to support implementation of community-determined solutions. With this knowledge they should be able to catalyze action and bridge between academics and practitioners, including helping to direct academics so that particular communities are not overwhelmed with requests and others unable to develop partnerships.

Giving funding levels, it is likely that the specialist will be a recent graduate, postdoctoral scholar, or professional fellowship (e.g, Knauss Fellowship or AAAS Science and Technology Policy Fellowship). As a result, they may have the skills, knowledge, and personality to be successful, but not the experience, so the specialist will need to figure out how Sea Grant works, the stakeholder networks in the region, and will need to build relationships with stakeholders. Thus, creating a space for both early wins and integration into the MDSG network and climate extension specialist community will be key. Equally important will be fostering a willingness to learn and improve from failures; this is especially critical for strategic priorities that may require experimentation or engagement with communities and vulnerable populations where there are not currently MDSG relationships.

Below is a 5 year strategy that provides pragmatic, yet aspirational, goals for a climate extension specialist based on insights from those who have served in this role in South Carolina, North Carolina, and Virginia.

Year 1

The first year the climate extension specialist will be working to build relationships, supporting and being integrated into existing extension projects or funded projects. It is helpful to have a few projects where the specialist can directly work on with others to build skills, relationships, and get an early win. Additionally, the specialist should establish a presence in the region by meeting all the key stakeholders, learning what is going on, and doing a stakeholder needs assessment. Because this project funded a stakeholder needs assessment, the specialist can use this assessment as a starting point, especially for understanding key stakeholders who are shaping the discussion through participation in regional stakeholder events focused on climate decisions. If the specialist is already connected in the region, understanding major regional issues and establishing a presence will likely require less time and time can be redirected towards developing relationships with communities who have not been part of the existing stakeholder processes. Additionally, they should be giving audience-specific climate impact talks, as requested; existing extension specialists can help to facilitate this exposure.

Additionally, the specialist should construct an advisory committee and start working on scoping or building out a signature project that directly addresses stakeholder needs that are not being

addressed elsewhere in the region. This may flow from building out a nascent effort, such as the Casual Climate Group into something bigger like the Virginia Sea Grant Forums, or it may flow from opportunities to support communities, such as the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS)[8]. To support these efforts the specialist should start identifying funding opportunities and being incorporated into grants. If the specialist does a good job of building networks and getting some early-win projects the first year, the work flows afterwards.

Year 2-3

By this stage, the climate extension specialist ought to have a known presence in the region. In years 2-3, the climate specialist should start a new project, ideally funded with outside grants, given the groundwork completed in the first year. The specialist should be building longer-term, deeper relationships with academics and stakeholders, evidenced by being embedded within existing stakeholder networks, contacted for advice, invited to events, and being included in grants in the proposal development phase.

Once you establish the relationships with the communities, you can more easily and successfully write grants with communities, work on projects, products, and actionable planning documents. Though other programs have prioritized communities based opportunities and communities that are interested in engaged, it might be useful to figure out the right balance between being responsive to proactive communities and building bridges to communities that have higher environmental or social vulnerability.

For community centered projects, planning assistance is a first step and easier win. It may be useful to develop resilience partners who can work together, pulling on each group's strengths, which may help communities move communities beyond the first step of resilience.

In three years, it will be difficult achieve impact, as defined through Sea Grant evaluative metrics, with more than one project/community, but there should be a clear pathway for demonstrating impact at the end of 5 years.

Year 4-5

By years 4-5, the initiatives started by and those that involved the climate extension specialist should start achieve impact (e.g., change policy, implement project) as defined by the Sea Grant metrics.

[8] http://www.vcapsforplanning.org/

For a typical community project, it can take 4-5 years to achieve impact instead of an incremental metric.

In addition to continuing to set up new opportunities, it is important to develop a 5 year strategic plan for the next stage of the climate extension work. This ought to consider building capacity for working across jurisdictions instead of with single communities or organizations. Additionally, if there is sufficient demand, program success, and external funding, it would be useful to consider building out a larger team that can better serve communities.

STAKEHOLDER NEEDS

The Chesapeake Bay Watershed, consisting of Delaware, Maryland, Pennsylvania, New York, Virginia, West Virginia, and the District of Columbia, is often categorized as part of other region groupings of the U.S., for example, portions are categorized as part of the Northeast and Southeast.[9] While the Chesapeake Bay Watershed is often categorized wholly as the Mid-Atlantic, there lacks consistency in states that are included in this region. The lack of consensus on defining the Chesapeake Bay region presents challenges for the stakeholders in this region that have unique needs for adapting to climate change.

This analysis includes documents from all states in the Chesapeake Bay Watershed and New Jersey. Documents in this analysis were collected via Internet searches for documents that explicitly discussed climate, such as "climate variability" and "climate change". The dataset includes 72 documents spanning the years 2007 to 2017. See Figure 1 for documents by publication year.

[9] Melillo, J. M. (2014). *Climate change impacts in the United States: the third national climate assessment*. Government Printing Office.

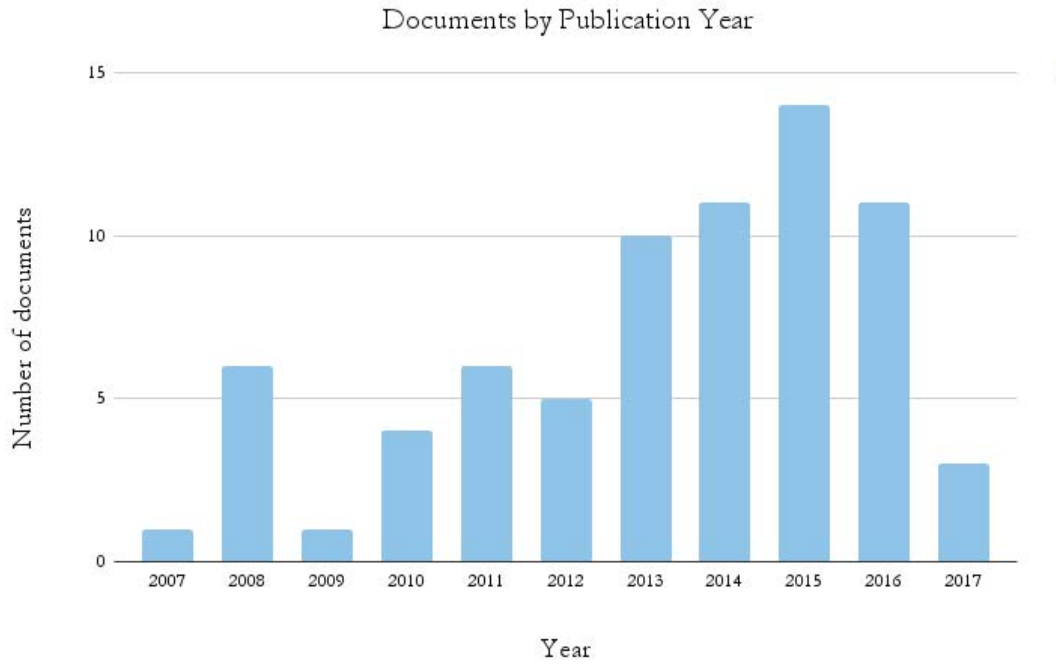

Figure 1. Documents by publication year

Stakeholder Needs Preliminary Results

This analysis adopted categories established by Dilling et al.[10], "1) data and information; 2) coordination, governance, and legal frameworks; and 3) communication and education." From this framing, we identified three preliminary categories that emerged from the dataset: 1) communication and education, 2) coordination, and 3) research needs.

Communication and Education

Nearly 80% of the documents expressed a need for improved communication of climate change impacts, risks, and climate change adaptation mechanisms to the lay public, businesses, and local government officials to create a common understanding of climate change. Over 50% of the documents expressed a need for increasing public awareness of climate impacts, risks, and basic climate science amongst lay citizens. From government and planners' perspectives, effective communication of risks to vulnerable populations is critical for building support for planning decisions that aim to increase climate or coastal resilience. To effectively increase awareness amongst

[10] Dilling, L., Lackstrom, K., Haywood, B., Dow, K., Lemos, M. C., Berggren, J., & Kalafatis, S. (2015). What stakeholder needs tell us about enabling adaptive capacity: The intersection of context and information provision across regions in the United States. *Weather, Climate, and Society*, *7*(1), 5-17.

the public, documents cited a need for "clear, consistent, and cohesive messaging,"[11] through venues such as webinars, web-based reports and resources such as toolkits, and social media. It was recognized that the use of boundary organizations or public information officers can be used as effective mechanisms to increase awareness and disseminating information.

Coordination

Nearly 60% of the documents stressed the need for coordination between the agencies and levels of government. Coordination between planners and researcher organizations/agencies, between states, within states, and between research organizations themselves were cited as other relationships were coordination needs improvement. The need for increased coordination was cited as essential for developing knowledge and data sharing, increasing participation of at-risk populations, and consensus-building.

Research Needs

Funding

While a minority of documents expressed a need for streamlining the processes for applying for funding, particularly for permits, the majority of documents stating funding needs conveyed a desire for diversifying and expanding funding to communities with fewer resources. In particular, targeted funding mechanisms such as grants were cited to be a useful strategy to effectively get the funding to the most at-need and at-risk communities. Ultimately, documents stressed the need for funding to be used for the purpose of directly addressing and meeting user needs for local-scale planning.

Modeling

Forty-eight documents conveyed the importance of improving models to inform scenario analysis, predictions, and informed planning. Many documents expressed that the findings in their documents would benefit from additional modeling or information to provide more robust findings. Items included incorporation of heat islands, spatial mapping, and integrated modeling. Recognizing that much of the available data is at the national or regional level, documents expressed a need for local or regional models, which may involve downscaling data to a more locally or regionally-relevant resolution. In addition to downscaling, another expressed need was cited for integrating models across disciplines, jurisdictions, timescales, and "fully integrated modeling."[12] In particular, a need

[11] Maryland Commission on Climate Change Adaptation and Response Working Group, Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change Phase I: Sea Level Rise and Coastal Storms (Annapolis, Md., 2008)
[12] Chesapeake Bay Program. 2015. Climate Resiliency Outcomes Management Strategy 2015-2025, v.1.

for regularly updating mapping products and models with current data is warranted for informed decision-making.

APPENDICES

The appendix includes several additional research products or datasets.

- Appendix A: Maryland Sea Grant: Findings from Identification and Synthesis of Maryland Experts and Spreadsheet of Experts
- Appendix B: Stakeholder-Defined Needs Analysis in Northeast U.S. Coastal Communities to Determine Research Gaps Informing Resilience Planning
- Appendix C: Job Descriptions from Other Climate Specialists
- Appendix D: Participant Table and Interview Notes (n = 28)

Appendix A: Maryland Sea Grant: Findings from Identification and Synthesis of Maryland Experts and Spreadsheet of Experts

Maryland Sea Grant: Findings from Maryland Expertise Analysis

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August 27, 2017

KEY POINTS

1. Analyzed and mapped over 500 stakeholders from 9 University System of Maryland schools, local community colleges, and area boundary organizations
2. Strong Chesapeake Bay watershed expertise in quantitative fields such as Atmospheric and Oceanic Sciences.
3. There is less expertise in Chesapeake Bay focused social science research, which will need to be encouraged and developed if we are to holistically address coastal resilience challenges.

FINDINGS AND RESULTS

Throughout the research period, our team developed a database of research scientists and relevant stakeholders, as well as their expertise, initially targeting those located at the University of Maryland, College Park (UMD). In an effort to analyze these institutional resources, we examined faculty and researchers from 17 departments from across UMD with a broad climate nexus—ranging from Agricultural Resource Economics to Sociology. Through this analysis we found that UMD's Chesapeake Bay focused institutional expertise is skewed toward quantitative areas, specifically in the physical and natural sciences. Though we found some expertise in the social sciences (Anthropology, Psychology, and Sociology), we believe that greater emphasis must be made to connect these researchers and faculty with their physical and natural scientists to solve regional climate challenges. Fostering these connections would enhance the ability of the scientists to conduct problem-oriented research that is relevant to state policymakers and local decision-makers in the region.

After completing a comprehensive examination of UMD, at the request of MDSG we expanded our purview to additional schools within the State of Maryland and within the University System of Maryland, such as Johns Hopkins University, Towson University, and Bowie State University. At these institutions, we focused on analyzing research centers or other centers of excellence—hubs that focused on specific issues areas broadly relevant to the climate. As we expected, we found numerous resources at schools like Johns Hopkins and the University of Maryland Baltimore County (UMBC); however, many of these resources were primarily focused on specific issues or scales that were not compatible with the Mid-Atlantic region. For example, Johns Hopkins has a strong focus on international topics (e.g., School for Advanced International Studies), so many of their faculty are working on climate topics at the international or global scale. Conversely, at UMBC

we found multiple centers of excellence that focus regionally. UMBC's has expertise in urban and environmental topics, such as hydrology, ecology, and urban planning, with joint centers of excellence with NASA and the LTER.

SUCCESSES AND CHALLENGES

This project was successful in accomplishing its major, overarching goal: mapping institutional resources at UMD. Our analysis at UMD was comprehensive and as close to exhaustive as is reasonably possible, requiring 150-200 hours of student time to construct the database in addition to senior scientist management. Additional schools within the University System of Maryland were analyzed at higher level, focusing less on individual research faculty and more on centers of excellence. Given greater resources, and additional time, the research focus could be expanded to include all institutions within the University System of Maryland, including all research faculty and staff, but it is unclear whether a more comprehensive data collection effort would modify the overall results.

PROJECT STATUS

At this time, all database work has been completed. Having examined UMD and the additional schools requested by MDSG, there are no outstanding institutions that have yet to be analyzed. We would recommend that additional expertise inquires first query the opt-in Chesapeake Research Consortium expertise database released July 2017 (CRC; http://chesapeake.org/expertise-1/)

In addition to the mapping of institutional resources, we utilized the database to develop a group of target stakeholders for semi-structured interviews or focus groups, to be conducted in Task 3b. Though the focus of this task is not academic stakeholders, we have additionally highlighted several key academics in collaboration with MDSG. The highlighted list of targeted stakeholders from boundary organizations has been culled and enhanced to provide additional context on each stakeholder's expertise. The project was classified as exempt by the Institutional Research Board (IRB); thus, there are no restrictions on contacting stakeholders to set up semi-structured interviews or focus groups, conducting interviews, or using the results (Task 3b).

DATABASE

Maryland Sea Grant Climate Scientist Spreadsheet:
https://docs.google.com/spreadsheets/d/1fzVdC-jnKgJ1cUYYGhn5v4gdZpRGSX5iends7ivulUk/edit#gid=0

Table 1. University of Maryland, College Park Experts

Scientists Name (Last, First)	Title	Department	University	3-5 word Title Expertise	Expertise (1-3 sentences)
Agar, Michael	Professor Emeritus	Department of Anthropology	University of Maryland, College Park	Public health, language	Developing and making use of "qualitative" research in domains such as organizational development, computer modeling, and knowledge transfer
Alberini, Anna	Professor	Department of Agricultural and Resource Economics	University of Maryland, College Park	Energy economics	
Alcaniz, Isabella	Assistant Professor	Department of Government & Politics	University of Maryland, College Park	Environmental politics and states in Global South	How domestic actors adopt international strategies to compensate for the loss of room to maneuver resulting from globalization, democratization, and the information age; problem of skill formation and skill updating in the environmental sector and other science-based policy areas (such as nuclear energy)

Allen, Dale	Associate Research Scientist	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Chemistry and transport modeling	His education is all in the field of meteorology. A majority of his published works are about tracking air pollution.
Allen, Marisa	Lecturer	School of Architecture, Planning and Preservation	University of Maryland, College Park	Sustainable preservation	Site history, sensory experience in the built environment
Anderson, Roberts	Professor Emeritus	Center for Environmental Science	University of Maryland, College Park		He studies the comparative immunology and immunotoxicology of marine organisms, as well as the immunological basis of disease susceptibility and resistance.
Angel, Rosalina	Professor	Department of Animal and Avian Sciences	University of Maryland, College Park	Maximizing nutrient availability	Maximizing nutrient availability from diets with the goal of reducing environmental impact as well as improving production efficiency and costs of production. Extensive work has been done and continues on minimizing the impact of poultry production on the environment, primarily as related to

					phosphorus and nitrogen. Work with nitrogen has focused on diet changes as well as post excretion changes to minimize nitrogen excretion and nitrogenous emissions to air.
Ann Peer, Wendy	Assistant Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Cell Biology, Developmental Biology, Ecology	Dr. Ann Peer specializes in chemistry and biology and her work centers around issues relating to food insecurity

Aydilek, Ahmet	Professor	Department of Civil and Environmental Engineering	University of Maryland, College Park	geotechnical, geoenvironmental and geosynthetics engineering research	His current research interests are in the area of sustainability in geotechnical infrastructure design, studying the mechanical and environmental behavior of recycled concrete aggregate, fly ash-stabilized unpaved road materials and soft soils for their possible reuse in highway construction, and development of design methodologies for various base materials considering their hydraulic and mechanical properties. Research activities include large scale dynamic testing, resilient modulus testing, water leach and column leach testing, field monitoring, geochemical analysis, and numerical modeling of

					surface waters and groundwater. Dr. Aydilek's past work involved study of capping of high water content wastes in a U.S. EPA Superfund site, and investigating their interaction with geosynthetics.
Ayyub, Bilal	Director of the Center for Technology and Systems Management, Professor of Civil and Environmental Engineering	Department of Civil and Environmental Engineering	University of Maryland, College Park	risk-informed planning and decision making	Dr. Ayyub's main research interests are risk, uncertainty, expert opinion elicitation, and decision analysis, and systems engineering applied to infrastructure, naval, energy, defense and maritime fields. They include resilience, sustainability, climate change, reliability-based design, and risk-informed planning and decision making covering many aspects of project lifecycles and portfolios, such as life expectancy assessment of structural

					systems, risk-informed inspection, bidding strategies, project execution risk, project life management, operational risk, risk management including risk transfer and risk finance, and liability and exposure analysis.
Baer, Ferdinand	Professor Emeritus	Center for Environmental Science	University of Maryland, College Park		Studied Meteorology and geophysical sciences at UChicago. Many of his publications are about radiation impacts on climate change.

Baiocchi, Giovanni	Associate Professor	Department of Geographical Sciences	University of Maryland, College Park	Environmental economics	Giovanni's main research looks at the global and local impact of economic activity, including trade, urbanization, and lifestyles. He has published a wide range of interdisciplinary research in international multidisciplinary journals such as Environmental Science & Technology, Ecological Economics, Journal of Industrial Ecology, Nature Climate Change, and Computational Economics. Giovanni is a lead author for the IPCC 5th Assessment for Working Group III, focusing on the drivers, trends, and mitigation of climate change.
Baldwin, Andrew	Professor, Director of Undergraduate Programs	Department of Environmental Science and Technology	University of Maryland, College Park	Biology, Environmental Engineering, Botany, Wetland restoration	Dr. Baldwin is a environmental engineer and a wetland ecologist and oversees the revision and development of

					ENST curriculum.
Bandaru, Varaprasad	Associate Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Agricultural systems and geospatial analysis	Integrating remote sensing, geographic information system, and biophysical and biogeochemical models to develop robust geospatial tools, and applying them to monitor and manage agricultural systems at multiple scales
Bean, Thomas	Post-doctoral Research Assistant	Department of Environmental Science and Technology	University of Maryland, College Park	Environmental Science, Toxicology	Bean researches avian ecotoxicology with other researchers at the USGS Patuxent Wildlife Research Center.
Bechhoefer, William	Professor Emeritus	School of Architecture, Planning and Preservation	University of Maryland, College Park	Regionalism and multi-culturalism in design practice	
Bell, Matthew	Professor	School of Architecture, Planning and Preservation	University of Maryland, College Park	Large scale design/planning	
Benessaiah, Nejm	Postdoctoral Associate	Department of Anthropology	University of Maryland, College Park	Ecological anthropology	Voluntary associations in contemporary water governance and potions of participatory governance

Bennett, Ralph	Professor Emeritus	School of Architecture, Planning and Preservation	University of Maryland, College Park	Housing and residential architecture	Single family homes and renovations to institutional housing, especially for special populations including the elderly
Berbery, Ernesto Hugo	Affiliate Research Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park		He uses regional models and diagnostic approaches to investigate the regional mechanisms of the American monsoon systems, and the effects of land-cover changes and land surface-atmosphere feedbacks on the hydroclimate and extremes of the Americas.
Bohannon, Meredith	Post-doctoral Research Assistant	Department of Environmental Science and Technology	University of Maryland, College Park	Environmental Toxicology	Bohannon's work on toxicology helped write her dissertation on the effects of PCB exposure on hepatic gene expression and enzyme activity in Japanese quail (Coturnix japonica) hatchlings.

Bowerman, William	Professor and Department Chair	Department of Environmental Science and Technology	University of Maryland, College Park	Fisheries/ Wildlife management, toxicology	Bowerman received both a B.A. and M.A in Biology and achieved a Ph.D in Fisheries and Wildlife. His research focuses on monitoring concentrations of toxins bioaccumulating in Bald Eagles to understand how chemical move through ecosystems.
Brower, Sidney	Professor Emeritus	School of Architecture, Planning and Preservation: Urban Studies and Planning program	University of Maryland, College Park	Environment-behavior studies	Ways in which people's attitudes and behaviors affect and respond to their physical surroundings; making research findings useful to planners and designers

Brown, Molly	Associate Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Nature-society interface and food security	Using long term data records in vegetation and rainfall to understand environmental change, particularly in Africa; research to develop new methods for ensuring the use of new and existing satellite remote sensing in applications with societal benefit; use of satellite data with demographic and nutrition household surveys to measure the impact of environmental shocks on human health outcomes; and the development of models and methods that enable the quantification of the impact of environmental and international food price shocks on local food prices

Brubaker, Kaye	Associate Professor	Department of Civil and Environmental Engineering	University of Maryland, College Park	human activities impact on the global environment	My research goal is to improve the usefulness of hydrologic and environmental models by (1) reducing uncertainty in the models, (2) reducing uncertainty in the data, and (3) providing tools to quantify and understand the inevitable uncertainty in model results. I wish to help provide the modeling community with high-quality, appropriate input data, and with tools for realistic assessment of model outputs.

Busalacchi, Antonio	Affiliate Professor and Director	Department of Atmospheric and Oceanic Science, ESSIC	University of Maryland, College Park	Tropical Ocean Circulation	He has studied tropical ocean circulation and its role in the coupled climate system. His interests include the development and application of numerical models combined with in situ and space-based ocean observations to study the tropical ocean response to surface fluxes of momentum and heat. His research on climate variability and predictability has supported a range of international and national research programs dealing with global change and climate, particularly as affected by the oceans.
Carroll, Mark	Associate Professor	Plant Science and Landscape Architecture department	University of Maryland, College Park	Turfgrass, water quality, nutrients, pesticides, runoff	Focuses on water quality issues in the management of turfgrasses and the development of low input

					sustainable turfgrass systems.
Carton, James	Professor/Chairmen	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Ocean Climate Change Influences	He studies temperature and salinity variations in the arctic region and their connections to climate in North America.
Chambers, Robert	Professor	Department of Agricultural and Resource Economics	University of Maryland, College Park	Production Economics	
Channan, Saurabh	Global Land Cover Facility (GLCF) Project Manager	Department of Geographical Sciences	University of Maryland, College Park	Semi-automated processing of geospatial data	PERL scripts and Java software for land cover indicators
Chernela, Janet	Professor	Department of Anthropology	University of Maryland, College Park	Environmental Anthropology of the Amazon	Her research interests include local knowledge, including environmental knowledge; indigenous rights and organizations; gender and language.
Cherupin, Gennady	Assistant Research Scientist	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Ocean Modeling	His papers are about seasonal heat and freshwater cycles, Ocean salinity content, ocean heat index.

Chini, Louise	Research Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Climate Projections; land use harmonization	Mathematical and computational modeling of coupled human-natural systems; interactions between ecosystems and land-use change; terrestrial carbon cycle modeling
Claverie, Martin	Research Associate	Department of Geographical Sciences	University of Maryland, College Park	Optical remote sensing systems analysis	Combining high spatial and temporal resolutions optical remote sensing data with land surfaces models (crop functioning models)

Coale, Frank	Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Agricultural Nutrient Management, Soil Fertility, Agroecology	For the past 15 years he has focused his research on the human dimensions of a range of environmental issues confronting the Chesapeake Bay, including management of natural resources, particularly fisheries and agricultural lands, water pollution, restoration, social justice, socio-ecological resilience and climate change. His Chesapeake research seeks to demonstrate how cultural models of the environment have a direct bearing on the use and management of natural resources, and how cultural models can be used to improve intra- and inter-stakeholder understanding, dialogue and collaboration in addressing

					environmental issues.
Cohen, Jim	Senior Lecturer	School of Architecture, Planning and Preservation: Urban Studies and Planning program	University of Maryland, College Park	Sustainable planning	Land use planning, growth management, planning history and theory
Cotting, Jennifer	Research Associate	Environmental Finance Center	University of Maryland, College Park	green infrastructure	landscape conservation and habitat management, as well as urban land use and stormwater management applications of green infrastructure
Cramton, Peter	Professor	Department of Economics	University of Maryland, College Park	spectrum, energy, and financial auctions	Since 1983, he has conducted research on auction theory and practice. Applications include spectrum, energy, and financial auctions. On the practical side, he is an independent director on the board of the Electric Reliability Council of Texas, chief economist of Rivada, and chairman of Market Design Inc., an economics consultancy

					founded in 1995, focusing on the design of auction and matching markets.
Cropper, Maureen	Distinguished University Professor	Department of Economics	University of Maryland, College Park	valuing environmental amenities	Her research has focused on valuing environmental amenities (especially environmental health effects), on the discounting of future health benefits, and on the tradeoffs implicit in environmental regulations.Her current research focuses on energy efficiency in India, on the impact of climate change on migration, and on the benefits of collective action in pandemic flu control.
Cui, Qingbin	Assistant Professor	Department of Civil and Environmental Engineering	University of Maryland, College Park	Civil and Environmental Engineering	His research focuses on renewable energy development and design, carbon management in infrastructure projects, and building energy efficiency.

Davis, Allen	Professor	Department of Civil and Environmental Engineering	University of Maryland, College Park	aquatic and interfacial environmental chemistry	Dr. Davis' interests are in aquatic and interfacial environmental chemistry. Recently, he has been working on various issues related to urban storm water quality and the concept of Low Impact Development. Much work on bioretention as an urban stormwater best management practice has been completed and is in progress. He recently received the 2010 A. James Clark School of Engineering Faculty Outstanding Research Award, recognizing exceptionally influential research accomplishments related to urban storm water quality, its management, and the concept of Low Impact Development.

de Bremond, Ariane	Research Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Climate Change and Development	I seek to integrate understanding of environmental governance and land-use/land policy and tenure issues in developing-country settings with adaptation and mitigation efforts in the context of development decision-making.
Deck, Leland	Lecturer	Department of Economics	University of Maryland, College Park	benefit-cost analysis of environmental regulation and policy	He specializes in benefit-cost analysis of environmental regulation and policy, with a particular concentration on air pollution programs. Leland is also a Senior Economist with the U.S. Environmental Protection Agency's Clean Air Market Division. Since receiving his PhD he has been an environmental economist working directly for, or as a consultant to, the EPA's Office of Air and Radiation, state

					agencies and foreign governments. He was the principal investigator for the design and development of EPA's BenMAP (the Air Pollution Benefits Mapping and Analysis Program) software.
Desai, Sonalde	Professor	Department of Sociology	University of Maryland, College Park	Demography	Social inequalities in developing countries with a particular focus on gender and class inequalities; changes in the nature and composition of Indian middle classes in the context of India’s movement from state-capitalism to market-capitalism and increasing involvement in the global economy

Dickerson, Russell	Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	multidisciplinary areas of atmospheric chemistry and air pollution	Prof. Dickerson's research focuses on the multidisciplinary areas of atmospheric chemistry and air pollution, specifically photochemistry and global biogeochemical cycles. His research group, composed of chemists and meteorologists, develops analytical instruments (for NO, NOx, NOy, NH3, CO, SO2, CO2, CH4 and aerosols), employs these instruments in the laboratory, field, and on ships and aircraft, and interprets the results in terms of photochemistry and atmospheric physics. They are studying the budget of tropospheric ozone both in the Baltimore-Washington area and on the large scale, the

					transport of trace gases in convective clouds, and the role of the atmosphere in the chemistry of the Chesapeake Bay.
Downey, Sean	Assistant Professor	Department of Anthropology	University of Maryland, College Park	Ecological anthropology	Social and ecological dynamics of farming and foraging societies, complex adaptive systems
Dubayah, Ralph	Professor, Associate Chair	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing	His main areas of interest are ecosystem characterization for carbon modeling, habitat and biodiversity studies, land surface energy and water balance modeling, spatial analysis and remote sensing science.
Ellicott, Evan	Assistant Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing, landscape ecology and human interaction	Examination of geospatial data to describe and characterize biophysical phenomena and the interactions with society
Ellixson, Ashley	Extension legal specialist	Department of Agricultural and Resource Economics	University of Maryland, College Park	Agricultural law	

Espinola, Brandy	Program Manager	Environmental Finance Center	University of Maryland, College Park	fundraising strategy, grant-making process, workforce development	
Fagan, Bill	Professor and Department Chair	Department of Biology	University of Maryland, College Park	Conservation Planning	My research involves meshing field research with theoretical models to address critical questions in ecology and conservation biology. I believe that ecological theory will be strengthened if it is forced to help solve real-world problems, and that conservation biology involves difficult choices that demand quantitative approaches.
Felton, Gary	Associate Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Biosystems engineering, agricultural engineering, waste management	Felton's research is centered around nutrient cycling to better manage biosolids and poultry litter. He has obtained both a Masters and Ph.D. in Agricultural Engineering

Finsterbusch, Kurt	Professor	Department of Sociology	University of Maryland, College Park	Sociology of Development, and Environmental Sociology	Scarcity, principles of organizations in the Global South, political sociology
Fisher, Dana	Professor	Department of Sociology	University of Maryland, College Park	Environmentalism and democracy	Environmental stewardship and American climate politics (Climate Constituencies Project); large-scale protest motivation; stewardship and mapping
Fisher, Daniel	Senior Research Scientist	Department of Environmental Science and Technology	University of Maryland, College Park	Aquatic toxicology, Ecology, Marine Biology	Conducted research in the following areas: aquatic toxicological studies in both the laboratory and field involving sediments, single compounds, mixtures, effluents and storm water runoff; ecological risk assessments involving the development of water quality criteria for numerous compounds; and continuous versus intermittent toxicity of chemicals. I

					have written more than 150 refereed journal and technical publications on a wide variety of environmental issues.
Fiske, Shirley	Research Professor	Department of Anthropology	University of Maryland, College Park	Environmental and policy anthropology	Natural resource management and environmental and climate policy issues
Garland, Anne	Lecturer	Department of Anthropology	University of Maryland, College Park	Ecology and risk management	Interactions of people and their environments in both time and space to learn the accumulated effects about changes that assist risk reduction
Gelfrand, Michelle	Professor	Department of Psychology	University of Maryland, College Park	Decision-making and cross-cultural psychology	
Geores, Martha	Associate Professor	Department of Geographical Sciences	University of Maryland, College Park	Society and Sustainability	My basic research philosophy is that you have to talk to people to find answers about how they socially construct space, use resources, and make their environment sustainable, or not. What issues are important to people? My basis

					methodology is qualitative methods.
Gerst, Mike	Assistant Research Professor	College of Mathematical and Natural Sciences, ESSIC	University of Maryland, College Park	systems, data, and decision science	His scientific work is motivated by helping stakeholders identify problems and solutions at the intersection of the environment, technology, and society. As a result of the complexity of these issues, his approach is rooted in systems, data, and decision science, which together allow for a holistic understanding of current knowledge so that stakeholders may assess trade-offs and risks of potential solutions.
Giglio, Louis	Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing of active fires and burned area	Global fire emissions, satellite direct broadcast applications

Goeringer, Paul	Extension Legal Specialist	Maryland Ag Extension	University of Maryland, College Park	Agricultural legal risk management	Paul Goeringer specializes in legal risk management as it relates to agriculture. Prior to coming to AREC, Paul worked at the University of Arkansas where his legal research was focused in the areas of environmental compliance, right-to-farm laws, agricultural leasing laws, contracting issues, federal farm program compliance, recreational use and agritourism issues, and estate planning issues in agriculture.
Goetz, Scott	Adjunct Associate Professor	Department of Geographical Sciences	University of Maryland, College Park	Ecosystem responses to environmental change	Monitoring and modeling the linkages and feedbacks between forests and climate, land use change and disturbance
Grand, James	Associate Professor	Department of Psychology	University of Maryland, College Park	Knowledge-building and collaboration	
Grodsky, Semyon	Research Scientist	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Ocean Wind, Sea level and velocity	Grodsky studies ocean wind, sea level, and current patterns in the ocean.

					These show climate instability.
Hadden, Jennifer	Associate Professor	Department of Government & Politics	University of Maryland, College Park	Environmental politics and international relations	Dr. Hadden researches civil society participation in global climate change politics and sustainable development.
Halperin, Steve	Professor, Director	Department of Mathematics, Climate Information Responding to User Needs(CIRUN)	University of Maryland, College Park	provide actionable information about environmental change	What is needed is a partnership among climate scientists, experts from disciplines such as agriculture, engineering, public health, and risk management, companies which deliver specialized information, and decision makers in the private and public sectors. CIRUN was created with the vision of developing and piloting effective ways to provide such actionable information: the environmental analogue of the “translational research” or “bench to the bedside” approach in medical research. It will

					focus on building links among the communities above
Hansen, Matthew	Professor	Department of Geographical Sciences	University of Maryland, College Park	Land cover	land cover and land use change mapping
Hanson, James	Professor	Department of Agricultural and Resource Economics	University of Maryland, College Park	Sustainable Agriculture	
Hardaway, Cecily	Assistant Professor	African American Studies Department	University of Maryland, College Park	SES and adolescent development	understanding how socioeconomic status influences child development and family processes; links between poverty-related risks and adolescents' socioemotional adjustment and academic achievement
Harral, Reginal	Professor and Extension Specialist	Department of Environmental Science and Technology	University of Maryland, College Park	Ecology, Genetics, Physiology	His areas of interest are ecological and natural resource ethics, bioethics, stress physiology of fish and other vertebrates, and conservation biology. Harrel's research is centered around ethics, genetics, environmental stress-physiology, and ecology.

He, Tao	Research Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park		Land surface energy budget; data fusion on satellite products
Hill, Bob	Faculty Advisor/ Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Soil, Water, and Land Resources	His primary research investigates tillage effects and nutrient management in agricultural soils and turf.
Hoffman, Jon	Professional Track Faculty	Department of Communication	University of Maryland, College Park	Political rhetoric and media criticism	Interrogating the political dimensions of temporality and the affective turn as they relate to media consumption, embodiment and expression, information technologies, and political rhetoric
Hofton, Michelle	Research Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Laser altimetry	Decimeter-level precise and accurate high-altitude air and spaceborne altimetry for a variety of uses including mapping forest structure and surface topography

Huang, Chengquan	Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing, land cover and vegetation dynamics	Quantify forest change at national to global scales using Landsat data, and is developing approaches for mapping forest structure and biomass change by integrating field inventory data, airborne or space borne lidar, and Landsat derived forest disturbance history
Huang, Wenli	Research Associate (Postdoc)	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing of forest and satellite monitoring of water	Measuring the forest carbon stocks stored in forest regions using lidar remote sensing and field data; monitoring the inundated area for North America using optical and SAR remote sensing data.
Hubacek, Klaus	Professor	Department of Geographical Sciences	University of Maryland, College Park	Ecological Economy	Dr Klaus Hubacek is an ecological economist with a research focus on conceptualizing and modeling the interaction between human and environmental systems and

					developing and modeling scenarios of future change. Klaus has worked extensively with stakeholders in participatory research projects and led large interdisciplinary research teams.
Hubacek, Klaus	Professor	Department of Geographical Sciences	University of Maryland, College Park	Modeling Human Dimensions of Global Change	Research project in sociology - Ecological Economics; Sustainable Consumption and Production; Land Use Governance; Ecosystem Services; Natural Resource Management; Climate Change Mitigation and Adaptation
Hudson, Robert	Professor Emeritus	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	ozone column density, ozone profiles, aerosol concentration, and sulfur dioxide in the troposphere and stratosphere, Tropospheric air pollution	Professor Hudson's research interests are in the derivation of ozone column density, ozone profiles, aerosol concentration, and sulfur dioxide in the troposphere and stratosphere from ultraviolet radiances

					observed from satellites, and in the application of these results to an understanding of atmospheric chemistry and dynamics.
Hultman, Nathan	Associate Professor and Director	School of Public Policy	University of Maryland, College Park	Environment and Energy Policy Specialization	His research focuses on national climate target-setting and assessment, U.S. emissions mitigation policy, energy technology transitions in emerging economies, and international climate policy.
Hunninghake, Mike	Program Manager	Environmental Finance Center	University of Maryland, College Park	Sustainable communities	
Hurtt, George	Professor	Department of Geographical Sciences	University of Maryland, College Park	Land Use	Earth System Science

Ide, Kayo	Associate Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Data Assimilation and Scientific Prediction in regards to wildfire, regional weather, carbon surface flux estimates, space weather. Transportation and mixing of atmosphere and ocean, variability of the ocean and atmosphere.	Data Assimilation is a method to estimate unknown true state by merging noisy and sporadic observations into the computational model of the system. Her main interest is development of methodology, including Lagrangian data assimilation, observing system design, non-Gaussian filtering, nonlinear filtering. Her main interest is application of dynamical systems theory to observational and computational flow fields. Her main interest is low-frequency variability. I work on observation, modeling and theory.
Iseki, Hiroyuki	Assistant Professor	School of Architecture, Planning and Preservation: Urban Studies and Planning program	University of Maryland, College Park	Transportation/transit	Balancing efficiency, effectiveness, and equity in public policy and planning with a special attention to

					transportation, environment, and land use
Iwamoto, Derek	Assistant Professor	Department of Psychology	University of Maryland, College Park	Physical and mental health disparities	
Izursa, Jose-Luis	Faculty Research Associate	Department of Environmental Science and Technology	University of Maryland, College Park	Environmental Science, Forestry	Izursa has published 7 papers related to forest ecology, conservation biology, and energy

Jin, Menglin	Visiting Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Identify and simulate climate variations of land surface, in particular, urbanization, skin temperature trend, and cloud-aerosol interactions via land surface model, GCM, and EOS observations.	We evaluate all urban areas over the globe in terms of their daytime and nighttime skin temperatures ("urban heat island effect"), surface albedo, surface emissivity, atmosphere stability, aerosol and cloud variations. Using the most advanced climate models (CCM2/BATS, CCM3/BATS) and satellite observations (MODIS, AVHRR, GOES, ISCCP), we concentrate on the understanding of land surface temperature related physical processes and the influences of vegetation, soil moisture and clouds on skin temperature. Our project aims to use MODIS, in situ AERONET aerosol observations, and TRMM rainfall observations in

					Year 2001 and 2002 to identify daily and seasonal variations of aerosol and clouds properties, to understand the aerosol-clouds interactions, and to identify cloud-aerosol relationships with skin temperature and rainfall.
Johnson, Katherine J.	Postdoctoral Associate	Department of Anthropology	University of Maryland, College Park	Resilience and environmental anthropology	Climate change, resilience, social-ecological systems, vulnerability, anthropology of the Chesapeake, multi-diciplinary and participatory risk management
Jones, Curtis	Assistant Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Crop modeling and irrigation management	Modeling biogeochemical cycling within agricultural systems; agricultural impacts, mitigation, and adaptation to climate change
Justice, Christopher	Professor and Department Chair	Department of Geographical Sciences	University of Maryland, College Park	Land Cover and Land Use Change	Dr. Justice's current research is on land cover and land use change, the extent and impacts of global fire,

					global agricultural monitoring, and their associated information technology and decision support systems.
Kalnay, Eugenia	Distinguished University Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	numerical weather prediction, data assimilation, predictability and ensemble forecasting, coupled ocean-atmosphere modeling and climate change and sustainability	Current research interests of Dr. Kalnay are in numerical weather prediction, data assimilation, predictability and ensemble forecasting, coupled ocean-atmosphere modeling and climate change and sustainability. Zoltan Toth and Eugenia Kalnay introduced the breeding method for ensemble forecasting.
Kangas, Patrick	Associate Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Environmental engineering, botany, geography	

Kaushall, Sujay	Assistant Professor	Department of Geology, ESSIC	University of Maryland, College Park	Watersheds and Aquatic ecosystem	Research focuses on the ecology and biogeochemistry of watersheds and aquatic ecosystems, primarily through long-term studies. Research interests include: land use and climate impacts on water resources, urban watershed restoration, long-term trends in stream chemistry, human-impacted biogeochemical cycles, and applications of geochemical tracers to ecosystem ecology.
Kearney, Michael	Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Geomorphology, Ecology, Oceanography	Kearney's research focuses on resilience of coastal regions related to erosion, development, and other hazards.

Kim, Do-Hyung	Research Associate (Postdoc)	Department of Geographical Sciences	University of Maryland, College Park	Multi-sensor data	Synergistic use of multi-sensor data including Optical and Radar data for the better characterization of land cover change; application of geospatial and statistical techniques to evaluate the effects of policy and conservation plans on land cover change
Kleist, Daryl	Assistant Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	use of data assimilation to improve numerical weather prediction, most recently through the use of the hybrid EnVar algorithm for the NCEP Global Forecast System model	Data assimilation is used for state estimation by combining observations with numerical models of a physical system. My main area of interest is in algorithm development aimed at improving initial conditions for numerical weather prediction.
Knaap, Gerrit	Professor	School of Architecture, Planning and Preservation: Urban Studies and Planning program	University of Maryland, College Park	Smart growth and economics	Economics and politics of land use planning; efficacy of economic development instruments; impacts of

					environmental policy
Kohn, Rick	Professor	Department of Animal and Avian Sciences	University of Maryland, College Park	Agricultural Nutrient Cycles	The Kohn laboratory develops and uses mathematical modeling for basic and applied research in animal nutrition. The goal of our research has been to decrease pollution of air and water resources from animal agriculture. Some models have been adapted to study options for biofuel production through anaerobic digestion and fermentation.
Lafrenz Samuels, Kathryn	Assistant Professor	Department of Anthropology	University of Maryland, College Park	Heritage of anthropogenic climate change	Archaeological and sociocultural anthropology around issues of cultural heritage, focusing on the transnational contexts of heritage, in the areas of international economic development, human rights,

					democracy building, and global climate change
Lampkin, Derrick	Assistant Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	glacial impacts on sea level rise	Our aim to improve our understanding of the evolving supraglacial environment. Our work has quantified the spatial clustering distribution of lakes and linked it to variability in melt production, drainage rates and other components of the supraglacial hydrology. We also established the impact of subglacial topography on the distribution of lakes and quantified the relationships between lake distributions and ice flow dominated by internal deformation versus basal sliding.
Landa, Edward	Adjunct Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Environmental health, soil science	Landa studies the presence of inorganic compounds in soils and how those toxins move through ecosystems

Lansing, Stephanie	Associate Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Waste management, environmental engineering	Lansing's research involves Anaerobic digestion (AD); Microbial and solid-oxide fuel cells (MFC and SOFC); and eMergy and life cycle assessments (LCA) in order to solve waste management and environmental issues.
Lea-Cox, John	Professor	Plant Science and Landscape Architecture department	University of Maryland, College Park	water and nutrient management	Water and nutrient management to reduce the environmental impacts of our production practices
Leisnham, Paul	Associate Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Mosquito ecology, watershed health	Dr. Laisnham studies the ecosystems surrounding medically important mosquitos and the socio-ecological aspects of watershed health
Li, Zhanqing	Professor	Department of Atmospheric and Oceanic Science, ESSIC	University of Maryland, College Park	Cloud absorption and reflection, remote sensing	Li looks at a lot of cloud impacts and their absorption and reflection. He researches cloud, UV, and land remote sensing.

					Researches Aerosol remote sensing and climate impacts.
Liang, Shunlin	Professor	Department of Geographical Sciences	University of Maryland, College Park	Remote Sensing and GIS	His main research interests focus on estimation of land surface variables from satellite observations, studies on surface energy balance, and assessing the climatic, ecological and hydrological impacts of afforestation in China
Lips, Karen	Professor	Department of Biology	University of Maryland, College Park	Conservation Ecology	The work of my lab is focused on the conservation and ecology of amphibians (and reptiles), with interests at multiple scales – including population, community, and ecosystems – especially as they are affected by emerging infectious disease and global change.

Liu, Brooke	Professor	Department of Communication	University of Maryland, College Park	Risk communication and resilience	How government messages, media, and interpersonal communication can motivate people to successfully respond to and recover from disasters
Liu, Chao	Research Associate	School of Architecture, Planning and Preservation: Urban Studies and Planning program	University of Maryland, College Park	Transportation/transit	Transportation planning, sustainable land use and transportation policy, transportation energy and emission modeling, social planning; application of GIS and statistical models
Loboda, Tatiana	Professor	Department of Geographical Sciences	University of Maryland, College Park	impact of climate change on ecosystem and biodiversity	Her research interests include wildland fire, biodiversity, climate change, and their interactions with other human and physical factors on the landscape
Lombardi, Sara	Faculty Advisor/ Lecturer	Department of Biology	University of Maryland, College Park	Biodiversity and Conservation Biology	Biology and Marine Science, Marine Estuarine Environmental Science

Lopez, Andrea M	Assistant Professor	Department of Anthropology	University of Maryland, College Park	Health inequities and governance; formal barriers	Medical anthropology, urban anthropology, the anthropology of drug use, health inequities, the U.S. welfare state, and subjectivity and social suffering in U.S. urban contexts
Lucas, Jeff	Professor, Associate Chair, and Director of Research	Department of Sociology	University of Maryland, College Park	Social psychology, group processes, and leadership	Leadership of science, technology, and innovation; stigma/status; research environment survey; collective action
Masek, Jeffrey	Adjunct Associate Professor	Department of Geographical Sciences	University of Maryland, College Park	Biospheric sciences	Mapping land-cover change in temperate environments; application of advanced computing to remote sensing; satellite remote sensing techniques

Miyoshi, Takemasa	Visiting Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Data assimilation for numerical weather prediction	Data assimilation with chaotic dynamical systems such as the weather system. Predictability, control, and synchronization of chaos. Improving numerical weather prediction (NWP) through data assimilation with particular focus on high-impact weather including Tropical Cyclones (Hurricanes and Typhoons).
Molinario, Giuseppe	Senior Faculty Specialist & Doctoral Student	Department of Geographical Sciences	University of Maryland, College Park	Land cover and land use change	How to make more detailed and accurate remote sensing based maps, what the drivers of LCLUC are, and how the human/environment interface can be detected and monitored more clearly
Momen, Bahram	Associate Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Ecological health, water quality	Dr. Momen's research looks at the implications of pollutants entering lakes and rivers in the

					Adirondacks of New York.
Morton, Douglas	Adjunct Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Land use change in tropical forests	Deforestation, forest degradation, and agricultural land uses that replace tropical forest
Murrow, Jennifer	Lecturer	Department of Environmental Science and Technology	University of Maryland, College Park	Wildlife Ecology, Habitat Modeling	Her primary research has focused on wildlife habitat use and modeling and demographic analysis as it applies to population viability on the landscape. Specialty in GIS applications for wildlife species.
Murtugudde, Raghuram	Professor	Department of Atmospheric and Oceanic Science, ESSIC	University of Maryland, College Park	effects of the ocean's phytoplankton.	Murtugudde studies the effects of the ocean's microscopic floating plants, or phytoplankton. He has discovered that, in aggregate, phytoplankton produce enough heat to affect large scale weather patterns. In work funded by NASA and the National Oceanic and Atmospheric Administration,

					or NOAA, Murtugudde has discovered that climate models must take into account the effects of phytoplankton to predict El Niños and La Niñas.
Nackoney, Janet	Assistant Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Conservation land use planning	Janet's research interests lie in the use of geospatial technology for biological conservation applications, land use planning, wildlife habitat modeling and monitoring, food security applications, and information development. Most of her work has focused on Africa.
Nagol, Jyoteshwar	Research Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing	Developing algorithms for long-term monitoring and study of the Earth system dynamics; analysis of uncertainty for multi-sensor data harmonization

Needelman, Brian	Associate Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Soil Science, Environmental Science	Dr. Needelman's expertise in pedology has given him the experience to help increase the resilience of tidal and coastal marshes in the presence of sea level rise.
Nees, Daniel	Director	Environmental Finance Center	University of Maryland, College Park		assisting communities throughout the Chesapeake Bay watershed and the Mid-Atlantic region in their efforts to implement and finance environmental and sustainable development initiatives
Negahban-Azar, Masoud	Assistant Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Environmental and Civil engineering	Dr. Negahban-Azar has a Ph.D in Environmental engineering and is currently working on how to implement green technologies and how to develop models for policy decision support.

Nelson, Robert	Professor	School of Public Policy	University of Maryland, College Park	Economics and environmentalism, land use management	Dr. Nelson is recognized as an authority on the use and management of federally-owned public lands in the western United States and the clashing foundations of economics and environmentalism.
Newburn, David	Assistant Professor	Department of Agricultural and Resource Economics	University of Maryland, College Park	Environmental and resource economics	
Nigam, Sumant	Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Hydroclimate Prediction	His research interests include atmospheric general circulation and teleconnections, climate dynamics, tropical ocean-atmosphere interaction, aerosols and Asian monsoon, and Great Plains hydroclimate variability and droughts. A current focus is unraveling the natural variability and secular change components of the climate record to advance understanding

					of the recent warming of the northern continents. Developing seasonal monsoon forecasts from more effective use of antecedent SST evolution information is another.
Nuckolls, Kelly	Legal Specialist	UMD Agriculture Law Education Initiative	University of Maryland, College Park	Agricultural Law	
Oliva, Patricia	Research Associate	Department of Geographical Sciences	University of Maryland, College Park	Fire mapping/monitoring	Use of multi-spectral remote sensing data for biomass burning monitoring, burned area mapping and burned severity estimation
Olson, Lars	Professor	Department of Agricultural and Resource Economics	University of Maryland, College Park	Natural Resource and Environmental Economics	
Paolisso, Michael	Professor and Interim Chair	Department of Anthropology	University of Maryland, College Park	Environmental Justice and Climate Change	
Park, Julie	Associate Professor	Department of Sociology	University of Maryland, College Park	Adaptation of immigrants in the US; urban studies	How immigrants improve their socioeconomic status with longer duration in the US; how residential segregation changes in new and established immigrant gateways; health and

					health care access assimilation process of immigrants
Patwardhan, Anand	Professor	School of Public Policy	University of Maryland, College Park	Climate studies, mitigation and adaptation responses	Dr. Patwardhan has experience in environmental engineering and advising international governance organizations such as IPCC and UNEP on energy.
Pavao-Zuckerman, Mitchell	Assistant Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Ecology	Dr. Pavao-Zuckerman has a Ph.D in Ecology. His work currently focuses on how soil, plants, and biogeochemistry of urban settings function and provide ecosystem services. He is also assessing resilience in the San Pedro River watershed to help with decision support.
Payne-Sturges, Devon	Assistant Professor	School of Public Health, Maryland Institute for Applied Environmental Health (MIAEH)	University of Maryland, College Park	Racial and economic disparities in environmental health	
Pederson, Shannon	Lecturer	Department of Environmental Science and Technology	University of Maryland, College Park		

Phillips, Bill	Faculty Advisor/ Assistant Clinical Professor	Plant Science and Landscape Architecture department	University of Maryland, College Park	Environment and Agriculture	Ornamental Horticulture, Agronomy/Weed Science, Weed/Crop Ecophysiology
Prell, Christina	Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Social networks and the environment; international trade and carbon exchange; communication	Role of social networks in shaping and/or diffusing views, values, and/or cultural beliefs about the environment and natural resource management; structure of global trade networks drive and/or co-evolve with a number of environmental inequalities, chief among these being between-country differences in pollution, as embodied in trade
Presser, Stanley	Professor	Department of Sociology	University of Maryland, College Park	Survey Measurement	His research focuses on questionnaire design and testing, the accuracy of survey responses, nonresponse, and ethical issues stemming from the use of human subjects.

Prince, Stephen	Research Professor/Professor Emeritus	Department of Geographical Sciences	University of Maryland, College Park	Vegetation remote sensing	Dryland degradation and desertification throughout the world involving monitoring and modeling land surface processes
Rabenhorst, Martin	Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Mineralogy, Geochemistry, Environmental Science	Dr. Rabenhorst studies the genesis of soils in wetlands and marshes
Raspanti, Greg	Doctoral candidate	School of Public Health	University of Maryland, College Park	Toxicology and environmental health	
Ray, Rashawn	Associate Professor	Department of Sociology	University of Maryland, College Park	Racial oppression; racial uplift activism and social policy	Race and mental health; barriers
Reaka, Marjorie	Professor, Director of Departmental Honors Program	Department of Biology	University of Maryland, College Park	Coral Reef Health	Dr. Reaka and her laboratory have focused on biodiversity and extinction on coral reefs and in fossil and contemporary Crustacea, with applications to conservation and management of marine environments.
Ren, Xinrong	Research Scientist	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Environmental chemistry	

Richardon, Joseph	Associate Professor	African American Studies Department	University of Maryland, College Park	Trauma, health risks, and parenting	1) Violence and trauma; 2) Incarceration as a social determinant of health; 3) The Black male life course and health risk behaviors; 4) Parenting strategies for low-income Black male youth
Rick, Torben	Adjunct Associate Professor	Department of Anthropology	University of Maryland, College Park	Ancient and modern human-environmental interactions	Coastal and island archaeology, historical ecology, conservation biology, North America, California, Chesapeake Bay
Risco, Cristina	Assistant Clinical Professor	Department of Psychology	University of Maryland, College Park	Health disparities among Black and Latinx communities	
Riter, Alex	Research Associate	Department of Environmental Science and Technology	University of Maryland, College Park		
Ruiz-Barradas, Alfredo	Associate Research Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	Climate Modeling	Alfredo researches modeling for different types of climate prediction. This includes precipitation and drought predictions, seasonal forecasting,

					atmosphere-sea and atmosphere-sea-land interactions.
Salahuddin, Nazish	Director, VTT	Department of Psychology	University of Maryland, College Park	Discrimination, aggression, and violence	
Salawitch, Ross	Professor	Department of Atmospheric and Oceanic Science	University of Maryland, College Park	effect of human activity on atmosphere	We develop computer models that are compared to observations obtained from orbital, air-borne, balloon, and ground based platforms. Our focus is on stratospheric ozone depletion and recovery, air quality, climate change, and the global carbon cycle. These studies are motivated by the need to define how atmospheric composition is being altered by emission of pollutants and greenhouse gases that affect air quality and drive climate change.
Sampson, Rachelle	Associate Professor	Logistics, Business & Public Policy	University of Maryland, College Park	strategic alliances and the organization of corporate R&D	

Samuels, Kathryn	Assistant Professor	Department of Anthropology	University of Maryland, College Park	Environmental Anthropology	Her current book project—Anthropogenic: Carbon Heritage and Climate Change—examines the heritage of human-caused climate change through the historic resources and material infrastructure of carbon-based energy resources at several sites in the United States. This research draws attention to the historic conditions of anthropogenic climate change, based in fossil fuels, and the implication of this past within contemporary adaptation and mitigation efforts as a way of reflecting upon and mobilizing social change.
Sapkota, Amir	Associate Professor	School of Public Health, Maryland Institute for Applied Environmental Health (MIAEH)	University of Maryland, College Park	Impact of Climate Change on Human Health	

Sapkota, Amy	Associate Professor	School of Public Health, Maryland Institute for Applied Environmental Health (MIAEH)	University of Maryland, College Park	environmental microbiology, environmental microbial genomics, exposure assessment and environmental epidemiology.	
Schnaar, Gregory	Lecturer	Department of Agriculture and Natural Sciences: Environmental Science and Policy	University of Maryland, College Park	Water, energy, quantitative methods	Dr. Schnaar has a PhD in Soil, Water and Environmental Science. His research is focused on applying quantitative hydrologic methods to evaluate contaminant transport and conduct water resources assessments.
Schroeder, Wilfrid	Research Associate Professor	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing for biomass burning	Use of multi-spectral remote sensing techniques for biomass burning analyses; vegetation fires, land cover and land use change building on ground, airborne and spaceborne science data sets

Sexton, Joseph	Associate Research Professor	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing for landscape changes	Statistical and ecological analyses using more than thirty years of Landsat images to map changes in Earth's forest cover; collaborative studies of urban heat islands, threatened and endangered species habitat, tropical deforestation, climate effects on boreal biomes, and urban growth
Shaffer, L Jen	Assistant Professor	Department of Anthropology	University of Maryland, College Park	Ecological anthropology, indigenous and community knowledge	Dr. Shaffer studies social-ecological systems and cultural knowledge to answer questions about vulnerability and risk.
Sharifi, Amir	Research Associate	Department of Environmental Science and Technology	University of Maryland, College Park	Ecohydrology, civil engineering	Dr. Sharifi's work generally revolves around using watershed models to assess water quality impacts.
Shirmohammadi, Adel	Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Agricultural Engineering, Bioengineering, Biosystems Engineering	Dr. Shirmohammadi's training is in agricultural engineering, and studies water quality through watershed scale

					modeling of the TMDL in the Chesapeake Bay.
Song, Xiaopeng	Research Associate (Postdoc)	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing of environment	Forest cover change; carbon storage and cycle; urban growth patterns and visualization
Sprinkle, Robert	Associate Professor	School of Public Policy	University of Maryland, College Park	Sustainability policy	Dr. Sprinkle has worked in medicine and in academia on politics, biological sciences, and health policy.
Sullivan, Joseph	Associate Dean for Academic Programs	Department of Agriculture and Natural Sciences: Environmental Science and Policy	University of Maryland, College Park	Effects of environmental stress on plants	Dr. Sullivan has a PhD in Plant Physiology. He studies how plants respond to both natural and anthropogenic environmental stress. He also investigates how physiological mechanisms (ex/ ozone depletion, climate change) impact plant, agricultural, and ecosystem productivity.

Sullivan, Joseph	Associate Dean for Academic Programs	Plant Science and Landscape Architecture department	University of Maryland, College Park	Environmental stress, natural, anthropogenic	Investigate the physiological mechanisms that enable plants to exist in a wide range of environmental conditions and how human activities such as stratospheric ozone depletion, global climate change or urbanization may impact plant, agricultural or ecosystem productivity or ecosystem structure and functioning
Sun, Laixiang	professor	Department of Geographical Sciences	University of Maryland, College Park	climate change mitigation and adaptation	environmental sciences and management, business and management studies, integrated modelling, and ecological economics
Suri, Mayhah	Faculty Specialist	UMD Agriculture Law Education Initiative	University of Maryland, College Park	Agricultural legal risk management	
Tamboli, Prabahkar	Adjunct Professor and Director of International Training Programs	Department of Environmental Science and Technology	University of Maryland, College Park		
Tang, Hao	Postdoc Associate	Department of Geographical Sciences	University of Maryland, College Park	Remote sensing of environment	Characterizing 3D dynamics of terrestrial ecosystems using different

					lidar remote sensing platforms
Tilley, David	Associate Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Ecological Engineering	Dr. Tilley's work focuses on determining the effects of ecological systems liken green walls, green roofs, artificial wetlands and how they balance energy and water quality in the environment
Tjaden, Bob	Principle Agent	Department of Environmental Science and Technology	University of Maryland, College Park	Forestry, Environmental Science, Environmental Economics	Dr. Tjaden seeks to determine the extent of knowledge farmers and agricultural workers have about ecosystem services and how financial aspects of administering a PES program affect participation.
Tomlinson, Tracy	Lecturer	Department of Psychology	University of Maryland, College Park	Cognition, law and decision-making	

Torrents, Alba	Professor	Department of Civil and Environmental Engineering	University of Maryland, College Park	transport of organic pollutants in the environment.	Dr. Torrents' research focuses on the fate and transport of organic pollutants in the environment. For the past 15 years much of her work has concentrated on developing a mechanistic understanding on the movement and transformation of agrochemicals in the environment. Recently has work has expanded to investigate the fate of emerging organic pollutants upon the sustainable use of wastewater treatment products, i.e. biosolids and wastewater and to assess the environmental impacts of animal farms.

Tully, Katherine	Associate Professor	Plant Science and Landscape Architecture department	University of Maryland, College Park	plants, soils, carbon, nutrient, and water cycles	Studies relationships among land management, biogeochemical and water cycles, and global environmental change. More specifically, assesses the sustainability of food production systems by examining their effects on interactions among plants, soils, carbon, nutrient, and water cycles.
Tyler, Forrest	Professor Emeritus	Department of Psychology	University of Maryland, College Park	Pro-social community development projects	
Upperman, Crystal Romeo	Doctoral candidate	School of Public Health	University of Maryland, College Park	Marine estuarine environmental sciences	Ms. Upperman's dissertation examines the role of climate change and variability on people with chronic respiratory diseases.
Vadrevu, Krishna	Adjunct Associate Professor	Department of Geographical Sciences	University of Maryland, College Park	Environmental/spatial studies	Use of remote sensing and spatial analysis to examine land use/land cover, human ecosystem interactions and air pollution episodes

Vermote, Eric	Adjunct Professor	Department of Geographical Sciences	University of Maryland, College Park	Terrestrial information systems	Radiative transfer modeling, vicarious calibration, atmospheric correction, aerosol retrieval, and the generation of climate data record for terrestrial studies
Wallace, Jennifer	Doctoral candidate	Department of Government & Politics	University of Maryland, College Park	Environmental and transnational politics	Ms. Wallace studies peace and conflict temming from natural resources management and international aid strategies.
Wallsten, Thomas	Professor Emeritus	Department of Psychology	University of Maryland, College Park		Developing methods for eliciting, modeling and aggregating continuous subjective probability distributions regarding real-world sociopolitical events
Weil, Ray	Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Waste Management, Soil Science, Environmental Science	Dr. Weil research focuses on how to increase the productivity of cover crops, how to improve soil quality, and how to manage soils. He is an

					expert in the field of soils and published several n
Wessel, Jennifer	Assistant Professor	Department of Psychology	University of Maryland, College Park	Identity, stigma and diversity	
Whitcraft, Alyssa	Research Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Agricultural mapping/monitoring	Methods and drivers of land management; understanding and improving Earth observations data requirements for global agricultural monitoring
Wilkerson, Taylor	Adjunct Professor	Logistics, Business & Public Policy	University of Maryland, College Park	supply chain management	
Wilson, Sacoby	Assistant Professor	School of Public Health, Maryland Institute for Applied Environmental Health (MIAEH)	University of Maryland, College Park	Environmental health and justice	Dr. Sacoby is focused on studying the impact of the built environment on humans and ecology as much as he is on engaging communities in citizen science and advocacy.
Winthrop, Robert	Research Professor	Department of Anthropology	University of Maryland, College Park	Socioeconomics and land management	Ecological anthropology, economic anthropology, climate change, social impact assessment, human/cultural rights, environmental and resource

					policy, conflict resolution
Yarwood, Stephanie	Assistant Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Soil Science, Microbiology	Dr. Yarwoon researches the factors of soils and how microbial community structure affect ecosystem function.
Yonkos, Lance	Assistant Professor	Department of Environmental Science and Technology	University of Maryland, College Park	Toxicology	Toxicity testing, water quality
Young, Naomi	Research Economist	Environmental Finance Center	University of Maryland, College Park	economist and policy analyst	economist and policy analyst addressing issues of environment, sustainability and water in the United States and the Asia-Pacific region through initiatives built on market and incentive principles.
Zhao, Maosheng	Research Assistant Professor	Department of Geographical Sciences	University of Maryland, College Park	Terrestrial information systems	Using satellite data and ecosystem models to quantify carbon, water and energy fluxes between terrestrial ecosystems and the atmosphere and their changes

Zhu, Jianhua	Associate Professor	Plant Science and Landscape Architecture department	University of Maryland, College Park	biotic and abiotic stresses, droughts, salinity, temperature	Identification of key components in signal transduction pathways for plant responses to abiotic stresses, with the long-term goal of developing rational strategies to improve crop productivity and agricultural and environmental sustainability.

Table 2. Non-University of Maryland, College Park Experts

Scientist/ Contact Name (Last, First)	Title	Department	University	3-5 word Title Expertise	Expertise (1-3 sentences)
Bates, Bronwyn	Training Coordinator, Workforce Development	National Weatherization Training Center	Baltimore City Community College	Energy-efficient building weatherization job training	Skills include repairing windows, insulating ducts, and performing heating, ventilating, and air-conditioning (HVAC) work. In addition, workers may perform energy audits and advise clients on energy conservation measures
Field, Tammy; Maase, David		Environmental Modeling Certificate	Chesapeake Community College	Immediate employment in environmental field	Management, conservation and protection of natural environment and resources; expand education opportunities to address current and emerging environmental issues of Maryland and the country

Fiorellino, Nicole		Agriculture Program	Chesapeake Community College	Prep for work in agriculture industry - production and sustainability	Facilitate proficiency in content knowledge and skills for the College's general education competencies; promote technical competency, professional knowledge and ethical responsibility; prepare students for entry into the agricultural workforce or for further study in the field
Fiorellino, Nicole		Land Use Management Letter of Recognition	Chesapeake Community College	GIS and business applications	Series of courses which will serve as the foundation for students interested in preparing for entry-level employment in land use management

Fiorellino, Nicole		Landscape Management	Chesapeake Community College	Horticulture and landscaping	Foundation in general education, chemistry, mathematics, and plant science, thereby preparing students for careers in commercial property maintenance; residential and commercial landscape development; landscape design; environmental management and mitigation projects; museum, zoo, or arboretum displays; and park supervision
Fiorellino, Nicole		Landscape Design	Chesapeake Community College	Design in historical, cultural, and ecological context	Balances the conservation and restoration of natural resources with responsible development of livable, productive and sustainable communities and places; build foundations in plant science, digital landscape design, history, and landscape architecture

Maase, David		Environmental Sciences Program	Chesapeake Community College	Prep for transfer to four-year environmental degree	Basic knowledge and skills for entry-level understanding of the multidisciplinary nature of environmental challenges and viable solutions. Through curricular course requirements and choices, students build foundations in biology, chemistry, geography/geology, physics and technology advances, as well as become familiar with relevant economic, social and political science issues related to environmental challenges, green practices, and jobs.
Jiru, Mintesinot	Chair, Associate Professor	Natural Sciences	Coppin State University	Land degradation, food security, and water management issues	Socio-environmental and bio-physical issues encompassing water quality in watersheds of Baltimore city drinking water supply system

North, Janette, Miracle Okoro and Nikia Brown	Undergraduates	Natural Sciences	Coppin State University	Socio-environmental approach to studying water quality deterioration in Baltimore City	
Ball, William P.	Professor	Whiting School of Engineering (Dept. of Geography and Environmental Engineering), Environmental Health and Engineering	Johns Hopkins University	Physical and chemical processes, water quality	Groundwater contamination; Mass transfer in aquatic systems; Physical and chemical processes in water and wastewater treatment; Pollutant fate and transport; Chesapeake Bay hypoxia; Subsurface remediation; Water quality modeling (surface and subsurface waters); Water, sanitation, and hygiene for development
Barnett, Daniel J.	Associate Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Emergency readiness/response	Disaster response surge capacity; design and evaluation of preparedness curricula for public health workers; mental health aspects of public health emergency response; public health readiness exercises; and organizational culture change

					issues facing health departments in building a ready public health workforce
Bleviss, Deborah	Administrative Director	School of Advanced International Studies, Energy, Resources and Environment Program	Johns Hopkins University	Renewables and sustainable urban transportation	Sustainable markets, international and domestic clean transportation and energy financing initiatives
Boland, John J.	Professor Emeritus	Whiting School of Engineering (Dept. of Geography and Environmental Engineering), Environmental Health and Engineering	Johns Hopkins University	Environmental economics and policy	
Brush, Grace S.	Professor	Whiting School of Engineering (Dept. of Geography and Environmental Engineering), Environmental Health and Engineering	Johns Hopkins University	Ecology, paleoecology, plant geography	Climate change and tree populations
Connors, Celeste	Associate Practitioner in Residence	School of Advanced International Studies, Energy, Resources and Environment Program	Johns Hopkins University	Intersection of economic, trade, environment, energy, and international development policy	U.S. climate change, environment, and clean energy policies for international institutions
Davis, Meghan Frost	Assistant Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Environmental microbiology	Antimicrobial resistance, asthma, environmental epidemiology, environmental

					microbiology, microbial ecology, microbiome
Fanzo, Jessica	Bloomberg Distinguished Associate Professor, Director	School of Advanced International Studies, Global Food Ethics and Policy Program	Johns Hopkins University	Multi-sectoral and system approaches to ensure better nutrition and diets	(1) on the linkages between agriculture, water, and health to improve diversity and quality of maternal and young children's diets in low-income rural communities, (2) the importance of regaining livelihoods in post-conflict regions through better nutrition governance (3) metrics for the emerging area of equitable, sustainable diets and value chains
Ferrarro, Paul J.	Professor	Carey Business School, Environmental Health and Engineering	Johns Hopkins University	Causal Inference; Environmental Economics and Policy; Field Experiments	Behavioral economics and the design and evaluation of environmental programs in the private and public sector

Fry, Jillian Parry	Assistant Scientist	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Food animal production and environmental public health	Disparities and environmental justice; resource use; effectiveness of regulation and policy processes relevant to food animal production at the local, state, and federal levels; how to pass and implement policies that are protective of public health and ecosystems through properly regulating food animal production or by encouraging environmentally responsible food production practices; aquaculture
Haskett, Jonathan	Associate Director	School of Advanced International Studies, Energy, Resources and Environment Program	Johns Hopkins University	Land use climate change mitigation, adaptation and poverty reduction	Creation of land use carbon projects, the development of landscape carbon measurement methodologies, and climate change policy at the domestic and international levels

Heaney, Christopher D.	Associate Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Environmental epidemiology	Occupational and environmental health; infectious diseases; Water and health; Global climate change; Community-based participatory research
Hobbs, Benjamin F.	Director	Whiting School of Engineering (Dept. of Geography and Environmental Engineering), JHU Environment, Energy, Sustainability & Health Institute (E²SHI)	Johns Hopkins University	Environmental, energy, and water systems, economics	Application of systems analysis and economics to electric utility regulation, planning, and operations, as well as environmental and water resources systems
Jordaan, Sarah Marie	Assistant Professor	School of Advanced International Studies, Energy, Resources and Environment Program	Johns Hopkins University	Climate policy and the water implications of energy technologies	Comparative Regional Analysis; Energy Technology Innovation; Land use and Water Consumption of Energy Developments; Life Cycle Assessment; Spatial Analysis of Energy and Environmental Policies

Kensler, Thomas	Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Biological/molecular mechanisms of cancer and emerging risk	Environmental Health Sciences, chemical carcinogenesis, chemoprevention, hepatocarcinogenesis, reactive oxygen, antioxidants, enzyme induction, aflatoxin, oltipraz, chlorophyllin, sulforaphane, Keap1, Nrf2, triterpenoids
Latshaw, Megan Weil	Assistant Scientist	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Environmental health surveillance at state/local level	Environmental health, environmental justice, public health practice, policy
Locke, Paul H.	Associate Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Law and health science	Environmental law; environmental policy; risk assessment/management; radiation; regulation; uranium mining; space radiation
McKenzie, Shawn E.	Research Associate	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Behavior change communication	
McPherson, Charles	Lecturer	School of Advanced International Studies,	Johns Hopkins University	Resource tax	Petroleum and minerals policies and taxation

Nahm, Jonas	Assistant Professor	School of Advanced International Studies, Energy, Resources and Environment Program	Johns Hopkins University	Renewables and green technology politics	Political economy of development and industrial upgrading in green industries, the politics of innovation, and the political economy of the energy sector
Neff, Roni A.	Assistant Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Food systems	1) wasted food; 2) protein consumption; and 3) urban food system resilience to climate change and other threats
Parker, Cindy L.	Assistant Scientist	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Climate change policy (MD state and national)	global warming, climate change, sustainability, global environmental change, peak oil, peak petroleum, risk communication, crisis communication, energy scarcity, energy policy, energy and health
Preheim, Sarah	Assistant Professor	Whiting School of Engineering (Dept. of Geography and Environmental Engineering), Environmental Health and Engineering	Johns Hopkins University	Environmental microbiology, microbial ecology, bioinformatics	Bacteria of aquatic dead zones

Schoenberger, Erica	Professor	Whiting School of Engineering (Dept. of Geography and Environmental Engineering), Environmental Health and Engineering	Johns Hopkins University	Economic geography	Environmental history, environmental politics and policy, history of mining, history of the automobile, interdisciplinary scientific collaboration
Schwab, Kellogg J.	Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Water and pathogenic microorganisms	Environmental microbiology, microbial fate and transport, Chesapeake Bay
Schwartz, Brian	Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Genetic-environmental interactions	land use and energy use contributing to global climate change, ecosystem degradation, and biodiversity and species losses, and ultimately, posing important risks to individual and population health
Semon, Natalie L.	Research Associate	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Preparedness and emergency response	
Smith, Genee S.	Assistant Professor	Bloomberg School of Public Health, Environmental Health and Engineering	Johns Hopkins University	Climate change and infectious respiratory disease	How climate change has the ability to modify exposure to disease, alter host susceptibility to disease, and

					impact disease morbidity
Stone, Alan T.	Professor	Whiting School of Engineering (Dept. of Geography and Environmental Engineering), Environmental Health and Engineering	Johns Hopkins University	Environmental and aquatic chemistry	Abiotic degradation of inorganic and organic pollutants; Agriculture, aquaculture, silviculture, and biogeochemistry ; ; Chelating agents and other hydrophilic compounds in environmental media; Chemical kinetics and mechanisms of environmental reactions; thermodynamics and kinetics; Metal ion speciation in natural and engineered systems; Nanoscale reactions at the surfaces of oxide/hydroxide s and other minerals; Oxidation-reduct ion and nucleophile-elec trophile reactions; Toxic metal ion and radionuclide subsurface chemistry and transport; Chemical structure-reactiv

					ity relationships; Chemical reactions in biofluids
Alesina, Inna	Faculty	Environmental Design	Maryland Institute College of Art	Product design	
Aziz, Timmy	Faculty	Architectural/Environmental Design	Maryland Institute College of Art	Architecture	Architect whose designs have included products, furniture, new buildings and renovations
Davis, Lee		Social Design	Maryland Institute College of Art	Social entrepreneurship	Social enterprise and value philanthropy
Erwin, Jonathan	Faculty	Social Design	Maryland Institute College of Art	Urban planning	Balances and connects top down bureaucracy of government initiatives with on the ground grassroots organizations in an effort to create and foster environmental resilience in diverse communities
Fantauzzi, Frank	Faculty	Architectural/Environmental Design	Maryland Institute College of Art	Architecture	Alternative forms of critical architectural practice; large-scale installations and outdoor constructions
Burnim, Mickey	President	Climate Commitment Coordinating Committee (4C)	Bowie State University	Comprehensive plan to achieve climate neutrality on campus	Signed Climate Commitment and White House Act on Climate Pledge;

					energy use in campus buildings
Badibanga, Thadee Mutumba	Visiting Associate Professor	Department of Accounting, Finance, and Economics	Bowie State University	Agricultural economics and policy	Structural transformation, economic growth, agricultural and rural development, and poverty analysis and measurement
Brown-Robertson, Latanya	Associate Professor	Department of Accounting, Finance, and Economics	Bowie State University	Urban and applied economics	Housing, poverty, economic empowerment, and various urban and financial economic policy issues
Ntembe, Augustin	Assistant Professor	Department of Accounting, Finance, and Economics	Bowie State University	Best practices/management	Private sector development, economic growth, economic development and poverty reduction
Sawyer, Granville Jr.	Professor	Department of Accounting, Finance, and Economics	Bowie State University	Workforce development	
Tawah, Regina	Associate Professor	Department of Accounting, Finance, and Economics	Bowie State University	Development	Development Economics, International Economics, Poverty and Women Issues
Parris, Elliott	Chair of Behavioral Sciences and Social Services	Sociology	Bowie State University		
Anderson, Alan	Associate Professor	Department of Natural Sciences	Bowie State University	Biochemistry	Synthesis of novel medical

					compounds and nano-materials
Lewis, William	Professor	Department of History and Government	Bowie State University	Policy analysis	Urban politics, religion and politics
Green, Makeba	Chairperson	Department of Social Work	Bowie State University		
Feher, Bori	Visiting Faculty	Social Design	Maryland Institute College of Art	Architecture	Adaptation to climate change; humanitarian design, design for disasters
Gardner, Thomas	Faculty	Social Design	Maryland Institute College of Art	Architecture	Design methodologies and tactical technologies, with a particular focus on pedagogy, fabrication, community engagement and emerging practices
Ogbu, Liz	Visiting Faculty	Social Design	Maryland Institute College of Art	Architecture	Sustainable design and spatial innovation in challenged urban environments
Akers, Mary Anne	Dean and Professor	School of Architecture and Planning, Center for the Built Environment and Infrastructure Studies	Morgan State University	Urban planning and community organization	Urban Sustainability and Resiliency, Community Design, Design and Human Behavior, Community-based Economic Development

Austin, Sandra	Ph.D.	School of Social Work, Social Work	Morgan State University	Community health	Health Disparities among African Americans, Health Promotion, Collaboration with Faith Based Institutions, Cultural competence in the delivery of health services, Community Economic Development
Barnes, Mark	Assistant Professor	College of Liberal Arts, History and Geography	Morgan State University	Adaptation to climate change	North American geography; climate and society; environmental policy and planning; transportation; urban studies
Bridge, Adam	Lecturer & Co-Program Director	School of Architecture and Planning, Architecture & Environmental Design	Morgan State University	Earthen Architecture	Design Studio, Architecture and Urban History, Architecture and Urban Theory
Charalambides, Jason	Assistant Professor	School of Architecture and Planning, Center for the Built Environment and Infrastructure Studies	Morgan State University	Green technologies	Tensegrity Structures, Concrete Design, Steel Design, Statics and Strength of Materials, Computer and Numerical Methods for the Built Environment Professionals, Building Technology and

					Solar Energy Controls, Building Materials and Methods, and Real Estate Project Management
Chavis, Celeste	Assistant Professor	School of Engineering, Transportation and Urban Infrastructure Studies	Morgan State University	Informal transit systems	Traffic operations, public transportation systems, policy and regulatory decisions, sustainability, and equity of transportation systems
Farkas, Andrew	Director, National Transportation Center; Professor	School of Engineering, Transportation and Urban Infrastructure Studies	Morgan State University	Electric vehicles	Transportation economics and policy, logistics, public transportation and land use
Green, Dale	Assistant Professor	School of Architecture and Planning, Center for the Built Environment and Infrastructure Studies	Morgan State University	Historic preservation	
Grieb, Brian	Assistant Professor	School of Architecture and Planning, Architecture and Planning	Morgan State University	Sustainable building and materials, integrated design, urban design	
Hawkins, Anita	Associate Professor	School of Community Health and Policy, Community Health & Policy	Morgan State University	Health communication	Health literacy, risk communication, cultural competency; age related differences in

					health communication needs, HIV risk behaviors and identification of best practices for prevention
Ilieva, Pavlina	Assistant Professor and Co-Program Director	School of Architecture and Planning, Architecture & Environmental Design	Morgan State University	Regenerative Urban Development and Social Engagement Practices	Design/Build, Digital Design and BIM
Jeihani, Mansoureh	Associate Professor	School of Engineering, Transportation and Urban Infrastructure Studies	Morgan State University	Socio-economic systems engineering	Transportation modeling and planning, traffic safety
Kroiz, Gabriel	Associate Professor & Undergraduate Department Chair	School of Architecture and Planning, Architecture and Planning	Morgan State University	Sustainable building systems	
Leonard, Jack	Assistant Professor & CSUC Program Director	School of Architecture and Planning, Architecture and Planning	Morgan State University	Green infrastructure	Sustainable Urban Communities; Green Infrastructures Role as a Catalyst for the Revitalization of Underserved Communities; Teaching Design in an On-Line / Distance Learning Environment; Interdisciplinary & Collaborative Design

Rowel, Randolph	Associate Professor and Chair	School of Community Health and Policy, Behavioral Health Sciences	Morgan State University	Disaster resilient communities, daily crisis and disaster preparedness	Why Culture Matters Disaster Studies Project; Preparedness and Emergency Response Research Center (PERRC) on Towards a Community Resilience Index; FEMA's "Whole Community Approach"
Sanders, Tonya	Assistant Professor	School of Architecture and Planning, Architecture and Planning	Morgan State University	Community development	Faith-based Community Development, Faith-based Curriculum Development, Built Environment and Health
Sen, Siddharta	Professor & Interim Assistant Dean/Program Director	School of Architecture and Planning, City & Regional Planning	Morgan State University	Urban design	International Planning; Urban and Environmental Design; Planning Theory and History; Diversity and Equity Issues in Planning; Transportation Planning; Housing and Community Development

Sharma, Archana	Associate Professor	School of Architecture and Planning, Landscape Architecture	Morgan State University	Environmental design	Critical review of theory and practice in Urban landscapes, Greenways, Sustainable development, Environmental design, through frameworks of Landscape urbanism, Eco-analogy, Systems approach
Shin, Hyeon-Shic	Assistant Professor	School of Architecture and Planning, Architecture and Planning	Morgan State University	Planning and policy for transportation	Transportation economics, Transportation safety, freight transportation demand management, land use and transportation, social/environmental justice
Hubley, Mark	Chair	Environmental Studies (Biological Sciences Department)	Prince George's Community College	Biology, chemistry, and math for the environment	Science requirement, social science requirement, program specialization (environmental health or policy)
Bloodworth, Gina	Associate Professor	Geography/Environmental Studies	Salisbury University	Water resource management, law and policy	Trans-boundary Rivers, dams and dam removal, and water issues in developing nations

Caviglia-Harris, Jill	Professor	Economics & Finance	Salisbury University	Environmental and natural resource economics	Tradeoffs that exist between development and deforestation in the Brazilian Amazon; welfare, poverty and land cover/land use trajectories over time
Horton, Tom	Professor of Practice	Environmental Studies	Salisbury University	Nature writing	Chesapeake Bay politics, cultures, science, nature writing, journalism and experiential education
Kolstoe, Sonja	Assistant Professor	Economics & Finance	Salisbury University	Environmental economics	
Namwamba, Fulbert	Professor	Environmental Studies, Hydrology and Geology	Salisbury University	Water resources and mapping	(1) Urban and Community-Forest Watershed Management; (2) Non-point source pollution (3) Riparian Forest Restoration
Nelson, Bill	Outreach/community coordinator	Environmental Studies	Salisbury University	Experiential education	
Ransom, Tami	Assistant Professor	Environmental Studies	Salisbury University	Conservation biology	Restoration ecology, management of fragile ecosystems and endangered species, and ecotourism

Surak, Sarah	Assistant Professor	Political Science/Environmental Studies	Salisbury University	Waste management politics	Environmental policy, public policy, environmental political theory, United States policy process, comparative politics, public administration, modern political and social theory
		Eastern Shore Regional GIS Cooperative	Salisbury University	Provides access to geographic information system (GIS) technology, data, technical support, and training to the local governments of Maryland's Eastern Shore	
Barnes, Kent	Professor	Geography and Environmental planning	Towson University	Human response and adjustment to environmental hazards	

Fath, Brian	Professor	Biological Sciences	Towson University	Systems ecology, network analysis, sustainability, environmental assessment	The goal of my research is to understand better Sustainability Science, which I address using three different approaches: network analysis, integrated environmental assessment, and complex systems science. Sustainability Science is a critically important area that encompasses a broad range of research interests including ecosystem services, biodiversity, natural resources, human cultures, and specific environments. I use network analysis to investigate thermodynamic sustainability indicators.
Fath, Natalia	Lecturer	Geography and Environmental planning	Towson University	Landscape responses to climate and land-use/land cover changes	

Gresens, Susan	Professor	Biological Sciences	Towson University	Aquatic ecology; Chironomidae (Diptera) ecology & taxonomy	
Haines, Sarah	Professor	Biological Sciences	Towson University	Science education and environmental education	My research interests lie in the areas of science education, and in particular, environmental education. My focus is in improving preservice and inservice teacher knowledge and training in the area of environmental education, and promoting environmental education and awareness among students in grades K-12.

Kautzman, Kathryn	Assistant Professor	Chemistry	Towson University		The aim of my research efforts is to further the understanding of the chemical and physical properties of atmospheric secondary organic aerosols (SOAs). A large fraction (80–90% in some locations) of atmospheric organic aerosol is secondary in origin. The effects of SOA impact issues of climate change and human health, which in turn have implications for weather, the hydrogeological cycle, and changes in ecosystem stability. My program seeks to directly address important questions in SOA formation mechanisms and chemical composition, and to relate chemical properties to the optical properties of atmospheric aerosols.

Kedzior, Sya	Assistant Professor	Geography and Environmental planning	Towson University	River cleanup and environmental awareness	
Lu, Kang Shou	Associate Professor	Geography and Environmental planning	Towson University	GIS applications for urban and regional planning	
Manley, James	Associate Professor	Economics	Towson University	Development Economics, Natural Resource Economics, Health Economics	
Moore, Joel	Associate Professor	Physics, Astronomy, and Geosciences	Towson University		Connections between mineral weathering and soil chemistry, tectonics, ecosystems, and climate shaping the Earth's surface, Understanding issues of societal relevance such as carbon sequestration, soil and water quality, and ecosystem sustainability, Investigating Earth surface processes, hydrology, and biogeochemistry
Moore, Todd	Assistant Professor	Geography and Environmental planning	Towson University	Physical Geography, Climatology, Meteorology, Severe weather climatology and hazards	

Morgan, John	Professor	Geography and Environmental planning	Towson University	GIS applications	
Ownby, David	Associate Professor	Chemistry	Towson University	Stormwater management	My training in metal fate and mixture effects in the environment led me to my current broad area of research: Stormwater Management. The importance of correctly managing this mixture of metals, PAHs, nutrients, and road salt as it moves from roofs and roads into waterways has both management and policy implications for what materials we use on our cars, roads, housing and how the urban landscape is shaped as development of previously pervious land continues. As part of this focus, the Urban Environmental Biogeochemistry Laboratory (UEBL) has developed new models for

					understanding the bioavailability of metals to earthworms (a first step into terrestrial ecosystems), collaborated with industry partners to develop low maintenance options for decreasing the bioavailability of copper in roof run-off, provided chemical characterization of yellow perch spawning grounds, and evaluated toxicity of realistic concentrations of these contaminants to local amphibian species.
Roberge, Martin	Professor	Geography and Environmental planning	Towson University	Physical geography, Hydrology, Geomorphology, Environmental applications of GIS	

Salice, Christopher	Director, Environmental Science and Studies	College of Science and Mathematics	Towson University	Applied ecology, ecotoxicology, population dynamics	My research interest is broadly focused on understanding and predicting the effects of anthropogenic activities on ecological systems. My lab uses field research, laboratory studies and mathematical modeling to address problems in applied ecology, conservation and ecotoxicology. A strong focus of current research lies in using bio- and eco-energetic frameworks to understand the effects of environmental toxicants on aquatic systems.

Seigel, Richard	Professor	Biology	Towson University	Conservation Biology	My basic research philosophy is that one cannot be a good conservation biologist without first being a strong population ecologist, and, conversely, that an interest in conservation biology is a ethical requirement of anyone calling themselves a population ecologist. Thus, research in my lab is oriented in two main directions; studies on the population ecology of amphibians and reptiles (using both field and experimental approaches) and studies on the conservation biology of amphibians and reptiles, which is almost exclusively field-oriented.

Sivey, John	Assistant Professor	Chemistry	Towson University	drinking water treatment	Research in the Sivey Lab focuses on environmental organic chemistry and the chemistry of drinking water treatment. Specifically, our group examines the chemistry of aqueous disinfectants (including free chlorine and free bromine) as well as the generation disinfection by-products. The reactivity of biologically-imp ortant molecules (e.g., amino acids) toward chlorinating and brominating agents is of particular interest. Our group also examines the transformation mechanisms and environmental fate of agrochemicals (including pesticides and "inert" ingredients).
Tasch, Jeremy	Associate Professor	Geography and Environmental planning	Towson University	Political ecology of resource	

Thebpanya, Paporn	Associate Professor	Geography and Environmental planning	Towson University	Applied GIS	
Wolfson, Jane	Professor	Biology	Towson University	climate literacy	My current activities are focused predominantly on improving climate literacy among pre-service and in-service teachers and incorporating these topics into introductory science courses. Climate change is a complex topic but one which needs to be understood in order to develop appropriate policies. Other recent activities have included improving sustainability on campus and linking student initiatives to facilities.
Bailey, Helen	Research Assistant Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Spatial ecosystems	Movement and habitat use of marine animals, predator-prey interactions, impacts of offshore energy
Boesch, Donald	Professor, President of UMCES	UMCES	University of Maryland Center for Environmental Science	Biological oceanography	Marine and estuarine ecology, marine pollution, national and

					international marine policy
Boicourt, William	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Plankton biomass and turbulence	Physical oceanographic processes, continental shelf and estuarine circulation
Boynton, Walter	Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Coastal marine ecology	Systems ecology, nutrient cycling in estuarine systems, food web dynamics
Castro, Mark	Associate Professor	Appalachian Laboratory	University of Maryland Center for Environmental Science		Atmospheric-bio sphere interactions, impacts of land use on water quality
Chao, Shenn-Yu	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Waves and upwelling	Continental shelf and slope circulation, numerical modeling of ocean circulation processes
Chen, Feng	Associate Professor	IMET	University of Maryland Center for Environmental Science		Marine microbial ecology, genomics, functional genomics, phage-host interactions, clean green biotechnology
Chung, J. Sook	Associate Professor	Institute of Marine and Environmental Technology	University of Maryland Center for Environmental Science	Crustaceans' response to hormones and neurotransmitter s	Neuroendocrine regulation on crustacean physiology of molting, growth, reproduction, sex differentiation

					and stress responses
Codispoti, Lou	Research Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Chemical oceanography	Marine nutrient and carbon budgets, coastal upwelling and chemical oceanographic instrumentation
Coles, Victoria	Research Associate Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Ocean response to climate variability	Observation and modeling of large scale ocean circulation, biogeochemical tracer distributions
Cooper, Lee	Research Professor	Chesapeake Biological Laboratory (CBL)	University of Maryland Center for Environmental Science	Biogeochemistry and ecology	Stable and radioisotope composition of organic materials in coastal waters, high latitude oceanography
Cornwell, Jeff	Research Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Biogeochemistry of nutrients in sediments	Sediment biogeochemistry, nutrient/metal/sulfur cycling in estuaries and coastal wetlands
Davidson, Eric	Director and Professor	Appalachian Laboratory	University of Maryland Center for Environmental Science	Exchange of plant nutrients and GHGs	Biogeochemistry and nutrient cycling in terrestrial ecosystems, land use and climate change
Dennison, William	Professor	Integration and Application Network	University of Maryland Center for Environmental Science	Coastal ecosystem ecology	Ecology of marine plants, assessing ecosystem health ; public outreach and

					ecological communication
Elmore, Andrew	Associate Professor	Appalachian Laboratory	University of Maryland Center for Environmental Science	Remote sensing for ecology, geology, and human sciences	Environmental Science, Land-use and land-cover change, Ecohydrology, Biogeochemistry, Remote sensing and spatial analysis
Filoso, Solange	Research Assistant Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Biogeochemistry and human impact	Nutrients in aquatic ecosystems, energy production on water resources, stream restoration
Fisher, Tom	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Water quality	Terrestrial and atmospheric nutrient inputs, nutrient cycling and limitation, primary production of aquatic systems
Fitzpatrick, Matthew	Assistant Professor	Appalachian Laboratory	University of Maryland Center for Environmental Science	Quantitative methods for biological diversity	Understanding how historic and current processes shape species distributions, patterns of biodiversity, and range expansion of native and introduced species, and developing spatially explicit predictions regarding the

					effects of environmental change on natural resources.
Grebmeier, Jacqueline	Research Professor	Chesapeake Biological Laboratory (CBL)	University of Maryland Center for Environmental Science	Benthic populations and in oceanography	Pelagic-benthic coupling, benthic community structure, marine ecosystem dynamics
Hill, Russell	Director and Professor	Institute of Marine and Environmental Technology	University of Maryland Center for Environmental Science	Marine microbiology	Diversity and roles of microbial symbionts associated with marine invertebrates, in particular sponges; marine microbes, including symbionts of marine invertebrates, as sources of novel bioactive compounds with pharmaceutical potential; marine microalgae for production of biofuels and other bioproducts; marine molecular microbiology
Hood, Raleigh	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Biological oceanography and jellyfish	Biogeochemical modeling

Houde, Edward	Professor Emeritus	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Variability in abundances of marine and estuarine fishes	Fisheries science, management, ecology; larval fish ecology; resource assessment
Jagus, Rose	Associate Professor	Institute of Marine and Environmental Technology	University of Maryland Center for Environmental Science	Genetics and viruses	Regulation of gene activity during early development, host defense against virus infection
Kemp, Michael	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Estuarine ecosystem processes	Systems ecology, primary production and nutrient cycling, trophic structure and ecosystem energetics, seagrass ecology
Kilbourne, Hali	Research Assistant Professor	Chesapeake Biological Laboratory (CBL)	University of Maryland Center for Environmental Science	Paleoclimatology and paleoceanography	Exploring the link between ocean circulation and climate and understanding the climatological controls on tropical cyclone activity.
Lapham, Laura	Assistant Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Methane biogeochemistry	Gas hydrates, methane cycling, sediment biogeochemistry, carbon and nitrogen cycling, sulfate reduction, methanogenesis

Li, Ming	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Fluid dynamics	Physical oceanography, estuarine and coastal dynamics, air-sea interaction, numerical ocean modelling, turbulent mixing processes, biological-physical interactions and marine pollution
Li, Yantao	Assistant Professor	IMET	University of Maryland Center for Environmental Science		Algal molecular biology and biochemistry, engineering of biofuels and bioproducts, algal biotechnology
Meritt, Don	Principal Agent	Horn Point Laboratory	University of Maryland Center for Environmental Science	Oysters	Aquaculture, oyster and invertebrate ecology
Miller, Thomas	Director/Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Quantitative fisheries ecology	Recruitment and population dynamics of aquatic animals, including feeding and bio-physical interactions; Fish early life history; Blue crabs
Murray, Laura	Research Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science		
Nelson, David	Assistant Professor	Appalachian Laboratory	University of Maryland Center for	Ecological consequences of global	Ecosystem ecology, paleoecology,

			Environmental Science	environmental change	microbial ecology, stable isotope ecology
Nidzieko, Nicholas	Assistant Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Coastal physical oceanography	Mixing in estuaries and seasonal variations in coastal circulation
North, Elizabeth	Associate Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Larva, human impact and decision-making	Larval fish and zooplankton ecology, estuarine physical oceanography, fisheries recruitment variability
O'Neil, Judy	Research Associate Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science		Cyanobacteria ecophysiology and plankton trophodynamics
Palinkas, Cindy		Horn Point Laboratory	University of Maryland Center for Environmental Science	Benthic environment	Sediment transport and deposition in intertidal, fluvial, and estuarine environments
Paynter, Kennedy	Associate Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Eastern oyster, Crassostrea virginica	Comparative physiology of estuarine organisms, oyster disease biochemistry
Place, Allen	Professor	IMET	University of Maryland Center for Environmental Science		Molecular mechanisms that permit organisms to adapt to unique diets, molecular basis of sex determination, pfisteria, toxic algae blooms

Plough, Louis	Assistant Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Marine genetics	Experimental breeding of shellfish, oyster biology, genomics of stress adaptation in marine animals
Roman, Michael	Director and Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Plankton	Zooplankton ecology, biological oceanography
Rowe, Christopher	Associate Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science		Impacts of sublethal exposure to pollution, ecotoxicology of coal ash, bioenergetics of aquatic animals
Sanford, Larry	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science	Transport processes and turbulence	Coastal physical oceanography, boundary layer fluid mechanics and sediment transport
Schott, Eric	Research Assistant Professor	Institute of Marine and Environmental Technology	University of Maryland Center for Environmental Science	Aquatic invertebrates virology	Molecular detection of estuarine pathogens, discovery and molecular characterization of blue crab pathogens, viruses in aquatic invertebrates
Secor, David	Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Species resilience	Population ecology of fishes; analytical techniques for determining fish life histories and

					demographics; fisheries and aquaculture
Stoecker, Diane	Professor	Horn Point Laboratory	University of Maryland Center for Environmental Science		Physiological ecology and feeding biology of planktonic protists, polar and subpolar microzooplankton and algae
Stylinski, Cathlyn	Senior Agent	Appalachian Laboratory	University of Maryland Center for Environmental Science	Informal science learning	Lifelong science learning; impacts of technology, media and community settings on science learning and connections to the natural world; links between teacher education and practice; design and evaluation of science education programs
Tamburri, Mario	Research Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Coastal technologies	Chemical ecology of aquatic organisms; Non-native species; Larval settlement and recruitment; Environmental sensor technologies; Green ship technologies

Testa, Jeremy	Assistant Professor	Chesapeake Biological Laboratory (CBL)	University of Maryland Center for Environmental Science	Estuarine biogeochemistry	Anthropogenic influences on estuarine biological and chemical processes, dissolved oxygen dynamics in estuarine ecosystems, numerical modeling, estuarine systems ecology
Wainger, Lisa	Research Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Ecological changes in terms of socio-economic outcomes	Regional-scale ecological and economic modeling; risk assessment of invasive species; environmental economic indicators; GIS-based spatial landscape analysis
Wilberg, Michael	Associate Professor	Chesapeake Biological Laboratory	University of Maryland Center for Environmental Science	Stakeholders' role in fisheries	Oyster stock assessment, dynamics of exploited populations, harvest policy development and application

		Agriculture, Food and Natural Resources	University of Maryland Eastern Shore	Agribusiness and plant/animal sciences	Prepares students for careers in veterinary medicine, animal management and production, agricultural education, plant breeding and biotechnology, greenhouse and nursery management, landscape design, water quality, nutrient management, food and fiber processing, natural resource sciences, food safety, marketing and management, international trade and development, and economic research
Everhart, Sarah	Research Associate and Legal Specialist		University of Maryland Francis King Carey School of Law	land use law, labor law and environmental policy	She began practicing law in Maryland in 2005 and her areas of expertise include land use law, labor law and environmental policy. She is also a trained mediator.

Pappas, Michael	Professor of Law		University of Maryland Francis King Carey School of Law	property and environmental law.	His scholarship explores the nature of property expectations, governmental responsibilities, and private rights in managing resources such as land, energy, water, wildlife, fisheries, and food. Professor Pappas has also worked extensively to advance interdisciplinary teaching and research collaborations throughout the University System of Maryland.
Baker, Matthew	Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	watershed ecology and ecohydrology and biogeochemistry	
Belt, Kenneth	Senior Research Scientist	Chesapeake Bay Watershed, Urban Environment	University of Maryland, Baltimore County	Urban water infrastructure	Belt is a forest service hydrologist who focuses on the integration of urban water infrastructure with natural hydrologic systems and the implications for stream ecosystems. His interests include carbon and

					particulate organic matter transport and processing, nutrients, pathogens, stream and runoff temperatures, and urban water budgets.
Bennet, Sari	Director of Geographic Education and Clinical Associate Professor	Chesapeake Bay Watershed, Urban Environment	University of Maryland, Baltimore County		Professor Bennett's research relates to K-12 curriculum development on environmental issues including impacts on the Chesapeake Bay. She also focuses on urban sprawl and environmental modification curriculum plans.
Berkowitz, Alan	Scientist	Institute of Ecosystem Studies	University of Maryland, Baltimore County		Berkowitz's research interests include physiological ecology of plant-plant interactions, schoolyard ecology, ecology of urban and suburban ecosystems and the long term growth of students, teachers and schools through

					ecology education. He is the education team leader for the Baltimore Ecosystem Study, a long-term ecological research project studying human settlements as ecosystems in Baltimore.
Biehler, Dawn	Assistant Professor	Geography and Environmental Systems	University of Maryland, Baltimore County		Professor Biehler studies urban environmental history, health geography and environmental justice.
Bissell, Rick	Associate Professor, Graduate Program Director and Director for the Center for Emergency Education and Disaster Research (CEEDR)	Emergency Health Services	University of Maryland, Baltimore County		Professor Bissell has most recently been studying potential health and human well-being impacts due to climate change including increased storm intensity, increased drought, sea water rise, changes in food production capacity, loss of arable land and potable water where needed and others. His research interests include emergency

					public health, disaster epidemiology, emergency management and EMS research.
Bradley, Brian	Professor	Biological Science	University of Maryland, Baltimore County		Professor Bradley studies diagnostic and environmental proteomics with particular focus on the expression of specific sets of proteins in response to environmental conditions.
Braunschweig, Suzanne	Lecturer	Geography and Environmental Systems	University of Maryland, Baltimore County	Plant ecology	Science education, plant physiological ecology, shale barren endemic plant species, long term forest community dynamics. Past research has included physiological acclimation ability of the shale barren endemic plant Eriogonum allenii and long term forest community structure of an Appalachian deciduous forest
Brennan, Tim	Professor	Public Policy	University of Maryland, Baltimore County		Professor Brennan is a nationally known advocate

					for market-based solutions to global warming.
Cullum, Brian	Associate Professor	Chemistry and Biochemistry	University of Maryland, Baltimore County		Professor Cullum's research involves the development of novel sensing tools and strategies for the monitoring of biological and environmental systems at both the nano- and macro-scales. His current research is focused on intracellular nanosensors for real-time cellular signaling monitoring. These sensors employ surface-enhanced Raman spectroscopy (SERS) to perform fundamental biological studies of how various cellular pathways are affected by environmental pollutants as well as the real-time monitoring of physiological exposure of individuals to

					environmental factors.
Ellis, Erle	Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	anthropogenic landscape ecology	My research investigates the ecology of human-manage d ecosystems at local and global scales towards the goal of informing sustainable stewardship of the biosphere in the Anthropocene.
Fagan, Matthew	Assistant Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	landscape management and conservation	My research investigates the causes and consequences of the fragmentation of natural habitat, and how we can best conserve and reconnect managed landscapes.
Farrow, Scott	Professor and Chair of Economics	Economics	University of Maryland, Baltimore County		Professor Farrow conducts research that integrates risk and economics and the economic evaluation of environmental and natural resource policies such as emissions trading and offshore oil and gas leasing. He maintains academic

					affiliations with the Woods Hole Oceanographic Institution and is a faculty fellow at UMBC's Center for Urban Environmental Research and Education.
Ghosh, Upal	Associate Professor of Civil and Environmental Engineering	Civil and Environmental Engineering	University of Maryland, Baltimore County		Professor Ghosh's research centers on toxic contaminants in the environment and the risk they pose to people and ecosystems. He has developed technology to remove pollutants from the San Francisco Bay and is working to apply similar systems for the Chesapeake Bay.
Groffman, Peter	Adjunct Professor, Senior Scientist for Institute for Ecosystem Studies	Geography and Environmental Systems	University of Maryland, Baltimore County		Groffman's work focuses on terrestrial microbial ecology, dynamics of microbial processes at the landscape level, nutrient cycling and transformation of environmental pollutants in

					wetlands, forests and agroecosystems and groundwater.
Halem, Milt	Research Professor	Computer Science and Electrical Engineering	University of Maryland, Baltimore County		Professor Halem is director of the Multicore Computing Center, a collaborative effort between IBM and UMBC to use networks of the super-computer-on-a-chip technology found in Sony PlayStation 3 for research related to weather/climate change prediction, among other uses. The former chief information officer for NASA Goddard, his numerous career awards include the NASA Distinguished Service Medal, the agency's highest honor.
Halverson, Jeffrey	Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	Meteorology and climate	Severe Storms, Meteorology & Climatology of the Mid-Atlantic Region

Hoff, Raymond	Professor	Physics	University of Maryland, Baltimore County		Professor Hoff directs two NASA Goddard collaborative research centers at UMBC – the Joint Center for Earth Systems Technology (JCET) and Goddard Earth Science and Technology Center (GEST). He has advised NASA on space shuttle experiments and has over 30 years of experience in research on atmospheric pollution and its impact on climate. Hoff's research group publishes the "Smog Blog," a daily online analysis of U.S. air quality.

Holland, Margaret	Assistant Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	land use dynamics and conservation	My scholarly interests rest, at a most fundamental level, on the intersections between rural livelihoods, land use dynamics, governance, and conservation strategies. To date, the majority of my research has situated itself in Latin America, with an added layer of focus on forests. I collaborate actively with economists, geographers, conservation biologists, as well as conservation and development practitioners. The common thread in this interdisciplinary effort is a commitment to developing research that not only contributes to academic discourse, but also is relevant and practical, informing a specific policy or

					management dialogue.
Kelly, Lisa	Associate Professor	Chemistry and Biochemistry	University of Maryland, Baltimore County		Professor Kelly is studying photochemical strategies for green remediation. Photosensitized oxidation of environmental of environmental contaminants is a viable way to use sunlight to remediate polluted regions. Kelly's laboratory is working on strategies to use organic and inorganic photosensitizers, coupled with a 2-electron oxidative "shuttle" to photochemically initiate 2, 4, and possibly 6-electron oxidation reactions, with the ultimate goal of transforming harmful organic pollutants into CO2 and H2O.

Lansing, David	Associate Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	conservation policy and rural livelihoods	My research interests are on the intersection of conservation policy and rural livelihoods. Drawing on political ecology, science and technology studies (STS), and theories of agrarian change I seek to explain how conservation policy is formed and implemented, and the effects it has on land use and the livelihoods of small farmers.
Lewis, Laura	Assistant Professor	Geography and Environmental Systems	University of Maryland, Baltimore County		Professor Lewis studies how farms can produce food indefinitely without causing irreversible damage to ecosystem health. Her research has focused on the factors that determine where ecosystems are situated.

McConnell, Virginia	Professor	Economics	University of Maryland, Baltimore County		An environmental economist who focuses on transportation issues, Professor McConnell is an authority on the impact of politics to reduce air pollution through vehicle emissions regulations, inspection and maintenance programs, fuel regulations, emission taxes and land-use changes.

Miller, Andrew	Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	watershed form, hydrologic response, and fluvial morphology	I am interested in the interaction between watershed form, hydrologic response, and fluvial morphology with particular focus on interactions between flood processes and channel and valley-floor boundary conditions. In recent years this work has focused primarily on small urban watersheds which experience extreme floods relative to watershed size with much greater frequency than is observed in other landscapes. I am also interested in the geomorphic transformation of the landscape associated with urban development, which we can now quantify at much finer resolution than was possible in the past; and

					with the implications of landscape transformation for hydrologic processes, flowpaths and residence times, including but not limited to floods.
Minkoff, Susan	Associate Professor	Mathematics	University of Maryland, Baltimore County		Professor Minkoff's work is focused on large-scale scientific computing and numerical analysis of seismic inverse problems, fluid flow and geomechanical deformation modeling and photonics. develops partial differential equation models and algorithms for solving these models to non-invasively image the subsurface and to understand the migration of underground fluids such as oil, natural gas, and carbon dioxide. Applications of her work include carbon sequestration and oil and gas recovery

Neerchal, Nagaraj	Chair and Professor	Mathematics	University of Maryland, Baltimore County		Professor Neerchal studies time series analysis, overdispersion models, environmental statistics and data analysis.
Neff, Robert	Assistant Professor	Geography and Environmental Systems	University of Maryland, Baltimore County		Professor Neff's interest lies in the human dimensions of global change, urban geography and environmental and social justice.
Payne, Gregory	Professor	Chemical/Biochemical engineering	University of Maryland, Baltimore County		Professor Payne's lab studies how renewable resources and natural systems can be more fully integrated into chemical manufacturing. He is working with private companies and state officials to convert wastes generated from Maryland's crab-packing industry into the value-added, environmentally friendly polymer known as chitosan, which researchers hope can replace less environmentally

					friendly synthetic polymers.
Pouyat, Richard	Adjunct Professor, Team Leader and Research Forester, United States Forest Service, Northeastern Research Station, Baltimore Long-Term Ecological Research Team	Geography and Environmental Systems	University of Maryland, Baltimore County		Professor Pouyat studies forest ecology and restoration; nutrient dynamics; influences of urbanization on ecosystem structure and function; classification, mapping and the interpretation of anthropogenic soils; the integration of ecological, soil and social sciences; and the integration of science and public policy.
Rabenhorst, Tom	Senior Lecturer	Geography and Environmental Systems	University of Maryland, Baltimore County		Lecturer Rabenhorst maps environmental change, specifically focusing on the impacts of climate change in Maryland. He also researches global warming, the mapping of Maryland state parks and the visualization of anthropogenic biomes.

Schwartz, Stuart	Senior Scientist	CUERE	University of Maryland, Baltimore County		Schwartz focuses on water resource systems analysis, urban hydrology and water policy.
Servatius, Nancy	Lecturer	Anthropology and Sociology	University of Maryland, Baltimore County		From a sociological perspective, Lecturer Servatius focuses on environmental health issues and the Chesapeake Bay, PEAS and Harmful Algae Blooms.
Short, John Rennie	Professor	Public Policy	University of Maryland, Baltimore County		Professor Short studies globalization, urban issues, environmental concerns and the history of cartography.
Strow, Larrabee	Professor	Physics	University of Maryland, Baltimore County		Professor Strow helped to design and calibrate the Atmospheric Infrared Sounder, a highly precise instrument in AQUA, a $2-billion satellite that monitors long-term global change in the Earth's atmosphere and climate. He is a fellow with UMBC's Joint

					Center for Earth Systems Technology.
Studds, Colin	Assistant Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	Biogeography and population ecology	Population Dynamics of Migratory Shorebirds, Phenology of Dragonfly Migration, Biogeographic Connectivity of Migratory Songbirds, Community Responses to Land Use and Climate Change
Swan, Christopher	Professor	Geography and Environmental Systems	University of Maryland, Baltimore County	Community, urban, and river and stream ecology	Community Assembly and Stream Restoration Metacommunities in River Networks, Multi-Scale Diversity in Built Ecosystems
Tang, Junmei	Assistant Professor	Geography and Environmental Systems	University of Maryland, Baltimore County		Professor Tang's interests include geographic information systems, remote sensing, urban landscape ecology, resource management and environmental modeling.

Welty, Claire	Director, Center for Urban Environmental Research and Education and Professor, Chemical, Biochemical, and Environmental Engineering	Center for Urban Environmental Research and Education	University of Maryland, Baltimore County	Urban Hydrology	Urban Hydrology, Contributing to fundamental understanding of transport processes in aquifers, Mathematical modeling of groundwater flow and transport in porous and fractured media
Yeakley, J. Alan	Professor and Chair	Geography and Environmental Systems	University of Maryland, Baltimore County	Watershed Hydrology	Ecosystem Ecology, Watershed Hydrology, Urban Ecology, Riparian Ecosystems, Watershed Biogeochemistry, Socio-Ecological Systems
		Joint Center for Earth System Technology	University of Maryland, Baltimore County		
		Goddard Earth Sciences and Technology Center	University of Maryland, Baltimore County		

Table 3. Stakeholder Organizations

Organization	Location (HQ)	3-5 word Title Focus/ Expertise	Focus/ Expertise (1-3 sentences)	Organization Type	Scale	Major Initiatives/ Projects
Chesapeake Bay Sentinel Site Cooperative	Virginia Institute of Marine Science	Provide information to Chesapeake Bay communities	The goal of the cooperative is to provide information to Chesapeake Bay communities and managers who need to address challenges such as storm flooding, long term, local sea level rise, barrier island movement, degraded water quality, and wetland loss. The information will also be useful to federal and state restoration planners and living resource managers who are addressing these challenges. Monitoring surface elevation, subsidence rates, water	Government	Regional	Decision support

			quality, vegetation, and living resources at sentinel sites; networking sentinel site data with Bay-wide monitoring stations; sea level rise prediction and planning tools; community education and outreach.			
Chesapeake Research Consortium	Edgewater, MD	Coordinate regional teams of scientific expertise	Encourages scientific and technical activities in the tidal Chesapeake Bay, its drainage basin, and adjoining airshed, as well as adjacent coastal waters of the Middle Atlantic Bight	Advocacy	Regional	Science-based management

Joint Global Change Research Institute (JGCRI)	College Park, MD	research, modeling and integrated analyses at the interface of human, energy, and environmental systems	The Global Change Assessment Model (GCAM), at the core of JGCRI's integrated capabilities, is a global integrated assessment model that includes both comprehensive and detailed representation of human systems that drive or are affected by global environmental change. JGCRI research results are used widely in reports of the Intergovernmental Panel on Climate Change, the U.S. Global Change Research Program, U.S. Federal agencies, and leading think-tanks, private sector firms, and non-governmental	University CoE	Global	Global Change Assessment Model

			organizations. Internships and fellowships at JGCRI provide training and research opportunities for a new generation of scientists.			
Maryland Institute for Applied Environmental Health	College Park, MD	discovery, education, and innovative application of knowledge in the field of environmental and occupational health.	To promote and protect human health in the diverse communities across Maryland, the nation and the world through discovery, education, and innovative application of knowledge in the field of environmental and occupational health.	University CoE	Global	Health concerns for fracking, extreme heat and precipitation impacts, environmental hazard distribution, biomarker detection, biodiversity research, pollutants and cancer, air pollution health impacts
NASA Wallops Flight Facility and Mid-Atlantic Coastal Resilience Institute	Washington DC	community resilience	MACRI is a multi-state, multi-disciplinary partnership dedicated to integrated climate change research with the goal of helping local and regional leaders make	Government	Global	Energy management, air and water quality, pollution prevention and green purchasing, sea level rise measurements, extreme weather, coastal

			coastal communities and habitats more resilient through scaled science and research informing public policy.			ecosystem degradation,
National Resources Defense Council	New York, New York	ensure the rights of all people to the air, the water, and the wild.	Collaboration of multiple experts in order to advocate for the protection of rights of people to the air, the water, and the wild	Advocacy	National	Serves to protect the health of the people by advocating for the rights of air, water, and other natural systems
National Wildlife Fund	Reston, Virginia	Protecting wildlife and habitat	We embrace a national responsibility to conserve wildlife and wild places wherever they may be and to broaden the conservation movement so that it encompasses America in all its diversity. We commit to nurturing with resources, attention, and talent a diverse national conservation movement that inspires local, state,	Advocacy	National	Protecting the environment, helping habitat, confronting climate change, advocating for conservation, education

			and national action and engagement on issues that transcend political boundary. And we fully accept our profound responsibility to speak up, to advocate, and to engage on behalf of America's wildlife.			
NOAA Climate Prediction Center	College Park, MD	responding to climate change and variation	CPC delivers real-time products and information that predict and describe climate variations on timescales from weeks to years thereby promoting effective management of climate risk and a climate-resilient society.	Government	Global	Data modelling and climate prediction

NOAA STAR Center for Satellite Applications and Research	College Park, MD	transfer of satellite observations of land, atmosphere, ocean, and climate	The Center for Satellite Applications and Research (STAR) is the science arm of the NOAA Satellite and Information Service (NESDIS), which acquires and manages the nation's operational Earth-observing satellites. STAR's mission is to accelerate the transfer of satellite observations of land, atmosphere, ocean, and climate from scientific research and development into routine operations, enabling NOAA to offer state-of-the-art data, products, and services to decision-makers.	Government	Global	Climate variability and change, protect, restore, and manage use of coastal and ocean resources, weather and water information, commerce and transportation information

Northeast Regional Climate Center	Ithaca, NY	collection, dissemination and use of climate data and information	The mission of the Northeast Regional Climate Center is to facilitate and enhance the collection, dissemination and use of climate data and information, as well as to monitor and assess climatic conditions and impacts in the twelve-state, northeastern region of the United States. Its activities are intended to further the economic efficiency and general welfare of public and private institutions and individuals in the region.	University CoE	Regional	Drought outlook, precipitation maps, climate perspectives, quarterly outlooks, monthly maps, CLIMOD 2
Science and Resilience Institute	Brooklyn, NY	integrated knowledge that increases biodiversity, well-being, and adaptive capacity in	The Institute produces integrated knowledge that increases biodiversity, well-being, and adaptive	Government	Local	ecosystem responses to climate change impacts such as sea level rise and water quality

		coastal communities	capacity in coastal communities and waters surrounding Jamaica Bay and New York City.			
Socio-Environmental Synthesis Center (SESYNC)	Annapolis, MD	scholarship that can inform decision makers.	The National Socio-Environmental Synthesis Center (SESYNC) is a unique resource for the scholarly, management, and policy communities. SESYNC brings together diverse groups in new, interdisciplinary collaborations to identify solutions to society's most challenging and complex environmental problems. Our researchers are encouraged to co-develop research questions with those who apply scholarly	University CoE	National	socio-environmental research, workshops, courses

			knowledge, resulting in scholarship that can inform decision makers.			
Wetlands Watch	Norfolk, Virginia	dredging and wetlands destruction	We are currently collaborating with state and local organizations to develop innovative land-use models that can be used by Virginia tidewater communities in coming years to protect our wetland resources as the sea rises. Wetlands Watch is conducting education and advocacy programs at the local level to educate and motivate citizens to press our state and local governments to take sea level rise into account in wetlands regulation and	Advocacy	State	Sea level rise adaptation, floodplain management, conservation landscapes, citizen action

			conservation. We are also working to bring the private sector into resource conservation work, helping develop a Maryland-Virginia program for education and certification of private landscape professionals in nature-based approaches to stormwater runoff reduction.			
Center for Climate Adaptation Science and Solutions (CCASS)	Tucson, Arizona	adaptation, risk management, and resilience	Providing an overarching “umbrella of opportunity” that leverages and builds from existing adaptation projects, resources, and expertise, linking and strengthening existing centers of excellence across the UA campus in a network of activities that build sustained	University CoE	Global	integrated adaptation resources and tools, support for decision makers, Adaptation includes the capacity to change institutions, infrastructure, behaviors, and relationships to respond to both current and unknown future threats or increase resilience in the environment.

			relationships and create products and services, collaborating with practitioners, decision makers, and scientists across the U.S. and internationally, conducting collaborative adaptation planning and implementation projects.			
North Atlantic LCC		Land conservation	The North Atlantic Landscape Conservation Cooperative provides a partnership in which the private, state, tribal and federal conservation community works together to address increasing land use pressures and widespread resource threats and uncertainties amplified by a rapidly changing climate. The		Regional	Planning, design, delivery, monitoring, evaluation and research - each aspect of the conservation work supported by the LCC contributes to a regional vision for adaptive management.

			partners and partnerships in the cooperative address these regional threats and uncertainties by agreeing on common goals for land, water, fish, wildlife, plant and cultural resources and jointly developing the scientific information and tools needed to prioritize and guide more effective conservation actions by partners toward those goals.			

Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS)	Silver Spring, MD	discover and apply new knowledge and understanding of our coastal ocean to help save lives and livelihoods, and maintain the quality of life in the Mid-Atlantic Region	MARACOOS seeks to discover and apply new knowledge and understanding of our coastal ocean to help save lives and livelihoods, and maintain the quality of life in the Mid-Atlantic Region. To accomplish this, MARACOOS membership has identified five high-priority regional themes: Maritime safety, ecological decision support, water quality, coastal inundation, and energy	Government	Regional	An array of High-Frequency Surface Current Radars covering the entire MAB, A fleet of underwater gliders able to adaptively sample the entire MAB, A network of hardened meteorological stations distributed throughout the MAB, Three satellite ground stations acquiring imagery of the ocean, atmosphere and land, Coast Guard drifters used for SAR operations and to evaluate the skill of the forecasting systems, and An ensemble of both statistical and dynamical ocean forecast models that (a) assimilate spatial data

						from the satellites, the HF Radar network, and the fleet of autonomous ocean gliders, and (b) are forced by an ensemble of atmospheric models validated with the meteorological network.
National Wildlife Federation	Merrifield, VA	Protecting wildlife and habitat	We embrace a national responsibility to conserve wildlife and wild places wherever they may be and to broaden the conservation movement so that it encompasses America in all its diversity. We dedicate ourselves to share respectfully with our neighbors our understanding and appreciation of our natural environment, of conservation, of cultural preservation,	Advocacy	National	Protecting the environment, helping habitat, confronting climate change, advocating for conservation, education

			and of America's outdoor heritage. We commit to nurturing with resources, attention, and talent a diverse national conservation movement that inspires local, state, and national action and engagement on issues that transcend political boundary. And we fully accept our profound responsibility to speak up, to advocate, and to engage on behalf of America's wildlife.			
The Conservation Fund	Arlington, VA	Land conservation	We practice conservation to achieve environmental and economic outcomes. Our trusted and get-it-done staff throughout the country create and	Nonprofit	National	Business partnerships, conservation acquisition, conservation leadership network, freshwater institute, land conservation loans, mitigation solutions, natural capital

			implement innovative, practical ways to benefit the natural world and the well-being of Americans from every walk of life.			investment fund, resourceful communities, strategic conservation planning, working forest fund
Chincoteague Bay Field Station	Wallops Island, VA	Wildlife and ecosystem conservation	From professional researchers to citizen science, research is a core part of our mission. We provide technical and logistical support for researchers from all institutions and of all ages.	University CoE	Local	Chesapeake Tributary monitoring, Living shoreline projects, oyster reef management, monitoring biodiversity, tidal dynamics, sea level rise attitudinal survey
Chesapeake Bay National Estuarine Research Reserve/Chesapeake & Coastal Service	Gloucester Point, VA	informed management of the Nation's estuaries and coastal habitats	The Reserve's and Institute's missions are closely aligned through interdisciplinary research in coastal ocean and estuarine science, education of students and citizens, and by providing advisory service to policy	Advocacy	Local	Virginia Estuarine & Coastal Observing System (VECOS)

			makers, industry, and the public.			
Smithsonian Institution Environmental Research Center	Edgewater, MD	measuring physical, chemical, and biological interactions in environmental settings	The Smithsonian Environmental Research Center (SERC) provides science-based knowledge to meet critical environmental challenges. SERC leads objective research on coastal ecosystems—where land meets the sea—to inform real-world decisions for wise policies, best business practices, and a sustainable planet.	Government	Global	Lead research on global change, pollution by toxic chemicals and nutrients, land-use management, over-fishing, and invasive species in coastal ecosystems, Global Earth Observatory networks (GEO) for forest ecosystems (Forest GEO) and coastal marine ecosystems (Marine GEO), Conservation Commons through preservation and restoration of crucial forests and coastal ecosystems, Biogenomics through applications of genomic tools in ecology, Lead development and

						implementation of Citizen Science linked tightly to the Smithsonian's and SERC's research networks and partnerships, Develop facilities and manage SERC's site on Chesapeake Bay as a unique research platform and model for landscape sustainability, integrating research, education, and stewardship for environmental resources
Johns Hopkins University						

Hampton Roads Planning District Commission	Chesapeake, VA	to encourage and facilitate local government cooperation and state-local cooperation in addressing on a regional basis problems of greater than local significance	Serve as a forum for local elected officials and chief administrators to deliberate and decide issues of regional importance, Provide the local governments and citizens of Hampton Roads credible and timely planning, research and analysis on matters of mutual concern, Provide leadership and offer strategies and support services to other public and private, local and regional agencies, in their efforts to improve the region's quality of life.	Government	Regional	Planning support

City of Virginia Beach	Virginia Beach, Virginia	Waste reduction, water quality, energy conservation	to improve the quality of life for our residents today and for the benefit of future generations. City initiatives for the environment are focused on protecting our unique resources and to assist residents in being better stewards of our resources.	Government	Local	
City of Norfolk	Norfolk, VA	resilience planning	At the core of our resilience strategy is a commitment by each citizen, organization, and municipal system, and by leadership from all sectors, to acknowledge our stresses and vulnerabilities and to work proactively to find solutions	Government	Local	Design the coastal community of the future, create economic opportunity by advancing efforts to grow existing and new industry sectors, advance initiatives to connect communities, deconcentrate poverty, and then strengthen neighborhoods

University of Delaware	Newark, DE	Delaware climate information	Leather's major research interests include understanding the role of snow cover in the global climate system, the influence of land-surface changes (natural and human induced) on regional climates, environmental monitoring and the integration of environmental data sources, and the climate of the northeast United States.	Government	State	

George Mason University	Fairfax, VA	inform decision making	Our mission is to develop and apply social science insights to help society make informed decisions that will stabilize the earth's life-sustaining climate, and prevent further harm from climate change. To achieve this goal, our center engages in three broad activities: we conduct unbiased communication research; we help government agencies, civic organizations, professional associations, and companies apply social science research to improve their public engagement initiatives; and we train students and professionals with the	University CoE	National	Surveys for the understanding and consensus on climate change, student training for climate change communication, public engagement for climate change

			knowledge and skills necessary to improve public engagement with climate change.			
Maryland Department of Natural Resources	Annapolis, MD	Preserve, protect, and restore the environment	The Department of Natural Resources leads Maryland in securing a sustainable future for our environment, society, and economy by preserving, protecting, restoring, and enhancing the State's natural resources.	Government	State	Sustainable Populations of Living Resources and Aquatic Habitat, Healthy Maryland Watershed Lands, Streams and Non-Tidal Rivers, Natural Resources Stewardship Opportunities for Maryland's Urban and Rural Citizens, Conserved and Managed Statewide Network of Ecologically Valuable Private and Public Lands, Diverse Outdoor Recreation Opportunities for Maryland Citizens and Visitors, Diverse Workforce

						and Efficient Operations
Maryland DOT	Hanover, MD	policy, planning, compliance, and stewardship	The Office of Environment is responsible for the Department-wide development, implementation, oversight, and coordination for environmental programs and initiatives that support a safe and sustainable transportation system while protecting human health and the environment.	Government	State	Air quality, land use, water quality

University of Massachusetts, Sustainable Adaptive Gradients in the Coastal Environment (SAGE)	Amherst, MA	resilient infrastructure framework	A new resilient infrastructure framework serves as the basis for this RCN, and includes understanding communities as existing and evolving within adaptive gradients, addressing spill-over and equity effects of infrastructure decisions, using evidence regarding the impacts of fast-onset disasters (e.g., hurricanes, tsunamis) to improve practices and policies for chronic, slow-onset phenomena (e.g. sea level rise), and tying the application of our theory to increasingly available indicators of climate change and	University CoE	National	Sustainable Adaptive Gradients in the Coastal Environment (SAGE): Reconceptualizing the Role of Infrastructure in Resilience

			local conditions. Caribbean region researchers and policy-makers are key partners in this effort as they bring extensive practical and research experience in managing disaster risk and recent highly innovative regional approaches to adapting to climate change.			

University of Maryland, Earth System Science Interdisciplinary Center	College Park, MD	climate variability and change	The major research thrusts of the center are studies of Climate Variability and Change, Atmospheric Composition and Processes, the Global Carbon Cycle (including Terrestrial and Marine Ecosystems/Land Use/Cover Change), and the Global Water Cycle. The manner in which this research is accomplished is via analyses of in situ and remotely sensed observations together with component and coupled ocean-atmosphere-land models. Together this provides a foundation for understanding and forecasting changes in the global	University CoE	Global	Satellite Remote Sensing of the land Surface, Atmosphere and Ocean, Integration of in Situ and Satellite Observations, Land Surface Modeling (including Hydrology and Vegetation), Climate Dynamics, Tropical Ocean Dynamics, Atmospheric Modeling and Analysis, Data Assimilation, Atmospheric Aerosols, Volcanology, Glaciology, Atmospheric Chemistry, Biogeochemical Cycling, Computational Science

			environment and regional implications. Data assimilation and regional downscaling provide the means by which the observations and models are linked to study the interactions between the physical climate system and biogeochemical cycles from global to regional scales.			

Cooperative Institute for Climate and Satellites-Maryland	College Park, MD	Satellite observations and earth systems models	CICS performs collaborative research aimed at enhancing NOAA's ability to use satellite observations and Earth System models to advance the national climate mission, including monitoring, understanding, predicting and communicating information on climate variability and change.	University CoE	Global	Develop innovative applications of National and international satellite observations and to advance transfer of such applications to enhance NOAA operational activities; Investigate satellite observations and design information products and applications to detect, monitor and understand the impact of climate variability and change on coastal and oceanic ecosystems; Identify and satisfy the satellite climate needs of users of NOAA climate information products, including atmospheric and oceanic reanalysis

						efforts; Improve climate forecasts on scales from regional to global through the use of satellite-derived information products, particularly through participation in the NOAA/NWS/NCEP Climate Test Bed; Develop and advance regional ecosystem models, particularly aimed at the Mid-Atlantic region, to predict the impact of climate variability and change on such ecosystems; and Establish and deliver effective and innovative strategies for articulating, communicating and evaluating research results and

						reliable climate change information to targeted public audiences.
Maryland State Highway Administration	Baltimore, MD	protecting and enhancing the environment	The decisions we make affect our environment - today and for generations to come. From the mountains in the western part of the state to the Chesapeake Bay, Maryland encompasses diverse ecosystems. SHA is committed to protecting and enhancing the environment; through the twin principles of mitigation and stewardship, we look at how highway projects will affect the environment today and in 100 years.	Government	State	Protecting and enhancing the natural environment, community improvement, cleaner, greener, practices and initiatives

DE DNREC	Dover, DE	manage and conserve natural resources	The mission of the Department of Natural Resources and Environmental Control is to ensure the wise management, conservation, and enhancement of the State's natural resources, protect public health and the environment, provide quality outdoor recreation, improve the quality of life and educate the public on historic, cultural, and natural resource use, requirements and issues.	Government	State	Ecosystem-based management, Organizational performance will be based on clear, legitimate measures to ensure accountability and continuous improvement, DNREC will create and develop partnerships that integrate economic development, social policy and environmental protection and rely on clear, effective communication, Our employees recognize and harness the tremendous power of information to transform the organization, empower and educate the public, We create a work environment that fosters mutual respect and

						understanding among all employees and values diversity.
Delaware Sea Grant	Newark, DE	conservation of marine and coastal resources	our goal has been to promote the wise use, conservation, and management of marine and coastal resources through high-quality research, education, and outreach activities that benefit the public and the environment.	University CoE	Local	Healthy Coastal ecosystems, resilient communities and economies, sustainable fisheries and aquacultures, environmental literacy and workforce development

Carolinas Integrated Sciences and Assessments	Columbia, SC	decision-relevant climate information	CISA's work focused initially on the water resources sector and the development of information and tools to enhance drought management. Since then, the CISA program has evolved and expanded in order to meet regional needs for decision-relevant climate information and to support the capacity of communities to respond and adapt to climate-related stresses.	Government	Regional	establishment of a coastal climate extension program with NC and SC Sea Grant in 2007, research and stakeholder engagement for the third National Climate Assessment in 2010, expansion of our portfolio of projects to include integrated climate-health work, collaboration with the National Integrated Drought Information System (NIDIS) to support the coordination of a regional Drought Early Warning System for the coastal Carolinas, additional outreach, communications, and engagement efforts across the Carolinas through

						materials such as a quarterly newsletter, Carolinas Climate Listserv, and the biennial Carolinas Climate Resilience Conference
University of Colorado Boulder, CIRES and Western Water Assessment (WWA)	Boulder, CO	societal vulnerabilities to climate variability	Our mission is to conduct innovative research in partnership with decision makers in the Rocky Mountain West, helping them make the best use of science to manage for climate impacts.	University CoE	Regional	In addition to conducting research projects, we produce synthesis and assessment products to make existing knowledge more accessible to stakeholders, such as the 2014 WWA report Climate Change in Colorado for the Colorado Water Conservation Board. WWA also makes accessible real-time climate information in our Intermountain West Climate Dashboard and other products. In providing

						useful products for our stakeholders in our region, we also serve to prototype, for NOAA, the delivery of regional climate services.
City of Baltimore	Baltimore, MD	climate change risk management	The City of Baltimore is continually working to manage risks associated with climate change—protecting vulnerable populations and creating adaptation strategies for systems and infrastructure.	Government	Local	Climate Action Plan (CAP), informing the citizens of Baltimore
UMCES, Chesapeake Bay Biological Lab	Cambridge, MD	understand and manage the world's resources	Comprised of the Appalachian Laboratory in the mountains of western Maryland, the Chesapeake Biological Laboratory at the mouth of the Patuxent River, the Horn Point Laboratory on the Eastern Shore, the Institute of	University CoE	State	research on: Oyster, seagrass, rockfish, blue crab management, alternative energy

			Marine and Environmental Technology in Baltimore, UMCES scientists provide sound advice to help state and national leaders manage the environment and prepare future scientists to meet the global challenges of the 21st century.			
Virginia Institute of Marine Science/College of William & Mary	Gloucester Point, VA	Coastal research, education, and advisory	The Virginia Institute of Marine Science (VIMS) has a three-part mission to conduct research in coastal ocean and estuarine science, educate students and citizens, and provide advisory service to policy makers, industry, and the public. VIMS provides these services to	University CoE	Global	Make seminal advances in understanding marine systems through research and discovery, Translate research findings into practical solutions to complex issues of societal importance, Provide new generations of researchers, educators, problem solvers, and managers with a

			Virginia, the nation, and the world.			marine-science education of unsurpassed quality.
Old Dominion University						
EPA Chesapeake Bay Program Office	Annapolis, MD	Chesapeake Bay Restoration	The Chesapeake Bay Program Office (CBPO) supports the Chesapeake Bay Program EXIT, a unique regional partnership that has coordinated the restoration of the Chesapeake Bay and its watershed since 1983.	Government	Regional	A "Pollution Diet" to Restore the Bay: Total Maximum Daily Load (TMDL) project, Chesapeake Bay Compliance and Enforcement Strategy, Restoration of the Chesapeake Bay
PNNL	Richland, WA	Chemistry, Environmental science, and data analytics	Powered by the creativity and imagination of more than 4,000 exceptional scientists, engineers and support professionals, at PNNL we advance the frontiers of science and address some of the most challenging	Government	Global	deepening the understanding of climate science, inventing the future power grid, preventing nuclear proliferation, speeding environmental remediation

			problems in energy, the environment and national security. As DOE's premier chemistry, environmental sciences and data analytics laboratory.			
Columbia University, Consortium for Climate Risk in the Urban Northeast	New York, NY	assessing and managing risks from climate variability	CCRUN serves stakeholder needs in assessing and managing risks from climate variability and change. It is currently also the only RISA team with a principal focus on climate change adaptation in urban settings. As such, CCRUN is designed to address the complex challenges that are associated with densely populated, highly interconnected urban	University CoE	Regional	advance understanding of context and risk, support knowledge to action networks, innovate services, products, and tools to enhance the use of science in decision-making, and advance science policy

			areas, such as urban heat island effects; poor air quality; intense coastal development, and multifunctional settlement along inland waterways; complex overlapping institutional jurisdictions; integrated infrastructure systems; and highly diverse, and in some cases, fragile socio-economic communities.			
Old Dominion University, Intergovernmental Pilot Program	Norfolk, VA	sea level rise preparedness and resilience	The mission of the Pilot Project is to develop a regional “whole of government” and “whole of community” approach to sea level rise preparedness and resilience planning in Hampton Roads that also can be used as a template for other regions.	University CoE	National	implementation of n intergovernmental planning organization to effectively coordinate sea level rise planning and preparedness

City of Chesapeake, Emergency Management Office	Chesapeake, VA	emergency preparation, mitigation/resilience, response, recovery	The effort of planning, organizing and gathering resources before a disaster or emergency in the hopes that those preparations reduce citizen's impacts to those events. Actions that occur during or immediately after a disaster that aid in securing a safe outcome to an extreme event. The effort of rebuilding and restoring a community, family, building or region to pre-disaster conditions. Sometimes the focus can be on restoring the community to better than pre-disaster conditions. Recovery can be measured in weeks,	Government	Local	emergency plan, resilience plan, response plan, recovery plan

			months and even years.			
Pennsylvania Sea Grant	Erie, PA	sustainability of coastal resources	PASG is dedicated to promoting the ecological and economic sustainability of Pennsylvania's coastal resources through the development of science-based research, education, and extension programs.	University CoE	State	establishing healthy coastal ecosystems, resilient communities and economies, environmental literacy and workforce development, sustainable fisheries and aquaculture
University of Maryland Sea Grant Extension	College Park, MD	preserve and restore the Chesapeake Bay and Maryland's coastal waters.	Our mission combines scientific research, education, and public outreach. Guided by our strategic plan, we work to develop sound ideas and practices that can enhance the Bay's ecology as well as the businesses and jobs that depend on it. Working with a variety of partners, we act as an "honest broker" to spread	University CoE	State	Research projects to improve understanding of Bay ecosystem dynamics, water quality, commercial fisheries species, and more, spread environmental-science education at all educational levels, advise community groups, teachers, government officials, aquaculture businesses, seafood processors,

			science-based, useful, unbiased solutions to a wide audience. We are pursuing these efforts at an important time in the Bay's history. An unprecedented array of activities is underway to reverse decades of damage to the Chesapeake and coastal bays' environments.			and others, We produce a quarterly magazine, documentary films and short videos, and news articles that provide context, depth, and narrative that nonscientists can understand and enjoy
DC Department of Energy and Environment	Washington DC	promote environmentally responsible behavior	The Department of Energy and Environment (DOEE) is the leading authority on energy and environmental issues affecting the District of Columbia. Using a combination of regulations, outreach, education, and incentives,	Government	Local	enforcing environmental regulations; monitoring and assessing environmental risks; developing energy and environmental policies; issuing permits; and providing residents and local businesses with funding, technical assistance,

			our agency administers programs and services to fulfill our mission. We work collaboratively with other government agencies, residents, businesses, and institutions to promote environmentally responsible behavior that will lead to a more sustainable urban environment.			and information on initiatives designed to ensure a more resilient and sustainable city

Virginia Sea Grant	Gloucester Point, VA	resilience and sustainability of coastal and marine ecosystems	Through university-based research, extension, education, and communication, Virginia Sea Grant makes science-based information accessible to citizens, businesses, educators, resource managers, industry stakeholders, and policy makers across the Commonwealth of Virginia, the region, and the nation. Collectively, Virginia Sea Grant forms an agile multi-university network. We are a dynamic 21st century knowledge management entity, comprised of a broad portfolio of expertise. Our communities of practice	University CoE	State	advances the ecological, economic, and social sustainability and resilience of Virginia's coastal and ocean ecosystems and the communities that depend on them.

			and interests cross both institutional and functional boundaries, and we adhere to rigorous network management principles that optimize innovation, responsiveness, and performance.			
Institute for Governmental Service and Research	College Park, MD	state and local government decision making		University CoE	State	The Institute develops innovative, customized software and service solutions to automate and improve the efficiency of public agencies. Projects include business process analysis and reengineering, modeling studies, systems/project management, custom applications and programming, training, technical support, and NIST audits

						for small organizations.
Center for Agricultural and Natural Resource Policy	College Park, MD	agriculture and natural resource policies		University CoE	National	
Center for Environmental Energy Engineering	College Park, MD	Alternative Cooling, Refrigeration Systems & Refrigerants, Heat Exchange Technology, Energy Conversion Systems, Quantitative Flow Visualization of Thermophysical Properties	CEEE provides innovative solutions to industry's research and development challenges and cost-effective, timely technology transfer. CEEE has developed a highly flexible and task-oriented consortium structure that emphasizes pre-competitive research. They conduct extensive experimental and theoretical research, exploring and developing new ideas in energy conversion.	University CoE	National	Energy efficiency and heat pumps, advanced heat exchangers, and modeling and optimization

Center for Risk and Reliability	College Park, MD	Uncertainty Characterization and Assessment, Human Reliability and Socio-technical Systems Risk, Risk Based Design	CRR research covers a wide range of subjects involving systems and processes, and include topics on predictive reliability modeling and simulation, physics of failure fundamentals, software reliability and human reliability analysis methods, advanced probabilistic inference methods, system-level health monitoring and prognostics, risk analysis theory and applications to complex systems such as space missions, civil aviation, nuclear power plants, petrochemical installations, medical devices, information	University CoE	National	Uncertainty Characterization and Assessment, Human Reliability and Socio-technical Systems Risk, Risk Based Design

			systems, and civil infrastructures.			
Center for International Earth Science Information Network	New York, New York	Intersection of the social, natural, and information sciences	The intersection of the social, natural, and information sciences, and specializes in on-line data and information management, spatial data integration and training, and interdisciplinary research related to human interactions in the environment.	University CoE	Regional	Environmental Performance Index, Consortium for Climate Risk in the Urban Northeast, High-Performance Green Infrastructure to Sustain Coastal Cities
Global Land Cover Facility	College Park, MD	earth science data and products to help everyone to better understand global environmental systems data and products to help everyone to better understand global environmental systems	GLCF research focuses on determining land cover and land cover change around the world. Determining where, when, how much and why change occurs with land cover is a crucial scientific concern. It is imperative that	University CoE	Global	Deforestation mapping group, Earth science data interface, Carbon Cycle and Global Climate Change

			appropriate tools be made available to better manage and adapt to change.			
Institute of Applied Agriculture	College Park, MD	educational program for UMD students		University CoE	Regional	
Institute for Bioscience and Biotechnology Research	Rockville, MD	Bioengineering techniques, plant growth, cell imaging	oster integrated, cross-disciplinary team approaches to scientific discovery, translational development and education, – and to create commercialization relationships and initiatives that serve the expanding economic base of biosciences and technology	University CoE	National	
Center for Technology and Systems Management	College Park, MD	resiliency and sustainable construction, sea level rise		University CoE	National	Climate change impacts on Washington, DC; Measurement science in resilience, Sustainable construction and

						manufacturing
Institute for Applied Environmental Health	College Park, MD	Fracking impacts on groundwater, spatial epidemiology	Promote and protect human health in the diverse communities across Maryland, the nation and the world through discovery, education, and innovative application of knowledge in the field of environmental and occupational health.	University CoE	Regional	
Maryland Technology Enterprise Institute	College Park, MD	Innovation and Entrepreneurship	Maryland Technology Enterprise Institute is a national leader in entrepreneurship and innovation education and venture creation and is a pioneer in building successful university-company partnerships. Mtech has built a comprehensive entrepreneurship and	University CoE	Regional	Chesapeake Bay Seed Capital Fund: venture capital financing available for Maryland state startups with innovative technologies addressing air and water quality in the Chesapeake Bay area

			innovation ecosystem at the University of Maryland. Its programs arm top students from around the world with the knowledge of how to successfully launch companies and guide aspiring and existing entrepreneurs through the entire lifecycle of launching and maintaining technology-based ventures.			
Energy Research Center	College Park, MD	Maryland energy, sustainability,		University CoE	State	
Chesapeake Climate Action Network	Takoma Park, MD			Nonprofit	Regional	
Delaware Valley Regional Planning Commission	Philadelphia, PA	regional planning		Government	Regional	
Antioch University Center for Climate Preparedness and Community Resilience	Keane, NH	community of practice		University CoE	Regional	

Georgetown Climate Center	Washington, DC	adaptation clearinghouse		University CoE	Local	
Audubon Society - Maryland/DC Chapter	Baltimore, MD	conservation		Nonprofit	Local	
George Mason Climate Communication Center	Fairfax, VA	Resilience communication in Mid-Atlantic		University CoE	Local	
American Society of Adaptation Professionals				Nonprofit	Global	
Eastern Shore Land Conservancy	Easton, MD			Nonprofit	State	
Watershed Stewards Academy	Anne Arundel County, Howard County, National Capital region, Cecil County, St. Mary's County, Harford County, Maryland			Nonprofit	State	
Riverkeeper Alliance	Ossining, NY			Advocacy	Regional	
Coastal Bays Program (MD)	Berlin, MD			Nonprofit	State	
Center for Inland Bays (DE)	Rehoboth Beach, DE			Nonprofit	State	

Appendix B: Stakeholder-Defined Needs Analysis in Northeast U.S. Coastal Communities to Determine Research Gaps Informing Resilience Planning

Stakeholder-Defined Needs Analysis in Northeast U.S. Coastal Communities to Determine Research Gaps Informing Resilience Planning

Grace D. Molino[1], Melissa A. Kenney[2], Ariana E. Sutton-Grier[3,2], Kim Penn[4]

1. Department of Earth, Environmental and Planetary Sciences, Brown University 2. Earth Science Systems Interdisciplinary Center, University of Maryland, 3. The Nature Conservancy, 4. Office of Coastal Management, NOAA

PA31B-0334

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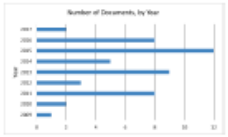
Abstract

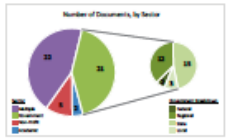
The impacts of climate change on our coastlines are increasing pressure on communities, ecosystems, infrastructure, and state-to-local economies in the northeastern United States (U.S.). As a result of current or imminent risk of acute and chronic hazards, local, state and regional entities have taken steps to identify and address vulnerabilities to climate change. Decisions to increase coastal infrastructure resilience and grey, green, and cultural infrastructure solutions requires physical, natural, and social science that is useful for decision-making and effective science translation mechanisms. Despite the desire to conduct or fund science that meets the needs of communities, there has been no comprehensive analysis to determine stakeholder-defined research needs. To address this gap, this study conducts a stakeholder needs analysis in northeast U.S. coastal communities to determine gaps in information and translation processes supporting coastal resilience planning. Documents were sourced from local, state, and regional organizations in both the public and private sectors, using the northeast region defined by the third National Climate Assessment.

Identifying Sources

Source documents were identified based on the following criteria:

- Northeast US as defined by the National Climate Assessment
  - Excluded Vermont and West Virginia because they do not have coastline
- Focused on coastal resilience, broadly defined
- Includes stakeholder-defined needs
  - Excluded documents which solely presented the views of academia
  - "Multiple" authors refers to documents collaboratively written by authors from more than one sector
- Published between 2009 and 2017
  - Captures regional impact and response before and after Superstorm Sandy





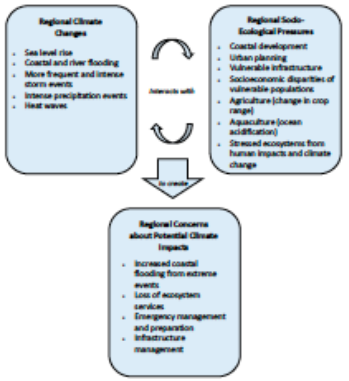
How Sources Were Analyzed

Fifty documents, including stakeholder surveys, workshop proceedings, and reports, were identified and coded for themes and patterns using software NVivo. A deductive coding schema was developed, modeled after Dilling et al. (2015), that categorized documents using codes such as "Location and condition of infrastructure" and "Proactive planning". Qualitative document analysis approaches were used to synthesize the patterns across the documents.

NVivo coding schema based on Dilling et al. 2015.

Example of coding (yellow) to nodes (i.e. Monitoring and Data Collection).

What are the Stakeholder-Defined Needs



NORTHEAST STAKEHOLDER NEEDS
Improved understanding of current processes influencing climate sensitivity
Enhanced mapping to understand vulnerability of natural and built infrastructure to extreme events, sea rise, and flood risks.
Monitoring and data collection
Priority conservation and preservation areas, sea level rise, wetlands, water quality.
Integration of information
Incorporate climate science into infrastructure improvement and public adaptation plans.
Legal framework
Regulations and ordinances protecting the current environment and enforcing resilient practices.
Availability of resources and supportive policies
Creation of policies which support coastal resilience planning by both public and private stakeholders; enforcement of existing policies. Availability of permanent funding resources to support plans.
Collaboration
Across levels of government and between agencies. Between government and stakeholder organizations.
Communication, education, and awareness
Improved methods to disseminate available data and facilitate exchange of up-to-date information to stakeholders. Training for community members and agency employees on how best to prepare and adapt to climate change. Public education on impacts of climate change and personal methods of adaptation..

References

Dilling, Lisa, et al. "What stakeholder needs tell us about enabling adaptive capacity: The intersection of context and information provision across regions in the United States." *Weather, Climate, and Society* 7.1 (2015): 5-17.

Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

Acknowledgments

This poster was prepared by Grace Molino with support from the Earth Science Systems Interdisciplinary Center at the University of Maryland and NOAA National Ocean Service, Ernest F. Hollings Undergraduate Scholarship. Melissa A. Kenney and Allison Baer received support from Maryland Sea Grant from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. This project was also partially supported by the NSF Research Collaboration Network (RCN): Science, Engineering and Education for Sustainability (SEES) Project title: Sustainable Adaptive Gradients in the Coastal Environment (SAGE): Reconceptualizing the Role of Infrastructure in Resilience Award Number: ICER-1338767.

Appendix C: Job Descriptions from Other Climate Specialists

POSITION ANNOUNCEMENT

SEA GRANT EXTENSION COASTAL CLIMATE SPECIALIST

South Carolina Sea Grant Consortium
www.scseagrant.org

The S.C. Sea Grant Consortium, in partnership with the Carolinas Integrated Sciences and Assessments (CISA) based at the University of South Carolina, is seeking a coastal climate specialist for its S.C. Sea Grant Extension Program (SCSGEP).

The South Carolina Sea Grant Consortium in Charleston, SC, is a university-based state agency established in 1980 to optimize the environmental, social, and economic potential of the coastal and marine resources of the state and region through the support of high-quality research, extension, and education programming. CISA (www.cisa.sc.edu) is one of eleven NOAA-supported Regional Integrated Sciences and Assessments (RISA) research teams that help expand and build the nation's capacity to prepare for and adapt to climate variability and change.

Responsibilities
The coastal climate specialist will extend science-based information to coastal communities, resource managers, and interest groups in South Carolina and the region. The specialist will also contribute to research motivated by community needs and provide hands-on operational and technical support for coastal climate issues addressed by South Carolina Sea Grant Extension and the Carolinas Integrated Sciences and Assessments (CISA). The specialist will report to the extension program leader for the South Carolina Sea Grant Consortium. Plans of work are developed by the specialist and SCSGC-CISA program team. Formal job evaluations are conducted jointly by the South Carolina Sea Grant extension program leader and the Principal Investigator of CISA program at the University of South Carolina Columbia.

Position Objectives
- Continue to develop capacity of South Carolina Sea Grant extension programs to inform public access/awareness of climate data products, information, and decision support tools. These resources will educate and support coastal decision makers in evaluating and preparing for the impacts of climate variability and change on, for example, sea level, shoreline erosion, invasive species, land use, salt water intrusion, fisheries, aquaculture, tourism, coastal community development and natural hazards.
- Collaborate with CISA to provide tailored, decision-relevant information on the implications of climate variability and change to coastal decision makers such as residents, government officials, and business people.
- Evaluate and review improvements in Sea Grant climate education and outreach capacity and approaches.

Specific Duties
- Develop and conduct Extension programming for climate-related issues in coastal South Carolina.

- Work with CISA staff and research faculty at USC and at other Consortium member institutions to design and conduct interdisciplinary applied coastal climate research and extension projects.
- Plan, conduct, and evaluate coastal climate extension programs, public seminars and workshops for stakeholders in South Carolina and the region.
- Give formal and informal presentations on SCSGC and CISA activities at state, regional, and national conferences and workshops.
- Travel within the coastal region to meet and interact with client groups, identify their needs, and develop solutions to climate-related issues.
- Prepare performance-based program objectives, benchmarks, metrics, program evaluations, and other programmatic reports as required by SCSGC and CISA.
- Participate in the development of grant proposals with SCSGC, CISA, and others to secure funding for user-based applied climate research and extension projects.
- Supervise student assistants and interns.

Qualifications
A climate scientist with a M.S. or Ph.D. in Atmospheric Sciences, Coastal Science, Geosciences, Geography, or related field. Experience in public outreach/extension. Strong commitment to and experience with communicating science information to non-scientists. Excellent computer and communication skills (written and oral) required. Experience with coastal hazards and/or planning are also favored.

Key Job Skills
- Ability to interpret scientific research for non-science audiences;
- High level of analytical, organizational and planning skills;
- Evaluation and research experience;
- Ability to work independently and as a part of a team;
- Effective oral and written communication skills;
- Fluency in computer and communications technology; and
- Demonstrated proficiency in grant writing;

Location and duration
The incumbent will work out of the main office of the South Carolina Sea Grant Consortium in Charleston, S.C. This position is funded jointly through the Consortium's core Sea Grant Extension Program grant and the Carolinas Integrated Sciences and Assessments (CISA) program. Position is funded to August 2016 with the possibility of extension beyond that date.

Compensation
Compensation includes salary of mid $40s to low $50s with state benefits, commensurate with experience and qualifications.

To Apply:
Applicants must submit by email a cover letter, detailed resume, and the names and contact information for three references, including their email addresses, to:

Ms. Judy Linder
Administrative Manager

S.C. Sea Grant Consortium
287 Meeting St.
Charleston, SC 29401
Judy.linder@scseagrant.org

Review of applications will begin on June 15, 2013, and will continue until the position is filled. NO PHONE CALLS PLEASE. Applicants will be contacted for interviews.

The South Carolina Sea Grant Consortium is an Equal Opportunity/Affirmative Action Employer.

ANNOUNCEMENT

Faculty of Practice in Climate Change Resilience and Adaptation (Assistant or Associate Professor level)

Location: ODU, Climate Change & Sea Level Rise Initiative, Norfolk, VA.

The Virginia Sea Grant (VASG) program and Old Dominion University (ODU) have entered a partnership to support a Faculty of Practice in Climate Change Adaptation at the Assistant or Associate Professor level. Located at ODU, this position will fill a critical gap in the region for outreach, coordination, and scientific synthesis and integration capacity. The Faculty of Practice will serve the Hampton Roads region of southeastern Virginia, the Commonwealth of Virginia, the Mid-Atlantic, and the U.S., and will be a part of the national network of climate extension specialists in state Sea Grant programs (http://sgccnetwork.ning.com/). The faculty member will be an employee of ODU and a VASG extension staff member, reporting to the ODU Vice Provost and evaluated by the Vice Provost with input from VASG. This position is funded jointly through VASG and ODU under a 4-year Memorandum of Understanding, with possibility of extension beyond that duration.

Virginia Sea Grant is a Commonwealth-wide network of partner academic institutions. VASG is a state-federal partnership, with federal funding from the National Oceanic and Atmospheric Administration (NOAA) in the U.S. Department of Commerce (see http://vaseagrant.vims.edu/). VASG is headquartered at the Virginia Institute of Marine Science (VIMS), which is the graduate School of Marine Science at the College of William & Mary. Current VASG partner institutions include: VIMS/College of William & Mary, George Mason University, Old Dominion University, Virginia Commonwealth University, Virginia Tech, and the University of Virginia. VASG's mission is to enhance the ecological, economic, and social sustainability of coastal and ocean communities and the ecosystem services they depend upon through university-based research, extension, and education. VASG is a scientific broker, supplying science-based information to citizens, businesses, educators, resource managers, and policy makers.

Old Dominion University, located in the City of Norfolk in the metropolitan Hampton Roads region of coastal Virginia, is a dynamic public research institution that serves its students and enriches the Commonwealth of Virginia, the nation and the world through rigorous academic programs, strategic partnerships, and active civic engagement. ODU's Climate Change and Sea Level Rise Initiative (CCSLRI) seeks to leverage the university's and the region's foremost experts to find solutions to the anticipated effects of climate change on the economy, housing, ports, and infrastructure (see http://www.odu.edu/research/initiatives/ccslri). The CCSLRI has taken several steps toward establishing ODU's leadership role on this critical issue for our region. ODU has hired a leading climate scholar to significantly elevate its research capacity and international reputation in climate change. Thus, the research and education foundation has been built and new partnerships across the Commonwealth are emerging (including partnerships with adaptation planning, landscape architecture, and policy and legal analysis capacity at VASG partner institutions, including the University of Virginia, College of William & Mary, VIMS, and George Mason University).

Responsibilities

The Faculty of Practice in Climate Change Adaptation will extend science-based information to coastal communities, resource managers, and interest groups in Virginia and the region with the goal to reduce disaster risk, increase resilience and improve adaptation capabilities related to climate change and sea level rise. The faculty member will lead coordination, communication, and scientific synthesis and integration efforts. S/he may also contribute to applied research motivated by community adaptation

needs and provide hands-on operational and technical support to coastal communities addressing their adaptation needs. The Faculty of Practice member will participate in VASG's quarterly outreach meetings among the portfolio of outreach sub-awardees, which currently includes William & Mary Law School's Virginia Coastal Policy Clinic, VIMS's Marine Advisory Services Center, and Virginia Tech's Virginia Seafood Agricultural Research & Education Center in Hampton. The Faculty of Practice member will prepare a detailed two-year work plan collaboratively with ODU and VASG and with input from community stakeholders and advisors. Travel within the region, state, mid-Atlantic, and occasionally nationally is expected.

Position Objectives and Activities

- Lead efforts to synthesize, integrate, and facilitate the transfer of science-based information on coastal hazards to coastal communities, businesses, governments, and individuals.

- Promote on-going dialogue within the climate change and hazards community in the region to continue sharing and developing knowledge, best practices, strategies, and coordinate partnership formation, priority setting, and implementation monitoring.

- Engage other researchers and Sea Grant specialists throughout Virginia, the region, and the nation in the development of on-going extension programs on resilience and adaptation to coastal hazards, and serving as a liaison between universities and the public.

- Initiate and nurture partnerships with federal, state, and local agencies to develop a coordinated approach to serving these specific groups and the general public.

- Initiate, lead, and partner on funding proposals with colleagues from ODU, the Hampton Roads region, and the VASG network.

- Transfer research-based knowledge about resilience to coastal hazards and climate change adaptation to Virginia's urban communities, rural coastline, undeveloped shorelines, and other vulnerable communities in Hampton Roads and Virginia's Tidewater region, including regional government and business leaders, property owners, and other critical stakeholders.

- Lead the development and delivery of educational programs to reduce risks of coastal flooding and other climate change hazards to people and property and increase resilience to these hazards, in collaboration with existing hazards and climate change capacity in the region, state, and VASG network.

- Design and implement program and project evaluation activities to ensure adequate feedback, analysis, and modifications in programming and to promote an organizational culture of continuous improvement.

- Prepare detailed 2-year work plans with specific duties and activities collaboratively with ODU and VASG and with input from community stakeholders and advisors, likely to include, but not limited to: extension programming (e.g., workshops, direct technical assistance, presentations); interdisciplinary applied research; performance reporting; grant development; student assistants supervision.

Qualifications

- Ph.D. in a climate adaptation related field (e.g., coastal science, geosciences, atmospheric sciences, geography, land use planning, policy, or other appropriate field).

- Experience in public outreach and engagement.
- Experience communicating science information to non-scientists.
- Experience producing and communicating scientific synthesis and integrating across disciplines.
- Excellent computer and communication skills (written and oral) required.
- Experience with coastal hazards and/or planning preferred.
- High level of analytical, organizational and planning skills.
- Evaluation and research experience.
- Ability to work independently and as a part of a team.
- Demonstrated proficiency in grant writing.

Location
The incumbent will work out of the main offices of the Climate Change and Sea Level Rise Initiative (CCSLRI) at ODU in Norfolk, VA.

Compensation
Competitive and commensurate with experience.

To Apply:
Applications should be sent electronically to: CCSLRI Search Committee, attention of Elizabeth Smith (exsmith@odu.edu), 4111 Monarch Way, Norfolk, VA 23529. Applicants should include a letter of interest that outlines how the applicant meets the requirements and would approach the position, a curriculum vitae, and three professional references with email addresses and phone numbers provided. Review of applications will begin September 1, 2013; the search will remain open until an appointment is made.

For more information contact: Hans-Peter Plag (hpplag@odu.edu) or Larry Atkinson (latkinso@odu.edu).

SHORT VERSION:

Faculty of Practice in Climate Change Resilience and Adaptation (Assistant or Associate Professor level), Old Dominion University, Norfolk, VA. The Virginia Sea Grant (VASG) program and Old Dominion University (ODU) have entered a partnership to support a Faculty of Practice to fill a critical gap in the region for outreach, coordination, and scientific synthesis and integration capacity in climate change adaptation. The Faculty of Practice will serve the Hampton Roads region of southeastern Virginia, the Commonwealth of Virginia, the Mid-Atlantic, and the nation, will be an employee of ODU and a VASG extension staff member, and will be part of the national network of climate extension specialists in the state Sea Grant programs. The faculty member will lead coordination and communication, and scientific synthesis and integration efforts aiming at disaster risk reduction, increased resilience, and improved adaptation capabilities. S/he may also contribute to applied research motivated by community

adaptation needs and provide hands-on operational and technical support to coastal communities addressing their adaptation needs. Qualified candidates should have a Ph.D. in a climate adaptation related field (e.g., coastal science, geosciences, atmospheric sciences, geography, land use planning, policy, or other appropriate field), experience with public outreach and engagement, and experience producing scientific synthesis across multiple disciplines. Applications including a letter of interest, a curriculum vitae, and the e-mail addresses and phone numbers of three professional references should be sent electronically to: CCSLRI Search Committee, attention of Elizabeth Smith (exsmith@odu.edu). Review of applications will begin September 1, 2013; the search will remain open until an appointment is made. For a full job description see: http://www.odu.edu//research/initiatives/ccslri

Appendix D: Participant Table and Interview Notes (n = 28)

Interview Participants
n=28 including focus group participants at ESCAP

Status	Participant Count
Completed	28
Scheduled	0
Not Scheduled	0
Not Contacted	0

*including ESCAP participants

ESCAP Meeting Participants					
Stakeholder Organization	**Location**	**Organization Type**	**Scale**	**POC for Interview**	**Status**
Talbot County Department of Emergency Services	Easton, MD	Government	Local	Jim Bass	Completed
Eastern Shore Land Conservancy	Easton, MD	Nonprofit	Local	Brian Ambrette	Completed
Cecil County Planning and Zoning Division	Elkton, MD	Governmment	Local	Bryan Lightner	Completed
Talbot County Planning and Zoning	Easton, MD	Governmment	Local	Martin Sokolich	Completed
Dorchester County Planning & Zoning	Cambridge, MD	Government	Local	Brian Soper	Completed
City of Cambridge (Dorchester County)	Cambridge, MD	Governmnnt	Local	Brent Jett	Completed
Chesapeake College	Wye Mills, MD	Academic	Local	Greg Farley	Completed
Maryland's State Highway Administration	Baltimore, MD	Government	State	Elizabeth Habic	Completed
Kent County Emergency Planning	Chestertown, MD	Government	Local	Ginger Gregg	Completed
Queen Anne's County	Centreville, MD	Government	Local	Helen Spinelli	Completed

Stakeholder Organization	Location	Organization Type	Scale	POC for Interview	Status
North Carolina Sea Grant	Raleigh, NC	University CoE	State	Jessica Whitehead	Completed
Maryland Department of Natural Resources	Annapolis, MD	Government	State	Sasha Land	Completed
Maryland Department of Natural Resources	Annapolis, MD	Government	State	Nicole Carlozo	Completed
University of South Carolina	Columbia, SC	University	State	Dr. Kirstin Dow	Completed
The Nature Conservancy	Various: POC located in Columbia, SC	Nonprofit	Global	Elizabeth Fly	Completed
NOAA Chesapeake Bay Program Office	Annapolis, MD	Government	Regional	Zoe Johnson	Completed
The Conservation Fund	Arlington, VA	Nonprofit	National	Erik Meyers	Completed
Maryland Department of Natural Resources	Annapolis, MD	Government	State	Bhaskar Subramanian	Completed
Chesapeake Bay Foundation	Annapolis, MD	Nonprofit	Regional	Erik Fisher	Completed
Urban Sustainability Directors Network	Baltimore, MD	Nonprofit	National	Kristin Baja	Completed
College of Agriculture & Natural Resources at the University of Maryland	College Park, MD	University CoE	State	Amanda Rockler	Completed
Annapolis Historic Planning Division	Annapolis, MD	Government	Local	Lisa Craig	Completed
The Nature Conservancy	Various: POC located in Columbia, SC	Nonprofit	Global	Dr. Ariana Sutton-Grier	Completed
The Nature Conservancy	Various: POC located in Columbia, SC	Nonprofit	Global	Kelly Leo	Completed
College of Agriculture & Natural Resources at the University of Maryland	College Park, MD	University CoE	State	Jennifer Dindinger	Completed
Maryland Department of the Environment	Baltimore, MD	Government	State	Brian Hug	Completed
VA Sea Grant, Old Dominion University	Norfolk, VA	University	State	Michelle Covi	Completed
University of Maryland	College Park, MD	University / Consulting	State	Sandra Knight	Completed

ESCAP Pre-Breakfast Meeting
November 14, 2017 | 8:30 am – 9:15 am

Attendees:

- Jim Bass, Emergency Management Coordinator, Talbot County
- Bryan Lightner, Resource Plans Reviewer, Cecil County
- Martin Sokolich, Long-range Planner, Talbot County Planning
- Brian Soper, Environmental Planner, Dorchester County
- Brent Jett, Assistant City Engineer, City of Cambridge (Dorchester County)
- Brian Ambrette, Coastal Resilience Manager, Eastern Shore Land Conservancy
- Greg Farley, Director, Center for Leadership in Environmental Education (CLEEN), Chesapeake College
- Kristin Baja, Climate Resilience Officer, Urban Sustainability Directors Network
- Elizabeth Habic, Climate Change Program Manager for Maryland's State Highway Administration
- Ginger Gregg, Kent County Emergency Planning
- Helen Spinelli, Queen Anne's County

Main Discussion Points: *responses to workbook here: https://docs.google.com/a/umd.edu/document/d/1yyrlEGB0bUMTVbpquzUbhzbKwtnKnmV31dPwViBSaQs/edit?usp=sharing. Scanned files are here: https://drive.google.com/drive/folders/1LNr9hKjRqfGc4Vzkc_ED2Bq0atOvCt1a?usp=sharing*

- **Melissa: What are these problems are called? For example, misinformation with smoking and similar misinformation campaign and over time people understood it but understanding the risks of smoking, people continue. What are you struggling with in your positions with respect to disconnect with information, not aligning with ideology, etc.?**
- **Ginger:** I think smoking took a whole generation to have the nation wake up and say this is a problem and we need to address it. Maybe that's a direction we need to take with our children. But it is scary putting it off for a generation because we need action now. She has thoughts on both, but it might take a whole generation for it to become a reality. People who are 20's 30's might be the target; maybe hit both children and older generation--if we teach kids and then they talk to their parents. The parents will soon be elected officials as well.
- **Martin:** There is mixed messaging.
- **Ginger:** In my community, faith-based people are living in the vulnerable neighborhoods. They are not as aware as much of the problem. The struggle is for survival. They are in lower-paying jobs, live in cheaper neighborhoods that are vulnerable to climate impacts. For them, survival is their top issue, not the environment.
- **Martin**: Insurmountable – hard to chunk it down into things that can be spread out to individuals and small groups of people at a scale where they can handle responses. Working in government, talking about another level up whether the physical infrastructure we have to maintain or work with prioritized in budgets etc. Based on institutions who have been doing shoreline restoration for rears but disjointed. Different solutions for living shorelines, etc. all individual choice, and it's pretty disorganized, too. That's an individual decision few feet to

¼ mile inland … trying to figure out how to break it down an disseminate not everything individuals cannot do; no point in ignoring it entirely not sure if brought that way to people. He was in front of the county council lately.

- **Brian:** Need actionable items to happen. Already had some of the just regular accretions occur in some low-lying areas. There is no sustainability in these areas. People that can are leaving, or have already left. Ones behind can't afford to do anything, just a short-term fix. To them, 30 years is mortgage and they likely won't be there. For us, it's about getting and informing the public about programs. An internal discussion about the open space program that doubles as mitigation–open space from bought old homes. We say it'll help property values. We say moving structure from blighted or vulnerable area and one by one moving these structures isolate these people and incentivize them to leave probably not sincere, but likely that's how it'll happen. When people feel isolated they want to move.
- **Brent**: Take what Brian was saying and having a discussion with Ray in Talbot County. Mentioned that this might be the last mortgage cycle for 20% land mass within these counties. Thought process if they get isolated, Program Open Space, left for dead, sales are well under perceived value for what they purchased for. At the end of the day, if sea level rise reaches 2 ft by 2050, if you look at Talbot has a completely differently than Dorchester; Talbot will lose 20-25% of tax wall if don't fix; becomes tax not environmental, livability, etc. if elected official see that it might get their attention. Think there's a language issue on shore. 'Climate change' on the Eastern Shore a 4-letter word and that shut down the conversation – it was political. He is reminded of Dave Hart – went to south county in Dorchester. A woman declined to be interviewed stating that if the camera is put in her face the documentarian will put a scientist behind her and make her look like a fool. In the video, she said it used to take an 8 minute walk to a church. Now, it takes 40 minutes by car, no direct way. When a kid couldn't see it because forest. Now ghost forest, see church clear as day. Tuesdays high tides have to close restaurants because of the high tide. That story on screen would be powerful. Say 'this is my agenda', 'this is how I want my story to go'--saying same thing but there is a language barrier. When rolling this into it in that thought process, it gets lost in translation. What she said is very powerful; that story goes further for me than even me being an engineer, says a lot more than numbers. Not sure how to make story more digestible, believable. Read article in *The Atlantic* about the solar eclipse. "Well I don't trust scientists don't think it's going to happen" yet eclipse came and went. If you trust scientists for an eclipse, why wouldn't you trust them for climate change? It's presentation of material. Not sure how to present it differently but seems to be the discord there.
- **Melissa:** Summarized two things being brought up. 1) Properties and people who will be displaced regardless of what we do. Strategies are needed to assist with the migration; especially when county fiscal issues are tied into the revenue bases. 2) Also a story of changes and whether or not those are inevitable. Find the change stories and the migration. Pivot to places where we might actually be able to make smarter decisions. I grew up in rural VA, can relate to some of the stories, don't have to call climate change or convince people of nuance of projections in order for them to understand the impacts. **How do we make decisions smarter given what we're already observing? What is the role of universities and MDSG that can help the translation of research to help you do your job better…how can we help, what are you really struggling w/ in terms of science,**

solutions, coordination, etc. What are some of the roadblocks that present you in that space? Not solving ideological battles but want to help you do things better.

- **Brian**: Planning and zoning are the biggest things we do related to climate change does with our floodplain management. What we aim for in our floodplain management is based on the FEMA flood insurance rate map which has its own issues. It's unfortunately a one-time snapshot of what it looks like. They have a program where you can be a technical partner. If there's an opportunity to have the funds to become a technical partner to reflect map of more of what the community sees vs. FEMA sees. If you improve the firm map or map community goes off of that it uses to puts its regulations in place, help them.
- **Jim:** In Talbot County, the GIS guy helped and did that. When he looked at the maps he saw the FEMA maps were absolutely not true. Not sure if it was a partnership with FEMA led to the funding.
- **Brian:** FEMA will provide funds on backside; that's something that could really be improved. There is CRS training course; interesting people who underwrite flood insurance vs. FEMA vs. rate. How they determine your rate is diverging. How rating is slowly becoming different; don't need certificate for elevation anymore etc.
- **Ginger**: What was the impetus for GIS planner to do that?
- **Jim:** When FEMA did the limited release comment for flood insurance rate map.
- **Martin**: In 2015; called the county and marked places he could identify with regular knowledge; you need to correct erroneous data points. Didn't do their own research. They were under contract, agenda, etc. Flood zone actually smaller from 1985 maps across multiple folks' maps (Brent agreed).
- **Brian & Bryan:** Both using maps that were 20 years old.
- **Jim:** Martin brings up good a point about projects that need to be completed. How can we best help you; if we can, whether ESCAP or people around this table come up with things people want to see having a singular person or multiple folks would be helpful. Would need consensus but not enough hours in a day…already too many projects.
- **Ginger:** The larger part of it. The fiscal side of it is a way to really make people aware. If we're going to be losing taxable properties – Kent County college buying up properties and problem b/c not taxable. If we can hit them with real fiscal effect; bring to commissioners meeting. Affecting the purse is a more successful way to bring it to their attention.
- **Brian:** They did the reverse on the argument Ginger made. Their argument was the properties were paying like $30 b/c valued so low. We reversed the argument by saying the county is not losing that much on the tax roll for Project Open Space. Cost XX per year in road and this much in taxes. Reducing maintenance on road, etc.
- Comprehensive economic impact analysis is needed.
- **Brent:** Needs to be the next one. $30 here, $30 there, look at road maintenance, etc. worse in Kent, Talbot, than it for Dorchester. Economic analysis in real estate props up the economy. # are going to move people. Thirty year projection and also short-term. Loss in food production with agriculture (ag) sector. Dealt with all the money. One thing we don't have is that ag sector. I'm sure their cognizant but not this map level.
- **Brian, Martin, Helen:** Discussing economic impact analysis with respect to the compound effect; brackish water also a factor, etc.
- **Brian:** See rentals go up, etc. not sure how people would look at economic analysis about selling the property now.

- **Martin:** Know we've just gone through a recession, property sales, etc. bounced back but he has heard that marquee properties in the counties have sold for much less than asking and sat on the market for years. People have been making choices based on something – could be extraneous things on other items. E.g., not on Eastern Shore – not the situation it was.
- **Melissa: What should MDSG spend 100K on to help coastal communities make better decisions? A support a person, science, etc.?**
- **Jim:** A staff person of shared by multiple jurisdictions for the express purpose of mitigation efforts
    - **Melissa:** Not necessarily GHG reduction
    - **Jim:** Climate adaptation of some sort
- **Brian:** Mitigation and targeted outreach as a start. The purpose would be to drum up that interest and support for; marrying the two. Tying funding and resources to folks interested.
- **Martin:** Thinking along similar lines. Disconnect people who can be directly involved with issues vs. individuals. A way to really communicate directly with citizens in our area. If they don't have a property right on the shoreline, what is going to impact them and what are they going to do about it.
- **Brian**: Echoing what Jim said. The outreach about why climate change is happening, but issues with flooding etc., potential buyouts available. If you get them out of the way of thinking it's someone taking my property and someone to help that's different. Provide pictures, plaques, etc. People want to preserve their heritage.
- **Brent**: Someone to facilitate a study chasing another grant and do a large-scale all-inclusive 'what do we got' this area has been studied individually but not for the region. We're not all that different on the Eastern Shore except county lines. All driven by different economics, councils, etc. but ESCAP has been successful. One person to do the outreach and grant to drive a mega program of what will look like in the future…we haven't put everything together (metaphor to having all parts of salad but not dressed).
- University can help with economic analysis, mapping, etc. Encourage to keep a pipeline of local or regional-scale analyses and planning ways to make them relevant as justification or decision-making tool.
- **Kristin:** Combination of things will be experiencing (heat SLR, etc.) studies are important and outreach can help coordinate. Dorchester is starting its Comprehensive Plan and Queen Anne's is starting in a few years. If we put it in the plan then we get it done. I echo the outreach. We did the game of floods a few times now, it's an interesting tool, it managed well can bring the resources. It is called "Game of Floods", a Climate 201 training designed for city planners and managers. The game utilizes risk assessment and vulnerability framing to assess trade offs between what will be saved vs. not saved.
- **Greg**: Observation that this region will not listen to science but people in this room will. Economic projections will be the way to meet people where they are and use the economic language. Abandon scientific. Worried about using wrong projections. Say which ones are going to be going off of the tax roll by X date, that's the better way.
- **Elizabeth:** Looked at economic analyses and they primarily look at farming. When in transportation, lots of things omitted in traditional analyses

ESCAP Pre-meeting Breakfast Discussion Workbook

November 14, 2017 | 8:30 – 9:15 am ET

Maryland Sea Grant Coastal Climate Stakeholder Needs

The focus of this discussion will be on "How can communities in Maryland can best prepare and respond to climate change events (e.g. flooding, SLR, heat, storms, drought, power loss, etc.)?"

The Climate Integrator Role in the Chesapeake Bay Region

1. ***Boundary people*** **is a phrase to describe individuals at an organization who facilitate the use of science in decision-making or who help identify scientific research questions that would assist decision-makers in the region. Who do you think are the most important people in the region for making these connections? Is there a lack of capacity to do this?**
    - ESLC
        i. A third party that doesn't seem to have a political agenda that can speak to and address the region in a unified language and focus
    - ESCAP
    - Chesapeake College - Greg Farley

Regional, Organizational, and Stakeholder Needs

1. **What are the top 3 problems or regional issues that concern you and/or your organization?**
    1) Devotion of staff/resources to the issues
    2) Cooperation from state and regional partners for infrastructure
    3) Developing popular consensus around resiliency
    4) Need for climate adaptation
    5) Politics of climate change
    6) Potential for displacement
    7) Need additional staff to address many issues facing emergency management
    8) Incomplete or ill-informed opinions on climate issues
    9) Lack of coordination among organizations working toward climate resilience
    10) Lack of belief
    11) Lack of priority
    12) Lack of intrusion to do
    13) Not enough time for outreach and mitigation grants

2. **What is the most common scientific or capacity need expressed by stakeholders in your network?**
    - Regionally-relevant data
    - A better presentation--language and projection
        - Ice cube theory example: There is a reason why the polar ice caps are retreating, thus the sea level is going to rise. If you present this

concept/reason to grade-school children they would laugh you out of the room. We are taught at a young age that a glass full of ice and water will not overflow when the ice melts. Apply that concept to the earth and the water won't overflow, or rise. "We" know the rise is due to thermal expansion and salinity change but these reasons aren't presented as part of the discussion/reason. The story needs to work and maybe some real points of "reality" to show "credibility" to actual sea level rise. And the reality of a cyclical change shouldn't be ignored or discounted. That would bring several more people into action on-board with focusing on doing something.

- Are FEMA maps not good enough for estimating risk?

3. **Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?**
    a. Consistent leadership and support from state/federal government
    b. Buy-in from locals who are skeptical
    c. We need to figure out how to incentivize the people with power and influence to care for/plan for/ look after the disadvantaged and powerless regions
    d. A plan, a cost, an outcome projection
    e. Not enough time, county employees too busy, need to extend reach

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Opportunities and Future Directions

1. **What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?**
    1) NGO outreach and education
    2) Strengthening cooperation between economic sectors
    3) Developing examples of successful adaptation
    4) Open space preservation
    5) Mitigation projects
    6) Updating land use patterns
    7) Coordinate with non-traditional partners such as economic development, public schools, NGO's in mitigation and resilience planning
    8) Economic study
    9) Revised sea level rise projection
    10) Getting elected officials to plan and budget
    11) Outreach
    12) Strategic mitigation projects and celebrating their successes

2. **What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?**
    a. ESCAP
    b. Government staff is well-versed in reach and their locality
    c. Highly-studied area
    d. The people in the group and the ability to realize the reality of the situation

3. **If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest it?**
    a. Citizen outreach, education, and support
    b. Update FEMA FIRM maps/economic update on climate impact
    c. Regional staff position(s) to focus on hazard mitigation, community resilience, and climate adaptation
    d. Like we discussed, an individual for outreach, discussions, education, and the facilitate a study based on economic impacts to the ESCAP region
    e. Strategic outreach and mitigation projects

Cultivating Community Flood Resilience: A Peer to Peer Discussion

Chesapeake Bay Foundation: 6 Herndon Ave, Annapolis, MD

Merganser Room (upstairs conference room)

9:30am-12:30pm

January 24, 2018

9:15 Arrival: Coffee/Tea & Light Refreshments

9:30 Welcome & Introductions: Sasha Land: CCS & Jen Dindinger: UMD, Sea Grant Extension
Intent of the session

- Brian Ambrette - ESCAP
- Jen Dettinger - MD Sea Grant
- Jennifer Lee - Georgetown Climate Center (works with Jessica Grannis), CRS, regional collaborations, ag land use policies
- Taren - Chesapeake Bay Sentinel Site Coordinator, MDSG
- Fredrika Moser - MDSG
- Nicole Carlozzo - MD DNR, coastal grant program to support community resilience
- Jen Sparenberg - hazard mitigation, historic trust
- Jen Rawlin - Maryland Estuarine Research Reserve, lower Eastern Shore MD,
- Carl Shatz - NWF, green infrastructure in MD, applications outside state, vulnerability assessment for impoundments
- Michael Paolisso - UMD anthropology, Deal Island, cultural environmental knowledge
- Liz Van Dover - UMD anthropology, ICRA (integrated coastal resilience assessment) project sociocultural drivers and heritage and how they think about and respond to climate change, MD Sea Grant research fellow
- Sasha Land - MD DNR, coastal zone management, CoastSmart program - reduce flood risk of communities, Deal Island Peninsula Project
- Kelly Leo - coastal manager TNC
- Shirley Fiske - UMD anthropology
- Brian Crawford - UMD anthropology student

Not here

- Kevin Wagner - MDE, National Flood Insurance Program

10:00 Deal Island Peninsula Project: A Quantitative & Qualitative Approach

Website: www.dealislandpeninsulaproject.org

- Marsh Restoration
    - Ditch plugging
- Marsh Monitoring
    - SET - sediment elevation tables, long-term monitoring of marsh accretion/erosion
    - vegetation
    - mosquito
    - fish
    - water wells
- Marsh Valuation (Lisa Wainger)
    - economic analysis
- Building a stakeholder network
    - collaborative learning model
    - how does the community view vulnerability and what is resilience -- pull for MDSG grant so we can build on what they have already done and feed into network

- Collaborative Research Projects
    - Heritage

    - Shoreline Erosion and Flooding
        - least successful, led by Sasha but may have needed someone local because this is so central to the community and their way of life
        - need champion of issue and someone local if focus on building
    - Marsh Restoration
        - gotten better about communicating
- Flood Risk Vulnerability Maps
    - ICRA - Integrated Coastal Resilience Assessment
    - flooding part of every conversation, need to quantify and more realistically show the potential flood impacts near-term
        - Don't use sea level rise, climate change…
        - mix a quantitative approach with qualitative interviews and local knowledge
        - understanding and discussion of change -- science vs daily community perspective -- historic to near-term to longer-term future
    - Michael Scott (Salsbury) - Coastal GIS cooperative, MD DOT, vulnerability index created
        - usually developed for 2050 and 2100
        - for this project focused on decade level (up to 2050) what changes are anticipated, expanded beyond road network, also included people's properties and structures, mean high high water as proxy for storm surge event
        - question was then what do you put out for the community 2020, 2030, 2050
            - both incremental and step change increase
        - walked the communities through the maps
            - first want to see how they are effective
            - maps - risk assessment and so information can be scary
        - story map associated with maps is really important for the decision support piece given the audience
    - Process developed based on experience that would allow for community input and also move the process forward
- social vulnerability -- Census data aggregates and can be difficult to downscale especially when you map the downscaled indicator to realities on the ground, NOAA for Oxford, MD, problem in indicator design -- SOVI can't be downscaled
- having community members do both a physical and social vulnerability assessment is challenging -- it can be easier to do environmental because not as personal, social demographic questions difficult (e.g., income, financial) can be very difficult for assess when community members ask

- Solution focus - lots of talking need to move towards solutions

    - sunny day flooding
    - ditch structure
        - ditches used to maintain them (high school students paid by USACE a long time ago, no longer happens), looking at mapping ditches and an assessment of on-road and off-road ditches (lots of ditches)
        - many built over 100 years ago, currently can be always wet (breeds mosquito), original ditches likely tidal
        - create tidal ditches or don't maintain because that's allowing more water to go onto the land
        - management system is different for on-road vs off-road ditches. on-road DOT and off-road usually private sector, not tax ditches, not part of PDA - public ditch administration
        - ditches causing flooding on peninsula and potentially contributing to flooding
        - ditch assessment to determine what is causing the problem and confirm the hydrology of what is happening given community statements -- helps to figure out solutions or places for interventions (short-term fix - decades - to community)
        - local knowledge on ditches very high because it affects them regularly
    - shoreline erosion (esp. on Tangier Island Sound)
        - community know changes of marshes
- integrating local knowledge with scientific knowledge to help develop effective solutions
- state and county government involvement is key because of access to resources that helps to support community decision-making and moving from a property-owner or parcel-by-parcel basis -- strength in the collective (even if it's a loose collective)

- does community engagement in the process -- e.g, surveys and interviews -- does it support shared community understanding -- cultural consensus analysis theory
    - need level of consensus as a modeled responses of the shared cultural view from the community
    - developed baseline and then did stuff and conducted survey again

10:45 Group Discussion: Moving from understanding to planning to implementation….
Come prepared to discuss:
- What is going well in your work to build Community Flood Resilience?
- What successes have you had that we all could benefit from hearing about?
- What are some the greatest challenges that you are facing?

Responses to the 3 questions above

- no one paying to build relationships that are needed for successful funding
- listening
- identify niche for organization and communities
- impoundment -- about 40% of peninsula
- a lot of questions focused on very vulnerable MD communities -- same as Pacific small islands -- what does migration look like? what are the lessons learned? what resources are valued and how do you preserve key resources?
- physical project in Deal Island shoreline project is a success story -- document success stories -- identified by community and moving forward with implementation, tangible action
    - demonstration project, beyond a plan, is key to success
    - great example for how communities can drive the work -- identified by community, vetted by science
- community relocations through Tennessee Dam Authority, also look at Dust Bowl and Holland Island -- similar major envi crisis that impacted migration
    - Porch Street development in Easton, MD, went through vibrat African American community because there are decisions that might wipe out their community, study on what are the most important areas to document and preserve via Memory Peg Mapping -- social nexi developed by community members who identified what pieces are important, could recreate the neighborhood of what was most important places (including places that were demolished), that can help with identifying heritage areas to save or preserve in memory
- TNC interested in working in Eastern Shore and the intersection of environment, socio-economic, including migration
- relationship with community is key for getting traction for movement for solutions
- LA community moving via HUD -- this might be where the movement money might come
    - also community in AK moving
    - other communities don't want to move
    - MD policies on easements? -- DNR has resilient easement in place, don't acquire properties that are within 2' SLR, but can put easements in place
- success when start with as many partners at the table from the beginning - harder to bring in later
    - who was brought in at what time is important
- 2050 and 2100 -- focus at state-level, but for community level interested in near-term prediction,
- how communities have developed projects and priorities vs a facilitated process and discussion
- science based solutions for MD
    - building out work in climate, already focused on coastal communities
    - TMDL, stormwater, and climate change issues

- never underestimate inertia and what a mighty force that is -- change and solutions are impacted
- challenge of scale, relationships, and resources
    - only so much time, geography, and resources to expend
        - if spending time with one, less time for others
    - all have different niches around the state - identifying where you are most effective,
    - taking a supply side issue -- if have enough resources, communities will take advantage of them, and if have success, then others who have not been involved they'll find you
- Collectively, how are we doing connecting resources from different agencies/organizations to local communities?
    - How well are we making the bridge between current & future impacts and the value of planning now and taking adaptive measures?
    - Collectively, are we covering MD's geography?
    - What are your trusted sources of information/data? What are you missing?
- community driven process in DC -- lots of challenges that are similar to the Eastern Shore
    - noted Sasha statement about how as part of state can't engage as
    - Georgetown -- climate adaptation and climate mitigation plan, the community that is most vulnerable to climate change has a difficult relationship between DC and community (majority African Americans - need to preserve historic and community heritage because one of first locations where they were able to buy home, strong roots), so developing relationship with people who have not felt they have not had a relationship and voice
    - trying to develop process where they can help implement
    - take the values and things they care about and ground in climate
    - don't want plan to present it after the fact, need community involvement early
    - who builds the relationships that you can partner with -- if they don't exist then it's difficult
        - who is at the table matters
- advantage and disadvantage because of where I sit at state - understand intersections and see networks that were put in place (might be underutilizing them)
    - things are bubbling up so that there are big state level policy issues that need to be taken up
    - relocation and who is responsible -- is it the state government? who is giving guidance on this
    - when are residents and businesses going to local governments and FEMA saying you let me build here…
        - examples from relocations that might be able to look towards

    - Deal Island helping to solidify the kinds of state level policies that we might need to put in place
- loss of properties through attrition? If so, is it a failure of the state? what about abandoned properties?
- heritage -- already a history of being in a more isolated landscape and independence
- power of interviews and ethnographic approaches -- listening can help others to make sure that their opinions and perspectives matter as part of the larger community discussions, so even if they aren't coming to formal community meetings in churches, these perspectives can be brought in and included in the conversations
    - helpful in building relationships, rapport and trust
    - but how do we sustain this engagement in the future? several funded projects that allow for community engagement, but reliant on grants. looking towards grant leadership to drive project forward instead of community leading project moving forward
    - teasing apart different understandings of the issues e.g, flooding, it means something different in Deal Island vs climate scientist, useful to understand culturally informed understandings of issue
    - framing things as climate change can be difficult -- haven't avoided it, but also can be difficult (e.g., press about Deal Island on climate change impacts)
- relationships built first and then funding gone after together better then everything focused on funding first
- sometimes wonder -- why did I decide it was my job to help these communities develop solutions -- might be able to say it personally, but also challenged about how to work with other communities and do they want me? Sometime talk about relocation, but have not discussed WHERE, who pays for it, how can we encourage, how can we pay for water logged homes, …
- question use of communities as case studies -- understand moving method and theory -- not physical $$ moving into communities as part of these projects
    - $1M grants but mean funding $36K for household… difficult match
    - can be mismatch between academia and communities -- need to be managed so that we can work in meaningful ways with communities
    - enough science out there for communities to get started -- not enough to solve problems
        - suggest people with access to resources, use grant programs that incentivize the types of planning that we want communities to do -- from policy and incentive programs for types of activities that you want communities to do
        - no MD adaptation policy proposed in past 3 years
        - bar needs to be higher than what we require of our communities thus far
        - publicly driven

        - cannot give communities unfunded mandates...
- My thoughts -- scale up, focus on solutions, multijurisdictional solutions for regional resilience, challenge of rewards for relationship building because of incentive structures for people, professional risk of doing this work if a lot of the time and effort not on activities rewarded

12:30 Adjourn & Continue Informal Conversations at Annapolis Smokehouse

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Amanda Rockler, arockler@umd.edu
Interviewer: Melissa Kenney
Date/Time: January 31, 2018, 2:30-3:00 pm ET

Amanda Rockler
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Amanda Rockler is a Regional Watershed Restoration Specialist with the Maryland Sea Grant Extension Program. She received her Bachelor's in Environmental and Ecological Biology from the University of Colorado @ Boulder, and her Masters from George Washington University in Sustainable Landscape Design. Amanda works with local governments, non-profits, residents, and other entities to improve water quality in the Chesapeake Bay.

The UMD Sea Grant Extension Watershed Protection and Restoration Program works to improve water quality through stormwater management and watershed restoration techniques. The Sea Grant Watershed Protection and Restoration Program works with local and state governments, watershed organizations, and community groups in Maryland to build partnerships, identify funding sources, and advise/assist in the planning, implementation and monitoring of restoration projects. Watershed Restoration Specialists facilitate measurable reductions in water pollution in the following ways:

- *Classes and workshops teach residents how to improve water quality in their own backyard with practices like rain barrels, rain gardens, conservation landscaping, and tree planting*
- *Technical Assistance Programs help communities address Total Maximum Daily Load (TMDL) and Watershed Implementation Plan (WIP) regulations and requirements*
- *Watershed Restoration Projects emerge from collaborative partnerships and effective funding techniques to reduce nutrient and sediment loads*
- *Watershed Restoration Specialists also connect watershed science to policy makers and community leaders to make the most effective water quality decisions.*

The Sea Grant Watershed Protection and Restoration Program is a member of the Watershed Assistance Collaborative with the Maryland Department of Natural Resources, the Chesapeake Bay Trust and the Environmental Finance Center.

- **Please briefly introduce your name, title, organization, and what you think is *most important decision* being faced by the region.**

It's all about flooding in my area. I'm not working in any areas where they're focused on SLR or other coastline issues. What we're struggling with is that the small scale practices are not meant to handle larger, extreme precipitation events. But larger precipitation events are happening. So should we be putting in projects that can handle larger storage capacity? Does that make sense for the life of the practice? How much will the precipitation patterns change over life the practice. -- Referring to stormwater management practices.

The challenge is that we have estimated lifetimes for a practice (e.g., bioretention = 20-30 years)? What are the precipitation predictions for the lifespan of these projects? And what is the costs (NPV) for the stormwater practices given how the project is sized? The communities are concerned about cost -- if it costs an extra $X to build in more storage capacity, most aren't going to do it because they're already over-engineering things for the 2025 Bay goals. Not sure how the new Bay climate TMDL goals will impact communities.

This comes up a lot -- they want to know the return on investment for projects that have greater storage capacity. Also these projects aren't designed to deal with flooding; at least solve it completely. Solving it is not as easy as putting in practices. A lot of it is cumulative infrastructure choices.

- **If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?**

I think a good example would be to look at the Elizabeth River, Wetlands Watch, and the Virginia Sea Grant have done with Ingleside, VA and Chesterfield, VA. Cultivated a relationship with a community to pilot partnerships and projects that can then be rolled out to other areas in the state. Recently visioning design work for flood events that are happening. Brought in Dutch Dialogues. Community that is highly invested in them and thinking about solutions in one area that can be demoed for other areas would be useful.

Started off pretty slowly and started with projects that would be wins and that would benefit the community pretty immediately. Further the community goals first. After establishing trust and

having some wins on the ground, they could experiment with bigger dollar efforts that may not be successful. This means it slow - 5+ years.

- **In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?**

Not sure how I would use a climate specialist. Didn't work with the previous person, so I'm not sure what this person would do. And if they're on the Eastern Shore then it's likely that the nature of the work will be Eastern Shore issues and not urban stormwater issues. People are starting to think about including climate in planning processes, not sure where they are in terms of capacity, so it's unclear what is needed for technical consultants that are able to support climate extension. In urban high capacity areas I don't provide technical assistance.

Rub between ag and stormwater that can be more pronounced in rural areas like the Eastern Shore. People in the Western Shore areas are concerned about climate but they don't feel like they know how to participate and help individually, but the focus of extension is more focused on working with local government to build community capacity.

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Ariana Sutton-Grier and Kelly Leo
Interviewer: Melissa Kenney
Date/Time: January 23, 2018, 1-2 pm ET

Ariana Sutton-Grier
Director of Science and Associate Research Professor
Mid-Atlantic Chapter and Earth System Science Interdisciplinary Center
The Nature Conservancy and University of Maryland
a.sutton-grier@tnc.org
240-630-7054
http://suttongrier.org/ and
https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/maryland_dc/index.htm

I am an ecosystem ecologist broadly interested in how human environmental change is affecting ecosystem function and the ability of ecosystems to provide the ecosystem services on which we depend. I study how nutrients cycle in ecosystems and how these cycles impact (or are impacted by) ecosystem restoration, water quality, biodiversity, and climate change. I am also interested in ecosystem service measurement and valuation, and how ecosystem nitrogen and carbon cycling can be included in environmental markets. (Photo credit: R. Drobis)

I was recently promoted to Associate Research Professor at the University of Maryland in the Earth System Science Interdisciplinary Center (ESSIC). I will maintain my affiliation with UMD but I am also taking on a new exciting position as the Director of Science for the MD/DC chapter of the Nature Conservancy.

My research interests and expertise lie at the nexus of science and policy and I continually seek additional opportunities combining science and policy to solve environmental problems and promote habitat conservation.

Kelly Leo
Resilient Coasts Program Director
Mid-Atlantic Chapter
The Nature Conservancy
kleo@tnc.org
https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/maryland_dc/index.htm

- **What are the top 3 problems or regional issues that concern you and/or your organization?**
- **What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?**

indicators and metrics of resilience and adaptation and effectiveness — link to retirement investments, accounting indicators — putting % income in and over time portfolio performance should help to lead to strong ROI -- lots of discussion about this topic

analysis by Mark (Boston TNC — ask for study) — current stressors on marsh systems and movement, came up with marsh resilience score (high — migration opportunities and not high stress). I don't see in people's thinking right now we need to be thinking about marsh migration corridors - in many MD have many places because of geography (and political resilience — coastal resilience migration and Blackwater) for marsh to move and could make investment for marsh migration. funding and acquiring private property/easements (need to be easements because too close to shore) will need to be important

Living shoreline law — lots of loopholes — but not necessarily doing what we're doing. The first line of defense is natural infrastructure instead of built. Bhaskar is doing innovative stuff to figure out solutions, but because of the innovation the movement on the policy might limit the innovation. Need policy change that is allows for innovation and successful implementation.

The human capacity is a big component. Need human capacity and political/community will with support of constituents to move forward. Need to figure out leverage points to move forward with action.

CRS - Community Rating System

Questions not asked directly:

- Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?

- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Bhaskar Subramanian, Bhaskar.Subramanian@maryland.gov
Interviewer: Melissa Kenney
Date/Time: December 05, 2017, 9:30-12:00 ET

Bhaskar Subramanian, Ph.D.
Shoreline Conservation Section Chief
Chesapeake & Coastal Service
Maryland Department of Natural Resources
Bhaskar.Subramanian@maryland.gov
http://dnr.maryland.gov/Pages/default.aspx

Dr. Bhaskaran Subramanian is from India. He received his BS (Chemistry) and MS (Environmental Chemistry), from India. He came to the United States in 2000 for his Ph.D. in the Marine-Estuarine-Environmental Sciences program at the University of Maryland Eastern Shore. His dissertation was on heavy metal remediation.

He worked as an intern researching shoreline projects and practices that are effective in shoreline protection and erosion control. He visited over 200 living shoreline projects in MD and compiled an assessment of the performance and conditions of these projects. He has presented his findings and shared the lessons learned in numerous platforms-panels, meetings, workshops, conferences, etc. In his current position, he works with various stakeholders (federal, state, local governments, private sector, and citizens) providing technical assistance for habitat creation/restoration projects.

He also administers Maryland's zero-interest loan program to implement shoreline restoration projects for private and public projects. He is also assisting Maryland Department of the Environment (State's regulatory authority) in implementing Maryland's Living Shorelines Law. Bhaskar is constantly working on opportunities to push the envelope on implementing innovative living shoreline projects in Maryland and likes to come up with interesting names for the techniques!!! In recognizing the crucial role that outreach programs plays in filling the knowledge gap, Bhaskar conducts workshops on living shorelines for various stakeholders to enable and enhance communication between different groups. He also conducts workshops exclusively for the living shoreline professionals (marine contractors, engineers, etc.), who play a pivotal role in implementing environmentally-sensitive projects.

- **Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.**

A couple of decisions or ideas

- *access to information*, working on the field there's questions about is it happening, how much is happening, and do I need to worry (how much time do I have)
    - e.g., SLR — you call it what you want to call it, focus on what they're observing and how they can help you
- *people don't know enough*, couple of things DNR working on with Coast Smart communities (mapping / planning tool for self vulnerability assessment), disseminate to individuals in public there's a disconnect
    - existing information in place, but not reaching people on the ground
- *50 year time frame too long, focus on much shorter time frames for decisions*, thinking differently even if they understand information
- *if you have practice, are they successful and how do you know?*, people want metrics about how do you define success, spatial scale of success (shoreline vs community),

Where do resources need to be focused? As a person on the ground, we have a lot of regulations and information, but it's access to the information. Access — 1) use different tools to get information to decision-makers and people on the ground — increasing dissemination to folks, and 2) based on their background and ideology and objectives (what they care about that is usually more individual focused) the information needs to be relatable or contextualized towards their decisions and what they care about

- **What is the most common need expressed by stakeholders in your network?**

Working with Somerset County, the exposure and political background and church and socioeconomic factors — both people and local governments — it's different from working with other counties (e.g., Anne Arundel County). It can be a stumbling block when working with them. working with diverse decision makers — needs can be different and the framing can be different so that you can work with them effectively.

- **If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?**

1) capacity building - there's a lot of need at the local level, if MDSG partners with local communities there will be more effective work on the ground
2) implementation — planning is good but implementation is needed, we need to show people practices on the ground that can be used as demonstrations of how these projects can be implemented successfully, increasing implementation of projects
    a) could be actual practices
    b) broad spectrum of practices

c) land-water interface, but also need to look at upstream floodplain management and other upstream aspects to increase connectivity to reduce negative community impacts (e.g., Ellicott City), so not just shoreline

E.g,. Coastal Resilience Grant Program — using different projects in different locations (e.g,. urban community near Annapolis vs state park vs island St Catherine vs rural community with environmental justice components Deal island vs town of Eagle Harbor near power plant vs Hurst Creek with dredging component to increase connectivity). First go around, do all these different settings. For other years, want to explore other things. For second go around, are interested in getting ideas from stakeholders about whether the ideas are making communities more resilient (innovations that are pushing the science and understanding forward). The innovations are important because they want to make sure that the framing isn't too narrowly scoped.

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?
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- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Brian Hug
Interviewer: Melissa Kenney
Date/Time: January 29, 2018, 1:00-1:30 pm ET

Brian Hug
Deputy Program Manager
Air Quality Planning Program
Maryland Department of the Environment
brian.hug@maryand.gov
http://mde.md.gov/aboutmde/FeaturedStaff/Pages/bhug.aspx

Brian Hug is the Deputy Program Manager for the Air Quality Planning Program. He has worked for the Maryland Department of the Environment for nine years. Brian is MDE's Employee of the Year for 2009. He was recognized for his outstanding effort to improve air quality, including efforts to address climate change in Maryland.

Brian grew up in Long Island, New York. As a child, he loved being outside. This passion followed him all the way to Binghamton University, where he received a degree in Environmental Planning. Though he originally intended to study economics, a class in geology changed his mind. "Some people like math," he stated simply, "I like the environment." After college Brian moved to Maryland, where he worked as an environmental consultant for five years. He then came to MDE as an environmental specialist and advanced to his current position.

His most recent achievement as "Employee of the Year" is certainly a notable one: "The employee of the year is recognized for going above and beyond the call of duty to serve Maryland and ensure that public health and the environment is protected," said MDE Secretary Shari T. Wilson. "As lead staffer working with the Maryland Commission on Climate Change, Brian was instrumental in helping the Commission complete the very complex Maryland Climate Action Plan in a short time."

The Climate Action Plan addresses the drivers of climate change, explores its likely impacts in Maryland, and establishes goals and timetables for implementation. The Commission emphasized Maryland's particular vulnerability to the impacts of sea level rise, increased storm intensity, extreme droughts and heat waves, and increased wind and rainfall events. Brian drafted portions of the Climate Action Plan and led the development of a greenhouse gas emissions inventory. The report concludes that Maryland would see significant economic and environmental benefits from taking early, immediate actions to reduce global warming pollution and that the goals proposed by the Commission are achievable and would help spur innovation in the State. Preliminary analysis in the Climate Action

Report indicates that, by 2020, implementation of these forty-two strategies could result in a net economic benefit to the state of approximately $2 billion dollars.

At MDE, Brian is also responsible for the timely development of clean air plans for the Washington, Baltimore, and Hagerstown areas. These plans outline Maryland's regulations and programs that will enable Maryland to meet federal air quality standards. This work requires a unique combination of technical expertise, in-depth understanding of policy, and the ability to strategically coordinate complex regulatory efforts.

Brian's work within the Air Quality Planning Program will benefit not only all of Maryland's current residents, but also future generations. Along with many environmental advocates, Brian believes there is still much work to be done toward improving air quality: "Addressing climate change and air quality requires a team effort," said Brian. "I am proud to be part of this project, making Maryland a leader in addressing climate change and protecting our air quality."

- Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.

I focus on the air quality planning program. I staff the Climate Change Commission -- two managed by MDE -- education/outreach and the other mitigation. MDNR -- manages the adaptation and resilience group.

I think SLR was the first foray for the adaptation work group and how do we manage our coastal issues. Really thinking through the coastal resilience issues. Over the past year have focused on more inland adaptation -- extreme precipitation that happens inland e.g., Ellicott City -- depending on where you live and what part of Maryland you're talking about it

Mitigation -- GHG plan 2009, another draft 2015. These are the programs that we're implementing in state. 25% reduction by 2020. 40% by 2030. What programs the state is implementing that are aimed at reducing our emissions. Some structural changes some behavioral changes. Absent new Federal programs, how are we going to get to 40% reduction. Especially how it's going to happen that it won't be a net loss economically and on jobs. On whole can be balanced, but some of the projects will be harder sells. Where do communities tie in? Some degree, some communities have GHG plans at city to county level. This is included in the state plans and highlight and promote local programs.

- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?

The place where we suffer the most is outreach. Folks don't know about the Climate Action Plans on the website. Not necessarily the fault of state government, but we need multiple ways to get the word out. Research that isn't helping to build on the existing work, and especially stretch out to the local communities.

The 40% reduction is going to be hard because need to account for population growth (and associated emissions), previous programs continuing, and then need more to help reduce emissions. ~70% from energy and transportation (about 35/35) -- anything that will reduce from those slices.

Some behavioral change, some programs to promote cleaner fuels for energy consumption, and somewhat can we do to expedite mass transit and/or create efficiency in car transportation (less idling).

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
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- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Erik Fisher, EFisher@cbf.org
Interviewer: Melissa Kenney
Date/Time: January 24, 2018, 12:30-1:30 pm ET

Erik Fisher
Environmental Protection and Restoration
Chesapeake Bay Foundation
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(443) 482-2150
http://www.cbf.org/

Mr. Fisher is the Maryland Land Use Planner for the Chesapeake Bay Foundation. Based in CBF's Eastern Shore office, he works to connect communities with the tools needed to align infrastructure, preservation, and growth management policies with the cleanup plan for the Chesapeake Bay watershed. Erik has been with CBF for six years, where he has actively engaged in a variety of clean water initiatives at the state and local level. In 2011, he was appointed to the Governor's Task Force on Sustainable Growth and Wastewater Disposal.

Erik served as a city planner for the City of Westminster from 2002 to 2007 and he has also worked in Carroll and Prince George's counties. Erik is a member of the American Institute of Certified Planners and holds a master's degree in community planning from the University of Maryland at College Park. He and his family live in historic Whitehaven on Maryland's Lower Eastern Shore, where his children constantly ask to ride the cable ferry back and forth across the Wicomico River. Fortunately, it's free.

- **Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.**

Background in urban planning. Started in municipal planning in county in MD. Came to CBF as a professional planner to work with growth and development issues, infrastructure investment, and land management. Anything other than ag. Can define how you want -- so has worked on local zoning to state legislation to waste water treatment, open space.. No two days are ever the same. Lots of people care but come from different perspectives. 1.5 years came on as Assistant Director, policy and restoration side of CBF. Argue for policy change and watch budgets. Policy team state focused -- he works on MD state policy issues.

Run against issues of climate change. Over the last 8 years CBF has been tightly focused on Chesapeake Blue Print -- TMDL, WIPs. Organization strategic plan have focused on making sure TMDL and WIPs solid and work supports implementation of these policies. Climate change hasn't been central theme -- it's been N, P, and sediment. 2025 things in place to meet targets, 2017/2018 mid-point assessment. Look at progress and see what we need to do thus far -- climate and TMDL/WIP. 2 additions Phase 3 -- Phase 2 1st part of clean up Phase 3 - Full of sediment, Conowingo Dam -- Hartford County, MD -- BMP for Chesapeake Bay because trapping sediments from PA and now full and goes right over. Climate change -- how bay partners dealing with climate change. Modeling climate change impact on Chesapeake Bay. Modeled anything that could increase or decrease sediment and nutrient flows -- precip, water temp -- conclusions that there are likely to be increased flows, time horizon (shorter) so impacts not as dramatic.

Major buckets looking at:

1. Ability of mitigation strategies for nutrients and sediments to hold for extreme precipitation -- is this reasonable that we're capturing the majority of nutrients if precipitation rates higher and more frequent than 1" in 24 hr -- stormwater
2. Bay impacts -- one of primary habitat goals is to dramatically impact SAV, eelgrass primary in lower bay, cool water grass and at increased water temps in summer likely to impact eelgrass in Bay. then question of succession -- what can replace it as a viable habitat for key species in Bay
3. As planner think about land use and land use changes impact the Bay. Wetland migration -- trying to figure out especially on the Eastern Shore -- if 1" rise it covers a lot of land -- not the case for Western Shore. Blackwater - "Everglades of the North" -- if need to stay away from tidal wetland, not allowing for migration. Both how we spend conservation dollars -- MD Open Space -- but also the policies for land protection and zoning. For MD Open Space -- the lands where the wetlands will be in 40 years are a priority and could be added to the framework.
4. Depending on where you go in the CBF and what state the solutions are very state focused. So that people feel that there is value to them to help Save the Bay. In PA focus on Bass fishing. In VA in Hampton Roads have climate fellow -- climate adaptation strategy and water quality -- are there strategies that help with both. Already experiencing it -- because they see it.
5. Smith and Tangier Island -- call it erosion not just SLR. Experienced flooding 2 times a year to 3-4 days a month within 8 years. Houses in the floodplain have one more mortgage cycle. CBF properties e.g, Port Isobel -- lost tens of feet of beach and trees because of saltwater intrusion.

Buyout program offered after Sandy -- felt like government telling them what to do and trying to take land and property. CBF has a tricky relationship with communities -- live in communities and

employ people, but also lobbying for catch limits because it's not sustainable. Even more difficult to have conversations about migration because an advocacy organization. Communication with community but doesn't have work plan objective to focus on the human side. Laser focus on TMDL.

Save the Bay means work with humans. Humans are treated equally in the solutions that come with it. Starting to ask questions about what it means to participate in the EJ movement. Intersection between environment and EJ. On the shore the groups need to be defined differently -- socio-econ and education. One example is the engagement with the trash facility -- Wheel-a-brater -- power plant (smokestack with Baltimore written on side) -- trash incineration, creates power, emits NOx and lots of other air quality problems -- could have gone through regulatory process, and instead went into the community so that when we went to the regulatory agency it was community informed. Community needs and priorities, implications of decisions… foresee CBF doing more of this kind of work. Board has made diversity and EJ priority.

MD Sea Grant familiarity -- Work with local office in Easton so that we can work with communities. Jen Dettinger and Erik Buel (extension). Really valuable.

- **If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?**

Brian Ambrette -- probably has the best answer….

A couple areas of focus --

- Land conservation conversation in the Eastern Shore -- not really happening - how can we strengthen or alter land policies for climate change that will impact land
- Jumpstarting the market for ecosystem services to lessen what we'll have to adapt to -- slow down the trajectory of impacts -- so much private capital that could be spent on the environment - work with US SIF -- apparently globally a trillion dollars that is people money that they want to have something to do something -- lower return to produce social good outcome -- carbon market, etc Private market that could make investments for credits -- trying to do the same work with nutrient trading in MD. Only so much money to spend on stormwater retrofits, doesn't make sense to do that on nutrient reductions only. Land owners in Eastern Shore could benefit from markets -- blue carbon markets -- Carbon and N and P credits -- might be able to sell through different markets….
- Don't know about what's going to happen here -- less related to community -- would like to know about climate change will mean beyond what will happen with SLR. Want to know more about Bay acidification for key species and impacts on people. **What questions**

people want to know the answers to so that they can help make sure that funding can answer decision-relevant questions.

- **TMDL and WIPs --** what does adding climate mean and communities already feeling under resourced, under knowledged, ill equipped to meet them and now adding climate… want them to feel additional responsibility worth doing. Needs to be more than a fact sheet.
- Even ES studies, envi community loves because like to talk economics, but largely irrelevant to communities that don't pay for services or destruction of services. What will people respond to in this area… Costs not operationalized in the decisions that people make.
    - Worked with city of Salisbury to adopt stormwater fee -- didn't do it to address stormwater they did it to address flooding and erosion -- but it makes sense and people were investment -- people in favor of tax in the Eastern Shore, need to figure out how to frame things so that they're important to them

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?
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- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Erik Meyers, emeyers@conservationfund.org
Interviewer: Melissa Kenney
Date/Time: 15:30 - 16:30 ET

Erik Meyers
Vice President
Climate and Water Sustainability
The Conservation Fund
emeyers@conservationfund.org
https://www.conservationfund.org

Erik currently leads projects on climate adaptation and resiliency, provides leadership on urban and coastal water sustainability relationships, and assists with mitigation efforts. Recent projects include pioneering coastal marsh adaptation work at Blackwater National Wildlife Refuge and a national nature-based coastal protection initiative led by the U.S. Army Corps of Engineers and the National Oceanic and Atmospheric Administration. Previously, Erik was Vice President and General Counsel for the Environmental Law Institute, where he created its corporate environmental management program; directed its legal education, recognition, and wetlands programs; and served as chief legal officer. He also directed a national public health policy organization and staffed another.

- **Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.**

Rural areas — Eastern shore. Wide open low, topography where there are use like forestry, fishing , open use, ag, — economic opportunities based on the land and primary ecosystems that are important. This is a limited window of time to think about the implications and look the projections for SLR and say now is the time to plan for that future in 50 years. Need to think about that now. Despite uncertainty need to be smarter now to think about opportunities for the future, new developments, built infrastructure, and ecological resources. More systematic approach.

Developed areas — affect the coast, look at the fluvial and riverine networks because we're seeing increased precipitation. Have large down pours and more intense over a larger area. Flooding. Goes hand and hand with development policies. Needs to be more tightly connected. E.g., TX post Harvey, the uncomfortable reality is that it will take more restrictions and money then people willing to talk about. Landscape scale green infrastructure (e.g., stormwater parks) can help, but take money and planning and awareness that you can't go back into bad development patterns. Also

remembering if we plan that it has to be for the long-term (can't just revert back in 10 years). Can have built structures but also need green infrastructure.

Tangent — Milkwalki (MMSD program CSO overflows 16-17 years paid by rate payers) green stormwater infrastructure program. Show contributions of various green infrastructure (80-85% capacity) and built infrastructure (deep tunnel; 15-20%) — data shows green infrastructure critical to keep flooding out of urban area. Needs to be a watershed scale to be cost effective and comprehensive. Flooding and water quality benefits. Hard to plan because of how these systems are managed. Need scale to do this. Maryland struggles from the same challenges of authoritative s of land development, water management, but still tricky.

E.g., STRATUS consulting report for Philadelphia for green infrastructure and built infrastructure. Insights into decisions that helped to create and promote what they set up for the study. Philly used a focus of social justice and equity issue instead of just an environmental issue. Also had other problems with people are moved to these areas that are flooding and impoverished. Climate didn't factor into the previous report and efforts too much.

Integrated water management - stormwater management with waste water and water supply. E.g., Kansas City, MO lower, more developed than up-watershed areas in Kansas. Started looking at rates that were paid for water for different parts of the city, most expensive was poor areas because they were flooding and because where the utility is putting in CSO compliant structures. But problem not getting better because of development on Kansas side. Impacts on WQ, flows, runoff, etc. Working to construct a green streams program. Many cities at end of watersheds (e.g., Philly, DC) and for compliance purposes will need to install long-term control structures, and green infrastructure in their borders even through the most important impact could be keeping it out of the system in the first place.

Need to look for bridging mechanisms (Raleigh, Upper Neuse R), increasingly more effective network amongst different jurisdictions and corporations for that system. Need cooperation. Challenge because of the shallow water system — more supply and WQ then flooding.

One does need to plan out a landscape scale and think about the impact of fluvial flows into coastal areas. Critical for thinking systematically.

- **If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?**

It would be interesting exercise to see if you could get a group of elected local leaders or officials to meet over a period of time to talk about how to meet the challenges of a changing climate and pick

out a few salient issues that they're facing. SLR, storm surge, upstream communities to talk about flooding, so that you can start to create the conversation about the shared challenges across jurisdictional lines and cooperation. E.g., Annapolis invests in another town to minimize flow into their system. E.g,. when we did our project for Baltimore and Sandy $$ it was fascinating to find out that they were not talking between jurisdictions. And if they were not coordinated then they the projects could be counter and negate the benefits of a single project. Start these conversations and opportunities for collaboration across communities. Most cost effective and long-term solutions. Metrics of success are challenging — would want pre- and post- to get a sense.

One of the things that we've done with community stakeholders and appointed professional leadership on green infrastructure is take them to places to see examples so they can see what they're talking about with the types of things that would get into place. Set up series of site visits of different infrastructure project types . Letting people see what the features look like makes it more approachable and see what it looks like at a larger scale. So that you can see co-benefits. Interesting approach that could be applied to other areas. Potentially pulling in the MD elected leadership at the state level to hear the conversation so they are part of it. Can help with implementation (e.g., Proctor Creek in Atlanta, GA) to see it. Downgradient from Peach Tree so this is an area that is commonly funded adn the same storm a water infrastructure was not installed and it is consistently flooding out areas because of stormwater. Area is vacated and dilapidated and impact on local businesses. Can see developed area. The first community part was built in English Ave and it had green infrastructure (with Park Pride). Community didn't understand because green infrastructure?? and don't' know if this will be the thing. So took team from the city to Philly to meet with the city officials to talk with them about how they structured it, the Atlanta community was able to bond, and then a field trip to Milwaukee where they were able to see the green infrastructure opportunities. Really helps to see it. And use those projects that then get implemented in the city of Atlanta as ways to build new projects so they can see what's getting built. Green infrastructure task force (semi-formal arrangement across departments) to think about the management, operationalization, etc. Can see what the future looks like.

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
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- What is the most common need expressed by stakeholders in your network?

- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Additional information provided after the meeting (including PDFs of projects):

See https://www.youtube.com/watch?v=S88tS9yeVjo for Kansas City insight on sources of rising downstream flooding. Slides for presentation on community engagement in Atlanta is attached (4th PDF) to address similar urban flooding problems, that were getting worse from climate change.

See
https://www.mmsd.com/what-we-do/green-infrastructure/resources/regional-green-infrastructure-plan for Milwaukee's (MMSD's) GI plan and metrics and this link for future direction
https://www.freshcoast740.com/resources/our-plans

For Raleigh, NC and upper Neuse, see
https://www.conservationfund.org/projects/upper-neuse-clean-water-initiative - this is also one of the metro targets of our integrated water management efforts where climate considerations of extended drought and intense precipitation require changes in how water supply and storm water are managed.

For Baltimore, here's a link to our mapping and discussion of climate resiliency on regional scale. See http://resiliency.cicapps.org/coastal-resiliency/resiliency-maps/ We were involved in helping create and continue to support and promote the Greater Baltimore Wilderness Coalition as a regional collaborative of agencies and organizations, (national to local) that support use of green infrastructure at varying scales to achieve greater resiliency to effects of climate change (plus deliver greater equity, biodiversity and health outcomes). See http://www.baltimorewilderness.org/

For MD Eastern Shore, the Blackwater 2100 report [see
https://www.conservationfund.org/images/projects/files/Blackwater-2100-report_email.pdf] briefly discusses approaches that would help rural farmers stay on their land longer but it's at early stage. TNC, Chester River Alliance, and Center for Inland Bays are focused on switchgrass for clean

water (taking up nutrients, and fixing sediment) in Bay watersheds, and we implemented a small project demonstrating replanting of bean/corn fields with native switchgrass strain meant to be harvested annually for use as poultry house absorbent litter. TNC has been leading effort with Delmarva Poultry Growers Association to substitute switchgrass for pine shavings in chicken houses. This would be interesting area to explore and see where matters stand. Sea grant dollars might fund interesting work here to support taking concept to scale and see what market players might need to be created to make practical (e.g., middle market players who harvest, process, cut and deliver SG to poultry growers).

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Jennifer Dindinger, jdinding@umd.edu
Interviewer: Melissa Kenney
Date/Time: December 6, 2017; 10:00-10:45 am ET

Jennifer (Jen) Dindinger
Agent, Regional Watershed Restoration Specialist
Maryland Sea Grant Extension
University of Maryland
jdinding@umd.edu
410-228-8800
http://agnrfacultystaff.umd.edu/node/129

Ms. Jennifer M. Dindinger Regional Watershed Restoration Specialist Sea Grant Extension Program Based in Cambridge and serving four counties on the Eastern Shore, Jennifer is developing a program that builds community and economic development while promoting natural resource protection. Jennifer holds a Master's degree in Environmental Policy from Bard College and a Bachelor of Science in Medical Technology from the University of Delaware. In 2014 she was awarded the Off-Campus Junior Faculty Award for her contribution to the UME 2014-2019 Strategic Plan.

- **Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.**

There are two areas where the local governments are going to be challenged.

1. What to do with properties in the floodplain and in coastal areas that have repeat damage and inundation. Still buildable lots that are in high risk areas -- how to prevent that type of growth in those areas overlaid on how we function as a property rights and democracy nation. The one challenge is that there is SLR and it's not happening uniformly in the same areas but there are repeated flooding along the coast. Most want help to be able to stay and right now there's no uniform approach to assessing whether they should stay or go and how you would implement it.
2. Somewhat managed by MD Stormwater Rules, making sure that increased precipitation that is predicted isn't going to flood the upland areas that may not experience SLR but still experience climate impacts from fluvial flooding. Zoe led workshop on climate resilient BMPs -- lots of things on the ag side for how to manage climate stressors, but urban

stormwater side is not as far as long. Need to figure out climate smart retrofits and sizing for urban stormwater BMPs to prevent or minimize flooding from increased precipitation. E.g., Easton will end up with the possibility of rising SLR and stormwater flooding hitting them at the same time. Layered behind that is the tax and political structure of these jurisdictions -- low tax area, people don't want more taxes for public funds to manage flooding, but also people along the coast who don't want to put in living shorelines and will instead put in cheaper bulkheads. There are philosophical challenges or decisions that we haven't had as a society -- should we invest in private property shoreline protection because it helps other people? Should we only help those without lots of $$? E.g., Deal Island vs Talbot county.

3. A lot of challenges that are linked to local challenges and WIPs - haven't invested in people who can organize their data. So they can't answer the questions when asked -- voluntary or regulatory required reporting. E.g., Caroline County hired someone and mapped impervious surface. Not required to track existing BMPs so they don't even know what's in and whether it's maintained -- and that's not even getting at the climate piece. E.g, Healthy Watersheds Roundtable -- recommendation from tracking and reporting (especially for WIPs), best way to get data from under-resourced and under data areas. Bringing together Eastern Shore jurisdictions to accelerate WIP implementation (e.g., CBF, Eastern shore land conservancy, MD SG, Huges foundation?). Jen worked specifically on tracking and reporting. How to encourage and support the jurisdictions to work together themselves without continued prompting. Convening can be one more meeting about talking on problems but not moving things forward (action oriented).

- **If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?**

Hiring climate resilience specialist would add value to MDSG. Getting the right person hired is really key. This study can help with a revised job description. Connecting to and being able to utilize the research world is going to be a weak link for extension agents, and this is a really important role for the climate person. Need someone to build relationships between academia and communities. Need to translate the existing science so that it can be brought to communities.

One place for MDSG is divided is that we have the aquaculture and fisheries, watershed, and then the education group (that partially bridges). I think the climate person, if it was the right person I would want to see some kind of program or way of looking at it holistically instead of siloed. Need to think about how communities and watershed and fisheries intersect with climate stressors. If there was the right person in place or a structure that supported that type of integration (possibility -- working waterfront program) might be an opportunity to bridge the different elements to work collaboratively in a series of communities. If there were information on the research side about

how to manage working waterfronts, how does it affect aquaculture operations, the watermen in the communities, moving products to places via flooded roads, etc. Not just SLR, not just aquaculture, but how we bring these things together (aspirational).

Can get overwhelming because the size of the problem is so big. Want this person to do some sort of assessment of who is doing what and where so that you have a sense of who the big climate players are in the region and Maryland. They should help to scope out some of the opportunities for collaboration, overlap that is important or redundant, and window of opportunities for projects. There's so much focus on climate that the location for engagement could vary -- western shore vs eastern shore. Need to ask people what they're working on and what they couldn't work on that they thought was important.

Communicating uncertainty and risk well to communities is really important. May not need to focus all their effort on this, but it is important.

Important to have these that they can start on from day 1 -- so they can start building success and having something they can talk about that they've done. It helps to lead to bigger projects and opportunities.

- **In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?**

What I find limiting in my current role is that I don't have a solid grasp about what the research is saying about the likely regional changes in temperature, SLR, and precipitation. I don't understand what datasets and tools that I should use to get that information. I would want the climate person to know that information so that we could work together on communicating that information to folks in communities including elected officials. The model in Deal Island, took a long time in part because it was academic focused, but it might be useful to think about that approach to community assistance and I would like to try that in a different community. I would want the climate person to be the science expert and would want to work with them to understand what the science says is happening, identify research that could help connect with communities (similar to Deal Island not just dissemination), and, similar Jess Whitehead VCAPS approach, write up or formalize or standardization of a model (one-size-fits-none) but identify best practices or framework that could be used with multiple communities. Sitting in the Climate Workgroup Meetings -- look to climate person to play that role for MDSG -- they would engage at the state and bay program policy level. Bridge between communities, state, and Chesapeake/regional policy. It would take the pressure off

other extension agents to participate, but would then need to bring it back so that the extension can share it with the communities. I would not see me or other extension as community gatekeepers -- I would certainly want the climate person to have established relationships with communities so that they are representing communities (not playing telephone).

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Jessica Whitehead, j_whitehead@ncsu.edu
Interviewer: Melissa Kenney
Date/Time: 11/09/2017, 14:30-15:00 pm ET

Jessica C. Whitehead, Ph.D.
Coastal Communities Hazards Adaptation Specialist
North Carolina Sea Grant
NC State University
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office: (919) 515-1686
https://ncseagrant.ncsu.edu/about-us/our-team/jessica-whitehead/

Jessica Whitehead is the coastal communities hazards adaptation specialist for North Carolina Sea Grant.

She assists coastal users with integrating information about coastal weather and climate hazards into their decision-making processes. Her work ranges from providing community groups with climate science data to working with scientists to develop decision-support tools for climate change risk and adaptation.

As a co-creator of the Vulnerability, Consequences and Adaptation Planning Scenarios (VCAPS) process, Whitehead has facilitated participatory diagramming exercises for stakeholders. So far, these activities have helped 17 Gulf and Atlantic coast communities understand weather and climate hazards, their communities' vulnerabilities to these hazards, and adaptation options that could increase community resilience.

Whitehead's current projects include helping Hyde County develop a flood resiliency plan, and assisting the Town of Nags Head begin planning efforts to make public infrastructure and resources more resilient to sea-level rise over the next 10 to 30 years.

In September 2015, Whitehead began a new project to help water managers in Charleston, S.C., and the Morehead City, N.C., region explore the public health risks of storms and near-term sea-level rise. This project is led by South Carolina Sea Grant Consortium, and includes partners from East Carolina University, and the Carolinas Integrated Sciences and Assessments (CISA) program at the University of South Carolina.

Prior to joining North Carolina Sea Grant, Whitehead was the regional climate extension specialist for the South Carolina Sea Grant Consortium, North Carolina Sea Grant and CISA.

Whitehead holds a doctorate in geography and a Master of Science degree in meteorology from the Pennsylvania State University. Her doctoral dissertation focused on building scenarios to determine the capacities of small drinking-water utilities to adapt to climate change. She also holds a Bachelor of Science degree in physics from the College of Charleston.

- **Tell me about your role as a climate integrator.**

Title coastal community adaptation specialist. (instead of climate extension, changed name because gave more cover to work with more diverse partnerships, weather vs climate battles, allowed to work in different communities) Prior to 2013 shared between SCSG, NCSG, and CISA. Sharing between the states as extension worked well as a multistate model because there weren't too many climate extension folks; over time built up market and started to think through the "market".

2012 -- travel became too much between multiple states (still a lot in one state). Also lots of transitions in the state including policy related to sea level. Opportunity to repurpose NCSG position because the market had grown, different political and legal requirements, and it was important to focus only on one state. Work with a lot of Federal partners. Linda Rimer (EPA Reg 4) works a lot with CISA and .

- **How would you define a climate integrator? What is the role does a climate integrator play in Sea Grant?**

What you can do 10 years after building capacity. Draw on methodologies used doing dissertation, but apply in real world context to get to a policy change without advocating. Requires some of the same research skills, but in a lot of other ways there are a lot of things that you have to learn how to do. I'm already a system thinker which is really important when doing this kind of work because you need to understand how diverse things connect.

Needed to screw things up in order to understand how to message and work with diverse participants. Doing the "people part" is really important and requires development to do well.

Really looking for a "unicorn" someone who has the research training, interested in doing applied, on-the-ground work, excellent communication and collaboration skills, management, and an ability to see thing through to impact.

Side comment about climate extension mentoring: Do we need a mentoring network for climate extension? Weather and climate sea grant network? Part of 10 year vision for SG weather and climate. May help to have something more structured to be successful more quickly.

Side comment: Strategic doing (http://strategicdoing.net/) workshop in Easton, MD in Nov 2017 - this is a methodology that might be able to be used to get over the hurdle because it focuses on what they can do instead of what they can't do. Can also make them more competitive for other funding.

- **What would you expect (realistic yet ambitious) from a climate integrator/extension in 5 years? What does the 5 year plan look like?**

Year 1 - figuring out what you're doing and getting your feet under you, looking at hiring someone from grad school or postdoc, figuring out how it works and building relationships

6 months - starting to get pilot projects, ideally working with other efforts and linked under existing grants or efforts - thus it is helpful to have something that they can directly work on with others to build skills, relationships, and get an early win

Year 2-3 - get a new project going, probably not getting to impact because need to do the work, build the local community relationships

Good project -- planning assistance is an easier win, may already be other partners in the space so need to work together and delegate work

Gap in the enterprise ton of partners and ton of people in urban areas, but less service and partners in rural communities, this might be a niche, the underserved communities that are not getting this service in the same way as they're doing in large urban areas

Year 4-5 - get to SG impact (e.g., change policy, implement project), for any given community project it takes 4-5 years

Questions not asked directly:

- What would you describe as the lessons learned (good and bad) from your role as a climate integrator?
- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network? What niche does a climate integrator fill that was previously unmet?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?

- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Kirstin Dow, DOWK@mailbox.sc.edu
Interviewer: Melissa Kenney
Date/Time: November 29, 2017, 15:30 - 16:00 ET

Kirstin Dow, Ph.D.
Professor
Department of Geography
University of South Carolina
DOWK@mailbox.sc.edu
http://artsandsciences.sc.edu/geog/

Dr. Dow is a social environmental geographer focusing on understanding climate impacts, vulnerability, and adaptation. Kirstin was recently named as Fellow to the 2016 inaugural class of AAAS Leshner Leadership Institute Public Engagement with Science.

- **Tell me about the climate integrator position for the state.**

The position itself gets shaped by who you bring in. There were lots of people who could replace Liz when she left this summer (30-40 applied, lots of people were competitive)

The shared position worked well - SG has better brand recognition then CISA, so they oftentimes got credit. But need to be careful about branding. Many of the activities that they would do are similar so it made sense to share. Need to make sure they were introduced to both programs well. Go to SG academy; also needed to go to RISA academy.

- **How would you define a climate integrator? What is the role does a climate integrator play in Sea Grant?**

Talk with Susan Lovelace -- supervisor extension at SC SG -- able to to tell you about value add to the SG program. Rick also fully supportive of the position. Troy Hartley (Michelle Covi).

Having someone doing talks, going to meetings, meeting with communities, bring science and connections has been really important. It's helpful for communities to talk with an expert who will give them a straight answer about "Why these SLR numbers are so different?". Having someone

write and synthesize the science that is relevant.

For the SG program one of the things they would be able to speak to is how successful they have been at leveraging additional funds. As people look to partner with communities more and more, this person is the gateway. Able to bring in funds for both science and community implementation -- able to do both especially when need to have community relationship for successful proposals. Able to continue relationship with the communities so that there is longer-term capacity and respond to evolving needs.

A lot of communities need someone who can tell you the latest about climate change information. One of the questions is about how much they should specialize… GA has someone whose expertise is getting through the CRS process other states SC have people who support community needs.

- **What would you expect (realistic yet ambitious) from a climate integrator/extension in 5 years? What does the 5 year plan look like?**

Year 1 -- first 6 months meet all key stakeholders, learn what's going on, build network, build an advisory committee, do needs assessment. Start finding projects and opportunities to support communities, start finding grants and pursuing projects.

Year 2 and 3 -- Start working on projects, building longer-term relationships and embedded in the network, getting grants

Year 4 and 5 -- complete projects, set up new opportunities

Projects -- depends on the community what is a good project, potential for growth (more than one and done), facilitating things that are community led and owned (supportive of growth and development),

- Faculty member and student could collaborate with SG person to do a project -- this could be something that is interesting
- Communities had someone they could call, a resource person to ask questions, someone who had technical expertise to find answers and SLR maps, reliable resource was the most important contribution.
- The SLR taskforce report for Beaufort, SC. Helped to find scientific information that was relevant and could have the questions answered that were most important for them.

Skills: extension personality - listeners and communicators (most important), science communication (but effective hands on, not just theoretically), science training (doesn't have to be a

climate science), organized, independent, politically astute, grantsmanship, willingness to build relationships, picked people skills over training

In Interview: Asked them to do an exercise -- put together a 2 pager on a specific topic, give a brief presentation about a particular topic for a specific community (helps with whether they understand risk based thinking), what skills they had versus what could be taught, how much they are listeners vs top down

Recruitment: Sea Grant list, coastal management fellows, Kanauss, ASAP, some community of practice lists, a few other places

- It's a good time to hire for coastal management because there's not as much transition into the Federal government
- $50-60K -- has to be consistent with SG hires, comes with state benefits

Questions not asked directly:

- What would you describe as the lessons learned (good and bad) from your role as a climate integrator?
- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network? What niche does a climate integrator fill that was previously unmet?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Kristin Baja, kristin.baja@baltimorecity.gov
Interviewer: Melissa Kenney
Date/Time: December 07, 2017, 9:00-10:00 ET

Kristin Baja
Climate Resilience Officer at the Urban Sustainability Directors Network
Climate and Resilience Planner at Baltimore City's Office of Sustainability
kristin.baja@baltimorecity.gov
phone
https://www.usdn.org/home.html?returnUrl=%2findex.html

Kristin Baja is the Climate and Resilience Planner with the Office of Sustainability at Baltimore City and the Urban Sustainability Director's Network's first-ever Climate Resilience Officer. She is responsible for development and implementation of the City's Disaster Preparedness Project and Plan (DP3) which integrates climate adaptation with hazard mitigation efforts. She is also responsible for climate change communication and outreach, Community Rating System certification, Resiliency Planning, and STAR Sustainable Communities certification. Kristin is also a Certified Floodplain Manager and is responsible for Baltimore's floodplain management program. Before joining Baltimore City, Kristin worked for the City of Ann Arbor developing their Climate Action Plan and Sustainability Framework.

- **Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.**

MADE CLEAR — interested in applying the game to a high school audience

- map out information that exists for the region

so many different groups building capacity around climate and resilience and adaptation — everyone is working in their silos, if there is a climate specialist at MD SG then she would work with those the SG person so that word can get filtered effectively through the network

- regional group that is leading climate for their constituents — and have them working together tightly as nodes, so there is much stronger collaboration
- who is on the ground doing work in this space (e.g., someone on the port, dredging, etc) — can understand how these pieces connect together and impact other decisions
    - many of these decision-making groups (e.g., port) are thinking at a larger scale

can we make it part of this person's work plan like Sasha and Kristen and all these other climate information

lots of people investing in DC right now, but there's a lot of other places, like the surrounding communities

granting —. a really big deal is we need to get beyond the municipal borders — working in watersheds etc. — but we don't provide grants that support this types of collaboration and working beyond borders. Need to provide the funding to support this and funding beyond a year. Need more than just science and data — need to get beyond information and planning. We need innovation that is based on the best available information, we have regional assessments, NCA,

- SG — universities and research groups that hold data and information, need to know who does the SL rise information, are there even people outside of the state that are going to do this work
- can SG be the place that identifies who is doing the assessments — precipitation, extreme heat (Baltimore ecosystem), SLR,
    - where are they doing it in the location
- gap assessments — through that interplay

need person to be connected to NSF, EPA, NOAA, foundations — the funders in this space

- someone having information in this space to navigate what's being done and what can also be useful
- connection with folks funding in this space
- we're going to be the group - where the research is being done and minimize redundancies

MARISA — precipitation riverine and coastal flooding — Kristin recommending — wanted to do heat research (doing, Baltimore only place done) and wanted to Bathtub model (discouraged because already done)

- Baltimore — Pratt St dividing line for coastal and fluvial system
- don't reflect reality of what's happening in FEMA maps
- SG — may want to do the RISA

Urban Resilience to Extremes — ASU SRN, one of the municipalities is Baltimore (but no one wants to live in the area, the person is in NY that is working on this project), advisory committee, scenario workshops regionally on connectivity to extreme weather events (DP3 for Baltimore city)

Sasha — ground truthing citizen science, what we're seeing on the ground and integrating in positions

TOPIC areas

- Equity focused — needs to have lens of equity from all aspects, social economist, or expert in that space, need to be connected to people most impacted
- Insurance and reinsurance — what are going to happen with massive claims (e.g., Harvey, same thing could happen here). Reliant on CRS and other incentive programs. Real estate, lenders, banks, and insurance… someone working in this space broadly…. how this connects to codes and policies. WE shouldn't be able to develop on flood plains — happening everywhere rapidly
- hazard mitigation — DON'T WORK, green infrastructure isn't going to save us, needs to be more especially in urban areas because it's not enough
    - green, blue, grey overlaps
    - opportunities for local govt to take action with partners
- connectivity in this space - but need to be looking at this in connection with human health — not doing the basic human needs well, homeless, disabilities, epidemic drug use, what is the next step….

If interested, Kristin would be Able to review job announcement. Kristin wil share white paper and job announcement for her current position.

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Lisa Craig,
Interviewer: Melissa Kenney
Date/Time: January 24, 2018; 2-3 pm ET

Lisa Craig
Former Director of Historic Preservation
Annapolis Historic Planning Division
Annapolis Local Government
lmcraig@annapolis.gov
phone
https://www.annapolis.gov/876/Historic-Preservation-Division

Lisa Craig is chief of historic preservation for the City of Annapolis. She has 20 years of preservation experience in public service, property development and nonprofit leadership at the state and national level. Ms. Craig served for five years with the National Trust for Historic Preservation before being named the State Historic Preservation Officer for the District of Columbia. Craig has also worked to rehabilitate officers housing at the U.S. Air Force Academy, drafted an agreement for the Fort Lawton Historic District in Seattle and developed a public-private equity structure for historic tax credit certification at Pearl Harbor in Hawaii.

- **Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.**

Creating framework that can be used with communities. How do you go about getting resources, data, etc. Lots of information with FEMA and flood insurance. Have tool that can work with historic communities, here are the steps, and a way to start.

Not creating more work, encouraging communication and collaboration. Preventative maintenance — need to maintain systems so that they last longer and function.

- **What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?**

documenting the stories and the people and places are really important for historical preservation — also links to anthropology. for very vulnerable places that will be underwater — how can we create the documentation of what will work for places that will be lost. capture all that is important about

it. why do we love this place. maybe don't necessarily work on how to solve it because some of it might not be able to be able to be solve it.

Tourism in Dorchester Co — SLR advisory group — Andrea someone — just now thinking about losing 50% land! might need to do story map or memory map for these communities that will be gone.

Government primary role when communities will disappear — are there places that are worth buying out before the properties have no value. Buy now and can live there until you leave. Need to strategically identify the places that are most vulnerable.

Open Space — purchase via easement on property to keep it open space. Could do the same thing by willing buyers could purchase an easement so that it would protect it from future hardening and development in the future.

- **If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?**

What are the outcomes suppose to be? What significant changes in the state do they anticipate seeing? Are they doing this so that the outcomes are generalizable to other areas.

People's comfort level lies in planning and public decision-making for public improvements. Annapolis — plans drafted unclear what is happening with it given council. Comprehensive plans — MD DNR are allow until 2020 to update Comp Plans and integrating future looking information so that climate forecasting maps to 30 years or less so that it links to mortgage and comp plan. Throughout areas — land use, zoning, recreation etc. — you have to run planning related to erosion, SLR, etc. Needs to run through every part of the comprehensive plan — use that tool. Comp plan place to call out places of Cultural and Community places of importance. Make sure not destroying and supporting those places.

5 year updates to the Hazard and Mitigation Plans. MD takes into account cultural resources, social vulnerability that are beyond the basic Haz Mit Plan. Alleghany and maybe one other doesn't have Haz Mit Plan. Need to FEMA benefits after event. Incorporate critical faculties but also critical ECONOMIC facilities and critical CULTURAL facilities. (e.g., Annapolis downtown, Ellicott City downtown because heart of city). Make sure flooding key piece of the hazard. e.g., Vernodena Beach, FL historic island community, refers to historic downtown as a critical facility because without it the community would be gone, people would lose jobs. Haz Mit plans predatory and responsive. Longer-term beyond immediate response, the post recovery is really important for recovery. For the recovery plan can think strategically about the private business and not just the

public infrastructure. Problem is that so many communities reliant on private business tax basis — if that goes away then it takes away revenue from city programs and services.

UMD study underway — UMD and Texas A&M working with NAS Allison Riley — urban flooding, presentation on urban flooding. Failing infrastructure, extreme rain events, we're seeing that they're happening more than 50% outside of the floodplain and happening in vulnerable areas both populations, failing infrastructure, renters vs owners. Look at Eastern Shore — also happening about flooding in failing stormwater systems due to water not in the floodplain. Can't limit to just coastal issues because flooding happening because of other weak infrastructure systems.

Capital improvement programs. There are all these projects — e.g., city improvement projects including stormwater improvements are in flood plain and none talked about it in terms of flooding because of coastal flooding and extreme precipitation. Are there opportunities to incorporate it and increase capacity when we're doing projects so that we can do a little more to address flooding.

Need one person sitting in position of authority thinking about flooding on impacts in all these sectors. How is this part of everything that we think about adn do to see if we can help create resilience and resiliency to the infrastructure and community.

Don't need another plan — just need to integrate in existing infrastructure. What science do you need to do this. It might be the translation of the science so that it gets used. Potentially think about it from communicating the science instead of spending time addressing the science and non-believers. Start with the wins where people want to solve problems. It then gets to the question of what places matter and experiences in those places.

Develop memory maps — to document places using public art. It can do a lot to help people understand the urgency. As Lisa for example at the end of her presentations— art that shows the flooding. Helps with the dialogue doesn't advance the solutions. But sometimes need to start the dialogue. Need to communicate in way that works with community. E.g, Blue line project — businesses puts blue line where the water level will be in 2050 so that it reminds everyone what they're looking at on a regular basis. Done one day a year.

Issue of use — Place Matters program in NY where organization that recognizes and designates public places. e.g., There's a corner where Laguardia would frequently speak. Community understands important because this happened here.

Incentive programs important for individual actions. And timeframe.

If the outcome is to ensure that we have provided relevant information and along with the interpretation of what this means, and then we need to figure out what you can tell us about the community. And then what are the necessary decisions that allow to make the changes and implement it. Annapolis vision and link to what is happening at Fed and State planning tools because of massive change of administration — may have implementation piecemeal. The decision-makers are key in this process. What are we going to do and who is going to take responsibility. It's implementation, action, and accountability. Thinking about their values in the changing landscape to deal with the threats. If you have physical changes to the landscape that are responsive to the threat.

Online survey before and after program starts or community engagement activities. Make sure you have quantitative metrics.

State as part of climate action plan — require resilience plan as part of comp plan. And leave it up to the community about what the biggest resilience challenge is —- environmental, social inclusion, etc. Needs to be more than a word and need communities to define what it means for them. In MD coastal communities it has to include flood mitigation.

— check out the Weather it Together Annapolis Storyline — exemplar

Science from multiple lines of evidence - it helps to provide the evidence needed to identify the problem need to figure out solutions. Whatever is done needs to be scalable. What does scalable mean in your community. all aspects scaleable including community building programs and what that means for the adaptation alternatives. Where are you making investments and how can they build.

Maybe useful to bring diverse science together to talk about climate in the state. Bring people together to discuss the research in the region.

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations

who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?

- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Elizabeth (Liz) Fly; elizabeth.fly@TNC.ORG
Interviewer: Melissa Kenney
Date/Time: November 29, 2017, 9:30-10:00 ET

Elizabeth (Liz) Fly
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South Carolina Chapter
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https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/southcarolina/contact/sc-chapter-staff.xml

Liz is the Marine Conservation Director for the South Carolina chapter of The Nature Conservancy. She is originally from St. Louis, Missouri, but has lived in South Carolina for ten years working on marine-related issues. She received her Ph.D. in Biological Sciences from the University of South Carolina, studying climate change impacts on marine mussels around the world. Liz spent a year in Washington D.C. as a Knauss Marine Policy Fellow, working on ocean and coastal issues for the Third National Climate Assessment which was released in 2014. Before joining the Conservancy, she was the coastal climate specialist for the South Carolina Sea Grant Consortium and the Carolinas Integrated Sciences and Assessments program, providing science-based information and technical support for coastal climate adaptation issues. As the new Marine Conservation Director, Liz looks forward to expanding the Conservancy's engagement in important coastal and offshore issues facing South Carolina.

- **Tell me about your role as a climate integrator.**

Former Coastal Climate Extension Specialist, SC Sea Grant and Carolina Integrated Sciences and Assessments

I ended up being the point person in SC for coastal climate adaptation issues. Giving a lot of talks and working with local communities. We would apply for grants or support other opportunistic funding opportunities. Assess community vulnerability or SLR strategies using community participatory processes. Helping to write reports that the communities consider implementing. It took 3 years to get to this point and Jess Whitehead was in the position beforehand so the starting point was different. The value is that there is someone that is a point person.

A lot of communities don't even know where to start, so the position helped to provide a starting point, a resource to connect them to other people, facilitator and translator of science into local level decisions -- walking through SLR scenarios and thinking through planning and risk. A little of connecting to academic scientists, but more I was recognized as the expert. For grant opportunities, it was connecting the scientists and communities. The position helped to mediate the relationships for research -- facilitating role in a lot of instances in part because some of the scientists aren't good at communicating with communities. I did no hard core research.

- **How would you define a climate integrator? What is the role does a climate integrator play in Sea Grant?**

The reality of it is that the local communities don't want to know that much information. They want to know what they need to know to make decisions. So you're trying to contextualize the science that is meaningful and useful to those communities. How much information is important to provide to these local communities.

My position was jointly funded 50/50 between SC Sea Grant (SCSG) and CISA. It presented a challenge to make sure to give credit to both organization could be tricky (e.g., being quoted in the newspaper). Also because I was based at SCSG I was seen as more as SCSG, but I tried to put both names out there as much as I could. For grant opportunities and being connected to the science, being connected to CISA helped because I was able to bring their science into the communities. As part of SCSG, the position was part of the extension program (no tenure for SCSG extension because of the state set up). There was an extension lead and then particular extension specialists. There was some overlap in part because each extension specialist covers every because the topic was the focus.

- **What would you expect (realistic yet ambitious) from a climate integrator/extension in 5 years? What does the 5 year plan look like?**

Within 5 years it is reasonable to facilitate several coastal MD communities to have developed SLR strategies. Raise awareness about climate vulnerability along the coast. Moving, at the local and potentially state level, developing plans and providing the funding and support to help implement strategies for implementation.

Year 1 -- realistically is about establishing a presence. Depending on how connected they already are, they need to establish a presence to proactively reach out to key stakeholders, getting out and providing talks, doing some research on what's already out there and what's already happening, who are the main stakeholders in the area. If you do a good job of that in the first year, then the work flows afterwards. Took on projects already started by Jess Whitehead.

Year 2-3 -- Once you establish the relationships with the communities, you can more easily and successfully write grants with communities. Working on projects, products and actionable plans. Prioritized communities based opportunities and communities that are interested in engaged. Because there was so much interest, there were more communities that reached out to me then we could work with in a lot of detail. Was also able to select and engage communities based on environmental or social vulnerability.

The types of skills are the ability to understand the science and can successfully communicate it to a set of diverse audiences (e.g., presentations, one-on-one conversations, briefing documents). Don't need a deep background in climate science. Need to be a people person and understanding the role of extension (trusted, neutral agent). Building and developing trusted background. Having a policy exposure is helpful (e.g,. Kanauss or similar fellowships) and can learn it. Having knowledge of local government is helpful.

Questions not asked directly:

- What would you describe as the lessons learned (good and bad) from your role as a climate integrator?
- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network? What niche does a climate integrator fill that was previously unmet?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Michelle Covi, mcovi@odu.edu
Interviewer: Melissa Kenney
Date/Time: January 25, 2018 10-10:45 am ET

Michelle Covi
Assistant Professor of Practice (non-tenure)
Virginia Sea Grant and Department of Ocean, Earth and Atmospheric Sciences
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Michelle Covi is an assistant professor of practice in the Ocean, Earth and Atmospheric Sciences Department at Old Dominion University and is one of the Virginia Sea Grant extension staff, helping to connect expertise in our universities to address climate change and sea level rise adaptation issues. She has a PhD in Coastal Resources Management from East Carolina University and focuses her research on climate change and sea level rise risk perception, communication and public participation in regional decision-making.

- **Tell me about your role as a climate integrator.**
- **How would you define a climate integrator? What is the role does a climate integrator play in Sea Grant?**

Virginia took a chance. When I came in, I had to make it up. My interests in doing my PhD was to do public communication related to environmental issues. I was interested in a role working with the county and state governments. Looking to take experience in PhD in wetlands and coastal issues and marry it with what I had been doing in public communication/translation. A lot of the stuff that I had done as an environmental educator (previous role) was that I was doing a lot but didn't have time to evaluate. So I also got very interested in risk communication and evaluation. I needed multidisciplinary training beyond science, I needed training in communication and evaluation. Some people are naturally good at this, like Liz Fly, but I sought out training explicitly.

For where I'm placed academically, I'm a little bit of an outlier. It's nice to be able to do research within the university and also have this extension role. In SC sit outside of university, but connected to university. In VA in university. Jess is climate scientists and helping working on climate and

coastal hazards. I've worked more in the middle. Done some of the research about the decision points, surveys… more than just an extension role.

My position is set up with ODU paying ½ and VA Sea Grant paying ½. I've leveraged this (4 years later) to find funding to build a program with additional staff. This is a faculty of practice position (non-tenure track). I don't know if they were looking for someone less academic. For me, there has been less direction rather than more direction because of being split between two groups. In my case because, even though I was just out of my PhD, I had other jobs prior to PhD so there was a lot of confidence.

Fortunate because ODU and Hampton Roads is a pretty collaborative place. Sea Grant people are particularly good at finding leverage points.

Work plans that go with funding -- Sea Grant. Had to figure out what everyone was doing and what I was going to do in this landscape. I had to figure out where I was going to fit it. I picked up the Hampton Roads Adaptation Forum that was already going on. https://sites.wp.odu.edu/HRAdaptationForum/about/ I made it a signature program and standardized it. In 2012, wanted to raise the knowledge level about SLR and resilience for local government staff. It was before the threat was hitting the papers and it was highlighted in the area. Started doing day long meetings (approx quarterly) and VA Sea Grant provided funding for forums. About 60-80 people attend these meetings; each meeting focused on different topics. This is really focused on education. I organize it and also do the fundraising (consulting firm sponsors) so there is no cost to the attendees. This is my signature program.

Other things are identifying where I could make a difference. I stayed away from opportunities where there are other entities working on things e.g, Wetlands Watch (works with local government staff and doesn't work as much with people on the ground), CRS. Georgia has gotten mileage out of CRS, but hasn't been VA focus.

To identify building new programs I was always listening to people. We've had a number of different efforts to try to get the region together. When we started that is what everyone said we needed. Still happens in the Forums. E.g, Intergovernmental pilot project -- started in 2014 when I arrived and would argue that the Forum was the genesis of that effort because was able to build lower level support to get higher level buy-in but they didn't have anyone that was thinking about the "whole of community" which was a key component of their grant. When it came down to it at the end of the grant, it really focused on how government talks to government and not as much how to engage with the broader citizen public engagement. Work with citizen engagement working group, have participatory engagement techniques in VA Beach as part of their SLR planning (NOAA Coastal Resilience planning grant).

Also key roles that I play in other people's projects. I'm a connector between some kind of scientific entity that wants to engage with end-users or stakeholders. Those scientists trust me and they get value from the Forum, and it doesn't cost them anything but time. Help to mediate relationships so that it is clear that we're interested in opinions of range of different groups -- not just academics. We also protect the stakeholders from being overburdened from the same community so everyone doesn't always try to engage Norfolk and can support other cities along the coast.

Increasingly trying to get into the rural areas -- e.g., project with UVA (Institute for Envi Negotiation, Tanya Denckla Cobb) the Resilience Adaptation Feasibility Tool which is community (town/locality to county to city) resilience scorecard and workshop -- rural areas in VA Eastern Shore and peninsula. Pairs the scorecard with workshop to create action plan so that can move information to planning and action. The goal was to help the communities to feel competitive with other communities to move forward. Did pilot, and hopefully builds capacity to keep going. Scorecard not finished because we did alterations after going through experience with pilot communities. Doing one more focus group to look at social equity issues. Want to create uniform approach across Eastern Shore and ideally across other communities. Key component was it was an independent assessment. Starting to move towards small regional areas; but not scoring unless we can offer them assistance, which limits ability. For rural the ability to get good scientific information limited. TNC has been big player, so they have gotten some help, but more need.

- **What would you expect (realistic yet ambitious) from a climate integrator/extension in 5 years? What does the 5 year plan look like?**

Since we're doing the research ahead of time there might be a faster start up. Part of this is fit -- making sure you're getting the right person. More important to get the right person than the right expertise.

I would look for having a program that is position well, in that the people are providing (both testimonial and metrics) the climate services that meet stakeholder needs. What are the most pertinent issues in the location that they're serving. What is the unique niche? I would look for someone who could talk with different stakeholders and multidisciplinary scientists at the university. Want someone seen as a colleague at the university. A typical extension role. Need educational background and scholarship to be respected by university.

For the metrics, need to link to Sea Grant program. Effective at reaching the audiences. How many communities? Have you served them well? Have you given them the information to help them

make changes in their resilience? Have they done anything to improve at the locality level hazards? (one of the reasons CRS is popular…. But it can be measured in lots of other ways)

The discussion in VA has been about changing building codes, development codes, and probably pressure in Eastern Shore.

Questions not asked directly:

- What would you describe as the lessons learned (good and bad) from your role as a climate integrator?
- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network? What niche does a climate integrator fill that was previously unmet?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Sasha Land and Nicole Carlozo
Interviewer: Melissa Kenney
Date/Time: November 13, 2017 10:00-10:45 am

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Coastal Training Program Coordinator at the Maryland Department of Natural Resources and environmental educator at the Chesapeake Bay National Estuarine Reserve.

Nicole Carlozo
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Nicole Carlozo is a Natural Resource Resiliency Planner for the Chesapeake and Coastal Service. Specializing in coastal resiliency and spatial analysis, she works to integrate climate change and coastal data into the state's conservation, restoration and waterfront planning activities.

Nicole came to the Maryland Department of Natural Resources as a Coastal Management Fellow from the National Oceanic and Atmospheric Administration to help inform the siting of water quality best management practices. Previously, she worked with the North Carolina Chapter of the Nature Conservancy on living shoreline suitability analyses to support integration of oyster reefs and seagrasses into Coastal Climate Adaptation activities. She earned her Master's Degree in Coastal Environmental Management and Certificate in Geospatial Analysis from Duke University, and her Bachelor's Degree in Biology and English from St. Mary's College of Maryland.

As a Resiliency Planner, I work with scientists, land managers, restoration practitioners, and state and local partners

to ensure that our state is making responsible, science-based and community-driven investments in coastal resources. Working with a wide range of experts means that my job is never boring; I am continually learning about new research, on-the-ground management practices and community stories. We bring together local knowledge and state data to inform conservation and restoration decisions along Maryland's coast.

I'm often thinking about Maryland's resilience to climate change and how restoration can help our natural environment and communities withstand and recover from its impacts. Climate science warns us that the Mid-Atlantic region will experience rising seas, increased flooding, changes in precipitation patterns and hotter summer days. Maryland is actually already witnessing these changes, from an increase in sunny-day flooding in coastal cities to flash floods in non-coastal cities to submergence of tidal wetlands.

As global sea levels rise, coastal lands sink and more extreme weather affects our state, coastal habitats and healthy watersheds provide the first line of defense.

Many people appreciate nature for its aesthetic value or for fishing and hunting opportunities, but don't fully realize its broader benefits to society. Dunes, forests, oyster reefs, seagrasses and wetlands naturally defend our coast against coastal hazards. Healthy streams, floodplains and forest buffers also protect our non-tidal areas from flood impacts. Through strategic restoration, we can make sure that coastal habitats are healthy enough to withstand and recover from intense storms, and that our floodplains can slow, intercept and filter water. In turn, these features help buffer communities from the brunt of high energy events like hurricanes, impede flood waters and even cool air temperature during hot days. Unlike structural "gray" infrastructure, natural "green" infrastructure thrives over time, only increasing in its effectiveness and stability.

The department is targeting restoration to enhance resilience to climate change via a new initiative called Resiliency through Restoration. Maryland's Coastal Resiliency Assessment identifies shorelines and marshes that provide coastal protection benefits to vulnerable populations and targets areas where natural features can make the greatest impact. We are now completing six climate-resilient demonstration projects in targeted locations where natural features can reduce the impacts of flooding and erosion. These projects range from living shorelines to wetland enhancement, Bay island protection to beneficial use of dredge material.

Lessons learned from planning to practice will support a wider breadth of projects across the state. Project by project, we are helping Maryland's vulnerable populations, economy and environment become more resilient.

- **Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.**

Coastal restoration - most interested in education activity benefits fo natural features versus hardened structures. Trying to get monitoring work going related to the natural benefit of coastal restoration. So can consider broader range of solutions. Communities might need technical

assistance to determine what solutions needed given the location. The adaptation and response working group (part of the MD Commission on Climate Change - governor appointed working group, work plans underneath) are looking into different municipalities are in the planning processes and how.

Looking at what's on the books. Comprehensive plans every 10 years. Hazard and mitigation plans more frequent. Coming on Nov 21 to see what's on the books. ESCAP looks to the adaptation and response working group. Comprehensive and planning is where things get done. Both top down and bottom up (Eg. ESCAP). Thinking more longer term than some of the other groups.

Sea Grant — what is the planning horizon. 2050 or 2100 or other time horizons important for the communities. How do we design restoration projects so that they can adapt with climate change.

Flooding as an example — nuisance flooding — what are we doing to help communities address and help decision-making around nuisance flooding? But there's also longer term impacts that will be exasperated and and also acute events that will create opportunities. Then there are planning opportunities. The is an opportunity to link those up. What impact do they want to have in the near-term, mid-term, and long-term. What are the flex points where they could have an influence. E.g, through sentinel site — think through longer-term monitoring and research, conservation and restoration… hard when you have 2 year projects

What impact do they want to focus on? Sea level rise? Near rise impacts (nuisance, storm flooding)? or Heat? — These are the 3 major impacts identified for the state. Operating at the watershed level. The science that they're funding — there could be a more direct connection to the science that's getting funded and making the bridge between the science and policy.

The policy piece of the science is missing. Not sure that it's getting out and making a difference. How to use the networks to get the information out the policy implications. Challenging the science community to really start making the bridge to the policy side and use the networks that are in place. Could capitalize on them more effectively.

Science policy piece — what's missing? There's a lot already out there, at the state the working groups help to synthesize and predict climate impacts at a state scale, but difficult to contextualize it and bring it down to the community level, there's a lot out there and difficult to wade through the information and figure out what's relevant, try to do both bottom up and top down approaches, trying to learn from local communities and they're also looking to the state what does the state propose and is that most appropriate or something more stringent.

Mismatch in the funding and how researchers go about getting the funding. The research uses the communities are case studies which means that it doesn't translate to implementation. There needs to be broader discussions about what we need to do to have impacts in the communities e.g., synthesis, analysis that is decision relevant, how do we present this to a community. And connecting datasets so that allows for larger problem solving.

Lots of money on storm surge maps - but where is this going? Once the academic question is done how this gets used.

Person to work with scientists to help to bridge the gap. Person works with decision-makers. Things that we could do for multiple communities that could get us most of the way there and then could tailor it for local communities. Potentially fund at a slightly higher level and then tailor to lower level. Need to have someone who really knows especially what they found and what can be taken away. Working on the proposal from the beginning with the stakeholders— that the proposal is refined and improved based on the stakeholder process. Looped into the outreach process.

Team approach — the scientists needs to be present and sit in the room. The NEERS system that could be used to help to bridge that gap. There might be one person that helps to serve as a bridge. May not be for every project, but invest in a few projects where it's a team approach.

Get MDSG and other stakeholders in the decision-making process for funding.

Managing projects - the projects where MD DNR is more involved are the notes where they get implemented. The buy-in is needed for it to be used. The processes is really important. Helps with trickle down.

MDSG can bring people together will be useful.

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?
- What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?
- What is the most common need expressed by stakeholders in your network?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?

- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?

Semi-structured Focus Group or Interview
Maryland Sea Grant Coastal Climate Stakeholder Needs

Interviewed (Name and email): Zoë Johnson, zoe.johnson@noaa.gov
Interviewer: Melissa Kenney
Date/Time: 11/30/2017 8:00-9:00 ET

Zoë Johnson
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https://www.epa.gov/aboutepa/about-chesapeake-bay-program-office

Zoë Johnson is the Chesapeake Bay Program's Climate Change Coordinator, a position managed by National Oceanic and Atmospheric Administration's (NOAA) Chesapeake Bay Office. She has been actively involved in climate change planning and policy initiatives in the state of Maryland since 1998 and is the author of various reports and publications on climate change and sea level rise adaptation. She serves as key staff to Maryland's Commission on Climate Change Adaptation and Response Working Group. The working group released Phase I of Maryland's Strategy for Reducing Vulnerability to Climate Change: Sea Level Rise and Coastal Storms, in 2008; and its Phase II Strategy: Building Societal, Economic and Ecologic Resilience, in January 2011. Using the Phase I and II Strategies as a guide, she is currently pursuing the development of state-level policy, as well as the execution of on-the-ground projects to implement a suite of natural resource adaptation priorities.

- **What are the resources and areas of strength that exist within the region? What do we do well in linking science to decision-making?**

It is a crowded space. Mapping will dry up. Someone who can do direct service. Someone who understands the science needs but can help to facilitate the process of implementation. Need to understand the policy process and how to move things from planning level to policy making and implementation. How you implement a resilience strategy.

The systems person has to understand — want someone broad. To show success, the person probably has to understand how to support large scale change in community. Really needs to understand how to move implementation forward. How can this move towards transformational change or opportunities that can drive change (community block grants). CRS, CBGD, land conservation — the mechanisms that they can use to support their decision-making change agents.

They have to understand where those lie. All the interconnected community planning — targeting science to information. Have to know when the opportunities arise.

e.g., —Thinking about how climate integrates into water for an agency — septic, water wastewater, water quality, drinking water, … opportunities to make smarter decisions.

Someone needs to understand the needs or willing to talk and be aware to identify opportunities to make change. Different in different communities. Decision supported science — start with decisions instead of science.

everything is so focused on mid-point assessment — if they pass the recommended decision to incorporate climate into watershed planning — may be an opportunities for MD SG. Understanding how it can impact BMPs on the ground. State of the knowledge low. "Programmatic approach" — adaptive management approach. Number of principles about aligning climate resiliency needs with watershed planning needs — co-benefits. The communities that I have been hearing about (STAC workshop) stormwater projects are not intended to become flood control projects but they're assuming that they are one and the same…. e.g., DC, Ellicott City, have met stormwater standard, but suffering from unpredictable flooding events, need to look at more systematically. Need better site design for stormwater and localized flooding. Want to know the projection that they can design for. For regulatory process they want a "stamped number" and a map. Need to be able to communicate effectively risk to help people get a number to help them design stormwater. New handbook for Naval facilities that helps with thinking about coming up with a number (Coast Smart guidance) — also starting to see on the WQ side now. Don't have guidance for how to incorporate climate into watershed planning. States have to figure it out (Jen Dettinger) and the states need to help with local communities because much of the implementation is local. Watershed planning is a niche that doesn't have a lot of investment. EPA has been funding a lot of the initial work. Urban flooding (development, heat, urban flooding, stormwater) and rural communities (inundation, lost land, higher water tables, impacts on infrastructure…) are the biggest issues. Good connection with the watershed specialist extension - ways to better integrate the two together. Also understanding positive and negative impacts of implementation of climate into these plans.

Disconnect between climate and watershed planning — two different skills sets. People who talk WIPs is a different language.

Other components to SG — connection to fisheries, aquaculture, and climate where it would be useful to have a voice. Changes in fisheries migration, habitat, stock assessments, … moving it to the next level. Still in research phase and not many managers thinking about…. starting to think

about climate aspect of fisheries resources and their role. Acidification, temperature, disease, Vibrio… big issues, is SG thinking about

If the Chesapeake Quarterly talks to specific issues — is there someone working on it at SG?? What's their involvement on this issue. May be a niche of the issues that are highlighted in these issues over the past 2 years

Climate goal in Bay agreement was too broad. SLR hazard planning already happening. There wasn't' a role for the partnership to help move it forward. There's no way to involved in all 7 jurisdictions. Finding what brings people together and isn't overwhelming. The next work plan will be important.

Helpful to have someone being a cheerleader, but need someone on the ground that is helping to move things forward so that the sun shines on everyone.

- **What is the most common need expressed by stakeholders in your network?**

It would be really useful to have someone that can help with seeing the big picture and to help with coordination. Need more than one off efforts. Someone that helps think about the interconnections. Being more strategic about the resources. What is the ultimate change to you want to see.

Delivery of climate science is needed. Coastal extension agent is needed. Someone to help do neutral match-making between science and decision-making.

Questions not asked directly:

- What are the top 3 problems or regional issues that concern you and/or your organization?
- What do you see as the top 3 emerging opportunities or focus areas in the next 5 years?
- Please briefly introduce your name, title, organization, and what you think is most important decision being faced by the region.
- In your current position, how much does your ability to make effective climate-related decisions depend on collaboration and coordination among climate specialists (e.g. scientists, planners, engineers) your organization, and the communities or organizations who need to adapt to climate related events (e.g. heat, drought, SLR, flooding, high tides, storms)?
- What is a need or capacity that is missing from the region that might not be commonly expressed in the region?
- If Maryland Sea Grant could invest $100K per year over the next 5 years to support coastal decision-making, how would you advise them to invest?

- Besides resource limitations, what do you see as the barriers to making Maryland more responsive to climate change? Can you speculate about how those barriers might be overcome?