

Built Environment Design for Climate Resilient Coastal Communities Roundtable Summary

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Proceedings prepared by Jenna Clark, Hannah Cooper, and Julissa Murietta Graphic design and layout by Jenna Clark Editors: Jenna Clark, Fredrika Moser, Hannah Cooper, Mike Allen, Jeannette Connors, Ashley Goetz, and Annalise Kenney.

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Maryland Sea Grant College University System of Maryland 5825 University Research Court, Suite 1350 College Park, Maryland 20740 T 301.405.7500 / F 301.314.5780 www.mdsg.umd.edu

Executive Summary

Maryland Sea Grant hosted the Built Environment Design for Climate Resilient Coastal Communities Roundtable in person May 10, 2023, and virtually June 27 and 28, 2023. The de-coupled hybrid workshop had 68 participants (40 in-person, 21 virtual, 7 both venues). The goal of the roundtable was to collaborate on building a Marylandbased design program that addresses climate resilience and adaptation for coastal communities. The program would emphasize multidisciplinary partnerships between scientists, civil and environmental engineers, architects, landscape architects, land-use planners, and community liaisons. Together, they would devise solutions for climate change resilience and adaptation within the built environment, such as outreach efforts, working groups, internships, trainings, and professional development. To that end, the roundtable was split into two sessions: Climate Science-Informed Multidisciplinary Education and Training and Collaborative Multidisciplinary Community-Based Project Ideas. Each session had two breakouts and a series of presentations to inform participants and encourage discussion. We created mind-map diagrams (Figure 1, 3) based on ideas discussed during the roundtable, which highlighted best practices for engaging with educators and coastal communities. Participants identified priorities for advancing resilient design for the built environment, including:

- Collegiate design studios, intensives, and competitions
- Transdisciplinary learning among practitioners with differing expertise
- Continuous inclusion of community members
- Climate science training.

Discussions and results from the roundtable are summarized below. We encourage continued dialogue among participants and are committed to connecting people to further develop these projects. If you are interested in connecting with others on a particular project, please contact Maryland Sea Grant.



Roundtable Background & Purpose

Maryland's coastal residents are vulnerable to coastal hazards, such as local flooding, sea level rise, extreme precipitation events, and storm surges, due to climate change. For more than a decade, Maryland Sea Grant has supported research, education, communication, and outreach to help coastal residents and communities become more resilient to climate change impacts. With partners, we seek to expand efforts to address the effects of climate change on the built environment and help underserved communities become more resilient through adaptation and mitigation at the water-land interface. We recognize that the most effective way to tackle these complex climate change issues is through multidisciplinary efforts and partnerships.

With this roundtable, Maryland Sea Grant and partners from a variety of backgrounds and knowledge types aimed to understand how we can collectively help Maryland become more resilient to climate change in the built environment. We viewed this roundtable as "phase one" of our programmatic development and collaboration. The structure of the roundtable can be found in Appendix A.

Participants

The roundtable hosted 68 participants (40 in-person, 21 virtual, 7 both venues) plus the Maryland Sea Grant planning (4) and communications (2) teams. Participants self-identified their professional categories, with some participants identifying with multiple categories. Overall, the demographic breakdown was: academia, faculty/staff (32 total; 21 in-person, 11 virtual), academia, student (6 total; 6 in-person, 0 virtual), government (22 total; 16 in-person, 6 virtual), nonprofit (6 total; 3 in-person, 3 virtual), industry (7 total; 6 in-person, 1 virtual), and other (4 total; 2 in-person, 2 virtual).



Idea Generation

The roundtable was split into two sessions, *Climate Science-Informed Multidisciplinary Education and Training* and *Collaborative Multidisciplinary Community-Based Project Ideas*. After background presentations, participants were split into small groups and asked to brainstorm ideas based on the session topic. The brainstorming breakouts had two parts. First, participants were asked to brainstorm project ideas. Then, after shifting tables, they were asked to develop the ideas and identify resources. The following are the condensed results from those sessions. More detail regarding the structure of the roundtable and the brainstorming prompts can be found in Appendix A.

Session 1: Climate Science-Informed Multidisciplinary Education and Training

In the first session, participants brainstormed potential climate science-informed multidisciplinary education and training programs (architecture, environmental science, environmental engineering, civil engineering, landscape architecture, and land-use planning). Condensed results from initial group brainstorming sessions (both in-person and virtual) are captured in a mind-map diagram (Figure 1). We categorized ideas first by education groups (i.e., K-12, undergraduate, graduate, trades, early career, etc.) and then participants suggested a variety of model and program ideas, best practices, education topics, potential partners, and considerations for creating new education and training programs (Appendix B contains additional comments on this type of programming). Participants then further refined their model and program ideas (as notated in Figure 1). We used a 'mind-map' illustration technique^{1,2} to summarize the richness of the participants' discussions. The '*Climate Science-Informed Multidisciplinary Education and Training* mind-map' diagram shows hierarchical groupings based on education groups (i.e. K-12, undergraduate, etc.; captured by the colored thick branches in Figure 1) which are then broadly expanded to capture multiple ideas that emerged from participant discussions (e.g., circles and branches in further groupings in Figure 1). Out of these discussions participants identified several models and program ideas that had the potential to advance education and training in climate resilient design. We highlight below the models and ideas generated during the development phase of participant discussions (yellow circled numbers link to Figure 1).

Undergraduate/Graduate Education

Maryland Sea Grant Applied Design Studio

The design program would be modeled after Delaware Sea Grant's Coastal Design Studio. The design studio would exist in a Maryland-based collegiate program and partner with existing programs (i.e., University of Maryland's Partnership for Action Learning in Sustainability [PALS] program) to solicit community proposals from Maryland-based, under-resourced, coastal communities. Proposals would be small in scope yet address some priority to strengthen the community's climate change resilience (e.g., sea level rise, coastal flooding, coastal erosion, saltwater intrusion). The studio would meet during one semester in one academic area (e.g., landscape architecture, architecture) to begin initial work on the selected proposal. Students would be required to involve the community and co-produce design solutions through partnerships with different community-based and focused organizations (e.g., community artists, food banks, nongovernmental organizations, faith-based groups). Maryland Sea Grant could connect students with climate scientists and provide information on key environmental challenges regarding climate change, adaptation, and community resilience to act as advisors and guest lecturers on projects. Maryland Sea Grant could also help connect students to community boundary organizations and community activities to build understanding of community-driven climate resilience needs.

¹ Fearnley, C.J. (2022) Mind mapping in qualitative data analysis: Managing interview data in interdisciplinary and multi-sited research projects. *Geo: Geography and Environment*, 9, e00109. Available from: <u>https://doi.org/10.1002/geo2.109</u>

² Faste, H. & Lin, H. (2012) *The Untapped Promise of Digital Mind Maps. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12).* 1017–1026. Available from: https://doi.org/10.1145/2207676.2208548

2 Week-long Climate-focused Design Practicum

This summer or winter practicum program and research experience for undergraduates would bring together a small cohort of multidisciplinary students to tackle a small-scale, climate-focused, community-based project. Three to four faculty members could help guide students in their design ideas and solutions. Speakers and other mentors could be invited to attend, including members from professional organizations, community members, nongovernmental organizations, Extension, and other academic researchers. For peer mentoring and cohort building, students from a variety of academic settings, backgrounds, and disciplines could be invited to attend. Student-developed solutions could be given to the community for inspiration and potential background material for them to apply for funding and project development. Student participants would have the opportunity to experience real-world, hands-on project development.

3 Coastal Resilience Design Internship

This internship, modeled after Virginia Sea Grant's coastal resiliency internships, would provide industry partners with diverse undergraduate interns to focus on climate resiliency projects within the industry. Interns would be placed with industry partners (e.g., architecture, landscape architecture, and engineering firms) to help students learn about innovative design strategies for coastal resilience. Interns would have education and collaboration opportunities with Maryland Sea Grant, as well as opportunities to participate in professional development and cohort-building activities.

4 Local Community Engagement Internship and Design Studio

A program could have students learn about a local community, identify local issues of importance, and develop projects with the community. For example, this student-centric program could reach out to local business associations and create relevant products for them, such as climate-focused manuals. Students could also connect with local design and architecture firms to offer help and support for their projects. Eventually, this could lead to internships, jobs, and other networking opportunities.

5 Undergraduate Student Ideas

Several initiatives could involve undergraduate students receiving skills, knowledge, and training about climate science, including:

- A 12-hour virtual architecture training program to introduce concepts of climate science and architecture
- Students visit Deltares or similar facilities to see how engineers and designers formulate real-world functional designs
- A program to help students learn to use web-based tools (e.g., MyCoast app) to help drive community climate conversations
- Students could use storytelling to understand a community through stories and then translate climate science back to the community

A stakeholder group (e.g., nongovernmental organization, local government, etc.) can help facilitate community connections. These projects may not all be done in one semester but could be done in a sequence of classes that span multiple semesters.

Early/Mid Career

Professional Development Program

This program would be structured as a series of short workshops and on-site meetings. Each workshop would have a different theme based on a risk- and priority-assessment. Participants would be part of a multidisciplinary cohort, so they can network with past and future cohorts. Climate Change Professionals (CCP), professional engineers, and architects could receive educational credits. Participants could receive a certification and bring their knowledge back to their hometowns. Similar programs exist (e.g., Climate Academy), so it would be important to leverage them rather than duplicate them.



Figure 1. Condensed mind-map diagram of the ideas generated from the *Climate Science-Informed Multidisciplinary Education and Training* discussions (Session 1). Yellow circles indicate ideas that were further developed in the second half of the discussion sessions. The numbers correlate to the idea description in the text. Note only some ideas were further elaborated on by participants in the afternoon discussion sessions.

Trade Training

7 Green Infrastructure Trade Program

This trade program would allow individuals to develop trade-specific knowledge and skills in green technologies and nature-based solutions. After completing the training, if funding is available, graduates could be hired for a year-long fellowship or apprenticeship with businesses, government agencies, and counties. This would allow individuals to build their portfolio, gain experience, and network with others.

Session 2: Collaborative Multidisciplinary Community-Based Project Ideas

Condensed results from initial group brainstorming sessions (both in-person and virtual) are captured in a mind-map diagram (Figure 2). We split ideas into two categories: project development and practices for community engagement. We again used a 'mind-map' illustration technique to summarize the breadth of the participants' discussions. The '*Collaborative Multidisciplinary Community-Based Project Ideas* mind-map' diagram shows hierarchical groupings based on project development and practices for community engagement (captured by the colored thick branches in Figure 2) and then broadly expanded based on participant discussions at the roundtables (e.g., circles and branches in further groupings in Figure 2). Out of these discussions participants identified several models and program ideas with the potential to advance built environment-focused solutions for climate change resilience and adaptation for Maryland's coastal communities. We highlight below the models and ideas generated during the development phase of participant discussions (yellow circled letters link to Figure 2). Overall, participants voiced a variety of program ideas, best practices, project topics, potential partners, and considerations for creating new and continuing community-based projects.

Community Engagement

A Developing a Strategy for Migration and Disaster Relief in the Next Century

Natural disasters are expected to increase in oncoming years due to climate change. People need refuge areas postdisaster. Maryland Sea Grant could build a consortium of nonprofits and their hubs to create collaboration among stakeholder groups. Resources can be gathered across the state to help support these hubs. Additionally, the hubs can connect with local universities to help develop interdisciplinary plans of engineering, design, architecture, etc. Maryland Department of Emergency Management, Maryland Department of Transportation, and Maryland Department of the Environment can provide state tools for decision support.

B Communication Between Neighboring Regions

Effective communication is needed between neighboring regions to help address ongoing issues occurring in each region and potentially for greater collaborative efforts. For example, Baltimore County's water management issues could affect Baltimore City. How could effective communication channels be established to allow for collaboration and pooled resources to tackle these wider issues? Additionally, these communication efforts could allow for greater transparency about where resources and funding are being directed. This would help residents understand the breadth and scope of the problems and where resources are being allocated.

C Art as a Mechanism for Engagement

Several initiatives can help incorporate the arts with concepts of climate change and resiliency. Artists can be seen as community pillars who are able to provide a voice for the community. Likewise, these initiatives could help communities understand what is happening in their areas due to climate change. In schools, a painting project could be proposed to showcase elements of environmental science and sea level rise. Art competitions can be held to showcase environmental issues, to help bridge the connection between art and science for broader audiences.

D Cultural Preservation in Changing Climates

One community concern is losing historical and cultural ties to the area. Historical societies and museums can potentially help capture those aspects of an area that may be lost due to climate change. For example, in Bellevue,



Figure 2. Condensed mind-map diagram of the ideas generated from the *Collaborative Multidisciplinary Community-Based Project Ideas* group discussions (Session 2). Yellow circles indicate ideas that were further developed in the second half of the discussion sessions. The letters correlate to the idea description in the text. Note only some ideas were further elaborated on by participants in the afternoon discussion sessions.

Maryland, a new project with the University of Maryland Center for Environmental Science will document all the sites of cultural significance to the black community, and then overlay those sites with flooding and sea level rise vulnerability layers.

E Community Engagement Strategies

Community profiles could be developed for several communities to help understand their values and needs. Within each profile, issues can be ranked to determine the most pressing issues that need immediate attention. Noting that the issues do not necessarily have to be related to climate change but could be any issues the community is facing. By identifying a wide range of issues and concerns instead of focusing only on climate change, trust can be fostered through working together and potentially transcend disparate ideologies. Profilers could then help connect communities with partners and resources to help alleviate the issues identified.

Project Idea Development

F Beneficial Reuse of Dredge Spoil Material

The use of dredge spoil material could be used to create a habitat or reef project. This project could help support flooding and stormwater backup in communities such as Cambridge, Maryland. The City of Cambridge would lead and maintain the project. Other potential locations could include Choptank, Rose Haven, Chesapeake Beach, and St. George's.

G Climate Conscious Affordable Housing Development

There is a need for affordable housing on the watershed scale, but there are several components and challenges to consider for planning. New technologies (e.g., elevated housing and smart growth) should be considered in housing development. The type of housing should be contemplated for adaptation in certain areas, such as tiny housing, which is commonly used on the western shore rather than on the eastern shore in Maryland. Furthermore, the development in each area should be dependent on the natural features of an area. It is important to keep in mind the priorities of communities, including affordability, mobility, and accessibility to amenities. Development should also consider emergency services that can provide assistance to respond to climate change hazards, and the preservation of historic and natural sites.

Resources

During the roundtable discussions, as participants refined their ideas around both education and training and community engagement ideas, they were encouraged to consider potential resources for advancing programs (Figure 3).

Next Steps

Maryland Sea Grant welcomes other ideas for collaborating at the intersection of climate change science, the built environment community (architecture, landscape architecture, civil and environmental engineering, and land use planning), and coastal communities. We will use these discussions to develop programming in this field and to initiate new collaborations.



Figure 3. Additional resources outlined in the development discussions that were not captured in Figures 1 and 2.

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Appendix A: Roundtable Structure

The roundtable began with an introductory presentation on the role of architecture and the built environment in climate change and community resilience by our keynote speaker, Omar Degan, *DO Architecture Group*. This was followed by an overview of coastal inundation, flooding, and sea level rise in Maryland by our coastal climate specialist, Kate McClure, *University of Maryland Sea Grant Extension Program*.

The roundtable then split into two sessions: *Climate Science-Informed Multidisciplinary Education and Training* and *Collaborative Multidisciplinary Community-Based Project Ideas*. At the start of each session, invited speakers gave a brainstorming primer to participants. Brainstorming sessions had two-parts. First, participants were asked to share project ideas. Then, they shifted tables to develop the previous group's ideas and to identify resources.

In the first session, participants brainstormed potential climate science-informed multidisciplinary education and training programs (architecture, environmental science, environmental engineering, civil engineering, landscape architecture, and land-use planning). Ideas focused on resilience to climate change and sea level rise for Maryland's coastal communities. Programs could focus on K-12, undergraduate, post-baccalaureate, graduate, or post-graduate education levels and include internships, externships, industry experiences, fellowships, etc. Three speakers helped prime this session:

- Ed Lewandowski, *Delaware Sea Grant*, gave an overview of Delaware Sea Grant's Coastal Resilience Design Studio and some of their projects
- Jack Leonard, *JGL Design Associates / Morgan State University*, spoke on a variety of projects and models that involved student engagement
- Jana VanderGoot, *University of Maryland College Park*, showcased a student-engaged project that partnered with the Maryland Department of Natural Resources

During the initial portion of the brainstorming activity, participants were asked to focus on programs that would:

- Incorporate a variety of disciplines as an approach to tackling the complexities of climate resilience
- Connect with coastal communities, especially those that are underserved and under-resourced
- Increase diversity in built environment fields (e.g., architecture, landscape architecture, environmental engineering, civil engineering, and land-use planning) and environmental science fields

Results from the first session are included in the ideas generation section of this report (page 3).

In the second session, participants were asked to brainstorm projects that focus on innovative design and implementation (i.e., architecture, landscape architecture, environmental engineering, civil engineering, and land-use planning). These projects considered environmental justice and equitable outreach strategies to help Maryland's coastal communities become more resilient to climate change. Two speakers helped prime this session:

- Brad Rogers, *South Baltimore Gateway Partnership*, gave an overview of the Middle Branch project in Baltimore with particular focus on environmental justice
- Roxolana Kashuba and Emily Eisenhauer, *US Environmental Protection Agency Office of Research and Development*, spoke about their community engagement work in Crisfield, Maryland

During the initial portion of the brainstorming activity, participants were asked to focus on programs that could address goals, objectives, and research interests heard in earlier discussions; known coastal community projects or interests; coastal community priorities; and methods of continued collaboration (e.g., workshops, working group sessions, professional trainings). When generating ideas, groups were asked to consider the following priorities:

- Benefit to underserved and under-resourced coastal communities
- Creating resilient coastal communities for future effects of sea level rise and other climate change generated challenges
- Multidisciplinary collaboration (i.e., a diverse team where all parties are included in project design and implementation)

Results from the second session are included in the idea generation section of this report (page 6).

Virtual Roundtable Structure

The virtual roundtable followed the structure of the in-person roundtable, except it was divided into two threehour sessions. The first session on June 27, 2023, focused on *Climate Science-Informed Multidisciplinary Education and Training.* The second session on June 28, 2023, focused on *Collaborative Multidisciplinary Community-Based Project Ideas.* During the first session, participants saw Kate McClure's coastal inundation, flooding, and sea level rise in Maryland overview, as well as some recorded talks introducing climate education. In a live talk, Peter Stempel, *Pennsylvania State University,* spoke about his ecologically-based architecture design initiatives with students. The discussion sessions occurred in the same format as the in-person workshop. During the second session, participants watched recordings of the talks given in the second session of the in-person workshop and conducted the discussion sessions as outlined above.

Appendix B: Additional Comments

Additional considerations from roundtable participants about programming in the built environment not captured in the mind-map diagrams:

- Student inclusivity
 - Paid internships allow for greater diversity
 - Enhance student benefits
 - Perhaps have "micro-credentials" for students
 - Internships counting toward credit hours
 - Sequential projects and classes on a particular topic
 - Diversity in student body in environmental science and design degrees
 - Partnerships with local community colleges to help with transition
 - Potential model: Morgan State University's new degree program, Coastal Design and Policy
- Considerations for strong partnerships
 - Rotating mentors and organizations to prevent burn out
 - Time needed to build relationships
 - Need continuity, students are only temporary
 - Coordinator capacity needed for long-term engagement
 - Involve community in the process
 - Not all organizations can take on interns
- Best practices for project design
 - Measure project impact
 - Avoid helicopter activities (i.e, temporary engagement models)
 - Manage expectations up front and be realistic about what can be accomplished
 - Keep post-design in mind, how to navigate next steps
- AI opportunities
 - Utilize AI to make a transect of issues related to sea level rise and strategies to address it
 - The platform, True Flood Risk, is an inventory and asset-level risk assessment that could help identify those issues
 - Other software companies are working in the AI space to help gather that knowledge
- Connecting with K-12 schools
 - Summer camp opportunities can be offered to engage elementary students
 - Use school buildings as examples for flood mitigation strategies
 - Could be a starting point for retrofitting in a community; however, funds are needed to pursue this idea
- Connecting with communities
 - Newspaper ads, social media, and fairs can help encourage people to reach out
 - Stipends and services can help to incentivize community participation
 - Community organizations (e.g., clubs, libraries, churches, etc.) can help connect project initiatives with members of the community
 - Look at other communities for existing, applicable resilient solutions
 - For example, in Mississippi a flood zone was turned into a community park

Appendix C: Workshop Participants

Diako Abbasi University of Maryland

Mike Allen Maryland Sea Grant

Uzma Aslam National Oceanic and Atmospheric Administration

Bruna Attica *City of Baltimore*

Ralph Bennett University of Maryland

Josh Boehlke Architecture by Design

Kelsey Brooks University of Maryland, Environmental Finance Center

Claire Cambardella University of Maryland Sea Grant Extension

Bridget Cantwell Maryland Department of Emergency Management/ Maryland Environmental Service

Camille Cimino AIA Chesapeake Bay

Jenna Clark *Maryland Sea Grant*

Hannah Cooper Maryland Sea Grant

Jennifer Cotting University of Maryland, Environmental Finance Center Omar Degan DO Architecture Group

Jennifer Dindinger University of Maryland Sea Grant Extension

Emily Eisenhauer U.S. Environmental Protection Agency

Chris Ellis University of Maryland

Molly Finch University of Maryland, Baltimore County

Kim Fisher University of Maryland

Kelly Fleming Neighborhood Design Center

Ashley Goetz Maryland Sea Grant

Henry Hausmann University of Maryland

Monique Head *University of Delaware*

Debbie Herr Cornwell Maryland Department of Planning

Ju-Ching Huang Maryland Sea Grant

Bill Hubbard University of Maryland Extension

James Hunter Morgan State University Madeleine Jepsen Maryland Sea Grant

Claudia Jones Chesapeake Bay Critical Area Commission

Roxolana Kashuba U.S. Environmental Protection Agency

Nick Kelly Chesapeake Bay Critical Area Commission

Annalise Kenney Maryland Sea Grant

Kayle Kreig Maryland Sea Grant

Sasha Land Maryland Department of Natural Resources

Jack Leonard Morgan State University/ JGL Design

Ed Lewandowski Delaware Sea Grant

Susan Makhlouf Chesapeake Bay Critical Area Commission

Nea Maloo *Howard University*

Jaelon Maoney American Institute of Architects

Kate McClure Maryland Sea Grant Extension Aliya Mejias Maryland Sea Grant

Judi Miller Architecture by Design

Fredrika Moser Maryland Sea Grant

Manal Murangi Maryland Sea Grant

Kate O'Meara Maryland Institute College of Art

Cindy Palinkas University of Maryland Center for Environmental Science

Karuna Pujara *ATCS*, *PLC*

Allison Reilly University of Maryland

Brad Rogers South Baltimore Gateway Partnership

Eric Schott University of Maryland Center for Environmental Science

Roderick Scott Flood Mitigation Industry Association Annie Sekerak Chesapeake Bay Critical Area Commission

Damian Shapes Padilla Georgetown Climate Center

Jen Shaffer University of Maryland

Charlotte Shearin Chesapeake Bay Critical Area Commission

Scott Smith City of Hampton

Ana Sosa Maryland Sea Grant

Emily Speierman University of Maryland

Peter Stempel Penn State University

Taryn Sudol Maryland Sea Grant

Jack Sullivan University of Maryland

Ariana Sutton-Grier U.S. Geological Survey Ryland Taylor Maryland Department of Natural Resources

Aubrey Tingler Maryland Sea Grant/ Maryland Department of the Environment

Tori Tomiczek U.S. Naval Academy

Jana Vandergoot University of Maryland

Liliana Velasquez Montoya U.S. Naval Academy

Kate Vogel Maryland Department of Natural Resources

Lisa Wainger University of Maryland Center for Environmental Science

Linda Walters University of Maryland

Wie Yusuf Old Dominion University