COASTAL RESILIENCE CENTER

A U.S. Department of Homeland Security Center of Excellence

DIVERSIFYING THE HOMELAND SECURITY ENTERPRISE

DIRECTORS' NOTE

Natural disasters in the United States are becoming stronger, more frequent and more expensive, and their consequences are falling disproportionately on minority communities. Expanding minority representation in the professional community that helps prepare for, respond to, and recover from these events is an important step for addressing the latter. Education is an essential long-term remedy to this situation and to creating a more resilient nation.

The University of North Carolina at Chapel Hill and Jackson State University are partnering with multiple other Minority Serving Institutions (MSIs) to create and sustain undergraduate and graduate courses, concentrations, certificates and minors in natural disaster-related subjects as well as to provide MSI students and faculty with internships and interactions with leading researchers in the field. This report shows examples of the many ways we have worked to help "develop the bench" for a more diverse and inclusive natural disaster profession.

An effort such as this takes time and commitment to succeed. We gratefully acknowledge the US Department of Homeland Security, Science and Technology Directorate's Office of University Programs for their long-term commitment to making this happen through the Coastal Hazards Center of Excellence (2008-2015) and Coastal Resilience Center of Excellence (2015-present). Without their steadfast support, this would not have been imaginable, let alone possible.

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Lead Principal Investigator

University of North Carolina at Chapel Hill

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Hurricane María devastated Puerto Rico in 2017. Prof. Ismael Pagán-Trinidad of the University of Puerto Rico-Mayagüez led a CRC project that includes education events for the wider community on coastal infrastructure design and resilience.

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This report is principally authored by Coastal Resilience Center of Excellence Communications Manager Josh Kastrinsky. The Center would like to express its gratitude to all of the contributors who offered their stories, perspectives and especially their years of work in making possible the efforts of the Center to create a more representative Homeland Security Enterprise.

EXECUTIVE SUMMARY

Since 2015, the Coastal Resilience Center of Excellence (CRC), led by the University of North Carolina at Chapel Hill and Jackson State University and funded by the Department of Homeland Security, Science and Technology Directorate's Office of University Programs, have advanced educational and community service opportunities across its network of Minority Serving Institutional (MSI) partners. Examples include:

• Support for undergraduate and graduate programs at four MSIs – two in Mississippi, one in North Carolina and one in Puerto Rico. Particularly noteworthy has been the development of the nation's first PhD program in coastal engineering at an MSI at Jackson State University. This effort has led to approximately 1,200 course enrollments in subjects ranging from the theory of ocean waves to the economics of disasters, contributions to 170 degrees, tuition / stipend support for 450 students, the placement of more than 90 students in homeland security-related internships and the assistance of at least 27 graduates in related employment.

• Initiation of the SUMmer Research EXchange (SUMREX) program, a unique networking and education opportunity that matches students from CRC-funded education projects with CRC research projects. Students spend up to 12 weeks at the research project campus site working on CRC-funded work. Through 2019, 20 MSI students had participated, and the program had established key pipelines among our partners.

• Extensive participation in the DHS Summer Research Team (SRT) program, which provides resident 10-week mentoring opportunities every summer for MSI faculty and students. Through 2020, CRC and its partners have hosted nine teams from eight different MSI's. Most of these teams have competed successfully for follow-on funding from the program. In addition to mentoring, this program has been an important way for CRC researchers to connect with MSI faculty for additional studies.

• Leading the Hurricane Matthew (2016) Disaster Recovery and Resilience Initiative in which faculty and students from UNC Chapel Hill and North Carolina State University partnered with local, state and federal leaders to engage with eastern North Carolina communities to assist them with identifying local needs and to help them develop post-disaster recovery plans. This effort included a Community Design Workshop at Princeville, N.C., the oldest town in the nation established by freed slaves, that brought in Black designers from across the country.

• Hosting the first Historically Black Colleges and Universities (HBCU) Flood and Hurricane Meeting in 2017. Because of their locations, historical significance and positive reputations, HBCU's are important as gateways for community outreach and engagement. As such, the meeting was designed to address the question: "What are the unique contributions HBCU's can make to improving community resilience to floods and hurricanes, and what needs to be done to make this happen?" More than 30 participants representing 21 HBCUs attended the meeting, which included an address by U.S. Rep. Bennie Thompson of Mississippi. One outcome of the meeting was the formation of the Community Resilience Project at Jackson State University, which focuses on equipping underserved communities with better preparedness skills and on providing education for disaster management and loss mitigation through a pipeline that begins in middle school.

Johnson C. Smith students spent a day learning from CRC researcher Dr. Casey Dietrich (foreground, left) at North Carolina State University in 2017 as part of an exchange program.

The CRC has maintained a long-term relationship with the William Averette Anderson Fund (known as the Bill Anderson Fund or BAF). This relationship dates back to the organization's namesake, a highly-respected Black disaster researcher, who was a member of the Coastal Hazards Center's (predecessor to the CRC) Advisory Board from 2009 until his death in 2013. Founded in 2014 by his widow, Norma D. Anderson, who now serves on the CRC's Advisory Board, the BAF, among other activities, provides fellowships for minority students to pursue PhDs in a wide range of disaster studies.

For more information and detail, please see the project descriptions and reports available on the CRC website: coastalresiliencecenter.unc.edu.

OUR MISSION

The mission of the Coastal Resilience Center of Excellence (CRC) is to conduct research and education to enhance the resilience of the nation's people, infrastructure, economies and the natural environment to the impacts of coastal hazards such as floods and hurricanes, including the effects of future trends.

The CRC-facilitated Summer Research Team members (left to right) William Short, Hyoungsu Park, Trung Do, Kevin Cueto, Tori Tomiczek, Diego Delgado, Dr. Pedro Lomonaco, Dr. Dan Cox and Ben Hunter are shown at Oregon State University in 2016. Not Pictured: Tim Maddux and Dr. John van de Lindt. Photo via Oregon State University.

Disasters in the United States are not only getting stronger, they are getting more expensive. Since 1980, the U.S. has had more than 250 climate and weather events that have cost more than $1 billion each, according to the National Oceanographic and Atmospheric Administration's National Centers for Environmental Information[1] . In 2019, there were 14 such billion-dollar events, a year with relatively low activity. Since 2015, the average annual cost of these disasters has been more than $100 billion annually.

In the United States, there is a documented history of the disproportionate burden that environmental hazards place on racial and ethnic minority communities[2].

The disproportionate impact of disasters on minority communities occurs across all life stages of a disaster:

- Risk perception and disaster preparedness (e.g. evacuating prior to a crisis)
- Response to disaster (e.g. more likely to experience disproportionate physical and financial loss)
- Recovery (e.g. more likely to be overlooked by federal government assistance)

1 https://www.climate.gov/news-features/blogs/beyond-data/2010-2019-landmark-decade-us-billion-dollar-weather-and-climate

2 Examples of sources include: https://link.springer.com/article/10.1007/s41885-020-00060-5 ; https://science.sciencemag.org/content/356/6345/1362

> ***Since 1980, the U.S. has had more than 250 climate and weather events that have cost more than $1 billion. In 2019, there were 14 such events.***

Coastal hazards, including hurricanes and rainfall-induced flooding specifically, are significant threats to vulnerable minority communities. Threats of this nature are also expected to increase in frequency and severity, according to most climate projections

Depending on the field selected, the progress of representation among graduates in Homeland Security Enterprise-related fields differs. Diversity among the workforce in Homeland Security Enterprise fields such as engineering, computer science and data analytics is limited.

According to the American Society for Engineering Education[3], of the nearly 65,000 degrees awarded to undergraduates in engineering degree programs in 2019, less than 17 percent were to students identifying as Hispanic, Black, Native American and Hawaiian/Pacific Islander. Students identifying as members of those groups earned slightly more than 14 percent of master's degrees and slightly more than 11 percent of doctoral degrees in the same period.

According to the American Society of Sociology, undergraduate degree representation in the field is changing more rapidly. In 2017, graduates identifying as ethnicities other than white made up about 54% of all graduates, up from 37% in 2007[4] .

Dr. Robert Whalin (right), CRC's Director of Education & Workforce Development and the lead of a CRC education program at Jackson State University, stands with graduate Joshua Brown. Brown now works for the U.S. Army Corps of Engineers.

For master's degrees, that figure was 42.5% in 2017 (an increase of 13.5 percentage points from 2007[5]). For doctoral degrees, the 2016 figure was 32.5%, up slightly more than 1 percentage point from 10 years prior[6].

In the 20 years to 2016[7], representation of degrees earned by people identifying as non-white across science and engineering fields rose by nearly 8 percentage points (13.9-21.6%) among bachelor's degrees and 5 percentage points among master's degrees (8.2-13.2%), while doubling (4.4-8.8%) among doctoral degrees.

A greater diversity

With knowledge of how disasters are expected to only increase as

3 https://www.asee.org/documents/papers-and-publications/publications/college-profiles/2018-Engineering-by-Numbers-Engineering-Statistics-UPDATED-15-July-2019.pdf

4 https://www.asanet.org/research-and-publications/research-sociology/trends/bachelors-degrees-awarded-sociology-race-or-ethnicity

5 https://www.asanet.org/research-and-publications/research-sociology/trends/masters-degrees-awarded-sociology-race-or-ethnicity

6 https://www.asanet.org/research-and-publications/research-sociology/trends/doctorates-awarded-sociology-race-or-ethnicity

7 https://ncses.nsf.gov/pubs/nsf19304/digest/field-of-degree-minorities

BY THE NUMBERS

THROUGH 2020 ACADEMIC YEAR

Students Supported by Funding

450

Graduating Students

170

Number of Courses

47

Internships

90+

Jobs in Homeland Security Enterprise

27

Course Enrollments

1,200

a threat – and with a growing body of evidence on who is impacted more by these events – the onus is on the disaster preparedness fields to "build the bench" for the next generation of disaster professionals. These professionals will be tasked with not only building back better, but with doing a better job of shaping communities to react to these growing threats.

A more diverse workforce brings a greater variety of perspectives on the impacts of disasters and the conditions of vulnerable populations that disasters can exacerbate. Training and education efforts focused on increasing minority representation in these segments of the workforce are critical, because these jobs are critical. Calls for increased diversity have become more prominent in recent years, reaching the halls of Congress[8].

Creating pathways to higher education in STEM fields for students in under-represented demographics is a long-term effort, one that can require development of programs that introduce subjects to undergraduates and create opportunities to support continuing education for a decade or more before producing graduates. Increasing the number of graduates in under-represented groups can increase the appeal for future students to enroll in courses and themselves become part of the future workforce.

At the Coastal Resilience Center of Excellence (CRC) – a consortium of research and education projects at the University of North Carolina at Chapel Hill – we have a major focus on helping create a more diverse future workforce. Funded by the Department of Homeland Security Science & Technology Directorate's Office of University Programs (DHS S&T OUP), CRC has been working since 2015 on developing disaster-focused educational opportunities for all levels of higher education. Working with six education partners – four of which are Minority Serving Institutions (MSI), CRC has worked with its university partners to develop dozens of courses that have served several thousand students that will outlive the Center's lifespan.

The work of the CRC follows on the heels of the Coastal Hazards Center of Excellence (CHC), which was similarly funded by DHS S&T OUP from 2008-2015. Investment in education programs – building courses and sustaining support for students – has continued across both the CHC and CRC, creating a decade-plus of investment in this space.

The Homeland Security Enterprise, broadly defined, involves public and private sector employers in a variety of fields related to disaster response, rebuilding, mitigation and public safety. At CRC, that focus includes students in coastal engineering, emergency management, sociology and planning.

8 https://www.scientificamerican.com/article/disaster-management-is-too-white-official-tells-congress/

CRC-SUPPORTED PROGRAMS

Clockwise from above right:

From right, U.S. Rep. Bennie S. Thompson (D-MS) and then- Secretary of Homeland Security Jeh Johnson view presentations from students at a CRC-supported program at Jackson State University in 2015.

Students from Johnson C. Smith University (JCSU) shown at graduation in 2016.

JCSU students learn about computer science and robotics in a CRC-supported program. Photo by Jeff Cravotta.

Our MSIs and their impacts

The efforts of CRC and its predecessor CHC to develop broad disaster-specific coursework at MSIs are the first of their kind in the country. CRC invests in long-term solutions by focusing on educating future professionals. The return on investment comes when these professionals enter their fields as federal employees and contractors, and especially when they deiversify the talent pool for state- and local-level emergency managers, engineers and other disaster professionals. While five years is a short period in what can be 40-year careers in these spaces, CRC's efforts have already shown successes.

In five years managing education programs for undergraduate and graduate students at four MSIs – two in Mississippi, one in North Carolina and one in Puerto Rico – CRC has supported courses that were part of 170 degrees. Around 1,200 enrollments in CRC-supported courses across these four programs, including new courses on diverse subjects like Geographic Information System (GIS), linear theory of ocean waves, economic aspects of disaster and rehabilitation of coastal structures. Project leaders have successfully placed more than 90 students in homeland security-related internships, and through five years 27 graduates have found employment in these fields.

CRC programmatic support has helped 450 students from MSIs continue and complete their education, through stipends and fee and tuition support.

At Johnson C. Smith University in Charlotte, N.C., more than 250 students enrolled in six courses offered through a

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NORMA DONEGHY ANDERSON

CRC Advisory Board member and founder of the Bill Anderson Fund

"Whenever you have an area that excludes or does not include any group of people there is a tremendous void that you experience. Whenever you can make any area as broad as possible the persepctives exchanged, the fruit that you reap from it, are tremendously greater.

Part of that is creating a message that can be received by members of marginalized communities that they can see participating would include them being part of the fix to the problems."

Learn more about the William A. Anderson Fund at billandersonfund.org

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CRC project titled "Preparing Tomorrow's Minority Task Force in Coastal Resilience through Interdisciplinary Education, Research, and Curriculum Development." The program has graduated 66 students with homeland security-related undergraduate degrees, and has supported more than 230 students with tuition and fee support or stipends through CRC funding. Three of those graduates have gone on to homeland security-related employment.

At the University of Puerto Rico-Mayagüez, project leaders have awarded more than 2,700 certificates to students, professionals and members of the community. Courses offered as part of the project "Education for Improving Resiliency of Coastal Infrastructure" include several large seminars open to the university community and the public, with recent expansion into online webinars. Project leaders have taught more than 300 graduate students in regular coursework supported by the CRC, graduating 15 students with homeland security-related degrees. More than 50 students have been placed in homeland security-related internships, with 10 securing employment in the field post-graduation. More than 90 students have been supported by tuition and fee support or stipends through CRC funding.

At Jackson State University in Jackson, Miss., 13 graduates from the program have secured employment in the homeland security sphere, including multiple former students now working at the U.S. Army Corps of Engineers. The project, "PhD in Engineering (Coastal Engineering and Computational Engineering) at an HBCU," has produced 14 undergraduate and 17 graduate degrees in the past 5 years, while placing 16 students in homeland security-related internships. About 350 students have attended courses developed as part of the CRC project, and CRC funding has supported more than 50 students with tuition and fee support or stipends.

At Tougaloo College, also in Jackson, Miss., nearly 300 students have taken courses provided as part of the CRC project "Multidisciplinary Certificate: Disaster and Coastal Studies." Project leaders have successfully placed 24 students in homeland security-related internships while graduating 22. More than 80 students have been supported by stipends, and one graduate has gained homeland security-related employment. The program has also awarded 10 certificates to members of the community.

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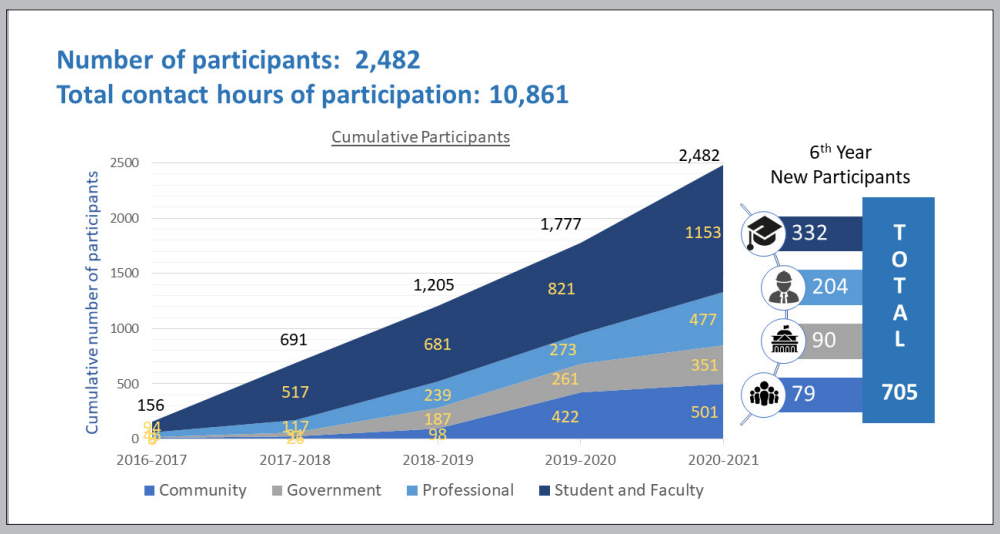
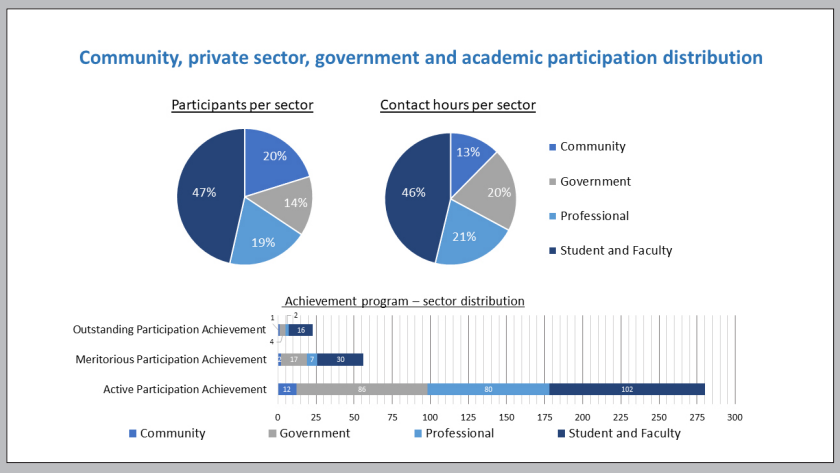
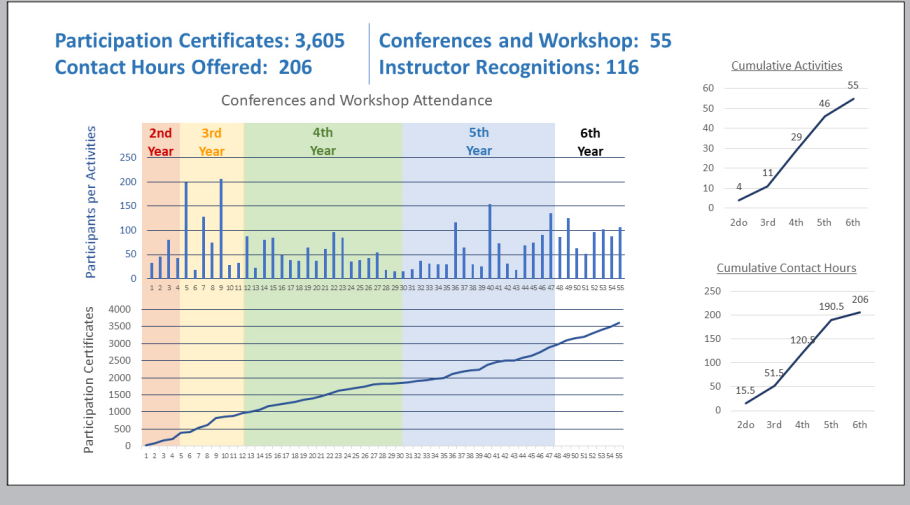
Johnson C. Smith University student William Case presented on behalf of his student team at the COE Summit 2019's Grand Challenge event. Case's team won second place. Photo by Chris A. Johns.

Overview of UPRM Student, Community Engagement

CRC partners at the University of Puerto Rico at Mayagüez work not only with undergraduate and graduate students, but also with the wide community. Here is a look at their success in the first five years of the program.







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Ties to other related efforts

The CRC also maintains a long-term relationship with the William Averette Anderson Fund (known as the Bill Anderson Fund)[1], dating back to the organization's namesake being a part of the Center Advisory Board from 2009-2013. Founded in 2014 by Norma Doneghy Anderson – who continues to serve on CRC's Advisory Board - the BAF has developed a mission dedicated to the work done by and the legacy of Bill Anderson, who passed away in 2013. This includes a focus on providing opportunities for minority students to pursue higher educational opportunities in a wide range of disaster studies.

BAF has awarded fellowships to several students affiliated with CRC programs, and the two programs share similar goals. The Center's relationship with Bill and Norma Anderson throughout life of the Coastal Hazards Center and CRC is a testament to the living commitment to better representation in hazards fields.

In 2019, the BAF Flagship was established at the University of Delaware under the directorship of Monica Sanders. The Flagship now carries forward the mission and vision of the BAF: to expand the number of historically underrepresented professionals in the field of disaster and hazard research and practice so that the diversity of the hazard and disaster field be reflective of American society.

SUMREX

The Coastal Resilience Center manages multiple exchange programs that allow students in various disciplines to learn from our partner institutions through summer exchanges, hosting research teams from Minority Serving Institutions and guest lectures.

In 2016, CRC internally developed the SUMmer Research EXchange (SUMREX), a unique networking and education opportunity that matches students from CRC-funded education programs with CRC research projects. Students spend up to 12 weeks at the research project campus site working on CRC-funded work. This program has established key pipelines between our partners, including annual participation (pre-pandemic) by University of Puerto Rico-

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9 https://billandersonfund.org

Sample courses at CRC education partners

JOHNSON C. SMITH UNIVERSITY

Data Mining
Risk Analysis and Management
Introduction to Geographic Information Systems (GIS)

TOUGALOO COLLEGE

Emergency Preparedness and Response
Health Psychology in Disaster Preparedness
Public Relations Writing

JACKSON STATE UNIVERSITY

Advanced Engineering Analysis
Linear Theory of Ocean Waves
Advanced Design for Breakwater Rehabilition
Engineering Hydrology

JOSHUA BROWN

2017 graduate, Jackson State University

My name is Joshua Brown, and I am a civil engineer with the United States Army Corps of Engineers (USACE) in Vicksburg, Miss. I specialize in river engineering and bank stabilization for the Mississippi and Red rivers. I earned a bachelor's degree in Civil Engineering in 2015 and a master's in Civil Engineering in 2017, both at Jackson State University. I was born and raised in Crystal Springs, Miss.

I became interested in coastal flooding after doing several papers on the flooding of New Orleans after Hurricane Katrina. After reading about the destruction and the effects that this storm had caused, I wanted to be more involved in studying and preventing such disasters. After obtaining my bachelor's degree, I wanted to further my studies in civil and coastal engineering. To better understand how coastal structures operate and function, I decided to get my master's in Coastal Engineering.

As a river engineer, I am responsible for making sure the river banks and navigation channel of the mighty Mississippi are protected against flooding. Flooding, which causes millions of dollars in damage to inland communities and farmland, can be very devastating. Though coastal and inland flooding happen on different spectrums, we use the same structures in both applications to protect coastal shores and inland bank stabilization. While my career has led me down a different path, learning about coastal structures has greatly helped me understand my current position. This working knowledge has greatly helped me to understand my job and the importance of protecting our coastal as well as inland banks.

Under the advisement of Dr. Robert Whalin, the experiences that I received through the Coastal Resilience Center of Excellence (CRC) at Jackson State University were nothing less than exceptional. Before becoming involved with CRC I had no idea that structures such as breakwaters and dikes existed to protect our coastal shores. Learning about how and why coastal structures are designed and needed to protect our shores has greatly influenced how I see the world. I am very appreciative for all the exposure and the knowledge I have obtained during my studies through this program. *(7.9.19)*

PROF. ISMAEL PAGÁN-TRINIDAD

CRC Principal Investigator
Professor, University of Puerto Rico-Mayagüez

"We are at a university where almost all of our undergraduate students are minorities. Fifty-one percent of our graduates and 46% of our student body on campus in 2020 were women. We rank among the first in graduating minority students in the United States. Ninety-seven percent of our graduates are Latin American Puerto Ricans, of which we're very proud, and we are convinced that they have a lot to offer to the national labor force and the Homeland Security Enterprise

Through the CRC we have been able to send our students to participate in the SUMREX (Summer Research Experience). This opportunity allows us to engage our students and be involved in research to understand better what are the hazards and the needs that we are going to have in the future. More than 700 students have participated in summer research internships with the Engineer Research and Development Center of the US Army Corp of Engineers (USACE), one of our key partners. More than 80 of our graduates have worked for ERDC and we are proud that Eng. José Sánchez, a UPRM graduate, is Deputy Director for Research at USACE.

These students have gone to PhD or master's programs, or they have been recruited by companies or the federal government to at least help the National Homeland Security Enterprise. We are sure our graduates will be role models to our students in Puerto Rico. Those are excellent ambassadors for our country, particularly nowadays after María, the 2020 earthquakes and the pandemic. They will develop as leaders and they would come back and help Puerto Rico grow and rise up for the future."

STUDENTS IN SUMREX PROGRAM:

Student exchanges between education programs and research partners from 2016-2019 (Program was not held in 2020 due to the COVID-19 pandemic.)

2016 Students	Home school	Host school
Qian Xuesheng	Jackson State University	University of Texas-Austin
Kevin Cueto-Alvarado	University of Puerto Rico-Mayagüez	Oregon State University
Diego Delgado-Tamariz	University of Puerto Rico-Mayagüez	Oregon State University
Taralyn Rowell	Tougaloo College	University of Delaware
Irenia Ball	Tougaloo College	University of Delaware
Felix Santiago	University of Puerto Rico-Mayagüez	University of Central Florida Louisiana State University
Rudy Bartles	Louisiana State University	University of North Florida

2017 Students	Home school	Host school
Sabrina Welch	Jackson State University	University of Central Florida Louisiana State University
Diego Delgado	University of Puerto Rico-Mayagüez	University of Central Florida Louisiana State University
Hector J. Colon	University of Puerto Rico-Mayagüez	Oregon State University
Peter Rivera	University of Puerto Rico-Mayagüez	Oregon State University
Stephen Kreller	Louisiana State University	UNC-Chapel Hill
Courtney Hill	Tougaloo College	University of Rhode Island
Rosalie Cisse	Tougaloo College	University of Rhode Island
Kierra Jones	Tougaloo College	University of Rhode Island

2018 Students	Home school	Host school
Bryan Acevedo-Marerro	University of Puerto Rico-Mayagüez	Oregon State University
Jorge Santiago-Hernández	University of Puerto Rico-Mayagüez	Oregon State University
DaChawn Kincaid	Tougaloo College	Old Dominion University

2019 Students	Home school	Host school
Courtney Thomas	Tougaloo College	Old Dominion University
Madison Bibbs	Tougaloo College	Old Dominion University
Ihan J. Acevedo González	University of Puerto Rico-Mayagüez	Oregon State University
Robert Ethan Lewis	University of Puerto Rico-Mayagüez	Oregon State University

WILLIAM CASE

Student, Johnson C. Smith University
Participant, 2019 Centers of Excellence Summit Student Grand Challenge

My name is William Case,

and I am an undergraduate student at Johnson C. Smith University (JCSU) in Charlotte, North Carolina, majoring in Computer Science. Before JCSU, I earned an associate's degree in arts focusing on business administration at Central Piedmont Community College (CPCC). While at CPCC, I served as the Student Government Association President and helped to start a peer mentorship program for the college's First-Year Experience department.

While at JCSU, I have had the opportunity to work with the Coastal Resilience Center under the direction of Dr. Awatif Amin, participating in several research initiatives that centered around coastal resiliency and preparedness. One, in particular, Building Tornado Resilient Communities (2019), our team had a chance to synthesize readily available atmospheric conditions from coastal communities, past tornado data and then apply Data Mining techniques.

I also participated in the Centers of Excellence 2019 Summit Grand Challenge, where teams of students developed innovative solutions in response to an emerging DHS challenge. Our team of myself, Ha Le, Jin Lee, Danielle Dobbs, and Annette Mariel Colon Mercado, won second place on the project "Drone-based MIR Laser Induced Thermal Imaging for Identification of Chemical Substances."

The most rewarding part of participating in the 2019 COE Summit was working on a multidisciplinary team. We all had very academically diverse backgrounds, and in the end, our proposal reflected the multifariousness of those fields.

My brief but fulfilling experiences with utilizing data for real-world solutions inspired me to continue my work. In the future, I will pursue a career in data science focused on finding and answering the critical questions of our time. *(10.14.20)*

Learn more about the Grand Challenge at https://cina.gmu.edu/conference/coe-summit-2019/students.

Attendees of the 2017 HBCU Flood and Hurricane Meeting pose with U.S. Rep. Bennie Thompson (center, at podium). Photo by Josh Kastrinsky.

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Mayagüez engineering students in the hydraulic lab tests at Oregon State University, in a project led by PI Dr. Dan Cox.

Summer Research Teams

CRC partners have also been frequent participants in the Department of Homeland Security (DHS) Science & Technology Directorate (S&T)-facilitated Summer Research Team (SRT) program[2], which allows them to host faculty and students from Minority Serving Institutions for 10 weeks each summer. This has been an important venue for CRC to connect with faculty on unique, short-term research projects.

The DHS SRT program, administered by S&T's Office of University Programs, is a summer internship that provides quality research experiences to early career faculty members and students attending a Minority Serving Institution in the United States and the 16 U.S. territories. The goal of the program is to foster relationships for long-term projects and enhance scientific leadership at MSIs in DHS-relevant research areas.

CRC partners have hosted teams from Benedict (S.C.) College, Norfolk State University (NSU), Florida A&M University (FAMU), Elizabeth City State University (ECSU), Fayetteville State University (FSU), University of Puerto Rico-Mayagüez (UPRM) and North Carolina A&T University (NCAT).

In 2016, CRC partners at UNC-Chapel Hill hosted Dr. Anton Bezuglov and student Reinaldo Santiago from Benedict College, as they worked on the project "Artificial Neural Networks for Storm Surge Predictions in NC." The project used artificial intelligence to attempt to speed up storm prediction computations.

In 2017, CRC partners at Old Dominion University (ODU) hosted Dr. Camilla Okpodu and Dr. Bernadette Holmes from NSU. Dr. Okpodu led a project called "A Systems Approach: Developing Cross-Site Multiple Drivers to Understand Climate Change, Sea-level Rise and Coastal Flooding for an African American Community." Dr. Holmes led a project called "A Sociological Framework for Understanding Climate Change, Sea-level Rise and Coastal Flooding in the African American Community: A Systems Approach." The NSU team included students Mikel Johnson, Raisa Barrera Bryan Clayborne, while ODU included students Dontá Council and Isaiah Amos.

Dr. Okpodu developed a questionnaire for the Chesapeake Bay region's minority populations, seeking to learn more about why those populations are

10 https://www.dhs.gov/science-and-technology/minority-serving-institutions-program

Prof. Ismael Pagán-Trinidad of the University of Puerto Rico-Mayagüez leads a site visit with a class as part of a three-day training event conducted with USACE in 2019. The project he leads, along with Carla López del Puerto and Raúl E. Zapata López, focuses on offering a Certificate in Multi-hazard Capacity Building to Mitigate Risks in Vulnerable Communities to students and the greater community. Photo by University of Puerto Rico-Mayagüez.

considered to have a lower affinity for the environment and environmental resources than the general population. Dr. Holmes developed a framework for studying the views of Black residents about sea level rise and coastal flooding in the Hampton Roads area. Evidence shows that minority communities are disproportionately impacted by natural hazards, including coastal hazard threats.

In 2018, both NSU researchers received a second round of funding to explore a related project, "Advancing Preparedness for Coastal Resilience." That project focused on supporting research and education initiatives centered on impacts from and opinions toward sea-level rise and other environmental factors by minority populations in the Hampton Roads region of Virginia.

In 2019, CRC partners at North Carolina State University hosted Dr. Michelle Dovil of FAMU and students Tenesha Washington and Tia Maxwell as they conducted 300 interviews in Wilmington and Elizabeth City, N.C., as part of their project "The Place We Call Home: A Critical Analysis of the Risk Perceptions and Place Attachments of Coastal Communities at Risk for Sea Level Rise in North Carolina."

The same year, CRC partners at ODU hosted ECSU's Dr. Kulwinder Kaur and students Jaida Ellis and Genesis McClain as they studied mental health impacts

ADDITIONAL PROGRAMS

of hurricanes on eastern North Carolina residents, particularly in Bertie County, as part of the project "An Examination of Mental Health Effects of Hurricanes in Coastal North Carolina to Strengthen the Efforts of Resilience." Both researchers were selected for follow-on funding to continue their research.

In 2020, CRC hosted three teams virtually because of the COVID-19 pandemic. Dr.Mauricio Cabrera-Rios and students Véronica Diaz-Pacheco and Frederick Gonzalez-Roman from the University of Puerto Rico-Mayagüez, who paired with CRC Executive Director Tom Richardson and Education Director Dr. Robert Whalin of Jackson State University. Dr. Liping Liu and students Tiana Johnson and undergraduate student Jackson Wiles of North Carolina A&T University, who partnered with CRC Lead PI and researcher Dr. Rick Luettich of the University of North Carolina-Chapel Hill (UNC). Dr. Sambit Bhattacharya and students Raymond Kimble and Grace Vincent of Fayetteville State University, who partnered with CRC researcher Dr. Brian Blanton of the Renaissance Computing Institute at UNC-Chapel Hill.

Other exchanges

CRC also facilitates multiple short-term, informal exchanges as well. The RETALK (Research Talks) program facilitates guest lectures from researchers at institutions hosting the Center's education projects. The RETALK program has four objectives: Disseminate knowledge about CRC research partners and their work to students at CRC education partners; foster collaboration and integration among the Center's projects; encourage interest among students in graduate studies at partner university programs; and strengthen the CRC (especially the SUMREX program) by building relationships between principal investigators.

Past summers have also included single-day exchanges between Johnson C. Smith University and North Carolina State University, in which JCSU students and faculty spend the day learning about NCSU's coastal engineering research and labs.

Aiding recovery process in historically Black community

In October 2016, Hurricane Matthew devastated many eastern North Carolina communities, both from the wind and storm surge of the event itself and from the flooding that took place over the coming week as collected water rolled east from the state's mountains to the sea. Matthew would be the first of four landfalling storms to hit the state in the next 4 years - hurricanes Florence (2018), Dorian (2019) and Isaias (2020) are the others - but the long-term recovery from Matthew still continues in many communities.

In 2017, CRC was selected to lead the Hurricane Matthew Disaster Recovery and Resilience Initiative (HMDRRI), a consortium involving the university engagement of faculty and students as well as professional planning experts in addressing community and state-level needs associated with recovery. Faculty and students from UNC-Chapel Hill and North Carolina State University partnered with local, state and federal leaders to engage with select communities to assist them identify local needs and help them develop post-disaster recovery plans.

The Initiative included a multi-day Community Design Workshop for Princeville, N.C., residents, held in late August 2017. The event brought together federal, state and local officials with HMDRRI faculty and university students to design a plan for a more flood-resilient future for the town, including a potential relocation of part of the town to a less flood-prone annexation outside of current town limits.

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Want to read more stories from our students?

Visit https://coastalresiliencecenter.unc.edu/students

DR. MICHELLE DOVIL

Visiting Assistant Professor, Howard University
Summer Research Team participant, 2019-2020

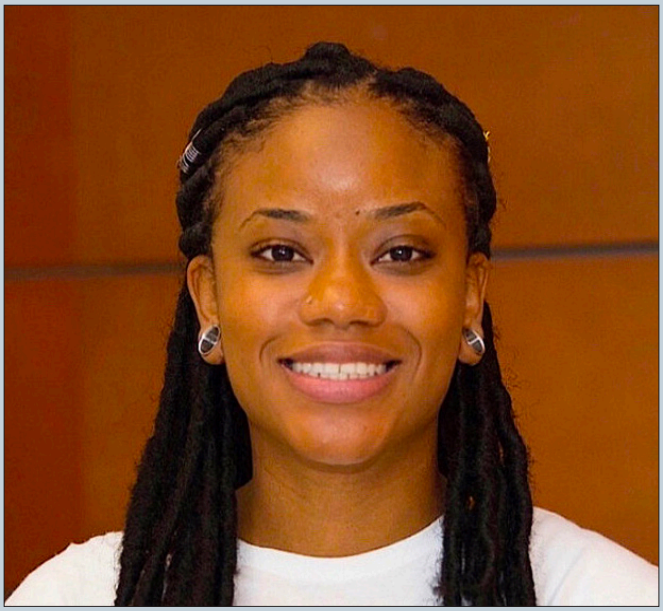
In the summer of 2019, I participated in

the Department of Homeland Security's Summer Research Team program for Minority-Serving Institutions, along with my two students Tia Maxwell and Tenesha Washington, while working at Florida A&M University. We were hosted by the CRC's Dr. Gavin Smith at North Carolina State University and mentored by Frank Lopez at North Carolina Sea Grant. During this time, my students and I worked on a research project that focused on two coastal communities in North Carolina: Wilmington and Elizabeth City.

Moreover, for this research project I made the decision to utilize a convenience sampling methodology for our data collection, where we essentially surveyed 300 residents on the ground in several different locations within the two cities. Our goal was to examine the risk perceptions and place attachments of coastal communities at risk for sea level rise. In our study, we found that Wilmington and Elizabeth City residents both had strong attachments despite living in highly vulnerable areas. We can infer that these attachments could be due to a number of residents owning their homes, which is consistent with the literature that suggests homeowner status can be a significant predictor as it relates to climate change environmental attitudes.

In regard to the risk perceptions, we found that a number of residents, as far as our sample is concerned, were interested in issues that directly impacted their property - hurricane damage, property value declining, flooding, as well as increase of insurance rates. We were also interested in relocation and buyouts, and found that 53% of the sample in Wilmington and 48% of the sample in Elizabeth City, were actually interested in relocating, despite their strong attachments. Many participants mentioned taking safety precautions for their family and themselves for their willingness to relocate.

We were funded to do follow-up work in 2020, through additional funding provided by the Department of



Homeland Security's Summer Research Program. The proposed research study is a continuation of preliminary work that seeks to include a qualitative component that consists of in-depth interviews as well an additional study site. The additional study site would be Princeville, a historic predominantly African American community in order to fully address the coastal resilience needs of both the DHS and the CRC.

Overall, my goal is to examine as many coastal communities within the United States and later write a book about their risk perceptions and place attachments, especially as it relates to relocating. Currently, the dominant conversations have been centered on adaptation and migration. However, I think we should consider shifting the conversation to migration and possible buyouts, because according to sea level projections within the next 50 to 100 years a number of coastal communities are projected to be underwater.

Working with CRC has been a great experience. And I think it's amazing that in this program, a faculty member can bring on students who are also immersed in the research and can really think through a lot of these things. It's been an amazing experience and I'm so glad I got the opportunity to do it.

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Uniquely, this event brought in Black designers from across the country to work on the Workshop, which helped imagine a new future for the town, considered the oldest in the country founded by freed slaves. Princeville was formed in the waning days of the Civil War and incorporated in 1885. Though surrounded by a levee built in the 1960s, Princeville was affected by two storms less than 20 years apart that overtopped those defenses.

This five-day workshop[3] brought together teams of land use planners, engineers, architects and landscape architects to collaborate with local, state and federal officials to develop three scenarios for a new 52-acre tract of land that the state intends to buy. The design team and resource team – which provided subject matter expertise for the design – included experts from across North Carolina and other states, including Louisiana and New Jersey. Members came from organizations as varied as the North Carolina Sea Grant, U.S. Army Corps of Engineers and the National Park Service. Read more about the HMDRRI communities and their road to recovery on the CRC website.[4]

CRC's commitment to helping recovery in hurricane-impacted communities continues in its support of a project with Partners for Educational Development, which is working to formalize the relationship between universities and small communities to provide recovery services through academic departments and student projects.

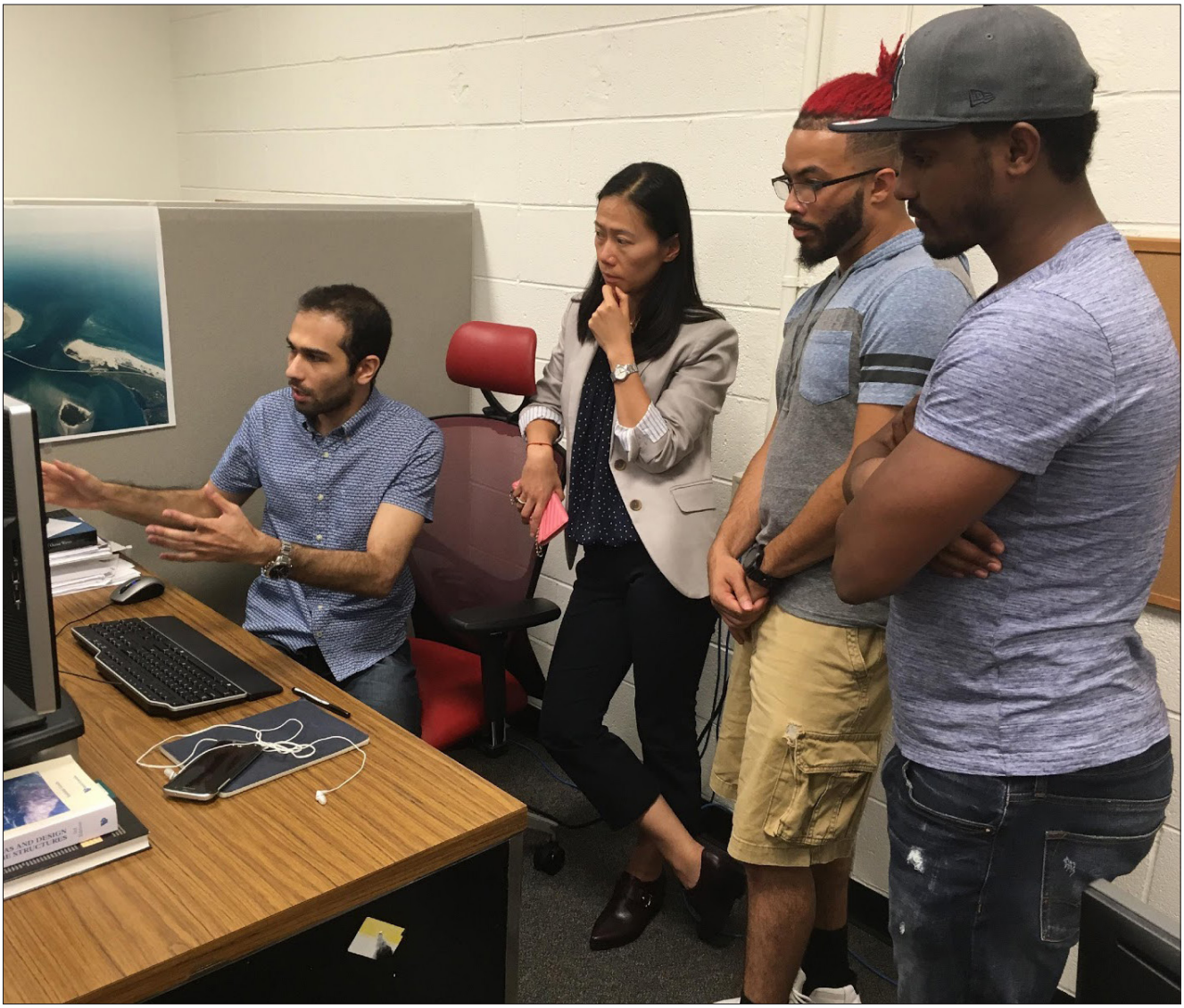
Gathering of experts from HBCUs

Earlier in 2017, CRC hosted the first Historically Black Colleges and Universities (HBCU) Flood and Hurricane Meeting on the campus of Tougaloo College in Jackson, Miss. More than 30 researchers and other professionals

11 https://coastalresiliencecenter.unc.edu/2017/10/princeville-residents-guide-plan-for-future-of-town/

12 https://coastalresiliencecenter.unc.edu/crc-projects/hurricane-matthew-recovery/

Dr. Meherun Laiju (center in red) poses with Tougaloo faculy and students in 2016. Dr. Laiju's project has built a multidisciplinary certificate in Disaster Coastal Studies to enable Homeland Security-related career and higher education pathways while also sponsoring interactive forums in high-risk communities with the local emergency management agencies. Photo courtesy of Tougaloo College.



North Carolina State University graduate student Alireza Gharagozlou, left, demonstrates numerical modeling work to former Johnson C. Smith University project leader Dr. Helen Chen, and two JCSU students as part of a summer 2017 exchange program. Photo by Casey Dietrich.

representing 21 HBCUs from Virginia, Texas, Tennessee, North Carolina, Mississippi, Maryland, Georgia, Florida, Arkansas, Alabama and the District of Columbia attended the meeting.

The HBCU representatives interacted with CRC researchers on issues related to response and recovery from natural disasters within minority communities. Because of their locations, historical significance and positive reputations within their surrounding communities, HBCUs are important as gateways for outreach to these communities.

The event included an address by U.S. Rep. Bennie Thompson of Mississippi, Ranking Member of the House Committee on Homeland Security, who spoke about the partnership DHS has with HBCUs and the importance of diversity within the universities that are involved with DHS.

Rep. Thompson said that through dealing with multiple hurricanes in the Gulf region of Mississippi – including Katrina and Rita– he began to better understand the gaps in emergency management planning for underserved communities. These communities are often disproportionately impacted by natural hazards, he said, and a mission for HBCUs is to train future professionals to provide a talented, local

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DR. JOHN COOPER

Assistant Vice President for Public Partnership & Outreach, Texas A&M University
CRC Advisory Board member

Marginalized populations suffer disproportionately due to the impacts of disaster. So as we seek to seed the next generation of hazards scholars, I think we ought to be drawing talent from marginalized populations. The perspective of scholars from marginalized communities will help us understand better the conditions, the concerns, the capacities of the most vulnerable among us, and make a significant contribution to our collective resilience.

I think there is still a lack of diversity in the field. Things have improved in the 25 years I've been a scholar and professional in the practice of emergency management - we're starting to see d more representation for people of color and women in the field for example - but we still have a lot of room for improvement.

Going forward the CRC will partner more with professional organizations and nonprofits like the Bill Anderson Fund to cast a wider net for students and faculty of color to bring them into the field.

Students and faculty from the University of North Carolina at Chapel Hill andf North Carolina State University worked with residents on designs for a potential expansion of the town of Princeville, N.C., in August 2017. Photo by Adam Walters.

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workforce for major emergency management functions.

The event concluded with an ongoing effort to promote networking between the represented institutions and to connect the attendees to resources available through DHS. One outcome was CRC support for a "Community Resilience Project at Jackson State University," led by Dr. Jessica Murphy. The project's goals include equipping Mississippi's underserved communities with better preparedness skills for future disasters and to provide emergency and disaster management and mitigate future losses through an educational pipeline that begins with middle school students.

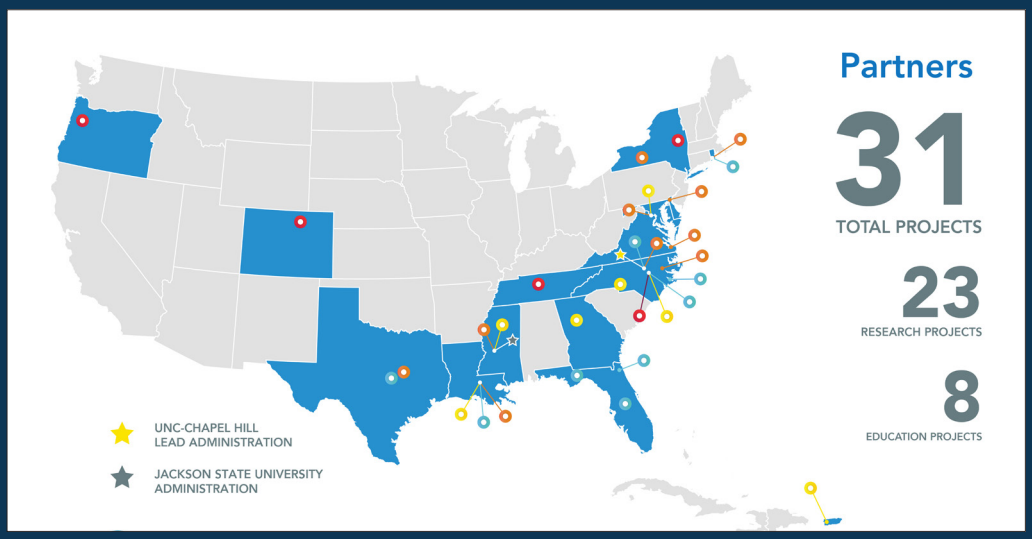
The way forward

By design, the Coastal Resilience Center – a multi-year, pan-university effort to make the nation and its people safer from and more prepared to endure disasters – will eventually sunset. Whatever form its supported projects eventually take, the goal from the beginning was to create education programs that would outlast it. As shown in this report, the Center has made great strides toward that goal.

The work never truly ends. Financial support from federal partners – especially the Department of Homeland Security's Office of University Programs – was key in making these successes happen. Future support of education efforts at MSIs from federal and state agencies, together with continued commitment from the MSIs themselves, are crucial to ensure that gains made now are not lost. The Center's hope is that the early successes of these programs prove their value to stakeholders who can help them continue to thrive.

The pipeline also must extend beyond higher education, in both directions. Professional organizations that support emerging members of the workforce are important, as is support within under-represented communities to help students thrive in higher education settings. The latter helps create the foundation for long-term success. CRC's future work will focus on ways to make sure these communities can emerge from natural hazard events even more resilient and adaptive, with the help of professionals who represent and understand their lives, backgrounds and values.

To see more about our people and what we do, visit coastalresiliencecenter.unc.edu.



From top:
CRC's Minority Serving Institution partners are among the 31 total project partners over the life of the Center.

Jackson State University student Sabrina Welch, right, visited the Maeslantkering storm surge barriers in the Netherlands as part of a funded research experience in 2018. Photo submitted.

A Summer Research Team from Elizabeth City State University, led by Dr. Kulwinder Kaur, and a SUMREX team from Tougaloo College, worked with Old Dominion Unicversity researchers on projects in 2019. Photo by Old Dominion University.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