

**CHEN, JCSU**  
**DHS Coastal Resilience Center**  
**Education Project:**  
**Annual Project Performance Report**  
Covers reporting period July 1, 2016 – June 30, 2017

1. **Project Title:**

Preparing Tomorrow's Minority Task Force in Coastal Resilience through Interdisciplinary Education, Research, and Curriculum Development

2. **Principal Investigator / Institution:**

PI, Dr. Hang Chen, Johnson C. Smith University

**Other Education Participants/Partners:** UNC-Chapel Hill, UNC-Charlotte, and Jackson State University (major partners)

3. **Short Project Description:**

We focus on the integrative, interdisciplinary nature of real-world problems and strive to bridge traditional academic programs to develop solutions to coastal resilience and its related problems facing our nation. The proposed program will build an undergraduate education framework to prepare tomorrow's minority task force in coastal resilience (approximately 80% of students are minorities), which presents tailored courses in coastal resilience, applied research experience, knowledge transfer activities, scientific seminars, and summer camps.

4. **Abstract:**

Given the national need to prepare future coastal resilience professionals with educational and research experience, this proposed program supports a critical mission. Most existing coastal resilience related curriculum currently either target graduate programs or vocational education. We will develop an undergraduate education framework that meets the needs and standards for excellence in undergraduate education.

The project is designed around the following aims:

- 1) **Aim 1:** Develop a curriculum to prepare undergraduate students for careers in coastal resilience;
- 2) **Aim 2:** Create partnerships to conduct applied research in the area of coastal resilience;
- 3) **Aim 3:** Create ongoing opportunities for the transfer of skills, knowledge, people and ideas between JCSU and the community at large.

To help reach these goals, we define the following objectives:

- 1) **Objective 1:** Develop four new courses to educate students with demonstrated interests and aptitudes in coastal resilience study;
- 2) **Objective 2:** Design and deploy interdisciplinary coastal resilience seminar series;

- 3) **Objective 3:** Establish and develop Faculty/Student research collaborations in coastal resilience;
- 4) **Objective 4:** Design and offer a summer camp to expose and increase the awareness of undergraduate students in coastal resilience study.

5. **End users:**

<b>End User</b>	<b>Agency/Employer</b>	<b>Project Role</b>
Dr. Rick Luettich	Principal Investigator & Director, the U.S. Department of Homeland Security's Coastal Resilience Center of Excellence UNC-Chapel Hill	External Advisor
Dr. Gavin Smith	Director, the U.S. Department of Homeland Security's Coastal Resilience Center of Excellence UNC-Chapel Hill	Collaborator (guest lecturer); Transition (helps students with internships/employment).
Dr. Robert W. Whalin Thomas Richardson	Jackson State University	Collaborator; Transition (Graduate study pipeline)
Wie Yusuf Associate Professor, Old Dominion University, School of Public Service, Strome College of Business	<b>Old Dominion University</b>	Transition (helps students with internships/employment).
Casey Dietrich <b>Assistant Professor, Department of Civil, Construction, and Environmental Engineering</b>	<i>NC State University</i>	Collaborator (guest lecturer, research project supervisor); Transition (Graduate study pipeline).
Elizabeth Austin	Society for Information Management-Charlotte region Chapter	Transition (helps students with internships/employment).
Dr. Mohamed Shehab	UNC Charlotte	Collaborator (guest lecturer, research projects supervisor); Transition (Graduate study pipeline).
Dr. Bei-Tseng Chu	UNC Charlotte	Transition (Graduate study pipeline).

Dave Canaan Mecklenburg County Water & Land Resources Director	Mecklenburg County	Collaborator (guest speakers); Transition (helps students with internships/employment).
Jeff Stovall Chief Information Officer at City of Charlotte	City of Charlotte	Collaborator (guest speakers); Transition (helps students with internships/employment).

**6. Explanation of Changes:**

Developed a new minor in sustainability. It will take effect in Fall 2017. It was not in the original plan. The recent literature and research argued that sustainability encompasses natural hazards. It is becoming increasingly clear that enhancing the capacity of social-ecological systems to cope with, adapt to, and shape change is central to building sustainable and resilient development pathways in the face of climate change. Natural disaster reduction and sustainable development are necessarily woven together. The Sustainability minor is a flexible program open to all majors. Students will be exposed to various concepts of sustainability and modern sustainable practices that can be used to address current issues affecting society, organizations, and the world. Therefore, our program is well aligned with DHS S&T Coastal Resilience Center of Excellence (CRC)'s research agenda, and supports the critical mission of DHS.

**7. Unanticipated Problems:**

None.

**8. Project Outcomes:**

There are numerous jobs in the DHS enterprise available for qualified candidates majored in Computer Science and Engineering. Nearly 70% of graduates with a master's degree in computer science are international students. Since candidates must be U.S. citizens to fulfill federal government jobs, many employers are facing a serious shortage of computer science and engineering professionals. Moreover, according to the data reported by the Computing Research Association, only 4.5% of all new recipients of bachelor's degrees in computer science or computer engineering are African American. It is critical to recruit and retain more underrepresented minority students into the STEM pipeline

All DHS end users who hire engineers, regardless of degree level, need engineers to have as much knowledge of coastal natural disasters as possible. However, most existing coastal resilience related curricula either target graduate programs or vocational education. No other computer science and engineering undergraduate program in the U.S. offers courses which focus on natural disaster resilience.

The education program we propose meets the needs and standards for excellence in undergraduate education. The curriculum and research experience will provide students a solid

knowledge foundation and skills to conduct coastal resilience research. JCSU is a HBCU with an approximately 80% minority population. Studies suggest that building partnerships between research-intensive universities and undergraduate-focused, minority-serving institutions can go beyond merely supplying the pipeline. We work with partner intuitions to identify gaps in the undergraduate training of coastal resilience for DHS and other agencies to ensure their success in graduate school and future careers.

Year 2 (January 1, 2016 to June 30, 2016) Outcome highlights:

1. Developed a new course, Hazards Risk Management. Nine students enrolled in this course in Spring 2017 semester.
2. Develop a new interdisciplinary minor in Sustainability.
3. Leverage Funding received in 2016-2017: North Carolina GlaxoSmithKline Foundation \$25,000 for Summer Sustainability Enrichment Program. Z. Smith Reynolds Foundation \$25,000, Green to Green Project: Economic Development through Urban Agriculture. Google, Inc. Foundation, \$45,000, Google Entice program. William R. Kenan, Jr. Charitable Trust, \$555,000 STEM Innovation Initiative.
4. Nine students participate coastal resilience undergraduate research projects in fall and spring semester.
5. Nine students who participated DHS CRC research graduated in May 2017. One student is awarded full scholarship to attend Applied Computer Science Master program at East Tennessee State University.
6. Two students received NSF CyberCorps scholarship for service.
7. Twenty students participated coastal resilience one-week summer camp, May 15 to 19, 2017.
8. Nine students conducted four-week summer undergraduate research, May 22 to June 16, 2017.
9. Hosted Re-talks semester with CRC research partners from Old Dominion University, UNC Chapel Hill, and North Carolina State University.
10. Collaborated with Dr. Casey Dietrich, research partner PI at NCSU to develop a field trip at NCSU.

9. **Education Activity and Milestone Progress:**

**Education Activities and Milestones: Progress to Date**

<b>Reporting Period 7/1/2016 – 6/30/2017</b>			
<b>Education Activity</b>	<b>Proposed Completion Date</b>	<b>% Complete</b>	<b>Explanation of why activity / milestone was not reached, and when completion is expected</b>
Develop one new course.	04/30/2017	100%	
Host Three Seminars.	04/30/2017	100%	
Select eight students to conduct research projects	01/30/2017	100%	
Design a one-week summer camp focused on Coastal Resilience	06/01/2017	100%	
Select nine students form the summer research teams.	07/01/2017	100%	
<b>Education Milestone</b>			
New course will be offered for spring semester.	05/01/2017	100%	
New Minor in sustainability is approved in spring semester	05/01/2017	100%	
Twenty Students complete the one-week summer camp.	05/30/2017	100%	
Nine students complete the four-week summer research projects.	06/30/2017	100%	

10. **Transition Activity and Milestone Progress:**

**Transition Activities and Milestones: Progress to Date**

<b>Reporting Period 07/01/2016 – 6/30/2017</b>			
<b>Transition Activity</b>	<b>Proposed Completion Date</b>	<b>% Complete</b>	<b>Explanation of why activity / milestone was not reached, and when completion is expected</b>
The students who participated in the research projects will be available for employment in the greater Homeland Security enterprise.	06/30/2017	On schedule	Employers feedback show that this research experience is valuable for job placement. Most graduates are working in private section. In year 3, we will emphasize on internships, graduate programs, and DHS career placements.
Dissemination of the undergraduate education and research education framework and results.	06/30/2017	On schedule	In year 2, we supported students to attend the Emerging Researchers National (ERN) Conference in Science, Technology, Engineering and Mathematics (STEM), and the National Society of Black Engineers Annual Convention. Two students presented their research on ERN conference.
Develop the collaboration with research partners.	06/30/2017	On schedule	
<b>Transition Milestone</b>			
Graduates are employed in greater HS enterprise or continued graduate school enrollment	06/30/2017	On schedule	Nine students who participated in this program graduated in May 2017. One student is awarded

			scholarship to attend graduate school.
Conference presentation and publications of the project results.	06/30/2017	On schedule	Two students presented their research on ERN conference. One research manuscript is submitted.
Students present research finding at regional and national conferences.	06/30/2017	On schedule	Nine students will submit their research posters to 2018 National Undergraduate research conference.

### 11. Interactions with research projects:

1. Dr. Whalin reviewed our grant proposal for the DHS Scientific Leadership Awards for Minority Serving Institutions (MSI). Dr. Gavin Smith provided us a letter of support on behalf of CRC.
2. Three research PIs visited JCSU in 2016-2017 to give the RE-Talk Seminars.
3. Nine students in CRC's JCSU Summer Research Program visited NCSU Department of Civil, Construction, and Environmental Engineering hosted by Dr. Casey Dietrich. This field trip is well-planned and successful. The director of graduate program gave an overview of NCSU CCCE department, and summer and graduate programs opportunities. Dr. Dietrich arranged presentations and discussions with faculty members in their computing & system group. Ten faculty members presented their interdisciplinary research projects addressing problems throughout civil and environmental engineering using computational tools. The JCSU students also sit with Dr. Dietrich's graduate students at their workspaces and learned more about their research and workflows. This field trip provided our students opportunities to be cognitively engaged and challenged, as they explored areas of personal interest and curiosity and engaged in communication with graduate students and faculty members. It also allows us to know each other better and identify opportunities for future collaboration.

### 12. Publications:

Cody Byrd, Jean-Marie Nshimiyimana, Ehije Idehenre, Hang Chen (Faculty Advisor), "Data Analysis of Haiti's Resiliency Post-2010 Earthquake". Presented at the 2017 **Emerging Researchers National (ERN) Conference in Science, Technology, Engineering and Mathematics (STEM)**.

NyJae Dickerson, Adonis Tillman, Desmond Taylor, Awatif Amin (Faculty Advisor) "Using Data Mining to analyze Natural Disasters at 10 countries". Presented at the 2017 **Emerging Researchers National (ERN) Conference in Science, Technology, Engineering and Mathematics (STEM)**.

Ying Bai, Hang Chen, "Build a Real Time Optimal Evacuation Contraflow Model for Natural Disasters by Using a Fuzzy Inference System," Submitted for review.

Student has completed their research projects in summer 2017. The abstracts will be submitted in fall 2017 National Undergraduate Research Conference.

Aaron Smith, "Analyzing Mecklenburg County's Flooding Resilience."

Amyr Washington, Tendru Howell "Vulnerability Assessment: New Orleans, Louisiana vs. Savannah, Georgia."

Imyer Majors, Frandy Prince, and Djerhkea Epps Dukes, "Hurricane Vulnerability Assessment: North Carolina Coastal Counties."

Thandiwe Balani, QUINTAVIOUS Coleman, Ashenafi Tsaudu, "Using Fuzzy Interference System to Build Real Time Optimal Evacuation Contraflow Model."

**13. Tables:**

**Table 1: Documenting CRC Education Project Courses and Enrollments**

Courses Developed by Johnson C. Smith University under Project Preparing Tomorrow's Minority Task Force in Coastal Resilience through Interdisciplinary Education, Research, and Curriculum Development						
Course		Developed (D), Revised (R), and/or Taught (T), by Project Year				
Number	Title	1	2	3	4	5
CSC436	<i>Hazard Risk Assessment</i>	D	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	-			
Enrollment			9			
	Community Resilience Summer Camp	D/T	T/R			
Offering: Elective (E), Concentration (C), Minor (M)		-	-			
Enrollment		20	20			
	Coastal Resilience Summer Research	T/R	T/R			
Offering: Elective (E), Concentration (C), Minor (M)		-	-			
Enrollment		9	9			
	Minor in Sustainability	-	D			
Offering: Elective (E), Concentration (C), Minor (M)		-	M			
Enrollment		-	-			

**Table 2: Documenting External Funding and Leveraged Support**



External Funding			
Title	PI	Total Amount	Source
Summer Sustainability Enrichment Program	Terik Tidwell, Director of STEM Innovation	\$25,000 We utilized the fund to support 1 faculty to develop community resilience summer camp for K-12 students.	North Carolina GlaxoSmithKline Foundation
Carolina Cyber Defense Scholarship	Hang Chen	\$262,917 We utilized the fund to support undergraduate tuition and travel.	NSF
Google Entice program.	Terik Tidwell	\$45,000, 2-week Computer Principle Training for two staff members. STEM summer camp. 30 Mac Laptops to support the program.	Google, Inc. Foundation
STEM Innovation	Hang Chen	\$555,000 Support students to attend conferences and faculty professional development activities.	William R. Kenan, Jr. Charitable Trust, STEM Innovation Initiative.
Leveraged Support			
Description			Estimated Annual Value
Reduced indirect cost of 8% (DHS negotiated rate of 34.4%)			\$20,188
In-kind faculty time to supervise Summer Research for 4-weeks (\$3,000 stipend)			\$25,000

#### 14. Metrics:

<u>Metric</u>	<u>Year 1</u> (1/1/16 – 6/30/16)	<u>Year 2</u> (7/1/16 – 6/30/17)
HS-related internships (number)	1	1
Undergraduates provided tuition/fee support (number)	0	0
Undergraduate students provided stipends (number)	37	47
Graduate students provided tuition/fee support (number)	0	0
Graduate students provided stipends (number)	0	0
Undergraduates who received HS-related degrees (number)	9	20
Graduate students who received HS-related degrees (number)	0	0
Certificates awarded (number)	0	0
Graduates who obtained HS-related employment (number)	3	0(*)
Lectures/presentations/seminars at Center partners (number)	0	0
DHS MSI Summer Research Teams hosted (number)	0	0
Journal articles submitted (number)	1	1
Journal articles published (number)	0	0
Conference presentations made (number)	0	2
Other presentations, interviews, etc. (number)	0	0
Trademarks/copyrights filed (number)	0	0
Requests for assistance/advice from DHS agencies (number)	0	0
Requests for assistance/advice from other agencies or governments (number)	0	0
Total milestones for reporting period (number)	7	6
Accomplished fully (number)	4	6
Accomplished partially (number)	3	0
Not accomplished (number)	0	0

\*: No 2017 graduates work with DHS agencies directly. But many work in insurance and financial institutions, whose companies must often retool their IT systems and data centers to cope with the possibility of power-grid problems, terrorist attacks and other unforeseen events. Additionally, two students are awarded CyberCorp Service scholarship. When they graduate in 2018, they are required to work with federal agencies.