

UPRM - Pagan
DHS Coastal Resilience Center
Education Project Work Plan Template
Years 4 - 5
[July 1, 2018 – June 30, 2019 / July 1, 2019 – June 30, 2020]

1. **Project Title.** Education for Improving Resilience of Coastal Infrastructure
2. **Principal Investigators.** Ismael Pagán-Trinidad (PI), Ricardo R. López (Co-PI)
3. **Other Research Participants/Partners.** ERDC-US Army Corp of Engineers, PR Emergency Management Agency, FEMA, PR Department of Natural Resources, Association of Professional Engineers of PR, UPRM partners (Marine Science Department, Sea Grant Program, CariCOOS NOAA project, Transportation Technology Transfer Center, Civil Infrastructure Research Center); NOAA (National Weather Service), INESI (Instituto Nacional de Energía y Sostenibilidad Isleña = “National Institute on Energy and Island Sustainability”), CRB (Community Resilient Building). Senior Personnel: Dr. Carla Lopez del Puerto, Dept. Of civil Engineering and Surveying, UPRM.
4. **Short Project Description.**

This project will help educate the community by transferring state of practice knowledge to stakeholders (students, faculty, professionals, first responders, and workforce) through formal (curriculum, internships, student projects, undergraduate research) and informal (workshops, seminars, lectures, short courses, webinars) learning experiences. It will serve as a vehicle to engage the community as a whole to understand and learn its members’ roles and responsibilities in providing resilient coastal infrastructure systems. The project will help the community understand better various stages in coastal infrastructure hazard prevention, preparedness, response, recovery, and mitigation. The focus will be on understanding the natural phenomenology, the engineering methodologies to address the level of risk the infrastructure is exposed to, the engineering methodologies and technology to analyze and predict the level of resistance and vulnerability the infrastructure and community is exposed to, the sustainable and resilient alternative available at the state of practice or state of art to cope with risks and vulnerabilities. The project will help motivate students and faculty which will create pipelines of students and professionals into CRI careers and practice.

5. **Abstract.**

The main goal of this project is to develop and offer formal and informal education through courses, workshops, seminars, lectures, and other educational means leading to advance knowledge on the state of practice on the Resiliency of Coastal Infrastructure (RCI) of the built and natural environment. This initiative aims at creating a **Certificate in Resiliency of Coastal Infrastructure**. The focus of the project is to provide students and faculty, professionals and homeland security personnel, and affected citizens with capabilities to assess the effects of natural hazards on coastal infrastructure, the conditions of existing structures, and rehabilitation alternatives to mitigate future damage and potential risks. The educational content will focus on pre-incidents, incidents and post-incidents.

New courses and revisions of existing course will be evaluated in Civil Engineering and related disciplines dealing with estimates of causes and effects of coastal flooding, storm surge, ocean waves, tsunami loads, earthquake effects, and strong winds. Courses will be alternatively offered in the form of conferences, workshops, and lectures. Lecturers and experts from CRC, ERDC, FEMA, and other partners will be invited to participate. State of practice technology will be a priority, e.g., FEMA P646 publication for tsunami load estimates. The National Infrastructure Protection Plan and state infrastructure protection programs and plans will be addressed. Results of recent research work by UPRM, ERDC, and other CRC partner investigators regarding flood, wave, earthquake and tsunami, and hurricane wind effects on structures will be incorporated. Being a small and fully developed island, Puerto Rico offers the ideal setting to assess lessons learned of the effect of natural hazards on built and natural infrastructure including housing, commercial, industrial, institutional, transportation, communication systems, and others. Most recent Hurricane Irma and María experiences on the devastation over Puerto Rico will continue to be evaluated and the lessons learned will be incorporated in presentations, curriculum contents, and guidelines. The principal investigators will continue participating in various working teams, forums and meetings addressing building a resilient community in Puerto Rico for the future. At present time the PI's are involved with various initiatives, for example, Resilient Puerto Rico, Imagine Puerto Rico, and others. All communities in Puerto Rico have been left overexposed to major damages and recovery challenges which requires strong capacity building from the engineering perspective.

The Island continues to present more catastrophic settings from overdeveloped and exposed urban and rural communities, more vulnerable zones (flood prone, weak soils and landslides, hurricane wind exposure), highly concentrated and poorly planned urban communities, stressful tradeoff between urban development and natural ecosystems development and conservation, extreme economic development constraints and suboptimal first responders resources (e.g. funding, equipment, capabilities, training, and others) make the Island educational settings most challenging. All this setting will be available for first hand assessment and evaluation from the educational and research perspective.

Puerto Rico will be in a continuous development process focusing on providing a more resilient community, infrastructure, families, and individual. The project will collect, disseminate and expose new knowledge and lessons learned from our past and expected natural events causing damages to the community.

This program has also the goal to facilitate internships at CRC universities performing research in CRI and in government agencies and industry dealing with coastal hazards. Being a minority serving institution (MSI) with a high women's participation (near one-third in Civil Engineering) it is also our goal to create and capacitate minority Hispanic students, faculty, professionals, and affected citizens to warranty up to date level of competency in Coastal Resilient Infrastructure to this part of the community. Our MSI University has been providing well qualified Hispanic engineers to the mainland United States for many years and will benefit from the opportunity to collaborate with DHS and the community it serves.