



Caribbean Climate Adaptation Network

— A NOAA CAP/RISA Team —

ANNUAL REPORT

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www.ccan-upr.org



ccan.rcm@upr.edu

Role and affiliation of team members and collaborators

CCAN Core Team Members

Dr. Pablo Mendez-Lázaro, Lead PI, Professor, Department of Environmental Health, University of Puerto Rico Medical Sciences Campus, Graduate School of Public Health

Dr. Frank Muller-Karger, Co-PI, Professor in the College of Marine Science, University of South Florida, Co-lead of the US and international Marine Biodiversity Observation Network and the NOAA Climate Program Office/Sanctuaries Climate Indicator Task Force

Dr. Masoud Ghandehari, Co-PI, Professor of Urban Systems Engineering, New York University

Dr. Patricia Chardón-Maldonado, Co-PI, Deputy and Technical Director, University of Puerto Rico-Mayaguez-Caribbean Ocean Observing System (CARICOOS)

Dr. Jorge González-Cruz, Co-PI, Professor, SUNY Empire Innovation Program, University of Albany of Atmospheric and Environmental Sciences, Lead Scientist of the Coastal-Urban Environmental Research Group (CUERG)

Dr. Gregory Guannel, Co-PI, Director of the Caribbean Green Technology, University of the Virgin Islands

Dr. Eric Harmsen, Co-PI, Professor, Department of Agricultural and Biosystems Engineering, University of Puerto Rico Mayaguez Campus

Dr. Stephen Hughes, Co-PI, Professor in the Department of Geology, University of Puerto Rico Mayaguez Campus

Dr. Reza Khanbilvardi, Co-PI, NOAA Chair Professor of Civil Engineer, The City College of New York/CUNY Executive Director, CUNY Remote Sensing Earth System Institute (CUNY-CREST Institute)

Dr. Tischa Muñoz-Erickson, Co-PI, Co-Principal Investigator of San Juan ULTRA and the SETS Convergence Network, and Research Scientist with the USDA Forest Service, International Institute of Tropical Forestry

Dr. Carlos Ramos Scharron, Co-PI, Associate Professor, The University of Texas at Austin

Dr. José Seguinot, Co-PI, Director of the Environmental Health Department, University of Puerto Rico Medical Sciences Campus, Graduate School of Public Health

Dr. Mimi Sheller, Co-PI, Inaugural Dean of The Global School at Worcester Polytechnic Institute

Dr. Seth Tuler, Co-PI, Associate Professor, Interdisciplinary and Global Studies Division, Worcester Polytechnic Institute

Dr. Kim Waddel, Co-PI, Project Lead for the USVI Hazard Mitigation and Resilience Plan, Principal Investigator and Director for the VI Established Program for Stimulating Competitive Research (VI-EPSCoR) Update

Manuel Heredia-Morales, Coordinator, University of Puerto Rico Medical Sciences Campus, Graduate School of Public Health

Senior Personnel

Dr. John-Michael Davis, Assistant Professor, Worcester Polytechnic Institute, Co-Director, WPI Puerto Rico Center

Jeannine Francis-Brown, Community Outreach USVI, University of the Virgin Islands

Dr. Scott Justo, Professor Emeritus, Worcester Polytechnic Institute, Co-Director, WPI Puerto Rico Center

Dr. Sara Strauss, Professor of Anthropology, The Global School, Worcester Polytechnic Institute

Michelle Mulkern, Associate Director, Pre-Award Services, Worcester Polytechnic Institute

Michael Piasecki, Associate Professor, Civil Engineering, City University of New York

CCAN Research Assistant and Graduate Students

Laura T. Cabrera-Rivera, Department of Environmental Health, University of Puerto Rico Medical Sciences Campus

Francis Russell, The University of Texas at Austin

Varun Baht, Worcester Polytechnic Institute

Frederick Boakye Opong, University at Albany

Stephan Cortes, New York University

Juan E. Flórez Coronel, University of Puerto Rico Mayagüez Campus

Sol Giesso, Worcester Polytechnic Institute

Gabriela Martínez Serrano, Graduate School of Public Health, University of Puerto Rico Medical Sciences Campus

Ana Mejía Manrique, City University of New York

Joshua A. Reyes Cintrón, Graduate School of Public Health, University of Puerto Rico Medical Sciences Campus

Vanelia Ruíz Pérez, Graduate School of Public Health, University of Puerto Rico Medical Sciences Campus

Keivan Tavakoli, University of Texas at Austin

Harol Valle Reyes, University of Puerto Rico Mayagüez Campus

Ryan Brenner, New York University

Jhon Ibsen-Chaguendo, City College of New York

Keneshia Hibbert, City University of New York

Said Mejia-Manrique, City University of New York

Solange Uwera, Worcester Polytechnic Institute

Tania Figueroa, University of Puerto Rico Mayagüez Campus

Cesar Rodríguez, University of Puerto Rico Mayagüez Campus

Desiree Bayouth, University of Puerto Rico Mayagüez Campus

Jonathan Chang, Worcester Polytechnic Institute

Zoe Price, University of the Virgin Islands

Daniel Otis, University of South Florida

Digna Rueda Roa, University of South Florida

Tylar Murray, University of South Florida

Collaborators and Partners

Wanda Crespo, Climate Adaptation Program Specialist I NOAA- Climate Adaptation Partnerships in Puerto Rico

Ernesto Rodríguez, National Weather Service-San Juan, Office

Ernesto Morales, National Weather Service-San Juan, Office

Odalys Martínez, National Weather Service-San Juan, Office

Iris Santos, Sub-Secretary, Economic Development and Trade Department of Puerto Rico

Aranzazu Lascurain, Southeast and Caribbean Regional Lead, NOAA Office of Coastal Management

Jennifer de Jesús, Program Manager, Taller Salud

Dr. Ana P. Ortiz, Associate Director of Cancer Control and Population Sciences Program, Comprehensive Cancer Center UPR

Mary Ann Gabino, Senior Vice-President, Fundación Comunitaria de Puerto Rico

María Rondón, President Coordinator, Fundación Comunitaria de Puerto Rico

Kate Brown, Co-Chair, Local2030 Islands Network

Francisco Valentín, President of COSSAO

Ada Monzón, Meteorologist, Founder and President, Eco-Exploratorio Science Museum

Rene Esteves, Marine Extension Director/Research Coordinator, Sea Grant Puerto Rico University of Puerto Rico-Mayagüez

Ruperto Chaparro, Director, Sea Grant Puerto Rico University of Puerto Rico-Mayagüez

Lourdes Pérez, Community Planning Lead, Whole Community Resilience Planning Program, Foundation for Puerto Rico

Ricardo Arzuaga, Executive Director, United Nations Association of USA-Puerto Rico Chapter

Zuleika González, Directora de Mitigación, Negociado de Manejo de Emergencias y Administración de Desastres

Yasmin Detres, University of Puerto Rico-Mayagüez-Caribbean Ocean Observing System (CARICOOS)

Lillian Ramírez, Sea Grant Puerto Rico University of Puerto Rico-Mayagüez

Jackeline Andújar Oyola, Municipality of Jayuya, Puerto Rico

Tamara González Rivera, Municipality of San Juan, Puerto Rico

Richard Nicklas, MEP New York-FEMA Integration Team (FIT) Preparedness FEMA Region 2 New York State Division of Homeland Security & Emergency Services

Ernesto Díaz, Puerto Rico Climate Change Council

Nora Álvarez, USDA-
Caribbean Climate Hub

Chris Nytch, ReDES

Dr. Chris Furhmann, NOAA's
Southeastern Regional Climate
Center

Dr. Marysel Pagan, Migrants
Clinicians Network

Dr. Yanira Raíces Vega,
Secretary, Department of
Education of Puerto Rico

Dr. Liza Millan, Public Health
Surge Planning Manager &
Behavioral Health SME
Coordinator/ Emergency
Management Primary Zone
Coordinator Division for Public
Health Preparedness and
Response Auxiliary Secretariat
for Public Health Surveillance &

Protection Puerto Rico
Department of Health

Mercedes Martinez, President,
Teachers Federation of Puerto
Rico

Wanda Ayala de Torres,
Executive Director, Private
Schools Association of Puerto
Rico

Lcda. Anaís Rodríguez Vega,
Secretary, Department of
Natural and Environmental
Resources

Advisory Committee

Soledad Gaztambide, Senior
Program Officer, Foundation for
Puerto Rico

Ingrid Vila Biaggi, President of
Cambio

William Gould, Director,
Caribbean Climate Hub and
Research Ecologist, USDA
Forest Service

Nelson Colón, President &
CEO, Fundación Comunitaria de
Puerto Rico

Daniel Imani, Executive
Director, Imkada Solutions

Hillary Lohmann, Coastal
Resilience Coordinator,
Department of Planning and
Natural Resources, USVI

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1. Accomplishments: Impacting Decision Making Activities.

1.1 Featured Accomplishment

Capacity building workshop: Recognizing the effects of climate change. Act now!

On January 24 and 25, 2024, a workshop entitled: *‘Recognizing the effects of climate change. Act now!’* was conducted in collaboration with the Puerto Rico Bureau of Emergency Management (NMEAD) and helped to provide a comprehensive understanding of the effects of human-induced climate change and extreme weather events in Puerto Rico. The objectives were: (1) to increase the adaptive and anticipatory capacities of governance systems, (2) present changes occurring in marine-coastal and terrestrial ecosystems on which communities depend, including loss of biodiversity and access to good quality water, (3) inform how government agencies and communities respond before, during, and after extreme weather events (e.g., hurricanes, extreme heat, droughts, landslides, floods, coastal flooding, coastal erosion), (4) create dialogues about how to translate hazard prediction and planning into local disaster risk reduction actions and (5) help to increase confidence, communication, and feedback among scientists, risk forecasters, government agencies, non-governmental organizations, and communities. A total of 240 participants attended over the two days, representing: 13 universities, 7 community-based organizations, 44 governmental agencies, 65 municipalities, 20 non-profit organizations, and 2 entities from the private sector.

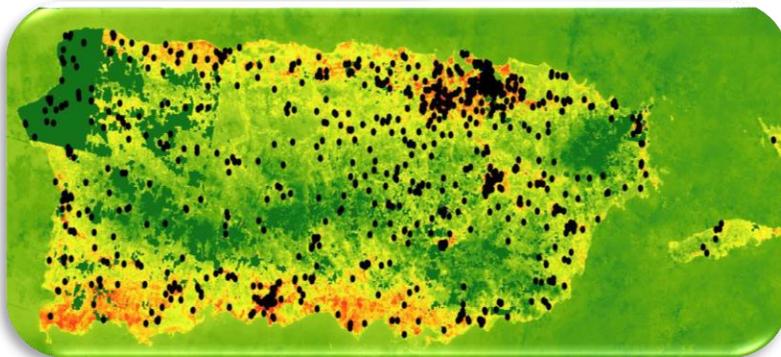
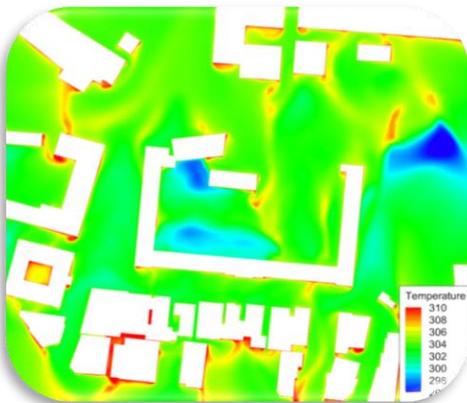


Group picture of the first day of the workshop.

1.2 - New Partnerships

1.2a – Initiatives to address impacts of extreme heat on learning environments

A collaboration between the Department of Education of Puerto Rico, The Teachers Federation of Puerto Rico, and the Puerto Rico Private Schools Association directs our energy toward a critical project on the effects of extreme heat on learning environments. To ensure students learn in safe and suitable conditions, a partnership was created to extensively evaluate and reduce high temperatures in schools across Puerto Rico. This initiative will involve various approaches to address the emergency, such as scientific expertise, teaching materials, and community participation. The objective is to evaluate the entire school structures to identify areas vulnerable to heat stress, implementing target-specific actions towards better cooling and ventilation mechanisms, and developing programs that expose pupils, teachers, and staff to dangers due to increased heat levels and ways of curbing it. The partnership also intends to build a cooperative network between schools, governmental establishments, health practitioners, and community partners who will share ideas and advocate for policies that favor learners during rising temperatures.



(Upper Right: Flyer for Extreme Heat perception in learning environments survey for school personnel. Center Left: Heat map for a pilot project in school in collaboration with NYU. Center Right: Extreme Heat Workshop with top PR Department of Education administrative staff. Bottom Left: Satellite heat image (Landsat 8) of the islands and the location of every public school on the island.)

1.2b - Building transformative adaptive capacities with communities in the Río Piedras Watershed

Dr. Tischa Muñoz-Erickson from the International Institute of Tropical Forestry (IITF) of the USDA has been collaborating with Alianza por la Cuenca del Río Piedras (Alianza) in building transformative adaptive capacities with communities in the Río Piedras Watershed, in particular, underserved communities at the frontline of both flood impacts and the large infrastructure flood projects in which they have been excluded from the design process. A core objective for the Alianza this year was to connect the different leaders and groups working with these communities into a community of practice that facilitates knowledge exchange and co-learning on flood adaptation strategies.



Dr. Pablo Méndez Lázaro is providing education and capacity building to help integrate a multi-hazard perspective into efforts exploring adaptive strategies for flooding. On August 21, 2023, Méndez-Lázaro led a Community Dialogue on the topic of Urban Heat in San Juan with 12 residents from different communities in the watershed. He presented the latest trends on heat waves regionally and urban heat specifically, emphasizing the impacts on health and potential solutions, such as heat advisories, adaptation mechanisms, and benefits of nature-based solutions.



Muñoz-Erickson and Wanda Crespo, NOAA's Climate Adaptation Specialist, collaborated with the Alianza to plan and facilitate a Community Summit held on November 4th, 2023. The Summit was a one-day workshop that brought the different communities along the Río Piedras to identify common concerns and objectives for addressing flood risks at a watershed level. Approximately 30 community leaders from eight different communities participated in the summit and came together to form the Coalición Comunitaria de la Cuenca del Río Piedras, or Coalición (Río Piedras Watershed Community Coalition).

1.2c - Climate resiliency in the Puerto Rico electrical system

The University of Albany team, led by Dr. Jorge E. González Cruz, formalized partnerships with an electric power utility in Puerto Rico, LUMA, to develop methods to explore resiliency and workforce development in climate resiliency of the power infrastructure. UAlbany is now leading a partnership to research and find mitigation solutions for managing extreme heat in learning environments following the extreme heat season of summer and fall 2023. This partnership includes Puerto Rico, USVI, Louisiana, Texas, and South Florida. Extreme heat has been identified as a key climate-driven hazard that impacts several sectors of society, including school systems. The partnership with LUMA, the electric power company of Puerto Rico, led to the design and is now in the implementation stages of a test-bed to monitor the risks of Puerto Rico's power infrastructure when exposed to extreme weather events. The major power line crossing the island south-north is being fully instrumented for monitoring and is being used as a living lab for climate resiliency studies.



1.2d – Educational collaborations: Climate Service Providers Academy



CCAN team, in collaboration with the American Society of Adaptation Professionals (ASAP), presented in their Climate Service Providers Academy (CSPA) on key initiatives to enhance climate adaptation in the Caribbean region on November 9th, 2023. It covered the Caribbean Climate Adaptation Network's (CCAN) endeavors to foster equitable adaptive capacities in the US Virgin Islands and Puerto Rico. Additionally, it explored the innovative project-based learning methods developed to bolster community climate adaptation efforts. The presentation also highlighted a specialized

tool designed for assessing drought and water resources in Puerto Rico and the US Virgin Islands, providing key insights for sustainable water management strategies. Furthermore, it featured the Caribbean Coastal Ocean Observing System (CARICOOS), a responsive initiative driven by stakeholders and users to address regional and national needs in the US Caribbean, revolutionizing ocean observation practices and enhancing resilience in coastal communities.



(Left: Dr. Pablo Méndez-Lázaro (UPRRCM), Dr. Mimi Sheller (WPI), Dr. Sarah Strauss (WPI), Dr. Sarah Molinari (WPI). Right: Dr. Eric Harmsen (UPRM), Dr. Patricia Chardón-Maldonado (CARICOOS))

1.2e - Engaging in community planning for climate adaptation

To continue with the commitment to enable community participatory planning processes, a partnership with the Foundation for Puerto Rico was established to work closely with 17 entities, such as non-governmental organizations and government agencies, to impact 79 communities with their Whole Community Resilience Planning Program (WCRP). The efforts allow the identification of strategic approaches that address the special requirements of these communities and thus make them stronger against future climate challenges. This partnership demonstrates the CCAN's commitment to sustainable development and community empowerment in the face of evolving climate risks.



1.2f – UVI Community engagement in St. Croix, St. John & St. Thomas

From the CCAN team at the University of the Virgin Islands, their community engagement specialist, Janet Turnbull-Krigger, has led the effort to identify and engage different audiences by attending community events, learning about climate-related events that impact the community, listening or reading what community members say about climate changes and impacts through news outlets, social media, legislative sessions, talk shows, research, etc.



A specific example was an interview with the St. Croix Community Foundation president, Deanna James. This foundation supported the testing of neighboring communities after the accidental and illegal release of highly hazardous hydrocarbon-based aerosols by the Limetree Oil refinery that contaminated land and water resources across communities on the south coast of St. Croix. She will be sharing their data with the team when it is available.

1.2g - Duke Engage: Climate Change, health and resilience for food security and agrotourism students exchange program



From January 11-14, 2024 Kay Jowers and Ashley Ward visited Puerto Rico for a site visit in anticipation of the Duke Engage Exchange Program. This program will bring students from Duke during the period of mid-May through mid-July 2024. Students will and have been collaborating with COSSAO, an initiative to boost the local economy by strengthening food security and resilience to climate change. Students will work with COSSAO and 14 of its most active member farmers in rural Utuado, Puerto Rico.

These farmers are facing significant challenges to the local agricultural sector, particularly in the face of climate change and increasing centralization of the food distribution economy that undermines local agricultural production. In response, the organization engages member farmers for agroecological activities that support agritourism in the region through programs for hospitality, health, and agriculture. Students will also have an opportunity to engage with students and faculty from the University of Puerto Rico and federal agencies working on climate change in the region.

One of the main activities planned is a “Hackathon” on June 21, 2024 where these students, in collaboration with community representatives and students from the University of Puerto Rico, Medical Sciences Campus, will exchange ideas and propose innovative approaches to tackle problems and issues across the communities of the area.

1.2h – Capacity building workshop: 1st US Caribbean Heat Summit

The [1st US Caribbean Extreme Heat Summit](#) was held at the Medical Sciences Campus of the University of Puerto Rico on February, 27-28, 2024. The event was co-sponsored by the Caribbean Climate Adaptation Network A NOAA CAP/RISA Team and by the National Science Foundation (thanks to Dr. Zheng O’Neill and Dr. Jorge E. González). During the opening remarks the participants had the opportunity to hear from the U.S. Department of Commerce Deputy Secretary, [Don Graves](#), who emphasized on the importance of the NOAA CAP/RISA program and the important of addressing extreme heat in the U.S. Caribbean region. The Summit had **27 panelists/lecturers** from diverse disciplines (education, energy, cancer, public health, agriculture, marine and coastal ecosystems, urban planning, sociology, emergency management, recreation and sports, engineers, architects, among others). A total of **26 institutions** (federal and state agencies, municipalities, academies, and non-profit organizations) discussed Heat Impacts in all Socio-ecological Systems and made a “Call to Action” in Puerto Rico and the Virgin Islands to accelerate Adaptation and Mitigation strategies in the face of Extreme Heat. The event attracted **over 200 in-person attendees and reached more than 2,500 people** via [Facebook Live](#) connection, thanks to Eco-exploratorio: Science Museum of Puerto Rico.



Following the human-centered design approach, compelling ideas and actionable suggestions were developed to address extreme heat. The summit's recommendations were compiled into a preliminary report shared with the Department of Education of Puerto Rico (DEPR) to help develop protocols for improved response to extreme heat episodes in all island schools. This was one of several dialogues that occurred between the CCAN and the DEPR that have resulted in a workshop for region leads and top administrative staff on April 10, 2024, to have an exchange to coproduce actions to be taken and also the CCAN is currently co-organizing an Extreme Heat Summit where every public school principal, private school representants and government representants will participate (1,200 participants) learning and sharing their experiences on how to prepare and respond during an extreme heat episode.

All this information will result in the forementioned protocols that will be developed. The Eco-exploratorio: Science Museum of Puerto Rico and the Puerto Rico Public Health Trust and its CDC CAP Brace project collaborated in these initiatives. Both have generously provided resources (personnel, educational materials, etc.) to advance heat-related initiatives impacting different sectors on the island.

1.2i - Sustainable Development Goals and regional knowledge exchange



The Sustainable Development Goals (SDGs) set by the United Nations urge global efforts toward environmental, social, and economic priorities. CCAN, with help from the Local2030 Island Network, has developed a homegrown strategy aligned with the SDGs, allowing for tailored adoption of the global agenda at a local level in collaboration with the partners. With the help of graduate student Juan E. Florez from the University of Puerto Rico Mayaguez Campus, the development of the CCAN's SDG's Dashboard will serve as an accessible online tool for monitoring progress, ensuring accountability, and promoting transparency regarding Puerto Rico's sustainability objectives. This platform resulted from a collaborative effort involving a wide range of stakeholders from the island's public, private, and community sectors. This partnership identified and agreed upon key statewide indicators to be tracked through the Dashboard.

On April 23-25, 2024 the CCAN was invited to be part of the Second Annual Gathering of the Local2030 Islands Network's Community of Practice in Honolulu, Hawaii. The project coordinator, Manuel Heredia Morales, represented the network in the Data for Climate Resilience CoP, in which he had the opportunity to present the CCAN's initiatives in the Data Collection panel, also reinforcing the efforts to be a central point of knowledge exchange in the Caribbean region. It also strengthens the CCAN commitment to learn and share initiatives with our neighboring island nations in the region.



1.2j - Educating and empowering to fight climate change

WPI's Post-Doctoral Fellow, Dr. Sarah Molinari, collaborated with various community-based organizations in Puerto Rico to understand local perspectives and needs regarding climate adaptation. They partnered with The Foundation for Puerto Rico and other key stakeholders to align research efforts with community priorities. WPI received funding from NOAA-BIL to extend research work and engage with universities and organizations in the USVI, leading to collaborations with Dr. Sarah Strauss and Dr. Seth Tuler, supervising master's students in Community Climate Adaptation.



(Upper right: WPI's Post Doctoral Fellow Dr. Sarah Molinari during the VCAPS session. Bottom left: WPI's Team during 1st CCAN Annual Meeting in Puerto Rico. Bottom right: Dr. Seth Tuler during VCAPS' session.)



These students initiated research in the US Virgin Islands (USVI) to enhance the CCAN network. The team also had a crucial role in the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) working session during the January workshop, where they implemented this exercise with a group of emergency managers, community leaders, and governmental representants to learn more about the planning processes in the island. Collaborations with the UVI led to students like Sol Giesso and Jonathan Chang being based there for the Spring 2024 term. The grant also facilitated hiring a community outreach coordinator at UVI, aiding students in making local connections and conducting

interviews to map actors and opinions on climate adaptation in the USVI. These efforts are crucial for aligning activities in Puerto Rico with new developments in the USVI.

(Upper left: WPI's former graduate student, Solange Uwera, who completed an MS in Community Climate Adaptation. Bottom Right: A group of WPI undergraduate students at the Puerto Rico Project Center.)



2. Research Highlights

2.1 Human-Centered Microclimate Modeling of Living and learning spaces in Extreme Heat

NYU (Dr. Masoud Ghandehari & Stephan Cortes) and UPR-MSU (Dr. Pablo Méndez-Lázaro & Laura T. Cabrera-Rivera) are implementing a two-phase temperature monitoring system using different types of devices and methodologies. The main objective of this project is to model temperatures in two school environments in Puerto Rico during 2024: the University of Puerto Rico High School located in Rio Piedras, Puerto Rico, and the Julián Blanco Specialized Ballet School located in Santurce, Puerto Rico. This monitoring will help map the hottest areas on school grounds to address the areas with the greatest need for heat mitigation. Simultaneously,



educational programs will be developed involving students in learning about environmental detection and modeling, promoting an interactive and safe learning environment.



2.2 Perception of Extreme Heat in Educational Institutions: Impacts and Adaptations

Puerto Rico and the U.S. Virgin Islands have common warm temperatures, and as a result, people often do not perceive excessive heat as a danger. Temperatures are rapidly increasing worldwide and in the Caribbean region due to human-induced climate change. Heat and humidity are reaching dangerous levels, suggesting that local populations are likely experiencing more heat stress and danger than they are accustomed to. In this context, it is crucial to understand how extreme heat impacts the educational environments, places where the community spends a significant portion of its time. The institutions participating in the study are the University of Puerto Rico, Medical Sciences Campus (UPR-RCM), the University of Albany, the University of the Virgin Islands, and the University of South Florida.



The study objectives were: 1) To analyze and understand the perceptions, vulnerabilities, and experiences of employees on school premises regarding extreme heat, as well as the associated risks and barriers; and 2) To identify potential solutions and adaptations to face these conditions in the educational environment. This study aimed to understand the perceptions and experiences of employees in these institutions and to seek solutions to better adapt to this new climatic reality.

This survey received 1,257 responses from people working in public and private schools in Puerto Rico. Important data was gathered from these responses, for example: 98.4% of the people perceived that 2023 was considerably hotter than previous years, or that only 38.2% had A/C in their working spaces (only a third of these were currently functional). This information was shared with the Puerto Rico Department of Education during the multiple meetings in the last months so the team can co-produce adaptive measures in the island's learning environments.

On May 2nd & 3rd, 2024, this research was presented by doctoral student Laura T. Cabrera Rivera, during the poster session of the 6th Puerto Rican Conference of Public Health. It is also currently accepted for an oral presentation at the American Public Health Association (APHA) Annual Meeting and Expo on October 27-30, 2024, in Minneapolis, Minnesota.

3. Outreach

3.1 Conferences, webinars, workshops



November 2023: The team at WPI organized a Global School Forum at their campus focusing on Caribbean Climate Adaptation, which included Dr. Mimi Sheller and three invited speakers from Jamaica with expertise on climate adaptation, climate vulnerability, and climate loss and damages, who were also part of an application together for an NSF Global Centers grant (not funded, but very productive collaboration). This panel was a Keynote Panel for the New England Council for Latin American Studies annual conference and attracted a wide audience. It was also recorded and made available online.

The team from University of Texas at Austin lead by Co-PI Dr. Carlos Ramos-Scharron were involved in a series of engagement activities that included: 5 presentations regarding land erosion, sediment mobilization in wet tropical settings, ArcGIS tool for runoff and erosion, bathymetric surveys on lakes (Lake Loco & Lucchetti), and sediment yields. These were given in various events for: FEMA, Department of Natural and Environmental Resources, Collaborative Center for Landslide Geohazards, Georgia Tech, National Fish and Wildlife Foundation, Puerto Rico Power Authority, and the International Association of Geomorphologists. Dr. Ramos Scharron was additionally interviewed by Telemundo Puerto Rico for a special program on 2023 Hurricane Season in Puerto Rico.



The team from UPR Mayaguez Campus lead by Co-PI Dr. Stephen Hughes and Dr. Eric Harmsen were involved in a series of engagement activities that included: 3 written press articles ("East Coast landslide impacts from Puerto Rico to Vermont and in between" by the Geological Society of America; "Rising heat and extreme weather Puerto Rico's struggle amidst its hottest summer" by Pasquines News; "Vulnerables a derrumbes sobre un millón de personas" by El Nuevo Día), several meeting with key stakeholders and organizations (Utua Municipal Recovery Planning Program, USGS Landslide Hazards Program, National Weather Service San Juan Office, USGS Geological Hazards Science Center, University Consortium for Academic Research, Community of Corcovada, National Public Lands Day, BIOGEMON International Symposium), the installation of 3 new monitoring stations (UPR Mayaguez Campus, Barrio Corcovada in the municipality of Añasco, in the municipality of Yabucoa), over 12 presentations at various events (UPR Mayaguez Campus, Puerto Rico Drought Committee, Hemispheric Cooperation Center, Remote Sensing and Geographic Information Systems, US Army Corps of Engineers Research and Development Center, Eco-Exploratorio Science Museum of Puerto Rico, Seismological Society of America Conference, FEMA Community Assistance Recovery Support Function, FEMA Higher-Ed Roundtable, University of New York Albany, Eco-Exploratorio EXPO Planeta Digital 2023), 2 television interviews (WAPA-TV news, Repaso Noticioso Podcast), lastly Dr. Hughes was accepted as a member of the organization Land Aware which is the international network of Landslide Early Warning Systems.

PI Chardón-Maldonado from CARICOOS, has had the opportunity to participate in several activities talking about climate change and its impacts and promoting interest in learning how to read and interpret weather patterns using existing data products/tools. Chardón-Maldonado envisions coordinating with the CCAN network more educational activities for the community, visitors, and students to learn about other topics/hazards and be more well-informed to cope, prepare, and prevent other climate-related extreme impacts. Published articles and reports on topics such as climate resiliency, environmental justice, and infrastructure reconstruction. Engaged with media outlets and policymakers to disseminate research findings and advocate for evidence-based decision-making. Organized workshops, seminars, and conferences to share knowledge and foster collaboration among stakeholders. In July 2023, the team published an article in Nature Energy focusing on climate resiliency and environmental justice, using Puerto Rico's post-hurricane Maria reconstruction as a primary case study. The article highlighted the significance of incorporating socio-economic factors as fundamental variables in infrastructure reconstruction. This publication sparked a broader conversation, leading to the publication of several Op-Ed pieces. Additionally, one of the Op-Eds was published in El Nuevo Dia, Puerto Rico's largest newspaper, further disseminating the importance of considering socio-economic aspects in climate resilience and infrastructure development.



Other presentations around the network include:

Name	Date	Key Participants/Institutions
1. Heat waves and its effects, Eco-exploratorio Science Museum of Puerto Rico (Link)	June 10, 2023	Dr. Pablo A. Mendez-Lazaro, UPR-MSC*
2. Climate Change and the Effects on the Public Health of Agricultural Workers in Puerto Rico, USDA	June 12, 2023	Dr. Pablo A. Mendez-Lazaro, UPR-MSC*, Lilliam Ramirez, Sea Grant Puerto Rico
3. Co-Designing Equitable Adaptive Capacities in the Virgin Islands and Puerto Rico, Eco-exploratorio Science Museum of Puerto Rico	September 19, 2023	Dr. Pablo A. Mendez-Lazaro, UPR-MSC*
4. Building Resilience capacity and climate adaptation in the US Caribbean, Southeastern Coastal Center for Agricultural Health and Safety (Link)	October 25, 2023	Dr. Pablo A. Mendez-Lazaro, UPR-MSC*
5. Facing Climate Crisis in the US Caribbean: Building Equitable Adaptation, Environmental and Global Health Seminar Series, College of Public Health & Health Professions, University of Florida	November 15, 2023	Dr. Pablo A. Mendez-Lazaro, UPR-MSC*

* University of Puerto Rico, Medical Sciences Campus

3.2 CCAN's Official Webpage Launch (ccan-upr.org)

The CCAN are incredibly excited to announce that the CCAN official webpage was launched last April 8, 2024! It is a newly developed platform meant to be a knowledge space for the communities to receive official information about climate risks, current initiatives, and partners committed to an equitable capacity-building process in Puerto Rico and the US Virgin Islands. This way, the information will be available to everyone in Spanish and English. This website is a critically important tool to keep people up to date and involved with efforts around climate adaptation and resilience. Please browse the site and join us in making a difference!

3.3 News and Media Coverage

Name	Date	Key Participants/Institutions
1. Puerto Rico is close to reaching a new record for the most intense and prolonged heat event. El Nuevo Día (Link)	June 9, 2023	Dr. Pablo A. Mendez-Lazaro, University of Rico-Medical Sciences Campus
2. The extreme heat affecting Puerto Rico impacts the mental health of its citizens, El Nuevo Día (Link)	June 16, 2023	Dr. Pablo A. Mendez-Lazaro, University of Rico-Medical Sciences Campus
3. Effect of heat and climate change in geological processes in Puerto Rico, Pasquines News (Link)	August, 2, 2023	Dr. Stephen Hughes, University of Rico-Mayaguez Campus
4. A Just Reconstruction for Puerto Rico, El Nuevo Día (Link)	August 7, 2023	Dr. Jorge E. González Cruz, University of Albany
5. SLIDES-PR project, objectives and efforts, Repaso Noticioso (Link)	August 28, 2023	Anishka Ruiz, Graduate Student, Tania Figueroa, Graduate Student, University of Puerto Rico, Mayagüez Campus

4. Challenges

4.1 - Research

- Landsat has a 16-day revisit time, providing 2 images per month, insufficient for monthly averages over Puerto Rico. Seasonal (June-October) LST products were estimated due to limited monthly data. Extending Landsat LST analysis to the US Virgin Islands was not possible due to poor ASTER GED data coverage. ASTER GED data is necessary for generating Landsat LST products; missing ASTER data results in missing LST values. There is a significant challenge due to the lack of long-term, high-temporal resolution rainfall data for Puerto Rico and the US Virgin Islands.
- NEXRAD data, with superior spatial and temporal resolution, was planned to address this rainfall data issue. NEXRAD data needed to be downloaded, preprocessed, and analyzed for accurate hydrologic models. Puerto Rico and the US Virgin Islands lack updated Depth-Duration Frequency (DDF) curves. The project plans to use radar data to create gridded DDF curves for these regions. Scarcity of flood depth and spatial flood event reporting data poses a challenge for accurate flood risk modeling.
- The team is exploring alternative data sources and methodologies to compensate for the lack of direct flood depth information.

4.2 - Community engagement

- Coordination between WPI and the Foundation for Puerto Rico is progressing slower than expected but is now improving.
- In the US Virgin Islands, community engagement and stakeholder identification are still in the early stages. The dynamic social and political context poses ongoing challenges for executing project plans as expected. Adaptability and intensive relationship work are required to align project plans with partner needs and concerns. Despite challenges, new partnerships and closer relationships with existing community networks are establishing a trusting foundation for successful coproduction during the CCAN period and beyond.

4.3 - Personnel

- Visa-related issues for an Iranian doctoral student have delayed modeling work on landslides and floods. The student might join UT-Austin in Fall 2024 if the visa issue is resolved by then.
- The UPRM team relies heavily on graduate and undergraduate student work; dedicated staff would be beneficial.
- CARICOOS has funds available to contract a social science research coordinator. Co-PI Chardón-Maldonado discussed the situation with Lead PI Dr. Pablo Méndez-Lázaro. The preliminary plan is to post a job announcement during the next project performance period or allocate funds to support project-aligned initiatives.
- Difficulty in recruiting a network evaluator has been encountered. Possible candidates are being considered, with input from Dr. Sussane Moser.

5. Next Steps

5.1 - Research

The team at CCNY/CUNY will work in the development of initial design rainfall through Depth-Duration Frequency Curves Analysis: This initiative will involve conducting a comprehensive literature review and acquiring technical proficiency in analyzing DDF curves to derive initial design rainfall values. An initial flooding GSSHA model will be created for a specific watershed. Pursue alternative data sources and methodologies to compensate for the absence of direct flood depth measurements (such as NOAA severe storm laboratory or Synthetic Aperture Radar (SAR))

The team led by Dr. Stephen Hughes at UPRM will develop the initial Landslide Ready certification with the municipality of Utuado. The Landslide Forecast System prototype will be made publicly available. For Dr. Eric Harmsen, they'll finalize the WEB model for St. Croix with updated land cover data. This will improve the model's various land parameters (e.g., runoff curve number, rooting depth, albedo, etc.). They will incorporate additional drought indices into the WEB models.

The partners at the University of Albany, led by Dr. Jorge E. Gonzalez-Cruz plan to continue their research in regional climate projections for the Caribbean using statistical and dynamic downscaling methods in close collaboration with NCAR. They plan to continue the development of climate resiliency tools for the energy infrastructure of the US Caribbean, and the deployment of concrete solutions. They also plan to create ground sensors networks in the Islands to ground truth the climate records. Specific actions are undergoing for a deployment in the island of St. Thomas. Finally, they'll work on publishing about the above topics and further engage communities in the process for their input.

5.2 - 1st CCAN Meeting in the US Virgin Islands

The University of the Virgin Islands will be hosting the CCAN 2024 Annual Meeting in St. Thomas. Currently, the CCAN is in the process of identifying and building trust/relationships with key stakeholders in these islands and identifying data gaps and needs for informing the communities and fellow researchers on the landscape of climate adaptation in the area.

5.3 - Community engagement

Dr. Tischa Muñoz-Erickson from the International Institute of Tropical Forestry at USDA (IITF) is working on analyzing and presenting results about the collaboration and knowledge networks of state government agencies that participated in the January workshop. Also, the Network Survey will be implemented with CCAN research members to capture the formation and expansion of the knowledge-action network over time. Finally, she will continue collaborating with the Alianza por la Cuenca del Río Piedras with facilitation and capacity-building to communities in the Río Piedras on climate change science and adaptation strategies.

The team at CARICOOS will continue with community and stakeholder engagement and will need assessment efforts to further the NOAA CAP/RISA initiatives. They participate in community outreach and engagement activities throughout the US Caribbean region. They also promote community engagement translational research focused on adaptation to the impacts of forecasted climate change. They also collaborated with the CCAN team in drafting several scientific publications and notes highlighting findings, action plans, and suggestions to address climate change adaptation gaps and challenges.

6. Impact

6.1 – Evaluation

At the moment, the CCAN have yet to be able to recruit someone to lead the evaluation of the network. However, a meeting with Dr. Susanne Moser was conducted. She provided valuable input on potential candidates for the position. These candidates have experience working with NOAA CA/RISA teams in the past, ensuring they possess the relevant expertise. A meeting with these candidates will be coordinated soon to select the most appropriate individual for this important role. Even so, the Governance and Decision-Making Working Group led by Dr. Tischa Muñoz-Erickson has developed an instrument to evaluate the network and how it expands over time. This survey is going through a last round of reviews by the CCAN team before submitting it to the local IRB for approval, and the expectation is to start doing interviews in late July or early August 2024.

6.2 - Evidence of social impact

As the CCAN moves from the second year into the start of the third year, it has solidified its ties with local stakeholders and agencies. The collaboration with the Department of Education of Puerto Rico and the Bureau of Emergency Management and Disaster Administration has proven vital for implementing adaptive capacities in Puerto Rico and to further the dialogue of key stakeholders about new collaborations to impact all sectors with special attention to the Sustainable Development Goals. The CCAN is at the forefront of the co-development of protocols, recommendations, and educational information for underserved communities. The CCAN is working closely with these communities to help them in the process of advocating for their needs and to be part of the planning and implementation of any project that might have any impact on the environment or their capacity to mitigate, adapt, or prepare for future weather extreme events or climate change in general.

6.3 – Publications

Ramos-Scharrón, C.E., *MacLaughlin, P., Figueroa-Sánchez, Y. (2024). Empirically-based road runoff and erosion models for the island of Culebra, Puerto Rico. *Journal of Soils and Sediments*. <https://doi.org/10.1007/s11368-024-03749-2>

Ramos-Scharrón, C.E., (2023). On the hydro-geomorphology of steep land coffee farming: runoff and surface erosion. *Agricultural Water Management* 289: 108568. <https://doi.org/10.1016/j.agwat.2023.108568>

Russell, F., Ramos-Scharrón, C.E. (2023). A call for collective organizing in Puerto Rico's coffee-growing communities. [INVITED] *NACLA Report on the Americas* 55(3): 312-318, Special Issue: Afterlives of Empire. <https://doi.org/10.1080/10714839.2023.2247770>

Ramos-Scharrón, C.E., Hernández-Ayala, J.J., Arima, E.Y., *Russell, F. (2023). Preliminary analyses of the hydro-meteorological characteristics of Hurricane Fiona in Puerto Rico. *Hydrology* 10(2): 40; <https://doi.org/10.3390/hydrology10020040>

Méndez-Lazaro, P.A., P. Chardón-Maldonado, L. Carrubba, N. Álvarez-Berríos, M. Barreto, J.H. Bowden, W.I. Crespo-Acevedo, E.L. Diaz, L.S. Gardner, G. Gonzalez, G. Guannel, Z. Guido, E.W. Harmsen, A.J. Leinberger, K. McGinley, P.A. Méndez-Lazaro, A.P. Ortiz, R.S. Pulwarty, L.E. Ragster, I.C. Rivera-Collazo, R. Santiago, C. Santos-Burgoa, and I.M. Vila-Biaggi, 2023: Ch. 23. US Caribbean. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023.CH23>

Ortiz, Ana & Hospedales, James & Méndez-Lázaro, Pablo & Hamilton, William & Rolle, LaShae & Shepherd, Marshall & Espinel, Zelde & Gay, Hiram & Nogueira, Leticia & Shultz, James. (2024). Protecting Caribbean patients diagnosed with cancer from compounding disasters. *The Lancet Oncology*. 25. e217-e224. [https://doi.org/10.1016/S1470-2045\(24\)00071-8](https://doi.org/10.1016/S1470-2045(24)00071-8)

Cabrera-Rivera, L. T, González-Cruz, J., Reyes, J., Martinez, G., Ruiz, V., Heredia Morales, M., Méndez-Lázaro, P. Understanding Extreme Heat Risks and Vulnerabilities in Puerto Rico's Learning Environments. Poster presentation at the Puerto Rican Conference of Public Health, 2024, San Juan, PR.

Cabrera-Rivera, L. T., Méndez-Lázaro, P., De la Flor, A.J., Vangas-Medina, A., Rey A. K., Díaz, J. M., Shandas, V. Intra-Urban Variation of Heat in the Urban Heat Island of San Juan, Puerto Rico. Poster presentation at the Central and Eastern European Conference on Health and the Environment (CEECH), 2024, Thessaloniki, Greece

Cabrera-Rivera, L. T., González-Cruz, J., Reyes, J., Martinez, G., Ruiz, V., Heredia Morales, M., Méndez-Lázaro, P. *Understanding Extreme Heat Risks and Vulnerabilities in Puerto Rico's Learning Environments*. Oral presentation at the American Public Health Association (APHA), 2024, Minneapolis, US.

West, J., Rodriguez-Cruz, L. A., & Hughes, K. S. (2023). Steep Risks: Assessing Social Vulnerability to Landslides in Rural Puerto Rico. *Natural Hazards Center Public Health Report Series*, 34. University of Colorado Boulder. <https://hazards.colorado.edu/public-health-disaster-research/steep-risks>.

Montoya-Rincón, J.P., Mejia-Manrique, S.A., Azad, S., Ghandehari, Masoud, Harmsen, Eric W., Khanbilvardi, Reza, and Gonzalez-Cruz, Jorge E. (2023). A socio-technical approach for the assessment of critical infrastructure system vulnerability in extreme weather events. *Nature Energy* (2023). <https://doi.org/10.1038/s41560-023-01315-7>.