



# Coastal Resiliency Institute & Marine Science Center NJEDA FINAL REPORT

August 2019

*Atlantic City*



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## FINAL REPORT

In July 2018, the New Jersey Economic Development Authority (NJEDA) issued a Request for Qualifications/Proposals (RFQ/P) to New Jersey municipal and county governments for the award of Innovation Challenge grants. Each award of up to \$100,000 was intended to:

- Catalyze planning and key investments within a city and region to augment their innovation ecosystem;
- Inform the NJEDA's own plans for economic development activities and programs; and
- Foster collaboration with the NJEDA and other local governmental entities to promote innovation across the State.

In response, the City of Atlantic City applied to fund a feasibility study for a Coastal Resiliency Institute and Marine Science Center (herein referred to as the Coastal Resiliency Institute) to be built under the auspices of Stockton University. As required by the grant application, grantees held discussions with several partners to gauge potential interest and encourage participation in the project. These included:

### **a) Federal, State and Local Offices:**

- United States Army Corps of Engineers (USACE)
- New Jersey Department of Environmental Protection (NJDEP)
- New Jersey Casino Reinvestment Development Authority (CRDA)
- South Jersey Economic Development District (SJEDD)
- Atlantic County Economic Alliance (ACEA)
- Atlantic City Special Projects Office

### **b) Institutions of Higher Education:**

- Rutgers University, Department of Marine and Coastal Sciences
- Stevens University of Technology, Davidson Laboratory
- Monmouth University, Urban Coast Institute

### **c) Non-Profit and For-Profit Partners:**

- New Jersey Sea Grant Consortium
- New Jersey Audubon Society
- New Jersey League of Conservation Voters
- The Jersey Shore Partnership
- Build Strong Coalition
- Jacques Cousteau National Estuarine Research Reserve
- Mott MacDonald Engineering
- Ørsted Wind
- Atlantic Shore Offshore Wind, LLC – EDF Renewables North America/Shell New Energies
- DCO Energy

All participants share a common goal, to strengthen coastal resilience in south Jersey, and serve as a model for such work on a national level. This has immediate practical applications, such as the design, maintenance and restoration for buildings and infrastructure in our region able to absorb or avoid damage without suffering complete failure. It also has more systemic and preventative connotations. A resilient structure/system/community should not only be able to resist an extreme event with minimal damage and functionality disruption, but also rapidly recovery its functionality similar to—or even better than—its pre-event level.

Consequently, resilience is multi-faceted, covering four dimensions: technical, organization, social and economic.

This work is especially relevant in New Jersey where, since 2005, almost \$4.5 billion in property value has been lost because of flooding related to sea-level rise. But it also is a necessarily-growing national concern. Severe hurricanes cost the United States \$300 billion in 2017 alone, and that price tag is only expected to rise. The economic losses caused by natural disasters have increased significantly from an average of about \$50 billion a year in the 1980s.

It is estimated that average global flood losses will increase nine-fold by 2050, from \$6 billion per year in 2005 to \$52 billion a year. This forecast only considers socioeconomic factors, such as growing population and property values. Add in the risks from sea-level rise and global flood damage for large coastal cities could cost \$1 trillion a year if cities do not take steps to adapt.

Considerable research and development are already underway to identify and develop a vast array of legislative, regulatory, policy, planning, institutional, financial, and capacity-building instruments. Moreover, there is growing public awareness about the need to strengthen disaster resilience as a critical component of efforts to achieve sustainable socioeconomic development and poverty reduction. Perhaps most importantly for New Jersey, offshore wind is being pursued as a viable alternative power source for the first time in the U.S.

The global need for scientific research to inform sound policy decisions to resolve coastal issues is self-evident and urgent. Such solutions can promote much-needed economic diversity and development in the Atlantic City region, which is a statewide and regional public policy priority. In addition, federal officials are considering prioritizing funding for resiliency based on the aggressiveness of the region to address future natural disasters – the Coastal Resiliency Institute would certainly help to advance the State's efforts to secure federal funds.

The proposed Coastal Resiliency Institute will also offer a focal point for scientific research and needed policy debates, as well as continue to diversify the region by providing an economic driver that provides higher-paying jobs, educational opportunities, and innovative branding. Work is proposed in two phases.

### **Phase 1: Establish a Coastal Resilience Incubator**

- Create a Coastal Resilience Incubator on or adjacent to the Stockton University campus in Atlantic City, using existing meeting and work space to bring together public and private sector leaders to develop resiliency solutions.
- Stockton University, the City of Atlantic City and other partners will continue to pursue funding and implement demonstration projects that showcase the latest resiliency and climate change measures.
- Collaborate on model projects in Atlantic City, such as the innovative design of the Inlet boardwalk and seawall, protection of bayside neighborhoods, offshore wind and microgrid projects.

### **Phase 2: Secure funding for a Permanent Home for the Coastal Resiliency Institute and Marine Science Center**

- Construct the Coastal Resiliency Institute and Marine Science Center in Atlantic City.
- Engage Meet AC to attract conferences, and trainings focused on coastal resilience.

- Recruit other university coastal research programs and private sector partners to create satellite programs and incubators in Atlantic City.

## 1.1 Why Atlantic City?

Atlantic City is located in the center of the coastal zone of New Jersey, which has 126 miles of shoreline. It accounts for much of Atlantic County's \$7 billion in annual tourism sales, and is visited by more than 25 million people annually. Other coastal counties also generate significant tourism revenues: Cape May County (\$6.3 B), Ocean County (\$4.8 B) and Monmouth County (\$2.5 B). Combined, the Jersey Coast hosts a large portion of the State's 87.5 million annual visitors and is home to nearly 7-million-year-round residents. Coastal resiliency is imperative to protect and grow this a major contributor to the State's economy, responsible for \$38 billion in tourism dollars annually as well as a thriving billion-dollar commercial and recreational fishing industry.

Atlantic City is one of the few completely urbanized barrier islands in the region, making it both a vulnerable and an ideal location for a laboratory focused on resiliency and sea level rise research and development. It is proximate to ocean/marine life, and boasts strong medical facilities and low real estate costs. Better still, the City has already launched an ambitious plan with initiatives in green infrastructure to provide economic opportunities. Mayor Frank Gilliam is one of 222 mayors across the country to support the Mayors for 100% Clean Energy initiative.

Other potential research partners have recognized the unique location of Atlantic City for climate change, resiliency, marine science and related studies. The New Jersey Institute of Technology (NJIT), Princeton University, Rutgers University, Columbia University, the University of Pennsylvania, the National Fish and Wildlife Foundation, the U.S. Economic Development Administration (USEDA), the US Army Corps of Engineers, the U.S. Environmental Protection Agency, the Federal Emergency Management Agency, the New Jersey Economic Development Authority (NJEDA), the New Jersey Board of Public Utilities (NJBPU), the N.J. Department of Community Affairs, the New Jersey Department of Transportation (NJDOT), the New Jersey Department of Environmental Protection (NJDEP), and The Rockefeller Foundation have all invested in resiliency research and development in Atlantic City.



Moreover, the Coastal Resiliency Institute concept has a long history dating back to 2012, following the impact of Superstorm Sandy, and many steps have been taken to make it a reality, including: national media coverage, inclusion in the Angelou Economics report, the introduction of State legislation to support the project, the planning and development of the Stockton University Atlantic City Campus and the adoption of the University District.

### Atlantic City Resilience Concepts Timeline:

November 2012	Atlantic City was the first community in New Jersey to publish a Resilience Plan to address the aftereffects of Superstorm Sandy.
July 2014	The Rockefeller Foundation was the lead supporter for Structures of Coastal Resilience which focused on Atlantic City. Participates included Princeton University, Harvard University, City College of New York and University of Pennsylvania.
July 2015	Fast Company published the article "Could Atlantic City Become an Innovation Hub for Climate Change and Resiliency."
July 2015	Architecture Lab and Curbed published the article "Big Tech on the Boardwalk: How Resiliency Could Redefine Atlantic City."
July 2015	CityLab published the article "Why Atlantic City Should Trade in Its Casinos for Research Institutes."
August 2015	Green Biz published the article "Shuffling the Deck: A Resiliency Plan for Atlantic City."
September 2015	AngelouEconomics published the <i>Atlantic County Economic Development Strategy and Action Plan</i> which stated that "One of the most exciting opportunities open to Atlantic County is the possibility of establishing a major center there for climate change research."
March 2016	City of Atlantic City issued a white paper entitled "Resilience as an Economic Driver in Atlantic City."
March 2016	Two meetings were held at Stockton University to discuss the potential of establishing Coastal Resiliency Institute in Atlantic City. Representatives from the State, regional, County, City, Stockton University, DEVCO, Army Corps, and other organizations attended.
April 2016	The State of New Jersey designed Stockton University as an Anchor Institution to recognize Stockton's impact on Atlantic City and the surrounding region, as well as its potential to contribute to, and help stabilize the local economy.
January 2017	City of Atlantic City issued a white paper entitled "Funding for the Coastal Resiliency Center."
April 2017	Stockton University breaks ground for the Atlantic City Campus.
May 2017	Legislation is introduced to determine the feasibility of creating New Jersey Marine Science Institute in the Atlantic County-Cape May County Region.
November 2017	Stockton University's Capital Budget Request to the State of New Jersey lists the Center for Marine and Environmental Studies as its top priority.

January 2018	Legislation is reintroduced by Senators Brown and Van Drew to determine the feasibility of creating New Jersey Marine Science Institute in the Atlantic County-Cape May County Region.
June 17, 2018	Governor Murphy Announces Adoption of Rules Returning New Jersey to Regional Greenhouse Gas Initiative
July 2018	Senator Brown's Economic Revitalization Advisory Committee recommends that action be taken to "...determine the feasibility of creating New Jersey Marine Science Institute in the Atlantic County-Cape May County region. The task force could ultimately assist in establishing Stockton's Coastal Resiliency Institute."
July 18, 2018	Atlantic City's City Council approved the designation of a University District surrounding the Stockton University Campus and including the Bader Field site.
August 2018	Stockton University's campus in Atlantic City is completed.
September 2018	Governor Murphy announces that Atlantic City has been awarded Innovation Challenge funding for the Coastal Resiliency Institute.
October 2018	Governor Murphy issued his economic development agenda which includes creating a Wind Innovation & New Development (WIND) Institute.
March 2019	Stockton University and Orsted Wind enter into a memorandum of understanding to further offshore wind development.
April 2019	Task force and stakeholders met to kick off the Coastal Resilience/NJEDA Innovation Challenge grant.

## 1.2 Why Stockton University?



There are several reasons why Stockton University is the appropriate place to locate the Coastal Resiliency Institute. Stockton's commitment to civic learning forms part of its mission statement: "Through research and community service, we actively seek to take advantage of and to improve the unique physical and human environment," and the institution believes that faculty and students have the capacity, and

responsibility, to study important contemporary issues, and contribute to the betterment of their communities. Because of its recent growth, and commitment to Atlantic City in particular, the state designated Stockton as an anchor institution in 2016.

Stockton is a state leader in environmental education, offering undergraduate degrees in Environmental Studies, Environmental Science, Geology, Marine Science and Sustainability Science, and graduate degrees in Environmental Science and Data Science and Strategic Analytics. The University also offers a robust continuing studies program that could contribute to job training and development in the resilience and offshore wind energy field. Stockton has campuses in Galloway, New Jersey with additional instructional sites in Atlantic City, Manahawkin, Hammonton and Woodbine and a Marine Field Station in Port Republic, NJ, and is prepared to leverage its Atlantic City location to provide shorefront access to training and support programs for the resilience and the offshore wind industry.

Stockton also offers a certificate in Energy that focuses on energy production, management and planning, and dual degrees in Chemistry/Physics /Mathematics and Engineering with partners Rutgers, NJIT and Rowan Universities, and graduate degrees in Environmental Science and Data Science and Analytics. Through its Office of Continuing Studies, the University provides programming for Workforce Development, Professional Development, and Public Safety and Security. Its pedagogical work is further broadened by its close works with many of the Community Colleges through articulation agreements.

**Sustainability and Energy Studies:** Stockton has a dedicated undergraduate degree program (BA/BS) in Sustainability, with defined professional concentrations in policy, sustainability management, agroecology, conservation, or Energy. Students pursuing the Energy concentration complete an interdisciplinary series of courses in sustainability, including a broad science curriculum, as well as courses in policy and law, economics, technology, and ecology. In addition, they complete a focused curriculum in energy studies that includes advanced courses in energy technology, energy management, planning, and a series of courses that provide applied training in building analysis, alternative energy applications and design, and applied energy technology.

**Marine Science:** Stockton offers degree programs (BA/BS) in Marine Science offering concentrations in Marine Biology, Oceanography and Education. Stockton maintains a Marine Field Station and marina at Nacote Creek in Port Republic which provides an unmatched opportunity to study New Jersey's coastal environment. The Field Station operates a fleet of vessels for that could support training in offshore wind operations, mapping offshore/hydrography, and environmental monitoring.

**Environmental Science:** Stockton offers degree programs (BA/BS) in Environmental Science (ENVL) as well as a Professional Science Masters (PSM) in Environmental Science. Students can concentrate in Environmental Quality, Planning and Geographic Information Systems (GIS), Wildlife and Hydrology and soils. Training in ENVL studies could support site planning, environmental monitoring and environmental impact studies.

**Geology:** Stockton offers degree programs (BA/BS) in Geological Science with strong emphasis with Marine Science in Marine geology. Training in GEOL sciences is crucial for shoreline protection studies, and could support siting considerations, monitoring and remote sensing of cable and infrastructure placement on the seafloor.

**Physics/Mathematics and Dual degree engineering:** Stockton offers degrees in Physics (BA/BS) and in partnership with Rutgers, Rowan and NJIT the option for a dual degree in engineering (mechanical, electrical, software, etc.). Studies in Physics and Engineering at Stockton could support basic science and offshore studies with a continuation at the partner of offshore wind energy technology engineering.



**Continuing Studies:** Stockton operates the largest workforce development program in Atlantic County, funded by more than \$1.5 million in grant monies, and serving nearly 1,000 clients last year. Workforce development and Certifications (HazMat, etc.) for specific necessary training needed in the industry can be developed through Stockton Continuing Studies.

**Stockton Coastal Research Center (CRC):** CRC originated in 1981 to assist local municipalities with coastal environmental issues related to recurring storm damage and shoreline retreat. Since then the CRC has been working on shoreline monitoring and assessment programs with the State of New Jersey and several municipalities in New Jersey. The CRC has also been a resource for geotechnical data working on numerous projects with Federal, State and municipal governments. With over 35 years of experience the CRC has grown into an exemplary organization known for coastal zone management. The CRC's continuing mission is to monitor and assess New Jersey's coastal zone resources. As a result of the work done by the CRC, Stockton recently received the American Association of State Colleges and Universities' Excellence and Innovation Award for Sustainability and Sustainable Development.

**William J. Hughes Center for Public Policy at Stockton University:** The Hughes Center serves as a catalyst for research on public policy and economic issues facing New Jersey and the Center is currently working on climate changes and its impacts on the region. The Center provides a forum for public discussion of policy issues to engage citizens and policy makers, frame policy issues in a manner that encourages broader civic engagement and strengthen the voice of Southern New Jersey in public debate. The Center also sponsors research projects designed to educate New Jersey residents and policy makers about our environmental resources, community development and citizen engagement. These projects incorporate the expertise of faculty leaders at Stockton University in collaboration with members of the Hughes Center to inspire broader citizen engagement and more effective participation in public policy matters. The Hughes Center welcomes opportunities to collaborate with organizations and individuals who lead similar initiatives or wish to engage in a partnership.

**Lloyd D. Levenson Institute on Gaming, Hospitality and Tourism (LIGHT) at Stockton University:** Light provides a forum for public policy discussions regarding the gaming, hospitality and tourism industries in New Jersey, which is the number one industry along the Jersey Shore and LIGHT will monitor the impacts of coastal resiliency on this important industry. LIGHT is supported in its efforts to provide the most recent, accurate and relevant information to community leaders and policy makers, by a team of skilled experts drawn from Stockton faculty and the broader community. Their contributions include the quarterly Atlantic City Tourism Performance Indicators report, a variety of studies focused on issues such as problem gambling among New Jersey's youth and the behaviors of Millennials in the consumer marketplace.

**Stockton Atlantic City Solutions Initiative (SACSI):** SACSI contributes to this mission by aligning academic resources and research with urban concerns. Stockton faculty have launched dozens of projects in Atlantic City and written extensively about its opportunities and challenges. SACSI harnesses this ongoing research to help inform policy development, provide expert testimony, support city initiatives, and implement community-wide research projects. Its work is guided by the Atlantic City Executive Council.

**Small Business Development Center (SBDC) at Stockton:** SBDC also provides training to start-ups and fosters new economic activity. It is part of a statewide network of Small Business Development Centers that help small businesses expand operations, manage growth or launch new ventures. The SBDC at Stockton helps small business owners in Atlantic, Cape May, & Cumberland Counties finance, market and manage their ventures at no cost.

### 1.3 Why a Wind Institute?

A key underpinning of Resilience is to foster carbon neutral practices and energy sources. An Institute focused on Wind Energy development would dovetail explicitly with the Coastal Resiliency Institute concept. The Wind Innovation & New Development (WIND) Institute has been proposed by Governor Murphy as a state clearinghouse for education, research, innovation and workforce training for the future of wind energy. This initiative could serve as the State's central location for research, development and knowledge-sharing related to the production, transmission and use of wind and other renewable energy solutions. The WIND Institute will consist of an advisory board made up of labor, developers and supply chain corporations that will provide feedback on the workforce needs of the offshore wind industry.

Stockton Atlantic City is uniquely positioned to be a nexus for training and industry support of offshore wind energy due to its central position to much of the currently leased areas for offshore wind development. Stockton also has a very strong Marine Science Program, a Marine Field Station, a fleet of vessels and survey instrumentation that could provide workforce development support to an offshore industry. In addition, the Atlantic County Utilities Authority (ACUA) hosts the only current wind farm (Jersey-Atlantic) in the New Jersey coastal zone at its wastewater treatment site in Atlantic City. The Jersey-Atlantic wind farm operates five, 380-foot turbines capable of producing a combined 7.5 megawatts of power.

Offshore wind presents the unique opportunity to create an entirely brand-new industry in the United States. Many of the 8,000 offshore wind turbine components can be manufactured here in the United States. Today, about two-thirds of the components in U.S. land-based wind turbines are manufactured domestically.

There are significant opportunities for U.S. manufacturers to play a similarly substantial role in the offshore wind supply chain. Local sourcing is preferred for towers, castings, forging services, nacelle covers and blades to reduce transportation costs, decrease currency risk, and increase just-in-time turbine availability, product quality and service. As turbines become larger, few suppliers are equipped to produce the unique components and the size makes the components expensive and difficult to transport. The offshore wind industry's development will open up new markets for local suppliers.

According to a 2011 study of the economic benefits of offshore wind commissioned by Atlantic Wind Connection, the employment and GDP impact can be immense. The study was conducted by IHS Global Insight, a leading global analytics firm. IHS analyzed the economic benefits of building 7,700Mw of offshore wind farms and the offshore transmission line along the Mid-Atlantic. They found that a Mid-Atlantic build-out can create approximately 310,000 job years of work (about 31,000 workers) in the US. There will be direct employment growth primarily in the construction of and operations/maintenance of the wind farms and transmission system, but that there will also be significant opportunities to develop the local manufacturing supply chain. Thus, a Mid-Atlantic build-out can create:

- 80,000+ job years from direct construction and manufacturing,
- 98,000+ job years from indirect employment at suppliers of equipment and services, and
- 130,000+ job years induced as wages flow through the economy.

All the additional economic activity would increase the GDP by \$33 billion and increase Federal, state and local taxes by \$7.5 billion.

The first offshore wind project in the State of New Jersey was awarded Ørsted's Ocean Wind proposed off the coast of Atlantic City. This 1,100 Mw wind farm is expected to power about 500,000 New Jersey homes and generate \$1.17 billion in economic benefits, in addition to creating an estimated 15,000 jobs over the project life. This is the first step towards reaching the state's goal of 3,500 Mw of offshore wind by 2030. Ørsted Ocean Wind has offices in Atlantic City and plans to develop its Operations and Maintenance Center in the City as well.

To facilitate the University's role in supporting renewable energy and expanding the sustainable economy, Stockton University's Coastal Resiliency Institute should host or work very closely with the Governor's proposed WIND Institute. This would include academic programs and research focusing on wind energy and engineering, providing a job training center for positions in the offshore wind field, and supporting the budding industry through co-ops, research, and technology commercialization.

## 1.4 Project Summary

The Coastal Resiliency Institute will be the home for educational, research and incubator facilities, with private and public sector partners including the New Jersey Department of Environmental Protection (NJDEP), the US Army Corps of Engineers (USACE), the Stockton Marine Science Center in Atlantic City, the William J. Hughes Center for Public Policy, the WIND Institute, a "Blue Economy" Coastal Research Incubator and private sector interests.

"Blue Economy" solutions to environmental problems use locally developed scientific solutions that combine environmental, financial and social benefits. Given the natural attributes of Atlantic City, these solutions could focus on offshore wind-energy and other renewable energy options, fisheries and aquaculture, marine science, shoreline protection, wetland restoration, living shorelines, emergency management, homeland security, health care and transportation on or around the water. This proposal provides an opportunity to attract, grow and expand a cluster of dynamic companies that are focused on resiliency.

The Stockton Marine Field Station and the Coastal Research Center currently makes use of a facility located at Nacote Creek, Port Republic, NJ, with access to the back-bay areas and Atlantic Ocean for research. The existing facility was originally constructed in the early 1900s and has significant deferred maintenance and improvements that must be attended to, including repairs for well and sewer systems, structure, health and safety and access for individuals with disabilities that preclude significant expansion. A facility located in Atlantic City would increase access for undergraduate students as well as create opportunities for the developing graduate research areas of the Marine Sciences, Coastal Zone Management, and other programs.

The Coastal Resiliency Institute will capitalize, catalyze, and add value to the growing infrastructure resilience and offshore wind energy industries. These industries will be directly investing billions of dollars into the State and regional economy in the short and mid-term. The Coastal Resiliency Institute will be positioned to connect the dots between industry, academia, non-profits, and government agencies to create an institution that is widely recognized, pertinent, and offers staying power to attract additional research and educational investment. In order to add relevance and credentials to the Institute, Stockton should prioritize the recruitment of faculty and students who are already established in the targeted fields of study.

The Coastal Resiliency Institute's standing would be enhanced by adding high-profile academics and students with a proven record of attracting competitive research funding and partnerships. Hosting collaborative research with other institutions and government entities, and hiring internationally recognized faculty who are leaders in their field, makes the University more competitive for attracting postdoctoral researchers and doctoral, graduate, and undergraduate students.

To set itself apart the Institute will require developing new talent, maintaining the school's and Coastal Research Center's existing offerings, and attracting outside talent who will bring funding and prestige to the school. Simultaneously, the University Foundation should begin building philanthropic relationships so that students and faculty in targeted fields of study can receive scholarships, endowed chairs, and other rewards to attract the most promising students and faculty.

Ideally, the facility will also include research vessels and equipment-support facilities, docks and ramps to access the inlets, Atlantic Ocean and back-bay areas, as required for vessels involved in research and testing performed by these entities.

The Coastal Resiliency Institute and collaborators can, among other things:

- Serve as a public outreach arm to disseminate and collect information for municipalities and the general public by providing web services portals, explanatory science and public policy information, user friendly material to link-in to State content.
- Operate a “think tank” on resiliency issues which may include national/international advisory board and appointed fellows from Universities and scientific centers who are in residence (physically or virtually) in which position papers on leading issues are commissioned and released.
- Serve to coordinate study resources that a set of MOUs so that federal and State scientists and collaborating partners can access vessels, equipment and other laboratory services.
- Provide a collaborative platform to launch large scale grant requests in partnership with the State to national programs.
- Provide a physical location for federal, State and University collaborators to interact and have access to shared services including meeting space, core laboratories and waterfront amenities.
- Poll and survey public opinion on climate change, resiliency and various actions planned to address these issues.
- Tract the economic impact of climate change and resiliency activities on the regional economy.
- Collaborate on local, regional, state and federal coastal engineering initiatives.
- Support shared services and stronger connections with the US Army Corps of Engineers, FEMA, HUD, NJDEP, New Jersey Sea Grant Consortium and State institutions of higher education.
- Encourage investment of provide industry, particularly resilient business development and “blue energy” enterprises.
- Provide outreach to and assistance for municipal governments struggling with climate change.

## ECONOMIC IMPACT ANALYSIS

Coastal resilience and offshore wind are two of the nation's biggest growth industries. These economic drivers will result in thousands of new jobs in research and development, planning and engineering, construction and operations, and maintenance. Indeed, the Center for Climate Integrity, an environmental advocacy group located in Washington, DC, in partnership with the engineering firm Resilient Analytics, projects that by 2040 simply providing basic storm-surge protection in the form of sea walls for all coastal cities will require at least \$400 billion. These figures do not include costlier steps such as revamping sewers, storm water and drinking water infrastructure along with moving homes and shops away from the most flood prone areas.

Likewise, growth in the offshore wind industry is accelerating. The University of Delaware recently published the "Supply Chain Contracting Forecast for US Offshore Wind Power" in March 2019 which projects a nearly \$70 billion investment by 2030 in seven states on the Atlantic Seaboard.

Atlantic City is well located to be a major hub for these fields and an ideal means to diversify the region's economy. The first offshore wind project awarded in New Jersey went to Ørsted's Ocean Wind proposed off the City's coast. This 1,100 Mw wind farm is expected to power about 500,000 New Jersey homes and generate \$1.17 billion in economic benefits, in addition to creating an estimated 15,000 jobs over the project life. Construction is expected to begin in 2020, and be completed by 2024. This is the first step towards reaching the state's goal of 3,500 Mw of offshore wind by 2030. Ørsted Ocean Wind not only has offices in Atlantic City, but also plans to develop its Operations and Maintenance Center in the City as well. Atlantic Shores Offshore Wind, a collaborative project of EDF-Renewables and Shell is also seeking state approval for development of their offshore lease holdings off of Atlantic City and are currently looking at locations in Atlantic City for offices and operations and maintenance.

This work is the natural extension of coordinated efforts at economic diversification urged as early as 2015. In the *Atlantic County Economic Development Strategy and Action Plan*, adopted on September 24, 2015, AngelouEconomics, emphasized the need to embrace emergent industries and, consequently, increased educational opportunities in STEM fields.

*It would be difficult to overstate the precarious condition of the Atlantic County economy, and the acute need for community leaders to implement short- and long-term economic development strategies to reduce the region's overdependence on the tourism and gaming sector and diversify its economic base [...]*

The same ideas appeared in James E. Johnson's *Atlantic City: Building A Foundation for Shared Prosperity—A Blueprint for Returning the City to Financial Stability*, released in September 2018. Johnson, appointed as Special Counsel for the revival of Atlantic City by Governor Murphy, notes: "Serious efforts at diversifying Atlantic City's local and regional economy are under way. Since the beginning of the Review, the local chamber of commerce has been working with labor representatives and the State to develop a jobs council that would link community members to jobs that are expected as old businesses expand and new businesses arrive. The focus of the job creation effort should be on developing jobs that create pathways to higher wages."

## 2.1 Optimizing Impact and Diversifying the Regional Economy

Much attention has been given to the Anchor Institution model for growing sustainability and wealth in local communities. Sometimes dubbed “Eds & Meds,” this model illustrates how public institutions can become growth generators for urban communities. In Atlantic City, the State of New Jersey has designated three Anchor Institutions, AtlantiCare, Atlantic Cape Community College and Stockton University.

As the name implies, these “anchors” are institutions which cannot leave the community and, more importantly, provide a service for the region and “import” dollars (see: [https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/paper-dubb-howard\\_0.pdf](https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/paper-dubb-howard_0.pdf)). As manufacturing industries—sometimes called “basic” industries—export goods to outside of the region (and import dollars), educational institutions receive tuition, loans, financial aid, grants, etc. from private, state and federal sources.

Dr. Oliver D. Cooke, Associate Professor of Economics at Stockton University, outlines the potential in the most recent edition of the *South Jersey Economic Review* (see: <https://stockton.edu/hughes-center/sjer/documents/2019-0218-sjer-winter-2019.pdf>). While recognizing the limits of the “anchor institution” model in a small city setting, Cooke emphasized the process that expansion of these institutions sets in motion:

Universities and colleges can play an important role in diversifying a local economy. Such diversification has two dimensions. First, significant institutional growth over the long-run—which, above all, means growing enrollment, faculty, and staff, and procurement expenditures—can foster greater demand for a host of goods and services across a range of industries, including, among others, retail and wholesale trade, professional and business services, financial activities, leisure and hospitality, and other services. Such increases in demand can quickly mushroom in cases where an anchor educational institution serves as a magnet for the establishment of new businesses, business relocations (say, to a university district), or branch openings of existing businesses...

The second diversification dimension relates to the research and development activities of higher educational institutions. There is a long and well-documented history of such institutional activities that have spawned entirely new products and industries.

Extant successful centers with comparable missions offer another way to gauge the potential multi-faceted role of a Coastal Resiliency Institute. The institutions and funding sources highlighted in this report provides examples of how this project can make Atlantic City a magnet for climate change, marine science and resiliency research and action. Finally, the development of this project would have several benefits for the local community and economy which are not to be directly measured in this report. These include:

### **Provide an Added Impetus for STEM Education and Careers**

The fundamental economic constraint on Atlantic City and all of South Jersey is the level of incomes relative to the rest of New Jersey. Part of the reason for this is the lack of well-paying jobs. While the area is the home to one of the country's leading federal research centers, the William J. Hughes Technical Center in Pomona, the economy does not have a technical base that is growing and open to entrepreneurs in the private sector. This project could attract small businesses with new ideas on resiliency. An incubator is envisioned as a component of the

project. In addition, the growth of an industry concerned with resiliency and climate change would offer a career path to STEM occupations for the residents of Atlantic City and the region.

### **Attract Research Institutions to the Region**

Given its location, the Institute would be an ideal location for one or more of the state's research institutions to participate in both graduate education and research with Stockton University. Rutgers, NJIT and Stevens Institute all have programs that shown an interest in Atlantic City.

### **Make Atlantic City Attractive to New Residents**

With limited success, Atlantic City has pursued new residents to add diversity to its community. Most attractive to the future of the City is the attraction of a younger, higher-income population which would be attracted to the urban environment. The growth of employment and career opportunities which this project would provide could be an attraction to new residents.

### **Provide a Cushion Against the Unpredictable Trends in the Casino/Tourism Industries**

One of the primary reasons for the encouragement of economic diversity by the state, city and county is to prevent the reliance on the hospitality/gaming industry. Recent history and the continued spread of competition have demonstrated in a very economically painful way the consequences of over-reliance on a single industry. This project could serve as a catalyst for a new industry sector.

## **2.2 Estimating Economic Impact**

The focus of this chapter is to provide a means for measuring the potential economic consequences of building and operating the proposed Institute in Atlantic City. It does not seek to quantify the additional benefits mentioned in the previous section that would take a longer longitudinal report of the impact of the project on development over time. However, while the former is possible given the information available at this time, the latter should be undertaken if this project comes to fruition.

Since this is a proposed project, the inputs used will change as funding and programming proceed (see Appendix 1 for the source data used). To accommodate these changes, the model used is flexible and can easily be adjusted to changes in size, employment and purpose. In short, this report presents an adaptable template for evaluating the economic impacts of this project as it moves toward funding and development stages.

In order to resist the over-estimation of economic impacts where some variables have not been directly measured, the most conservative estimates were used. While this has most likely also resulted in conservative overall impacts, the results can be used for audiences that need clear evidence of results.

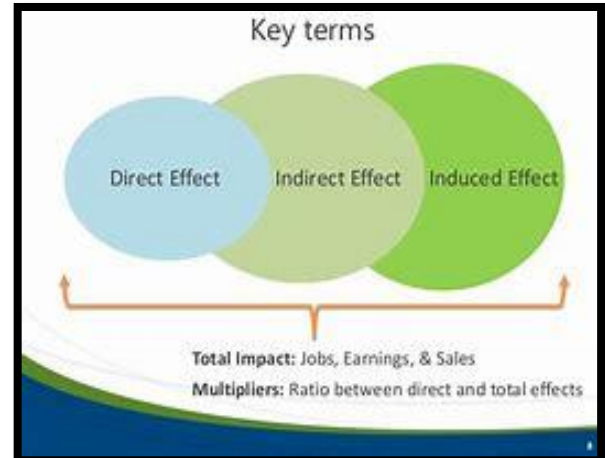
Though not included in the following Economic Impact calculation, it is noted that the Jersey Shore will see approximately \$80.737 billion in direct capital investment and \$495.1 million in annual operations, maintenance, repair, replacement, and rehabilitation expenditures resulting from various coastal resilience projects planned for the Jersey Shore between 2019 and 2035. These costs include the Back Bay Coastal Storm Risk Management project, various new beneficial dredge re-use projects, the New Jersey portion of the New Jersey-New York Harbor and Tributaries Coastal Storm Risk Management Project, Monmouth County Bayshore

resilience projects, and ecosystem restorations throughout the coast. The Coastal Resiliency Institute is envisioned to play a role in such projects through research and assistance to the Army Corps, the New Jersey Department of Environmental Protection, and other agencies.

Similarly, not included but also impactful will be the billions in economic impact spent on the development of Offshore Wind. A 2018 report by Environmental Entrepreneurs and BW Research Partnership estimate \$382 million in direct effects, \$145.9 million in indirect effects, and \$173.5 million in induced effects towards a total \$702.1 million in total economic effects for a 352 MW offshore wind project in New Jersey in addition to \$31.3 million in benefits resulting from operations and maintenance. Extrapolating these figures for the 2018 initial solicitation of 1,100 MW, the total effect on employment could be 13,378 jobs, \$871.4 million in wages, \$1.2 billion in value-added, and \$2.194 billion in economic benefits (inclusive of direct, indirect, and induced effects). Fulfilling Governor Murphy's goal of 3,500 MW of production by 2030 could yield nearly seven billion dollars of economic benefits, more than 42,000 jobs, and \$311.4 million in benefits from operations and maintenance.

**Economic Impacts - Methodology:** In order to provide measurements of both direct and secondary impact, the U.S. Department of Commerce, Bureau of Economic Analysis provides multipliers derived from the actual economic structure of the Atlantic County MSA. It gives estimates of economic impacts that are consistent with those of other large projects and events. The multipliers are directly measured from past transactions that can be traced using the government's tax and revenue accounts. They are specific to the Atlantic City region and are updated on a regular basis by the Bureau of Economic Analysis, U.S. Department of Commerce. The latest, used in this report are from the 2016 benchmark.

**Types of Impacts:** The spending on construction and subsequent operations creates impacts which are direct and/or indirect. The direct impacts are generally due to expenditures paid by those funding the project. Examples include architectural and engineering plans, bricks and mortar costs, salaries for employees working at the Institute, and the other expenses involved. Indirect impacts are those expenditures that are attributable to the direct impacts and are often referred to as spin-off or secondary effects. For instance, these include the purchase of insurance or computer equipment for use by the Institute. These impacts are sensitive to where these purchases occur. Leakage can occur if these purchases are outside the region. These also include impacts are due to repeated re-spending of the wages paid to employees in the local marketplace, often called induced spending. The total impacts are the sum of these two types of impacts.



**Figure 1: Economic Impacts Summary**

**Model:** In order to provide measurements of the impacts, the U.S. Department of Commerce, Bureau of Economic Analysis' most often used economic impact model was benchmarked and used. The *Regional Industrial Multiplier System, RIMS II*, uses multipliers derived from the economic structure of Atlantic County as the primary tool. It gives estimates of economic impacts that are consistent with those of other large projects and events. The multipliers are directly measured from past transactions that can be traced using the government's tax and revenue accounts.



RIMS II multipliers can be used by investors, planners, and elected officials to objectively assess the potential economic impacts of various projects. Estimating the regional impact of an increase in the production of goods or services is a simple application of the multipliers. See <https://apps.bea.gov/regional/rims/rimsii/> for further information.

**Economic Impacts:** This section develops the net economic impacts that can be attributed to the project itself. By applying the expenditure data to the regional multipliers, the total impacts – both direct and indirect - are estimated.

**Figure 2: Construction Impacts**

<b>STOCKTON U. - CENTER FOR MARINE &amp; ENVIRONMENTAL SCIENCE</b>				
<b>ECONOMIC IMPACTS</b>				
<b>CONSTRUCTION IMPACTS</b>				
<b>JANUARY 2019</b>				
<b>CONSTRUCTION - TASK</b>	<b>DIRECT EXPENDITURES (50% Contingencies)</b>	<b>TOTAL OUTPUT</b>	<b>TOTAL EARNINGS</b>	<b>TOTAL EMPLOYMENT</b>
Bricks & Mortar	\$30,623,198	\$42,498,874	\$10,004,599	184
Fixed Equipment	\$1,092,710	\$1,521,380	\$386,929	12
<b>Sub-Total</b>	<b>\$31,715,908</b>	<b>\$44,020,254</b>	<b>\$10,391,527</b>	<b>196</b>
<b>Soft Costs- A&amp;E</b>				
FF&E	\$3,210,528	\$4,470,018	\$1,136,848	35
Architectural	\$2,362,386	\$3,490,898	\$1,022,205	16
Engineering	\$607,771	\$898,104	\$262,983	4
Construction Mgmt.	\$1,249,888	\$1,893,705	\$661,316	13
Testing/Survey/Inspection	\$312,473	\$473,427	\$165,329	3
Regulatory Filing	\$28,543	\$43,246	\$15,102	0
<b>Sub-Total</b>	<b>\$7,771,589</b>	<b>\$11,269,398</b>	<b>\$3,263,782</b>	<b>72</b>
<b>Total</b>	<b>\$39,487,498</b>	<b>\$55,289,653</b>	<b>\$13,655,310</b>	<b>268</b>

For this analysis, the construction budget for the project is \$41 M. based on the Capital Project Report dated January 30, 2017 (see Appendix 1). More recent data places the total budget for the Institute at \$60 M including site development and offsite improvements.

The 2017 budget includes two-line items for contingencies. These were used at 50 percent of their budgeted levels in Figure 1 below for a total proposed budget of \$39.5 M. Each of the task categories belong to different industry classifications in the RIMS II model and have specific multipliers. The results of this are shown in Figure 1.

In short, the largest impacts are due to the 75 percent of the budget dedicated to the construction of bricks and mortar, creating 184 full-time equivalent annual jobs. The planning, design and construction of the facility itself would take up to 36 months. The total impacts shown in the final row indicate that the spending of \$39.5 M would result in \$55.3 M in overall new economic activity in the region – the difference being the indirect impacts – with \$13.6 M in wages and salaries (these include health benefits valued at 20 percent of base salaries) and supporting 268 jobs in the region.

According to the 2017 5-year American Community Survey performed by the U.S. Census Bureau, only 537 of the County's 8,167 workers employed in the construction sector lived in Atlantic City. As such, approximately 7 percent of the impacts due to earnings would be felt in the City.

The source document in Appendix 1 estimates a range of employees for each program as listed in the first column. The mid-points were used in each case. In addition, 20 percent of the employees were put into the administrative occupational employment category, custodial and security were added as services for the facility which would not be on the Stockton University Atlantic City Campus. The totals are reported in Figure 2.

**Figure 3: Employment from Operations**

<b>STOCKTON U. - CENTER FOR MARINE &amp; ENVIRONMENTAL SCIENCE</b>			
<b>ECONOMIC IMPACTS</b>			
<b>EMPLOYMENT - OPERATIONS</b>			
<b>JANUARY 2019</b>			
<b>Program</b>	<b>Employees</b>	<b>Professional @80%</b>	<b>Admin @20%</b>
Ctr. For Marine & Env. Science	7.5	6.0	1.5
Coastal Research Ctr.	3.5	2.8	0.7
NJDEP - Water Monitoring	25	20.0	5.0
NJDEP - General	-		
Coastal Resiliency Institute	17.5	14.0	3.5
<b>SUBTOTAL</b>	<b>53.5</b>	<b>42.8</b>	<b>10.7</b>
<b>Building Services</b>			
Custodial	2.0		
Security	4.0		
<b>SUBTOTAL</b>	<b>6.0</b>		
<b>TOTAL</b>	<b>59.5</b>	<b>42.8</b>	<b>10.7</b>

While the source document suggests that 100-110 employees could work at the Institute, the current estimate of 59.5 was used in the model. This can easily be scaled upwards.

Figure 3 reports the average salaries of the 59.5 employees as determined by the Occupational Wage Statistics (OES) for May 2018 as published by the NJ Department of Labor (see: [https://www.nj.gov/labor/lpa/employ/oeswage/oeswage\\_index.html](https://www.nj.gov/labor/lpa/employ/oeswage/oeswage_index.html)). These are determined by frequently conducted wage surveys in the Atlantic County region specifically. The occupational definition was matched as closely as possible with those in each program.

The RIMS II model's multipliers include health benefits in their determination of overall impacts for earnings and employment. As a result, the wage and health benefits bill for the operations of the Institute are estimated to be \$4.9M per year.

The wages and employment multipliers can be used to calculate an estimate of the output of the Institute. This can be viewed either as the value of services rendered (through teaching, grants, research, etc.) or the operational budget of the enterprise. The results are shown in Figure 4.

The Institute would produce an estimated \$13.6 M in goods and services and the region's output would increase overall by \$19.6 M each year, the difference being the secondary and induced, or indirect, impacts. To produce \$19.6 M in goods and services, the region would employ 94 additional employees.

**Figure 4: Wages from Institute Employment**

<b>STOCKTON U. - CENTER FOR MARINE &amp; ENVIRONMENTAL SCIENCE</b>				
<b>ECONOMIC IMPACTS</b>				
<b>EMPLOYMENT - WAGES</b>				
<b>JANUARY 2019</b>				
<u>OES Classification</u>	<u>Employment</u>	<u>Avg. Wage</u>	<u>+20% Health Benefits</u>	<u>Total Wages - 2018</u>
<b>Professional</b>	42.8	\$80,700	\$96,840	\$4,144,752
<b>Admin. (20%)</b>	10.7	\$41,200	\$49,440	\$529,008
<b>Custodial</b>	2.0	\$34,400	\$41,280	\$82,560
<b>Security</b>	4.0	\$34,300	\$41,160	\$164,640
<b>TOTAL</b>	<b>59.5</b>			<b>\$4,920,960</b>

**Figure 5: Impacts from Institute**

<b>STOCKTON U. - CENTER FOR MARINE &amp; ENVIRONMENTAL SCIENCE</b>			
<b>ECONOMIC IMPACTS</b>			
<b>TOTAL MPACTS</b>			
<b>JANUARY 2019</b>			
<u>Economic Impacts</u>	<u>Output</u>	<u>Earnings</u>	<u>Employment</u>
<b>Direct Impacts</b>	\$13,611,299	\$4,920,960	60
<b>Total Impacts</b>	<b>\$19,609,798</b>	<b>\$6,450,394</b>	<b>94</b>

## IDENTIFICATION OF POTENTIAL PARTNERS AND TENANTS

One of the most important aspects of the Coastal Resiliency Institute will be its ability to partner the University with other partners to catalyze research and educational benefits. The following list includes aspirational partners with which the Institute can engage for co-location, research assistance, co-ops, commercialization, and public outreach efforts. Potential partners include:

### 3.1 Resiliency NGOs/Private Sector

Resiliency non-governmental organizations (NGOs) have been formed in the wake of recent disasters and a heightening awareness of climate change in order to advocate for various issues and to independently study and fund specific issues relating to climate change and the environment. Some NGOs have focused on resiliency and on coastal resilience issues. This list includes potential partners in the NGO sector.

- **American Planning Association: Hazards Planning Center** - The APA Hazards Planning Center is one of the APA's Applied Research centers that works on several projects related to planning associated with natural hazards. Among its projects include a survey of state land use and natural hazards planning laws, developing a Disaster Recovery Guide for planning practitioners, and building coastal resilience through capital improvement planning.
- **American Society of Adaptation Professionals (ASAP)** - ASAP is an organization comprised of nearly 1,400 members working in the adaptation profession. The organization serves as a professional network for those in the resilience field.
- **Association of State Floodplain Management (ASFPM)** - The Association of State Floodplain management is a non-profit comprised of floodplain management and flood hazard mitigation professionals. ASFPM is actively involved in national policy and research work, including flood sciences. The ASFPM holds an annual conference in Atlantic City each year.
- **Battelle** - Battelle is a private non-profit applied sciences organization that works globally on research and development projects. Battelle currently manages national laboratories for the Department of Energy and has a local office in Egg Harbor Township. Battelle has a Marine and Coastal Services group that includes integrated assessment/monitoring, NEPA compliance, Marine Spatial Planning, Chemistry Consulting, Environmental Management Information Systems, and undertakes marine and atmospheric corrosion studies.
- **First Street Foundation** - The First Street Foundation is a non-profit focused communicating flood risk for every home in America. The First Street Foundation recently released a groundbreaking study that quantified the financial impact of sea level rise on real estate prices at the Jersey Shore. The First Street Foundation presents the type of research that will become increasingly valuable to coastal communities and economies.
- **Adrienne Arsht-Rockefeller Foundation Resilience Center/Rockefeller Institute** - The Rockefeller Institute took a profound role in resilience with its 100 Resilient Cities initiative, which funded "resilience officers" in participating municipalities. The initiative has since ended and has been replaced by the Adrienne Arsht-Rockefeller Foundation Resilience

Center. A new initiative endowed with \$55 million in Spring 2019, the program objectives and grant-making protocols have yet to be defined at this time.

- **National Science Foundation** - The National Science Foundation (NSF) provides a prodigious amount of grant funding for scientific research to institutions nationwide. Developing relationships with the NSF to support additional coastal research funding at the Institute should be a priority for the Institute.
- **The Nature Conservancy** - The Nature Conservancy has taken a significant role in coastal resilience in New Jersey by preserving critical habitat in coastal areas, providing resilience mapping data, and implementing living shorelines throughout the shore. Building Healthy Cities and Tackling Climate Change are two of the four priorities for the organization.

### 3.2 State, Regional, and National Programs

The Resilience Institute will require the assistance of state and national partners in order to be successful and build legitimacy. The following list identifies potential partners at the state, regional, and national level.

- **US Army Corps of Engineers** - The US Army Corps of Engineers will likely be responsible for designing and constructing some of the public works that will protect the Jersey Shore from flooding. The Philadelphia District of the Corps is directly responsible for all projects taking place in South Jersey. An office or research partnership with the Corps with its projects and better integrate the Corps with other stakeholder organizations.

The Army Corps published the New Jersey Back Bays (NJBB) Coastal Storm Risk Management (CSRM) Interim Feasibility Study and Environmental Scoping Document in March 2019. This Study presents a preliminary focused array of alternative plans that reduces risk to human life and flooding risk from coastal storms in the NJBB Region. These findings and associated analyses are consistent with study planning objectives in addition to minimizing environmental, social and economic impacts. The Study states that reduction of flood-related damages to residential structures, commercial structures, critical infrastructure, and industries is critical to the national and regional economy. The long-term strategy for resilience in the NJBB region is a scalable solution that integrates CSRM efforts included in this Study as well as CSRM efforts considered by the New Jersey Department of Environmental Protection (the NJBB Study Non-Federal Sponsor), other Federal agencies, NGOs and municipal entities. The schedule for future actions on this Study include:

- November 2021 – Final Feasibility Report and Environmental Impact Statement
  - April 2022 – Feasibility Please Completed
  - 2022 – Construction Funds Appropriation
  - 2023 – Preconstruction Engineering & Design Initiation
  - 2026 – Incremental Construction Commencement
- **Federal Emergency Management Agency (FEMA)** – FEMA plays a major role in disaster preparedness, rescue and recovery and is a major funding source for resiliency projects. New Jersey is part of Region II which has offices in New York City. FEMA provides state and local governments with preparedness program funding to enhance the capacity

of their emergency responders to prevent, respond to, and recover from a range of hazards.

- **New Jersey Department of Environmental Protection (NJDEP)** - NJDEP has taken recent steps to advance resiliency through the development of the Resilient NJ grant program, the appointment of a Resilience Officer, and the coordination of various sustainability and environmental initiatives. Supporting the agency's mission and co-locating with various agency functions will benefit both the Institute and DEP by sharing resources, administrative costs, and by providing opportunities for students to learn and transition to employment.
- **New Jersey Sea Grant Consortium** - The Sea Grant Consortium consists of educational institutions and groups that support stewardship of New Jersey's environment through research, education, and extension programs. The Consortium has a role in the development of marine technology, coastal policy, and the improvement of science literacy.
- **Jacques Cousteau National Estuarine Research Reserve (JCNERR)** - JCNERR is a reserve consisting of more than 116,000 acres of wetlands and Pine Barrens in coastal South Jersey. Administered by Rutgers University, the Reserve is one of several located nationwide. Facilities are currently located in Tuckerton, NJ. Co-locating JCNERR with the Resilience Institute could beneficially serve both groups by providing a greater opportunity for public interaction and placing JCNERR staff to work alongside other Resilience Institute partners.

### 3.3 Universities

Higher education partnerships between Stockton's Coastal Resiliency Institute and other institutes of higher education would serve to enhance the Institute's standing and allow for reciprocal, collaborative relationships. Other institutes could benefit from using the City as a living laboratory and by having satellite facilities available for their own programs. The Resilience Institute would benefit through the cross-pollination of research, people, and academics. The following list includes local universities. Additional higher education resilience initiatives are discussed in Section 5.

- **Rutgers University** - As the State University of New Jersey, Rutgers offers a number of degree programs related to resilience and has a track record of community engagement and expertise. The Bloustein School of Planning and Public Policy and Institute of Earth, Ocean, and Atmospheric Sciences, Cooperative Extension, Department of Landscape Architecture are high-profile and have dealt substantially with resiliency issues. Perhaps most notably, the Center for Urban Environmental Sustainability Rutgers Coastal Climate Risk and Resilience (C2R2) initiative for graduate students, supported by a National Science Foundation grant, represents a collaboration between its Institute of Earth, Ocean, and Atmospheric Sciences, Bloustein School, School of Arts and Sciences, School of Environmental and Biological Sciences, School of Engineering, and Graduate School-New Brunswick. The collaboration allows master's and PhD students the ability to take interdisciplinary classes focusing on coastal hazards, strategies, and coastal resilience knowledge.
- **Stevens Institute** - Stevens University has a robust program in Resilience and Sustainability. It has two marine research laboratories, a naval architecture program,

Maritime Security Center, and Center for Environmental Services that are each multidisciplinary. A partnership with Stevens may allow Stockton to also expand its engineering offerings.

- **Temple University** - Temple University is a prolific university in the greater Philadelphia area. Its Tyler School of Architecture and Environmental Design includes fields of study such as community development, architecture, city and regional planning, landscape architecture, and facilities management. Alongside its other programs (including law and public health), there is much that Temple University has to offer. Temple University has a track record of providing technical assistance to Cape May for design projects.
- **University of Delaware** - The University of Delaware's Center for Applied Coastal Research is a center that is dedicated to scientific studies of coastal engineering practice. The University also offers masters and PhD programs related to coastal engineering.
- **University of North Carolina-Wilmington-** UNC-Wilmington is "North Carolina's coastal university" and has extensive experience and a high profile in the coastal research field. A partnership or institutional mentorship with the College could guide the creation of the Institute.
- **University of Pennsylvania-** UPenn is the closest Ivy league school to the Atlantic City area. As one of the most prestigious universities in the world, UPenn offers fields of study in a number of fields of study. Its business school, education school, nursing school, medical school, and law school rank among the top ten nationwide. The programs available through UPenn, such as the Wharton Risk Management Center and PennDesign, could provide a substantial benefit to the Institute.

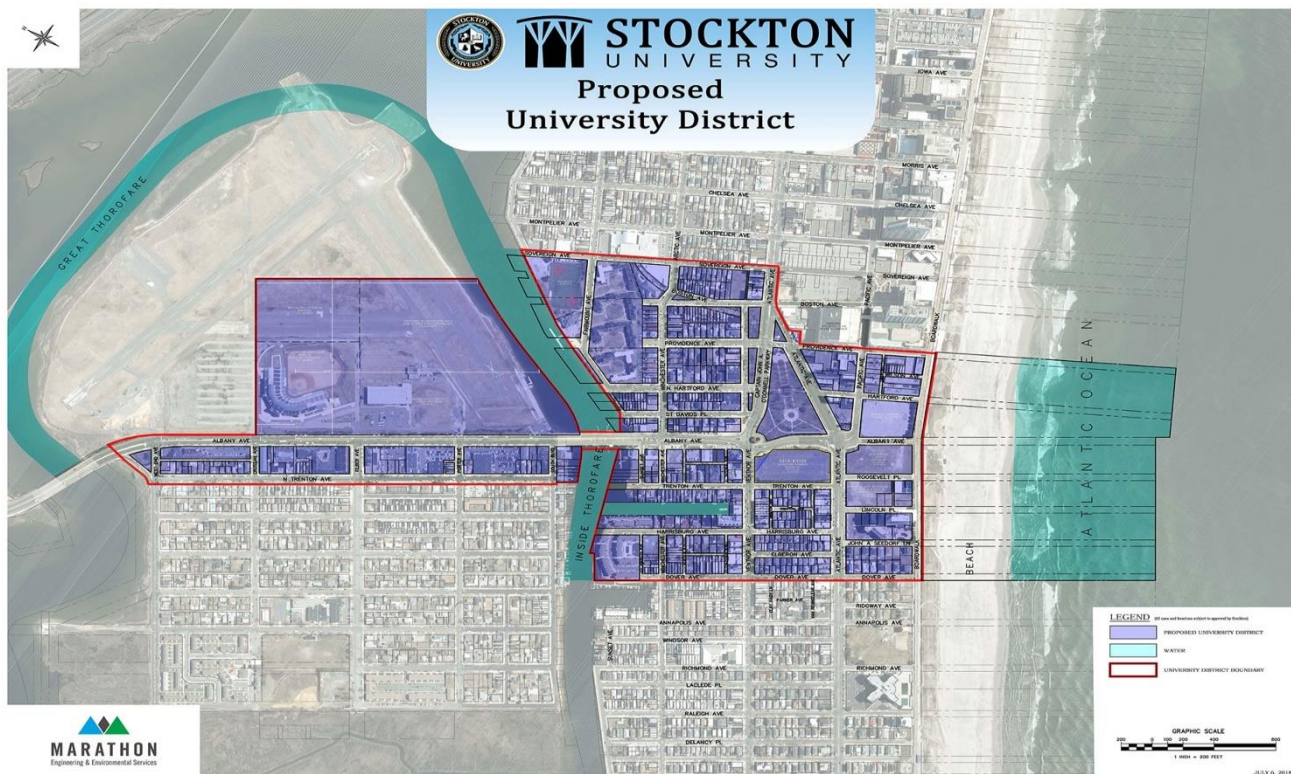
In addition to these local schools, the Coastal Resiliency Institute should consider a partnership with a school with a coastal engineering degree program. The program could be degree-bearing or be a specialty within civil engineering. Coastal engineering will play a foundational role in for coastal resilience and incubating regional expertise in the profession would benefit the Institute and University as a whole. Universities currently offering a coastal engineering degree or specialty include Texas A&M, Old Dominion, University of Florida, University of New Orleans, Oregon State University, Louisiana State University, and UNC-Wilmington.

## SITE FEASIBILITY

The development of Stockton's campus at the end of Route 40 has been one of the most transformative decisions in Atlantic City's recent history. The AC campus demonstrates the University's and City's commitment to diversify the local economy and welcome thousands of new residents and students to the area.

An extension of the City's orientation to support higher education was the 2018 enactment of a University District Overlay Zoning District, which is a Special Purpose District supporting a variety of uses, including housing, art galleries, entertainment, and research laboratories. As shown in Figure 6, the University District extends from Chelsea Heights to the beachfront, and includes a significant portion of the Bader Field site.

**Figure 6: Stockton University District**



The proposed Coastal Resiliency Institute would ideally be situated within this district and would be a model of resiliency itself. The following principles will be used in its design:

- **Flood resilience:** The structure should be built to comfortably withstand today's flooding events, tomorrow's sea level rise, and tomorrow's storms (accounting for sea level rise). The building would be constructed in compliance with the 500-year flood standards as required for critical facilities.
- **Structural sustainability:** The facility should be designed using sustainable materials, use sustainable construction practices, and be informed by LEED guidance. Designers will focus heavily on low energy use and water conservation.
- **Ecological resilience:** Though the Institute will be located on a site that is largely free of environmental constraints and is already disturbed, the structure's design and



construction should have a net beneficial impact in the coastal ecosystem. This will include incorporating native plantings, restoring natural areas, and incorporating living shorelines.

- **Economic resilience:** Coastal resilience and offshore wind are growing economic engines in New Jersey and will be for the foreseeable future. Focusing the Institute's mission on these two disciplines will ensure its relevancy and contributions to the economic diversification of the region. To accommodate such growth the site must have adequate space for public and private sector growth.
- **Social resilience:** Transforming a vacant site into a productive center of coastal resilience will ensure opportunity and demonstrate investment and care into Atlantic City's neighborhoods, offering opportunities for the public to access the waterfront and interact with the research being undertaken within.

In addition to the principles stated above, the following properties were examined using several selection criteria. The most critical factors were properties within the University's ownership or control and those that were of sufficient size to support the Institute's mission and proposed capacity. The availability of parking and land for future expansion were also considerations. It was assumed that all areas are reasonably accessible by the City's mass transit, including jitneys. The following sites were evaluated:

**110 S New Hampshire Avenue** - 110 S New Hampshire Avenue is a University-owned property located near the intersection of South New Hampshire Avenue with Pacific Avenue in the Southeast Inlet/North Beach neighborhood. The lot is approximately 25 feet by 90 feet, comprising just 0.05 acres. The property is surrounded on nearly all sides by vacant land, almost all of which is privately owned. The property is approximately 500 feet west of the inlet and 800 feet northwest of the New Hampshire Avenue Boardwalk entrance. Though the property is clearly a valuable asset in a changing neighborhood near the City's waterfront, the utility of the property for the Institute is diminished due to its small size and lack of direct waterfront access.

**225 S Oriental Avenue** - 225 S Oriental Avenue is a University-owned property located along Oriental Avenue between Seaside and Vermont Avenues in the Southeast Inlet/North Beach neighborhood. The lot is 25 feet by 72 feet (0.04 acres) and is surrounded by vacant parcels except for the property adjacent to the east. The property is approximately 700 feet from both the Seaside Avenue Boardwalk entrance and the Oriental Avenue Boardwalk entrance. Like 110 S New Hampshire Avenue (approximately 350 feet to the northeast), this property will help the University establish a presence in the North Beach neighborhood. However, its utility for the Institute is very limited unless additional land is bought in the vicinity.

**35 S Martin Luther King Boulevard (Carnegie Center)** - The Carnegie Center is a historic building located in the City's Midtown section near the intersection of Dr. Martin Luther King, Jr. Boulevard and Pacific Avenue. Stockton owned the property through 2019, at which point it was transferred to the City. The property sits on 0.42 acres of land and includes a historic building. The building does not waterfront access and is located approximately 1,300 feet from the Boardwalk. Limited parking is available on-site. The Center facility is currently occupied and too small to support the development of an additional 60,000 square foot facility.

**14 N Mississippi Avenue (Dante Hall)** - Dante Hall is a historic former Catholic school located along Mississippi Avenue between Arctic and Atlantic Avenues. The property is owned by the Parish of Saint Monica. Stockton currently uses the building for office space and storage associated with the Dante Hall performing space. The building is approximately four stories high, comprising 52,000 square feet an existing 4,000 square foot building. Expansion

opportunities are limited, and the property does not have waterfront access. The site is not ideal for the site of the Coastal Resiliency Institute.

**3430 Atlantic Avenue (Stockton University Rothman Building)** - The Rothman Building is a relatively recent Stockton acquisition located at the intersection of Providence and Atlantic Avenues near the proposed Phase 2 residential building across from O'Donnell Park. The property is 0.056 acres in size and is surrounded by a City-owned parking lot. There is no waterfront access on the site. The site is too small to be useful for the facility but may have expansion opportunities associated with the adjacent parking lot and Atlantic Club parking garage.

**3601 Boardwalk, Block 21** - 3601 Boardwalk is a 2.2-acre parcel on Atlantic City's beachfront. It is currently owned by the Atlantic City Development Corporation and is undeveloped. There are trailers on-site occupying the northwest corner of the site at the intersection with Albany Avenue, the balance of the property is a parking lot. There is no direct waterfront access from this site. Though the site's location is ideal for development expanding the University's footprint, it may not be appropriate for use as the Coastal Resiliency Institute owing to the lack of direct waterfront access.

**3701 Boardwalk (Stockton University Residential Complex)** - The beachfront Stockton University Residential Complex is located on a large block with ground-floor retail/office space and residential dormitories on the top floors. The entire site is occupied by the mixed-use development. There is limited retail/office space available, but the overall size of the existing space is not sufficient for the identified needs and vision for the Resilience Institute.

**3800 Atlantic Avenue (Stockton University Parking Garage)** - The Stockton University parking garage located one block south of the residential complex contains the University's parking deck, office space for South Jersey Gas, and ground-floor level retail/office space. Similar to the existing space at the Residential Complex, there is insufficient capacity for the space required by the institute and waterfront access for research/boats is not available.

**10 S Albany Avenue (Stockton University Academic Building)** - The Academic Building at Stockton University is located between Atlantic Avenue and Ventnor Avenue along Albany Avenue. The property supports a large academic building and surface parking lot along Trenton Avenue. Currently the building supports the academic facility needs of the University and there is insufficient capacity for the expansion required by the Resilience Institute.

**3401 Fairmount Avenue (Atlantic City Boathouse)** - The Atlantic City Boathouse is a recreation site along the Inside Thorofare. The Atlantic City Board of Education currently owns the site. The Boathouse is currently used by the City's rowing team, a use that is expected to continue. The Boathouse is located on a Green Acres-encumbered 0.6-acre parcel located between Fairmount Avenue and the Inside Thorofare. The Boathouse Clubhouse is approximately 11,000 square feet in size. The property does have direct waterfront access, unlike many of the other sites available for the University's use.

**800 North New Hampshire Avenue (Gardners Basin)** - Gardners Basin is a recreational site located in the North Inlet. The site is owned by the City of Atlantic City and hosts a marina, aquarium, restaurants and various other amenities. The site has direct waterfront access and can be used as a satellite facility for access at a minimum.

**Bader Field** - Bader Field is the largest available development site in Atlantic City. It is accessible by Route 40 and the Atlantic City Expressway. If there is to be a

commercial/research campus in Atlantic City, this is the most likely location for that development owing to the large, developable area and lack of major environmental constraints. Thus, it has the potential to be a very strong asset in the diversification of the economy. The site is immediately adjacent to a 40-acre parcel that fronts on Albany Avenue and is restricted by the State Green Acres Program. The University District Overlay Zoning District map indicates that 15-acres of Bader Field is reserved for future educational use. The remainder of the Bader Field site is planned as a Tech Park and would be an idea setting for private sector resiliency companies (i.e. engineering, research & development, architecture, planning, etc.)

The City of Atlantic City has deemed this site an idea location for a technology hub. The State re-established the Commission for Science, Technology and Innovation to identify and build out centers of innovation. It is recommended that the City and Stockton University work with the Commission to designate Bader Field as a center of innovation.

**Figure 7: Bader Field Aerial Image**



The proposed site will likely require a mix of floodproofing techniques in order to ensure the site's flood resilience. The difference in elevations will entail leveling and grading the site to ensure that the building is at the highest feasible elevation. The site could be the recipient of beneficially re-used dredged material from dredging projects currently planned for the Intracoastal Waterway. An elevated building with public space and parking below similar to the Coastal Studies Institute in North Carolina is a design option. Another option is to elevate the site using dredge materials mixed with stabilizing agents to preform similar to structural fill.

Also, the potential for a microgrid to serve the Coastal Resiliency Institute should be considered. This would ensure that the Institute can operate prior, during and after an event that can disrupt power to the island.

Ensuring public access and ecological uplift with this project is crucial. The proposed project should incorporate a living shoreline that serves to revegetate the waterfront and provide habitat. Water access will be incorporating by renovating the City's boat ramp and installing a removable flood gate to ensure that boat ramp does not become a resiliency weakness during storm events. The image in Figure 9 shows a living shoreline seawall in Palm Beach County, Florida that is designed to retain soils to grow mangroves and emergent grasses while providing fish passage and public art. This type of living shoreline would be ideal for providing an armored water's edge while also supporting the development of new habitats in areas where none exist currently.

**Figure 8: Living Shoreline Seawall**



Image from Michael Singer Studios

The following matrix of site selection criteria demonstrates that the Bader Field site fulfills the most criteria for the Coastal Resiliency Institute. Only one other site (Block 21) meets the size requirement, and only one other site (the Boathouse) has direct water access. Unlike the other sites, however, Stockton University does not have control over the Bader Field site because it is owned by the City. However, the University District zoning described previously indicates the City's willingness to see University facilities located on at least a portion of the Bader Field site.

**Figure 9: Site Selection Criteria**

Site	Direct Water Access	Size	Site Control	Parking
110 N New Hampshire Ave			X	
225 S Oriental Ave			X	
Carnegie Center				X
Dante Hall			X	X
Rothman Building			X	
Block 21		X		X
Stockton Building	Residential		X	X

Stockton Parking Garage			X	X
Stockton Academic Building			X	X
Atlantic City Boathouse	X		X	
Gardners Basin	X			X
<b>Bader Field</b>	<b>X</b>	<b>X</b>		<b>X</b>

Once a site is secured, the site development process can take up to 40 months to design, permit and construct the Coastal Resiliency Institute.

The Bader Field site is recommended as the site of the proposed Institute. Other properties discussed here, including the Rothman Building or new Stockton facilities at the Gateway site, should be considered as incubator or short-term sites in which office space could be leased pending the Institute's construction. However, the Bader Field site is the only site that fulfills the most critical facility needs for the Institute and also has the greatest potential for supporting catalytic developments in the vicinity.

**Figure 10: Project Conceptual Project Sequence**

<b>Architect RFP and Selection</b>	<b>1 month</b>
Concept Analysis and Project Approval	1 month
Programming/Partnership Development	2 months
Schematic Design and Cost Analysis	2 months
Design Development	2 months
Construction Documents	3 months
Bidding and Negotiations	2 months
Governmental Approvals and Permits	4 months
Construction Period	20 months
Contingency Period	3 months
<b>Total</b>	<b>40 months</b>

## 5.0 MODEL UNIVERSITY-BASED RESILIENCY INSTITUTES

This feasibility study included a review of comparable centers at other universities, including the funding necessary for their creation and ongoing operation and their impact on respective regional economies. This included:

- University of New Carolina - Coastal Resilience Center of Excellence
- Woods Hole Oceanographic Institute
- North Carolina State Coastal Studies Institute
- Global Resilience Institute at Northeastern University
- Texas Tech University's National Wind Institute (NWI)
- Virginia Institute of Marine Science - Center for Coastal Resource Management

**University of North Carolina at Chapel Hill:** The University of North Carolina at Chapel Hill officially launched its new Coastal Resilience Center of Excellence (CRC) in July 2015, made possible through a Department of Homeland Security (DHS) Science and Technology Directorate, Office of University Programs five-year, \$20 million grant. The CRC initiative, led by UNC-Chapel Hill, will ultimately include collaboration with more than a dozen partner universities to address the unique challenges facing communities across the United States that are vulnerable to coastal hazards.

The launch of the CRC expands on the existing UNC-Chapel Hill and Jackson State University co-led DHS Coastal Hazards Center work that started in 2008. The work done at the center has informed the U.S. Coast Guard and U.S. Army Corps of Engineers on operational decisions during recent hurricanes.

The CRC, which received an initial \$3 million grant for its first operating year, is charged with conducting research and education that directly addresses key challenges associated with growing coastal vulnerability. Specific examples include:

- Developing more accurate storm surge models and timely delivery of accurate predictions of storm surge prior to storm landfall.
- Assisting the Federal Emergency Management Agency, states, and local governments in the development of better predictions of coastal hazards and pre-disaster plans.
- Improving understanding about why individuals choose to (or not to) implement risk-reduction measures at the household level and what risk-reduction measures they employ.
- Improving the ability to communicate risk to multiple audiences and act based on that understanding.
- Educating the next generation of students who will become hazards researchers and practitioners, emphasizing the development of certificate and degree programs in minority-serving educational institutions.

**Woods Hole Oceanographic Institute:** The Woods Hole Oceanographic Institute offers another example of this type of organization. Established by representatives of Harvard University, Rockefeller Foundation, National Marine Fisheries Service and the Marine Biological Laboratory in the 1920s, it was initially funded by the Rockefeller Foundation (\$1 million for construction and equipment, \$1 million for endowment and \$500,000 for 10 years of operating expenses).

Subsequent partners and sponsors have included National Science Foundation, NOAA, Department of Defense, Office of Naval Research, NASA, USGS, Department of Energy, National Institute of Health, EPA, USACE, Chinese Academy of Sciences, Ecuador's Naval

Oceanographic Institute, French Research Institute, India's Council of Scientific Research, Pakistan's Institute, Vietnam Academy of Science, etc.

Academic Partners include Alexandria University, Cape Breton University, Cornell University, Dalhousie University, Korea Maritime University, Marina Biological Labs, MIT, Naval Postgraduate School, Oregon State University, Rensselaer Polytechnic Institute, Scripps Institute of Oceanography, Shanghai Ocean University, University of Tokyo

Non-Government Partners and Foundations include Smithsonian Institute, New England Aquarium, Rockefeller Foundation, Tiffany Foundation, Keck Foundation, Simons Foundation

**Global Resilience Institute at Northeastern University:** In 2016, the Board of Trustees at Northeastern University approved the launch of the Global Resilience Institute (GRI) as a major initiative to support the university's 2025 strategic plan. Underwritten with a significant internal investment, GRI has over 20 full-time staff; nearly 100 faculty affiliates from all 9 of Northeastern's colleges including the College of Engineering, College of Computer and Information Science, Business School, Law School, and College of Social Sciences and Humanities; and 18 eminent practitioners who serve as distinguished senior fellows. In March 2018, the institute launched the Global Resilience Research Network (GRRN) with the participation of 20 universities and research institutes from 14 countries around the world. This collaborative research and educational community share a common commitment to work in close partnership with industry and public entities in developing and deploying practical tools, applications, and skills that bolster the resilience of individuals, communities, critical systems and networks, and societies.

**North Carolina State Coastal Studies Institute:** Located along the shores of Roanoke Island on East Carolina University's Outer Banks Campus, the Coastal Studies Institute is a multi-institutional research and education partnership of the UNC system. Led by East Carolina University, in partnership with NC State and UNC-Chapel Hill, the Coastal Studies Institute focuses on integrated coastal research and education programming centered on responding to the needs, issues, and topics of concern of the residents of eastern North Carolina. CSI research integrates the natural and social sciences and brings together researchers from different disciplines to answer pressing coastal questions.

**Texas Tech University's National Wind Institute (NWI):** The National Wind Institute's mission is to serve as Texas Tech University's intellectual hub for interdisciplinary and transdisciplinary education, research, and commercialization related to wind science, wind energy, wind engineering and wind hazard mitigation. The institute will support Texas Tech faculty, students, and external partners involved in these activities and in other related areas of interest.

**Virginia Institute of Marine Science - Center for Coastal Resource Management:** The Center for Coastal Resources Management (CCRM) has a formal mission to support informed decision-making on resource management issues at all levels of government, including private and corporate citizens. To fulfill this mission, the Center undertakes research, provides advisory service in wetlands management, and conducts outreach education.

## FUNDING OPPORTUNITIES

Stockton University has a long history of securing funds for coastal research initiatives at the Stockton Marine Field Station and the Stockton Coastal Research Center. Funds have traditionally been attracted from NOAA, EPA, Conserve Wildlife Fund, US Geological Survey, New Jersey Sea Grant, NJDEP, USFWS and the Nature Conservancy.

Funding for the Coastal Resiliency Institute will build on the strong foundation set by the University and its history of over 35 years as a coastal research agency. The following programs and organizations are being considered for future capital and research support.

**U.S. Department of Housing & Urban Development (HUD):** Stockton University (or assigned agent) should inquire with State of New Jersey officials on available funding previously awarded as a CDBG in aftermath of Hurricane Sandy. Proposed project site is within designated 8 counties to receive federal funding.

**U.S. Economic Development Assistance (EDA) Programs:** The EDA provides strategic investments on a competitive merit basis to support economic development, foster job creation, and attract private investment in economically distressed areas of the United States. The EDA solicits applications from applicants to provide investments that support construction, non-construction, technical assistance, and revolving loan fund projects under EDA's programs. Grants and cooperative agreements made under these programs are designed to leverage existing regional assets and support the implementation of economic development strategies that advance new ideas and creative approaches to advancing economic prosperity in distressed communities. The EDA could provide up to \$3 million to support incubator space in the Atlantic City Coastal Resiliency Institute for established and start-up companies.

**U.S. Army Corps of Engineers (USACE):** The Army Corps of Engineers has initiated a multi-million-dollar study to examine the back-bay areas of Monmouth, Ocean, Atlantic and Cape May counties. This study will develop comprehensive solutions to address climate change and mitigate future flooding. The Coastal Resiliency Institute can partner with the Army Corps and NJDEP on this study.

**U.S. Department of Energy's Wind Energy Technologies Office:** The U.S. Department of Energy's Wind Energy Technologies Office (WETO) funds research nationwide to enable the development and deployment offshore wind technologies. This robust portfolio of research, development, and demonstration projects will help the industry overcome key barriers to offshore wind development. WETO has been working with the Department of the Interior's Bureau of Ocean Energy Management since 2011 to advance a national strategy to create and facilitate the development of an offshore wind industry in the United States. As part of that strategy, the Department of Energy has allocated over \$200 million for competitively selected offshore wind research, development, and demonstration projects.

**U.S. Environmental Protection Agency (USEPA):** USEPA has recently provided \$8.5 million in research funding to 12 universities to protect air quality from the current and future challenges associated with the impacts of climate change. In addition, EPA's Science to Achieve Results or STAR program funds research grants and graduate fellowships in numerous environmental science and engineering disciplines through a competitive solicitation process and



independent peer review. In addition, through this same competitive process, EPA periodically establishes large research centers in specific areas of national environmental concern. The program engages the nation's best scientists and engineers in targeted research that complements EPA's own intramural research program and partners in other federal agencies. EPA's STAR program supports research focusing on a few important aspects of how climate change affects air pollution:

- Investigating the impact of climate change on air pollution gases and particles;
- Understanding the underlying factors contributing to air pollution formation and transport; and
- Using modeling tools to better understand the impacts of extreme events on air quality as well as provide better predictions of future air quality under a changed climate.

The U.S. Environmental Protection Agency's Office of Sustainable Communities occasionally offers grants to support activities that improve the quality of development and protect human health and the environment.

**National Fish and Wildlife Foundation (NFWF) National Coastal Resilience Fund:** The National Coastal Resilience Fund restores, increases and strengthens natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife. Established in 2018, the National Coastal Resilience Fund invests in conservation projects that restore or expand natural features such as coastal marshes and wetlands, dune and beach systems, oyster and coral reefs, forests, coastal rivers and floodplains, and barrier islands that minimize the impacts of storms and other naturally occurring events on nearby communities. The National Coastal Resilience Fund is by NFWF to benefit communities with up to \$30 million in grants annually. Projects are expected between \$100,00 and \$3,000,000.

The National Coastal Resilience Fund is a national program with a regional focus, and targets specific circumstances, needs and priorities. The National Coastal Resilience Fund aims to:

- Benefit coastal communities by reducing the impact of coastal flooding and associated threats to property and key assets, such as hospitals and emergency routes
- Benefit coastal communities by improving water quality and recreational opportunities
- Benefit fish and wildlife by enhancing the ecological integrity and functionality of coastal and inland ecosystems

**National Oceanic and Atmospheric Administration (NOAA):** NOAA is committed to helping coastal communities address increasing risks from extreme weather events, climate hazards, and changing ocean conditions. To that end, NOAA's National Ocean Service has provided up to \$15 million in competitive grant awards through the Regional Coastal Resilience Grants Program. One of the projects funded to date is the \$900,000 to the NJDEP to bring state-of-the-art planning practices and regional coordination to 15 communities. This competitive grant program funds projects that are helping coastal communities and ecosystems prepare for and recover from extreme weather events, climate hazards, and changing ocean conditions. All project proposals undergo a rigorous merit review and selection process by a panel of subject matter experts from across the United States that include representatives of government, academia, and private industry.

Cooperative Institutes (CIs) are NOAA-supported, non-federal organizations that have established outstanding research and education programs in one or more areas that are relevant to the NOAA mission. There are 5 main mission areas covered by CIs. Two of NOAA's missions are lacking lead representation in the Mid-Atlantic region and East Coast in general. The "Healthy Oceans" CIs are based in Massachusetts and Florida while there appears to be

no university selected to lead the East Coast efforts on “Resilient Coastal Communities and Economies.” In one or both missions, Stockton University could fulfill geographical and research holes in NOAA's existing CIs program.

In Fall 2018, NOAA solicited proposals to establish a Cooperative Institute for the North Atlantic Region (CINAR). In May 2019, The Woods Hole Oceanographic Institution was selected as lead and partners with seven academic institutions in the Northeast from Maine to Maryland. \$37.9 million over 5 years was awarded with the announcement with the option for another five-year award. The research areas are:

- Sustained Ocean Observations and Climate Research
- Ecosystem Research, Observation, and Modeling
- Stock Assessment Research
- Protected Species Research and Recovery
- Ecosystem-Based Fisheries Management

Rutgers University is the only New Jersey institution represented as a partner. The CINAR has no academic partners in Southern New Jersey or Delaware, which gives Stockton University an opportunity to fill a regional void.

**Centers of Excellence (COE) for Homeland Security:** Congress called for “a university-based center or centers for homeland security” in the Homeland Security Act of 2002, which also established the Department of Homeland Security. The Centers of Excellence bring together universities, agencies and companies to conduct “groundbreaking research to address homeland security challenges,” per the program's website. The purpose of the center is “to establish a coordinated, university-based system to enhance the Nation's homeland security”.

The Department of Homeland Security has expanded its mission to address all hazards. Rising sea levels resulting from global warming and other consequences of climate change make the coast especially vulnerable to natural disasters. Nine Centers of Excellence have been established including: one at the University of Illinois at Urbana-Champaign that will study infrastructure resilience, and a second at the University of North Carolina-Chapel Hill, which leads the Coastal Resilience Center of Excellence (CRC). The CRC is a consortium focused on applied research, education and outreach addressing threats to the coastal communities due to natural hazards and climate change. The new Center of Excellence will be funded up to \$20 million over 5 years. COE's have attracted more than \$300 million from external sources.

**New Jersey Casino Reinvestment Development Authority (CRDA):** Since 1984, the Casino Reinvestment Development Authority has invested over \$1.8 billion in over 400 projects across the state. In Atlantic City alone, the CRDA have invested over \$1.5 billion with nearly \$750 million since 2011. The only agency of its kind nationwide – the CRDA uses casino reinvestments as a catalyst for meaningful, positive improvement in the lives of New Jersey residents statewide. In doing so, the CRDA has dramatically and positively altered Atlantic City's residential, commercial, cultural, and social landscape, while financially supporting quality-of-life improvement efforts throughout the State of New Jersey. The CRDA recently invested \$15 million in grant funds and provided land at no cost for the \$38 million, 65,000 square feet AtlantiCare Medical Arts Building planned in Atlantic City.

**New Jersey Public Private Partnership Law (P3):** The newly enacted Public Private Partnership Law provided the ability to be innovate and creative in financing public projects. P3 is a contractual arrangement between a public entity and a private entity that allows for greater private sector participation in the delivery and financing of capital projects with the objective

of shifting risk to the private sector. The P3 law allows for a design-build-finance-operate-maintain methodology in contrast to the design-bid-build approach provided for by the Local Public Contracts Law. The law provides for a competitive proposal and an unsolicited proposal pathway, a public hearing and State Treasury approval. It is advised that a project cost of \$50 Million is the minimum project threshold for a P3 project.

**New Jersey Aspire Tax Credit Program:** Governor Murphy has proposed the NJ Aspire Tax Credit Program to help catalyze investments in projects with a particular focus on cities, downtowns and suburban neighborhoods served by mass transit. The Program also would provide increased tax credits to businesses that locate within three miles of a University to engaged in qualified collaborative research agreements. This Program could leverage a private-public partnership for the Coastal Resiliency Institute or attract private sector resilience firms to location near the Institute.

**New Jersey Commission on Capital Budgeting and Planning:** Atlantic City is one of the few urban communities in the State that does not have a State Office Building. With NJDEP potentially being a major tenant at the Institute, the potential exists for the State to be the owner or major leasee at the Institute. The #1 priority for Stockton University in the State's Seven Year Capital Improvement Plan has been the Center for Marine & Environmental Studies (see Appendix 7).

**New Jersey Department of Environmental Protection:** The NJDEP has recently reorganized to have both coastal planning and engineering offices operate under the newly named Coastal Resiliency Officer. The Department plans to take immediate steps to develop a comprehensive New Jersey Coastal Resilience Plan and a Decision Support Tool to help allocate future funding. The Coastal Resiliency Institute can partner with the NJDEP to develop coastal policy as well as prepare Resilient NJ plans, the Coastal Resilience Plan and the Decision Support Tool.

**New Jersey Sea Grant Consortium:** Founded in 1969 as the New Jersey Marine Sciences Consortium, the organization has contributed leading research in the field of marine and environmental science. Since 1976 it has managed the New Jersey Sea Grant Program (NJSJG), part of a national effort that funds competitive research focusing on specific priority areas. In recognition of its academic and scientific achievements, the Consortium was awarded Sea Grant College status in 1989.

**Breakthrough Energy Ventures Fund:** Microsoft co-founder and billionaire Bill Gates is heading a \$1 billion venture fund that will invest in clean energy technology to combat climate change. Some of the world's wealthiest business leaders are joining forces with Gates, including Amazon founder and CEO Jeff Bezos, Virgin Group founder Richard Branson, LinkedIn co-founder Reid Hoffman and Alibaba executive chairman Jack Ma. The combined net worth of the fund's directors is roughly \$170 billion. The fund will focus its investments on projects relating to several clean energy issues such as carbon emission reduction and energy generation and storage.

**Resilient Communities Program:** In 2017, Wells Fargo and NFWF launched the Resilient Communities Program, designed to prepare for future environmental challenges by enhancing community capacity to plan and implement resiliency projects and improve the protections afforded by natural ecosystems by investing in green infrastructure and other measures. The program focuses on water quality and quantity declines, forest health concerns, and sea level rise. The program emphasizes community inclusion and assistance to traditionally underserved populations in vulnerable areas.

This four-year initiative is supported through a \$10 million contribution from Wells Fargo that will be used to leverage other private and public funds with an expected total investment of more than \$20 million.

Specific funding priorities for this program include:

- High-impact resiliency adaptations to help communities prepare for fire in the U.S. West, floods and droughts in the Mid-West, and sea-level rise on the Eastern seaboard.
- Community demonstration and capacity-building projects that help communities understand environmental risks and opportunities and organize and take actions to improve local resiliency by enhancing natural buffers and system functions.

Grants are offered once a year to support priority projects in states and communities associated with Wells Fargo operations.

**National Science Foundation:** The National Science Foundation, through its Coastal Science, Engineering and Education for Sustainability Program, has provided over \$13 million to study coasts in the United States and around the world.

**The Oak Foundation:** The Oak Foundation is a group of philanthropic organizations that addresses issues of global, social and environmental concern. In 2012, the Oak Foundation issued about \$33 million in grants for environmental projects. Since 1983, this foundation has given over 2,700 grants globally. The foundation provides grants ranging from about \$20,000 to \$6 million in size; however, it rarely funds projects of fewer than \$25,000 except in rare circumstances. The Oak Foundation supports environmental efforts through its Marine Conservation and Climate Change programs. While the Marine Conservation Program focuses mainly in the Mesoamerica, the North Pacific/the Arctic and the European Union, the Climate Change Program mostly focuses on the United States, Canada, Europe, India, China and Brazil.

**Threshold Foundation:** Thriving Resilient Communities funding circle (TRC) funds U.S.-based organizations strengthening local and regional resilience in climate, economy, justice, and collaborative networks. Complex issues like climate and justice need a "whole community" approach that can link across regions to create massive culture and behavior shift. The Foundation practices Democratic Philanthropy by involving allies (including grantees) in funding decisions. They fund regional and national network hubs in the US with systemic approaches that promote inclusive economic models and social justice. We also involve our allies, including our grantees in the grantmaking process.

**Kresge Foundation:** The Kresge Foundation Environment Program seeks to help communities build resilience in the face of climate change. They invest in climate resilience through two primary strategies:

- Accelerating place-based innovation through support to efforts that are anchored in cities and have a strong potential to serve as models.
- Building the climate-resilience field by supporting activities to disseminate and bring to scale promising climate-resilience approaches.

**Wells Fargo Innovation Incubator:** The Wells Fargo Innovation Incubator (IN<sup>2</sup>) is a technology incubator and platform funded by the Wells Fargo Foundation and co-administered by the National Renewable Energy Laboratory (NREL). IN<sup>2</sup> helps speed the path to market for early-stage clean energy and agriculture technologies by providing funding and technical

assistance that leverages the capabilities, facilities, equipment and deep expertise at NREL and the Donald Danforth Plant Science Center (Danforth Center).

**William and Flora Hewlett Foundation:** The Hewlett Foundation has consistently remained one of the largest U.S. foundation supporters of climate-change and environmental issues. Most notably, the foundation gave a multi-year grant of \$461 million to Climate Works Foundation in 2008. In 2011 alone, the Hewlett Foundation issued \$203 million through 591 grants, averaging about \$345,000 per grant. From 2003-2011, the foundation contributed \$818 million to environmental projects. Hewlett's Environment Program focuses on the expansion of clean energy and climate change. The Energy and Climate Program, a sub-category of the foundation's Environment Program, mostly provides large grants to foundations such as Climate Works Foundation and the Energy Foundation (see below), which make smaller grants available to non-governmental organizations.

The Hewlett Foundation has been investing for a number of years in various strategies to avoid the worst effects of climate change and spare human suffering by reducing greenhouse gas (GHG) emissions. Their grants focus on cleaning up power production, using less oil, using energy more efficiently, preserving forests, addressing non-CO2 greenhouse gases, and financing climate-friendly investments. Their grantmaking is focused in developed countries with high energy demand and developing countries with fast-growing energy demand or high deforestation rates.

**The Energy Foundation:** The Energy Foundation is supported by grants made by the William and Flora Hewlett Foundation and the David and Lucille Packard Foundation, among others. This grant-making institution promotes renewable energy and energy efficiency, with specific focus on the United States and China. The Energy Foundation has a Climate Program that focuses on climate education and awareness, as well as policy implementation and advocacy. Since 2009, the foundation has issued a total of around \$46 million through 345 grants on the issue of climate.

**National Offshore Wind Research and Development Consortium:** The National Offshore Wind Research and Development Consortium will award up to \$7 million in funding for offshore wind technology projects. The goal is to identify innovative technology to further drive down costs of offshore wind development in the United States. The consortium will seek proposal that foster reductions in the lifetime average cost of offshore wind energy while overcoming domestic market challenges in offshore wind technology. Proposals should address the following challenges: wind turbine array performance and control optimization; cost-reducing turbine support structures for the U.S. market; floating structure mooring concepts for shallow and deep waters; and power system design and innovation.

**Bloomberg Philanthropies:** Bloomberg Philanthropies' Environment program brings together a wide range of partners, including cities, businesses, public health and environmental advocates, and citizen's groups, to address some of the most serious threats to our environment, including climate change and overfishing. Left unchecked, carbon pollution causes long-term impacts on the global climate, including rising global temperatures, rising sea levels and extreme weather patterns, as well as health risks such as worsening smog and a range of respiratory illnesses. Overfishing poses risks to a vital food and economic resource for billions of people.

Bloomberg Philanthropies drives measurable, local action on climate and sustainability through the Sustainable Cities program, Clean Energy program, Vibrant Oceans Initiative and Sustainable Finance Initiative.

The Vibrant Oceans Initiative “partners with coastal communities, nonprofit organizations, local and national governments, policy makers, and academic groups to advance evidence-based conservation practices and implement data-driven fisheries management policies around the world.” Phase II (Fall 2018) is ongoing with the goal of awarding \$53 million to 10 target countries, including USA, to promote adoption of high-impact, science-based fisheries and marine protection policies and protect sensitive coral regions impacted by climate change. Ocean, Atlantic and Cape May counties constitute the 4<sup>th</sup> largest commercial fishing port in country and are therefore critical to the food supply.

Bloomberg Philanthropies America's Pledge on climate change is an initiative to compile and quantify the actions of states, cities and businesses to drive their greenhouse gas emissions consistent with the goals of the Paris Agreement. The University of Maryland's Center for Global Sustainability and the Rocky Mountain Institute was awarded a \$2.3 million grant by Bloomberg Philanthropies to evaluate nationwide greenhouse gas reduction efforts.

**Gordon & Betty Moore Foundation:** Approximately 44 percent (or \$1.75 billion) of their awards go to environmental research and conservation efforts. In 2018, over \$108 million was granted in this category. Solicited proposals are reviewed on a rolling basis generally for 24 months funding.

**David & Lucile Packard Foundation:** Since 1968 the foundation has awarded \$1.66 billion to 148 grantee organizations for their Oceans investment research. Currently they are awarding \$40 million annually. Several areas under the Oceans Program would be of interest to Stockton University and geographically relevant, including “protect seabirds and shorebirds and their habitats,” “understand and proactively address impacts of greenhouse gas emissions on the ocean,” and “protect places that are vital to maintaining biodiversity and wild fish stocks.”

The Packard Family has several endowed centers in the Bay Area. Additionally, they also established a fellowship partnership with U.C. Berkeley but have no such equivalent with an East Coast university at this time.

**BuildStrong Coalition:** The BuildStrong Coalition was born primarily from national insurance companies and the sustainable building materials industry joint efforts to find ways to lower costs of disaster response and rebuilding by mitigating hazards and promoting resiliency initiatives before disasters occur. Bipartisan legislation was introduced, passed by Congress and signed into law in 2018 based on their recommendations. BuildStrong now serves as lead partner with the Federal Emergency Management Agency (FEMA) in establishing guidelines for the upcoming Building Resilient Infrastructure and Communities (BRIC) grant program to be executed in 2020.

At present time BuildStrong Coalition has academic partners on the West Coast and Gulf of Mexico region for research and programming events. It is seeking an academic partner in the Northeast. Stockton University could be a potential strong candidate.

**Ocean 5:** Oceans 5 is “an international funders' collaborative comprised of philanthropists dedicated to protecting the world's five oceans through large, opportunistic projects and campaigns to establish marine reserves and constrain overfishing.” While direct funding from Oceans 5 is unlikely, their network of philanthropists all dedicated to coastal and marine ecosystem issues could foster leads for foundational funding, research grants or endowment opportunities.

**Oceana:** Focus under Oceana's ongoing "Responsible Fishing" campaign is protecting ocean habitats. South Jersey, particularly Cape May County, has been home to some federal and private demonstrations of artificial coral reefs as part of protecting the ecosystem. Stockton University research could complement their efforts.

**American Water Works Association:** A trade association representing 4,300 utilities with 51,000 total membership, Stockton University could support research into protecting near-shore fresh water sources impacted by coastal erosion, rising sea levels and other climate change-related factors. Opportunity for cooperation and funding from local and state water systems facing this concern with South Jersey barrier island communities serving as research, design, and evaluation test sites.

## CONCLUSION

NJEDA's Innovation Challenge Grant demonstrates the State's interest in promoting investment in Atlantic City, but the implications for research outlined in this proposal go far beyond the region—it has both statewide and national implications. As such, both federal and foundation funding could be available for the construction and operations of the Institute.

Preliminary economic modeling on the impact of the Institute estimates that total direct impacts for the project could result in 60 jobs, \$13.6 million in goods and services output, and nearly \$4.9 million in earnings. Total impacts are estimated to be \$19.6 million in goods and services output, \$6.4 million in earnings, and 94 jobs.

In addition to the direct impacts associated with the Stockton Coastal Resiliency Institute's employment and construction, additional economic impact benefits will be associated with the estimated \$400 billion in direct investment planned to be spent in the US on resilience projects between 2019 and 2040 as well as the millions spent annually on operations, maintenance, repair, and rehabilitation for those projects. Association with offshore wind development will further allow the Institute to capture and provide value-added towards the estimated \$70 billion in economic benefits in the seven east coast states. It is anticipated that an established Coastal Resiliency Institute would provide research and consulting assistance for coastal resilience and offshore wind projects, further cementing its place as a true coastal resiliency institute.

Next steps include:

**Incubator:** While it will take up to 40 months to fully develop and buildout the Coastal Resiliency Institute, Stockton has proposed an Incubator as a startup to begin work now. Requirements are minimum and would consist of office space, a meeting room and public information center. Sites within and adjacent to the Stockton Atlantic City campus may be adequate to host this facility. Seed grant funding from state, city or private sources would allow the administrative development and startup of this concept.

**Memorandums of Understanding:** The Coastal Resiliency Institute will consist of several partners who will work in collaboration. Memorandums of Understanding should be executed with each partner to detail the level of commitment to the effort and provide for long term relationships.

**Capital and Operating Funding:** Efforts have begun to establish the capital stack for the Institute and for future operating and research endeavors. Crucial to this phase is securing the development rights to the proposed site(s) from the city and state.

**Leadership Plan:** A plan for establishing the leadership of the Coastal Resiliency Institute must be established to mesh with the University hierarchy. The requirements for a director must be established to attract the appropriate leader for this Institute.



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Appendix 1: Capital Project Report – Proposal

Appendix 2: University District Overlay

Appendix 3: Letter of Support and Media Coverage

Appendix 4: Summary of Similar University Based Resilience Institutes

Appendix 5: Memorandum of Understanding

Appendix 6: Conceptual Design Plans

Appendix 7: New Jersey Capital Improvement Plan (excerpt)