

**State University System  
Education and General  
2015-2016 Legislative Operating Budget Issue  
Form I**

<b>University(s):</b> Florida Atlantic University, Florida International University, Florida State University, University of Central Florida, University of Florida, University of South Florida, University of Miami	
<b>Work Plan Issue Title:</b> Florida Center for Adaptation, Resilience, and Economic Sustainability	
<b>Priority Number</b>	
<b>Recurring Funds Requested:</b> \$1,645,000/year <b>Non-Recurring Funds Requested:</b> \$15,735,000 <b>Total Funds Requested:</b> \$17,380,000	
<b>Please check the issue type below:</b>	
Shared Services/System-Wide Issue	<input type="checkbox"/>
2014-2015 Non-Recurring Issue	<input type="checkbox"/>
New Issue for 2015-2016	<input type="checkbox"/>

- I. Description** *(Describe the service or program to be provided and how this issue aligns with the goals and objectives of the strategic priorities and the 2014 Work Plan established by your institution. Include whether this is a new or expanded service/program. If expanded, what has been accomplished with the current service/program?)*

The State of Florida already plays a critical role in supporting business and community-based adaptation measures. In 2010 the State University System Board of Governors granted cluster funds to several Florida universities to strengthen cooperation in tackling the pressing issues of climate variability and extremes in our state. That initiative positioned universities in Florida to develop and lead this statewide effort through the Florida Climate Institute (FCI). Florida CARES is the essential next phase to address key needs of industry and communities, identified through consultations with stakeholders and FCI-member universities.

Florida CARES will bring together prominent universities across the State in partnership with state and regional agencies and the business community to ***create an economy more resilient to risks from hurricane damage, periodic droughts and floods, higher sea levels, and future climate trends.*** It will develop research and deliver education programs in support of Florida's major economic engines (e.g., urban centers, tourism, agriculture, trade, and coastal marine resources). Working with partners from industries and agencies, it will help develop the workforce to manage Florida's resources while growing its economy. Florida CARES will make Florida more competitive through its collaborative research and training programs, and create marketable expertise and technologies to meet the increasing demands of the state's future.

**II. Return on Investment** *(Describe the outcome(s) anticipated, dashboard indicator(s) to be improved, or return on investment. Be specific. For example, if this issue focuses on improving retention rates, indicate the current retention rate and the expected increase in the retention rate.)*

The return on investment for well-informed expenditures and advance preparation is potentially enormous because every dollar spent anticipating hazards resulting from extreme events saves four dollars in the long term. Hurricanes Sandy and Katrina inflicted \$30 to \$100 billion in damage. Creating a statewide center to manage risk will ensure that investments are proactive, high performance, and cost effective--reducing risk to the economy, health, and safety as predicted by Bloomberg and Steyer in their 2014 report, *Risky Business*.

Florida CARES will bring new revenue and jobs to Florida and will position our state as the global leader in risk management and resilient businesses and communities. Florida faces imminent and intensifying threats from rising sea levels, increasing temperatures, and extreme weather events. By proactively strengthening Florida's preparedness for these threats, we can realize extraordinary economic benefits through increased public safety and the protection of our diverse economy with its trillions of dollars in assets and infrastructure. At the same time, we can leverage the know-how of our university system to ensure Florida's climate resilience. In partnership with businesses, Florida CARES will:

- Create a preeminent **knowledge delivery system** in the areas of climate change adaptation, mitigation, and resilience;
- Promote **innovation and entrepreneurship** for a climate-smart Florida and create strong public-private research and education partnerships;
- Give Florida-based companies a **competitive edge**, by providing research and training they can use;
- Create a **new skilled workforce** that meets the needs of the economy and addresses future challenges of climate change in Florida; and
- Identify appropriate incentive and market-based mechanisms that allow and support **growth**.

Over a three-year time frame Florida CARES would result in:

- Over **5,000 new jobs** in the energy, water, tourism, agriculture sectors;
- **Creation of** over 12 adaptation and resilience **spin-off companies**;

- **In-service training** for over 3,000 mid-level professionals on building climate-smart technologies into their areas of professional responsibility;
- Increased number of **undergraduate and graduate certificate programs** in climate adaptation and green technologies;
- Development of **new BSc, MA/MSc and PhD degrees and training programs** related to climate preparedness and resilience ;
- **High yield return on the state's investment** by reducing uncertainties for businesses and promoting present and future technology investment in the state; and
- Development and/or transference of **multiple new technologies** to the market place.

**III. Facilities** *(If this issue requires an expansion or construction of a facility and is on the Capital Improvement List complete the following table.):*

	Facility Project Title	Fiscal Year	Amount Requested	Priority Number
1.				
2.				

**2015-2016 Legislative Budget Request**  
**Education and General**  
**Position and Fiscal Summary**  
**Operating Budget Form II**  
(to be completed for each issue)

University: \*7 Universities listed below  
Issue Title: Adaptation, Resilience, and Econ

	RECURRING	NON-RECURRING	TOTAL
	per year	over 3 years	
<u>Positions</u>			
Faculty	2.40	0.00	2.40
Other (A&P/USPS)	14.50	0.00	14.50
AMP		4.00	
	-----	-----	-----
Total	16.90	4.00	16.90
	=====	=====	=====

Salary Rate (for all positions noted above)

Faculty	\$350,000	\$0	\$350,000
Other (A&P/USPS)	\$770,000	\$0	\$770,000
AMP		\$1,800,000	\$1,800,000
	-----	-----	-----
Total	\$1,120,000	\$1,800,000	\$2,920,000
	=====	=====	=====

Salaries and Benefits	\$1,435,000	\$0	\$1,435,000
Other Personal Services	\$0	\$1,800,000	\$1,800,000
Expenses	\$140,000	\$420,000	\$560,000
Operating Capital Outlay	\$0	\$0	\$0
Electronic Data Processing	\$0	\$210,000	\$210,000
Special Category (Specific)	\$0	\$0	\$0
Travel	\$70,000	\$750,000	\$820,000
<u>Course and Training Develop.</u>	\$0	\$1,515,000	\$1,515,000
<u>Applied research</u>	\$0	\$11,040,000	\$11,040,000
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Total All Categories	\$1,645,000	\$15,735,000	\$17,380,000
	=====	=====	=====

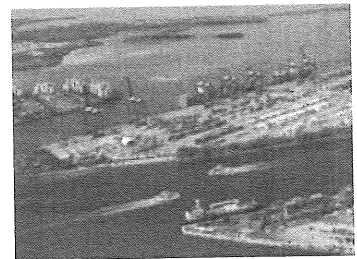
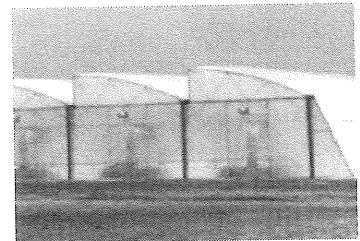
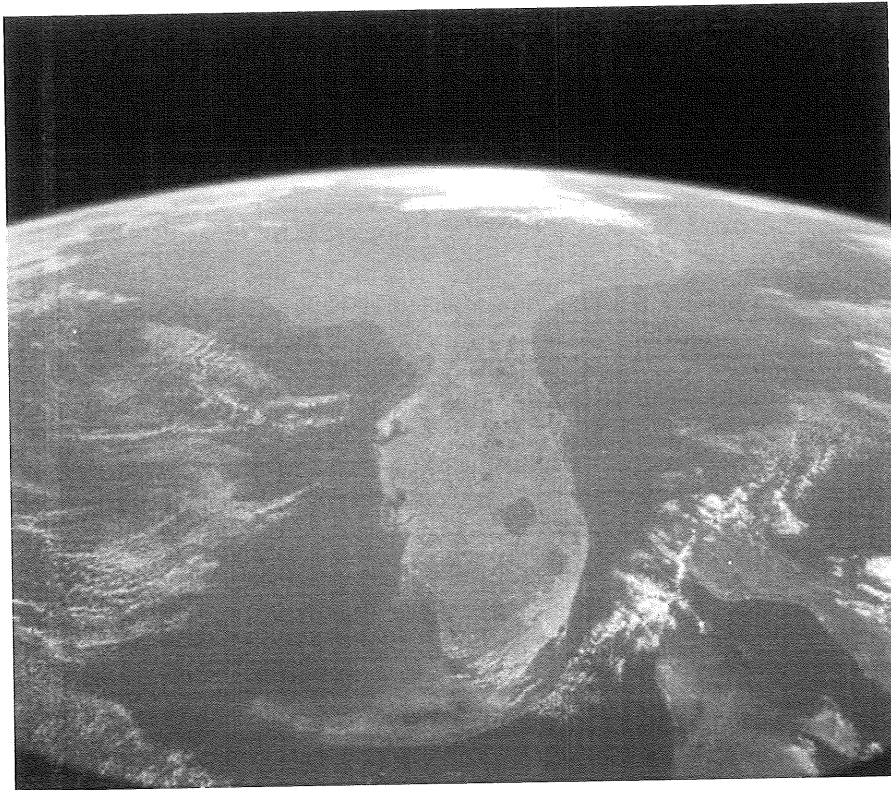
\* Florida Atlantic University, Florida International University, Florida State Uni



Florida Center for Adaptation,  
Resilience, and Economic Stability

# Florida CARES

A proposal for a state-wide Center  
July 2014



**FAU**  
FLORIDA  
ATLANTIC  
UNIVERSITY

**FIU**  
FLORIDA  
INTERNATIONAL  
UNIVERSITY



 University of  
**Central  
Florida**

**UF**  
UNIVERSITY OF  
FLORIDA

**U**  
MIAMI

**USF**  
UNIVERSITY OF  
SOUTH FLORIDA

Florida Center for Adaptation,  
Resilience, and Economic Sustainability

# Florida CARES

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## Executive Summary

Florida CARES will bring new revenue and jobs to Florida and will position our state as the global leader in risk management and resilient businesses and communities. Florida faces imminent and intensifying threats from rising sea levels, increasing temperatures, and extreme weather events. By proactively strengthening Florida's preparedness for these threats, we can realize extraordinary economic benefits through increased public safety and the protection of our diverse economy with its trillions of dollars in assets and infrastructure. At the same time, we can leverage the know-how of our university system to ensure Florida's climate resilience.

In partnership with businesses, the Florida CARES will:

- Create a preeminent **knowledge delivery system** in the areas of climate change adaptation, mitigation, and resilience
- Promote **innovation and entrepreneurship** for a climate-smart Florida and create strong public-private research and education partnerships
- Give Florida-based companies a **competitive edge**, by providing research and training they can use
- Create a **new skilled workforce** that meets the needs of the economy and addresses future challenges of climate change in Florida, and
- Identify appropriate incentive and market-based mechanisms that allow and support **growth**.

Over a three-year time frame Florida CARES would result in:

- **Thousands of new jobs** in the tourism, agriculture, trade and other sectors
- **Creation of** at least 5 adaptation and resilience **spin-off companies**
- **In-service training** for over 3,000 mid-level professionals on building climate-smart technologies into their areas of professional responsibility
- Increased number of **undergraduate and graduate certificate programs** in climate adaptation and green technologies
- Development of **new BSc, MA/MSc, and PhD degrees and training programs** related to climate preparedness and resilience
- **High yield return on the state's investment** by reducing uncertainties for businesses and promoting present and future technology investment in the state and
- Development and/or transference of **multiple new technologies** to the market place.

While Florida's economic growth is predicted to outpace national trends, sustaining our growth requires us to face serious threats from extreme events such as more intense storms and the compounding effects of sea level rise on damage these storms inflict. The state's agricultural industry must be ready to adapt to changing temperature and rainfall regimes and also take advantage of opportunities resulting from decreases in production elsewhere. Businesses and communities need accurate, reliable information as they plan future investments. Florida CARES supports this growth by supplying the data needed to reduce risk, applying that knowledge for economic growth through partnerships with core businesses, and promoting the rapidly emerging industry associated with climate adaptation.



The return on investment for well-informed expenditures and advance preparation is potentially enormous because every dollar spent anticipating hazards resulting from extreme events saves four dollars in the long term. Hurricanes Sandy and Katrina inflicted \$30 to \$100 billion in damage. Creating a statewide center to manage risk will ensure that investments are proactive, high performance, and cost effective, thus reducing risk to the economy, health, and safety as predicted by Bloomberg, Paulson, and Steyer in their 2014 report, *Risky Business*.

In addition to reducing risks to communities through applied knowledge and innovation, Florida CARES will help capture the economic benefits surrounding emerging global markets for emergency preparedness and response, climate adaptation, and community resilience—creating new businesses and high-skilled jobs in Florida. Globally recognized as “ground zero” for possible effects of sea level rise and climate change, Florida is now poised to position itself as a knowledge hub and market leader in providing business and community resilience solutions in the face of climate extremes.

Florida CARES will foster Science, Technology, Engineering, and Mathematics (STEM education) and train interdisciplinary problem-solvers to make Florida universities and graduates international leaders. Florida's universities are among the best prepared to lead in this area. But Florida must act quickly to secure its stature as a global leader in risk management and resilient communities. Capturing these rapidly emerging business opportunities requires decisive action.

The State of Florida already plays a critical role in supporting business and community-based adaptation measures. In 2010 the State University System Board of Governors granted cluster funds to several Florida universities to strengthen cooperation in tackling the pressing issues of climate variability and extremes in our state. That initiative positioned universities in Florida to develop and lead this statewide effort through the Florida Climate Institute (FCI). Florida CARES is the essential next phase to address key needs of industry and communities, identified through consultations with stakeholders and FCI-member universities.

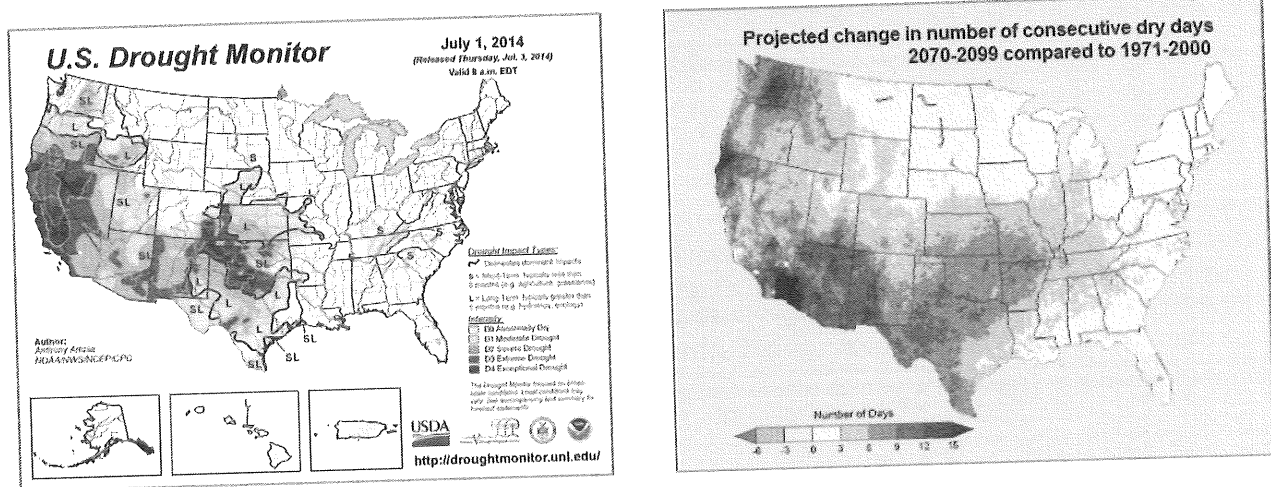
Florida CARES will bring together prominent universities across the State in partnership with state and regional agencies and the business community to ***create an economy more resilient to risks from hurricane damage, periodic droughts and floods, higher sea levels, and future climate trends***. It will develop research and deliver education programs in support of Florida's major economic engines (e.g., tourism, agriculture, trade, transportation and coastal marine resources). Working with partners from industries and agencies, it will help develop the workforce to manage Florida's resources while growing its economy. Florida CARES will make Florida more competitive through its collaborative research and training programs, and create marketable expertise and technologies to meet the increasing demands of the state's future.



## Background: Hazards and Threats

### National Scene

The recent National Climate Assessment report [1] compiled by more than 300 scientists concluded that climate change is happening now and that the changes seen over the last 50 years are primarily due to human-induced emissions of heat-trapping gases. Across the U.S. the average temperature has increased by 1.3 to 1.9 °F since 1895, with most of this increase happening since 1970 [1]. During the last 100 years, average sea level has increased by about 8 inches. U.S. average temperature is projected to continue to increase by between 2 and 4 °F over the next few decades, and seas will continue to rise by between 1 and 4 feet by 2100. These changes are affecting Americans in far-reaching ways, including prolonged periods of heat, heavier downpours, increased floods and droughts in some regions, and higher sea levels that cause more flooding in coastal areas.



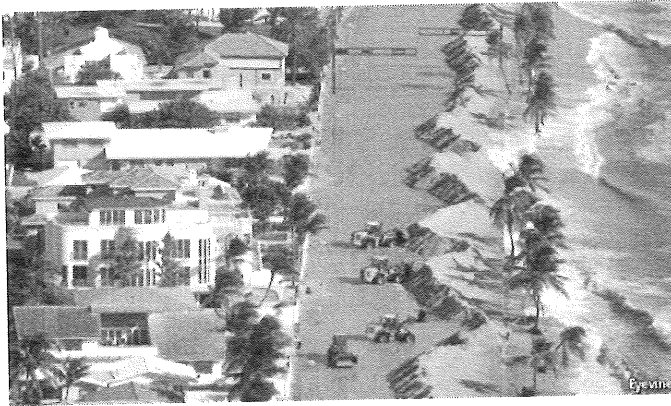
In some states changes in climate are already creating major economic losses and hardships for private citizens and businesses. For example, California is entering its fourth year of severe drought conditions, leading Governor Brown to issue a drought state of emergency and call for a reduction in water use of 20% [2]. The entire state of California has been in the highest stage of drought, and water restrictions are affecting farms and cities. Because California's agriculture supplies over half of the nation's fruit and vegetables and is a \$37 billion per year industry, this drought is causing food prices nationally to increase, as well as causing major unemployment in large agricultural regions in California.

In late June 2014, former Secretary of the Treasury Hank Paulson, former New York Mayor Michael Bloomberg, and founder of Farallon Capital Management LLC Thomas Steyer released a report describing the risk the nation's economy faces from climate change [3]. Standard risk-assessment techniques evaluated the possible consequences of inaction for different parts of the country and different economic sectors, focusing on sea-level rise (SLR) and storm damage to coastal assets, agricultural production, labor, productivity and public health. It emphasizes that – unlike many investment and policy decisions–future risks brought on by climate change are intimately tied to today's actions. Some key conclusions of the report are that: by 2050 between \$66 billion and \$106 billion worth of coastal property nationwide has a 2-in-3 chance of being below sea level, an average American is likely to experience a doubling or tripling of the average annual number of 95°F days compared to the past 30 years, and, if there is no adaptation, by 2100 some Southeastern, lower Great Plains, and Midwest states could see a 50% to 70% loss in average annual crop yields due to increasing temperatures.



Industry is taking note. Corporations such as Intel, Google, Walmart, Microsoft and others have sponsored technology development events, creative contests, and entrepreneurial projects nationally. Other organizations like the World Bank and the Rockefeller Foundation are providing tools and resources to invest in climate-related risk management and resilience for our communities, citizens, and the future of our nation. As predicted by McCue and others [4], the real estate industry must address this issue as a priority, because if a re-insurer such as RenaissanceRe thinks real estate professionals are opening themselves up to potential liability, they will increase their premiums.

## Florida Scene



Florida is one of the places in the world most vulnerable to climate-related threats due to its extensive coastal geography, concentration of human population along the coasts, low-lying topography, and exposure to extreme storms. For example, damages from recent storms, including Hurricane Wilma in 2005, have run into the hundreds of millions and even billions of dollars [5]. In the coming decades, some projections show that Florida's annual rainfall could decrease by 10 to 20 percent, hotter and drier conditions and summertime heat waves are expected to be more frequent, and tropical

storms and hurricanes may become more intense [6]. The 8 inches of sea level rise that Florida currently experiences already results in significant flooding especially at extreme high tides. In addition, it is projected that seas will rise by between 1 and 4 feet by 2100. Recent research shows even higher risk from sea level rise, as scientists found that collapse of the West Antarctic Ice Sheet appears inevitable [7], increasing the likelihood of greater magnitude in sea level rise. These changes are beginning to affect Floridians in far-reaching ways and will pose progressively higher risks to many elements of Florida's lifestyle, natural areas, and economy as time passes.

The vast majority of Floridians (80%) live or work in one of the state's 35 coastal counties—most of them within ten miles of the coast. These communities contribute about 79% of the state's economic productivity [8]. Most of Florida's coastal cities are already threatened by flooding and storm surges caused or exacerbated by rising sea levels. For example, the Miami urban area ranked highest in a global study of asset exposure to surge-induced flood events in large port cities [9]. The exposed assets in the Miami urban agglomeration are valued at \$3.5 trillion. By comparison the entire United States 2013 GDP was \$16.8 trillion. Sea level rise will also affect the natural environment, leading to erosion of beaches and barrier islands, salt-water intrusion into drinking water supplies, and will adversely impact coastal ecosystems, including fisheries, marshes, and mangrove forests. On the islands of Pine Island Sound alone, including Sanibel and Captiva Islands, a one-foot rise in sea level will cause a net loss of over \$1.1 billion in the value of ecosystem services such as storm surge protection and pollution filtering [10].

Few Floridians understand how dependent their quality of life and employment are on ecosystems for drinking water recharge, storm buffering, fisheries, and tourism and recreation. Florida universities are scientifically verifying and documenting these dependencies and creating ways of strengthening the resilience of those ecosystems.

Sea level rise threatens sustained growth in the key sectors of Florida's economy including tourism, agriculture, and trade. In 2012, 91.5 million visitors came to Florida and spent \$71.8 billion. Tourism generated 23% of the state's sales tax revenue and employed nearly 1.1 million Floridians, making it the number 1 industry in the Sunshine State [11]. Florida's agricultural industries generated more than \$120 billion in sales in 2010, contributing \$60 billion to Florida's Gross State Product and employing 1.35 million full or part time workers [12]. Florida's 15 seaports and network of navigational channels are an essential part of the state's economy, moving more than 100 million tons of cargo each year. Florida is also the cruise capital of the world, with 13.3 million passengers embarking and disembarking yearly [13]. Cargo and cruise activity support more than 680,000 jobs and contribute \$96.6 billion of output to the state's economy, equivalent to about 13 percent of Florida's Gross Domestic Product, according to the Florida Ports Council [14]. If the state does not address the challenges of climate change, these industries could be at risk. For example, without adaptation to climate change, Florida's tourism, agriculture, and trade sectors will sustain significant harm. The impact of climate variability and sea level rise on the economy will be high, and could reduce Florida's Gross State Product by 5% by the end of this century [15].

The human and economic costs of coastal flooding due to storm surge and damage from high winds in coastal areas are potentially enormous [16]. Because of Florida's low-lying topography, even a modest change in sea level means a dramatic change in the area of land at risk of inundation. The National Climate Assessment recently concluded that Florida cities such as Miami, Tampa, and Fort Lauderdale are especially vulnerable [1]. In Miami-Dade County, sea level rise has already resulted in 'sunny day flooding' at high tide in Miami Beach and likely contributed to beach erosion and extensive damage to highway A1A in Ft. Lauderdale during Hurricane Sandy. These flooding events are becoming more frequent due to higher sea levels, which are conservatively projected to rise along Florida's coastline by about 3 feet during this century [17]. A study by Tufts University [15] concludes



that by 2050, climate change will cause devastating consequences to Florida, with annual economic losses of \$93 billion and 700,000 jobs lost, signaling a compelling need to develop a climate-smart economy to protect the otherwise bright economic future of Florida.

Vulnerabilities to changes in climate exist in all of Florida's natural and managed systems. Florida's citizens are also at risk [1]. The specific nature of these vulnerabilities varies among coastal and inland natural resources and ecosystems, the built environment, the agriculture, forestry, tourism, and recreation industries, as well as the public health sector. The cost of inaction in the face of climate-related threats to Florida will be extraordinary [3]. At the same time, the global value of practical knowledge, decision-making tools, and technological solutions to these challenges is also great.

## Sea level rise is already creating multiple problems in Florida [18]

Coastal Flooding	Although sea levels have risen only a few inches in Florida in recent decades, we already experience flooding at high tide due to the backup of drainage systems. This new phenomenon occurs regularly at lunar high tides and is an indicator of future problems as sea level continues to rise.
Flood Control Challenges	Sea levels were several inches lower when South Florida's flood gates were constructed in the 1950s and 1960s. Several flood gates are now unable to discharge storm water during high tides. Many South Florida flood gates already need a multi-million dollar retrofit or rebuild. A recent report finds that only six more inches of sea rise may cripple almost half the area's flood control capacity.
Salinization of Aquifers	Many coastal well fields that withdraw freshwater from the productive Biscayne aquifer are located along the South East Coast. These well fields are extremely vulnerable to saltwater intrusion due to rising sea level and drinking water extraction. For example, because of sea level rise and salt water intrusion into fresh water wells, officials in the City of Hallandale Beach are spending \$16 million to upgrade their storm water system and to move the city's drinking water supply westward.



Across Florida, communities and businesses realize the need to adapt to the consequences of climate change and extreme weather events by updating building codes, improving the resilience of critical infrastructure systems, and planning for rapid recovery from extreme events. Unfortunately, community and business leaders are hampered in their efforts by a lack of sufficient scientific information, good predictive tools, smarter adaptation solutions, and a skilled workforce to help cope with the new challenges. Similar deficiencies exist on a global scale. Therefore, the situation creates immediate opportunities for better tools, technologies, expertise, and practitioners in this critical area of endeavor.

“The Miami-Dade Task Force concluded, “Over the past six years, Swiss Re has been conducting research to assess the cost of adapting to severe weather impacts using a rigorous risk management approach to assess local total climate risk and included proposed adaptation measures to address total climate risk on an economic basis. Using predictive scenarios, this study estimated the expected losses for Southeast Florida by scenario and by hazard ranged from \$17 billion, or 8.5 percent of Gross Domestic Product (GDP) in 2008, to \$33 billion or 10% of GDP in 2030. This study also suggested the most cost-effective ways to minimize loss. According to the cost/benefit curve developed in this study for the Southeast Florida region, it is estimated that approximately \$30 billion of the total expected loss in 2050 could be avoided if a comprehensive plan for adaptation were implemented.”

Miami-Dade Sea Level Rise Task Force [19].



## Why Florida?

Florida is one of the states most vulnerable to and directly impacted by extreme events. Florida is uniquely positioned to be the leader in innovation and knowledge generation in preparing for climate-driven natural hazards. Florida has learned a significant amount from its experience and is the right place for research and knowledge building that can be exported to other regions. By being a global leader in research and innovation, Florida CARES will attract new recreation, trade, technology, and other industries to the state and contribute to sustainable economic growth.

There are many additional justifications for creating Florida CARES, including the following:

- Collectively, Florida universities have the expertise and knowledge to develop academic and for-profit networks that can quickly produce cutting-edge technologies to address climate impacts in a variety of sectors
- Florida serves as a hub for international commerce, and is well positioned to provide new adaptation technologies to an international market
- Federal dollars will be available in greater amounts to support R&D in this critically important field of knowledge. Florida can secure much of this funding with a Center recognized as a leader nationally and internationally
- Florida's unique ecosystems, natural resources, and economic opportunities mean that simply importing solutions from other regions poses risks. In-state development of tools and technologies allows us to innovate flexibly for local needs.

**R**ising sea levels could limit the effectiveness of critical drainage infrastructure, endanger beaches, and coastal natural resources and increase incidents of saltwater intrusion on the Biscayne Aquifer—putting at risk the drinking water supply for the entire population of Southeast Florida...local governments, and the region as a whole, must give significant consideration to adaptation strategies designed to protect public infrastructure, property, water resources, natural areas, and native species, and basic quality of life...".[20]

Florida CARES will bring together recognized leaders in science and education to work with businesses and state and local agencies to develop solutions. This approach will significantly increase Florida's competitive advantage and provide opportunities to adapt our businesses and economic activities toward a sustainable economic growth trajectory, but universities cannot do this alone. Florida CARES will work with public institutions, agencies, and private industries to develop new risk management decision support tools like the existing AgroClimate model [21]. For example, Florida could increase production of high value crops to replace crops now produced in California by developing production systems that increase water use efficiency and protect our environment and natural resources. Measures would include developing crop varieties, technologies, and farm management systems to enable sustainable growth in agricultural production. Although these opportunities exist, taking advantage of them must be a joint priority of industry and our universities.

## Leveraging Florida's leadership in risk management and climate resilience

In April 2014 an insurance analyst with Swiss Re, the world's second largest reinsurer, testified at a Senate hearing that portions of Florida could become uninsurable due to sea level rise by 2100 [22]. This would have a cascading effect on Florida's economy, beginning with the value of real estate.

Recently, the Florida Senate unanimously passed a bill encouraging private insurance companies to provide flood insurance. Senator Jeff Brandes, St. Petersburg, stated that, "This legislation makes Florida a national leader in the flood insurance marketplace." The best approach to guarantee that existing ambiguous risks remain insurable is to foster the mitigation of risk today [23]. Economists have shown that for every dollar spent on preparing for climate hazards, society saves over four dollars in the long term [24]. A good business environment for long-term investment in Florida requires that the concerns of investors about climate-related risk management and the resilience of Florida communities be addressed.



Investment in risk management and resilient communities offers new opportunities for economic development. The World Bank estimates that by 2050 the required investment for climate adaptation will be between \$75-100 billion per annum globally [25]. The U.S. President's proposed FY15 Budget recognizes the critical importance of meeting the challenges of climate change, and includes support for State and local preparedness efforts, analysis of vulnerabilities of critical infrastructure, and development and dissemination of better information and planning tools. The Budget also includes a new \$1 billion Climate Resilience Fund, within a fully paid for \$56 billion Opportunity, Growth, and Security Initiative, that expands on existing climate-change preparedness programs to ensure we are doing everything we can to support the safety and security of our communities and resources. The Fund will help us better understand and prepare for climate change by investing in research and unlocking data and information, including new sea-level rise analyses.

Florida-based companies will be able to profit from these funding opportunities if the state chooses to leverage the knowledge and expertise essential to our well-being, health, and safety. Dollars spent on unavoidable measures needed to ensure Florida's climate preparedness and resilience should go to in-state businesses. Policies for adaptation to climate change can drive the market toward new innovation and growth [26]. An adaptation marketplace for the private sector can be developed where investments in adaptation incentivize new and expanded economic activity and help create new jobs [26]. The state of Florida and its businesses are well positioned to lead in this area, and have a solid track record of leadership in risk management and resilient communities. For example the Insurance Information Institute, recommended that New York might look to Florida's response to Hurricane Andrew in 1992 as an example of how a disaster served as a wake-up call to the government to implement a wide-scale urban risk management plan [27]. Because of its location and the expertise of its businesses and universities, Florida is positioned to become the international leader in developing improved risk management for businesses and communities, fostering more resilient communities, and promoting an increasingly robust business sector.

Companies able to analyze and manage the risks associated with climate change earlier and more successfully than their competitors will have expanded opportunities. Florida's businesses have much

to gain from developing innovative solutions and boosting the standards and technologies for resilient and climate-adapted buildings, infrastructure, cities, and industries. Climate adaptation needs and opportunities are very context-specific [28]. With its subtropical climate, Florida is well suited to develop adaptation strategies that can be marketed to other sub-tropical areas where a majority of the world's population lives.

**"I**f the Dutch have done it for centuries, then maybe Miami Beach and the rest of equally at-risk South Florida can figure out ways to weather the next hundred years, a period during which scientists are forecasting seas to rise anywhere from 1½ feet to six feet.

"It's not just a threat we should fear and run from, it's something we can adapt to and exploit," said Dale Morris, senior economist at the Royal Netherlands Embassy in Washington. "You make lemonade out of lemons."

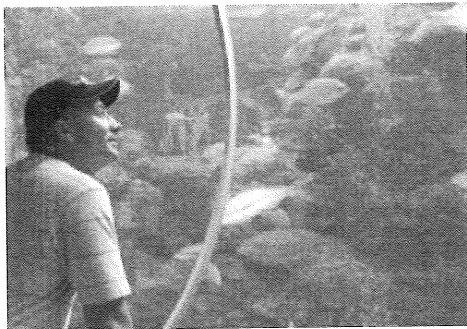
Miami Herald [29]

In order to leverage their advantageous position, Florida-based companies need a competitive edge that can be achieved by advancing applied "actionable" research and training provided by Florida's State University System. Research and training can stimulate the translation of know-how to commercial application by the creation of spin-off companies and through scale-up and demonstration projects for breakthrough technologies. For example, researchers at several universities have worked with the major water utilities in Florida in the Water-Climate Alliance, a collaborative learning network engaged in co-exploration and co-development of actionable climate science to determine best practices for managing water utilities given climate variability and uncertainty. This exploratory project has indicated the need for a continuing state-wide effort to enable utilities to best manage the state's water resources in a changing climate.

Florida is known today for its high-tech cluster along the Space Coast, and has an opportunity to be known for as the global center of excellence on research and education in the area of risk management and resilient communities—a test bed for innovations to prepare for an upcoming century of climate extremes.

The importance of positioning Florida as the leader in risk management and climate resilience is summed up by Brian Biero, a Senior Director of eBay, Inc.: "We see investments in adaptation as a win-win. Adaptation efforts that respond to more severe climate impacts at home and abroad can create new jobs and drive economic growth" [26]. Similarly, with accounting firms such as Ernst & Young, Deloitte, and PricewaterhouseCoopers, offering climate change and sustainability services as a major component of their business models, the need for properly trained professionals is clear.

## Creating new jobs in Florida



Florida's economy and employment, particularly in tourism, agriculture and trade, are sensitive to climate and weather-related events, both slow-onset (e.g., sea level rise, rainfall regime changes, water quality deterioration) and fast-onset (e.g., hurricane winds, storm surge, inland flooding). Florida's exceptional and "leading edge" vulnerabilities to these multiple hazards means that serious and sustained attention must be paid to job protection (i.e., existing employment in key industries and sectors) even as Florida positions itself for job creation as a knowledge and technology transfer hub for climate and weather resilience. In partnership with both private and public sectors, the Florida CARES will develop employment protection solutions as well as pathways for employment creation in Florida.

As Florida's key economic sectors (tourism, agriculture and trade) face the impacts of climate change, they have a more pressing need for professionals equipped with new skills and knowledge. New jobs in engineering and engineering management, planning, hydrology, geology, biology, architecture, agriculture, construction, risk management, sustainability, natural resource management, and other fields will be developed. Even today, professionals with experience in risk management and development of resilient organizations and communities are sought after by Florida's businesses and public authorities. The worldwide need to meet the demand for this expertise in other regions facing similar challenges can only increase [30]

Improved risk management, adaptation to climate change, and an associated shift to a more resilient and sustainable economy have the potential to propel the employment market [28]. Strong evidence in the United States indicates that investments in resilient and sustainable innovations can boost the economy and create new permanent jobs. For example, the 2014-2015 version of the U.S. Department of Labor Occupational Outlook Handbook predict growth in demand for civil engineers at 21%, environmental engineers at 21%, hydrologists at 20%, and geoscientists at 10% over the next 10 years [31]. In 2013, the green building sector alone will support nearly 8 million jobs in the U.S. Due to the labor-intensive nature of these activities, the positive employment effect will lead to the development of a sustainable economy [32]. Not only are these jobs in high demand but they are also well paid. The US Bureau of Labor Statistics [31] estimates an average wage of such professions to be between \$70,000 and \$85,000.

Investments in risk management and resilient communities provide a timely platform to support university Science, Technology, Engineering, and Mathematics (STEM) majors. STEM graduates are in high demand nationwide, and both Governor Scott and President Obama have called for universities to increase their number of graduates in these fields. Learning communities, interdisciplinary work, and opportunities associated with resilience and sustainability jobs and innovation related to climate change may encourage non-STEM students to pursue STEM degrees [33, 34]. This educational focus will have a multiplier effect that will lead the way in developing well-trained, highly-skilled, and motivated graduates in STEM disciplines that will benefit Florida's economy.

While adapting to climate change will require new types of jobs, it will also require redefining many existing job profiles [35]. For many existing jobs in the public and private development sector, including environmental engineers, ecologists, architects, developers, water resource managers, and attorneys, there will be necessary changes in day-to-day skill sets, work methods, and profiles. These changes will lead to demands for continuing education through professional development programs. Florida CARES will offer appropriate training programs through existing channels, including for example the Florida Cooperative Extension Service.

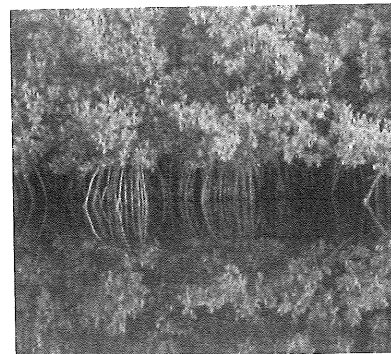
## The **Florida CARES** Vision

Florida CARES will be a knowledge hub and a workforce-generator for climate change adaptation, risk management, and resilience to protect and support Florida's economy, population, and environment. It will foster the growing resilience and sustainability-based economy in Florida, and export consultancy advice and adaptation technologies to the national and international stage. It will be recognized at state, national, and international levels as the premier climate adaptation institute noted for the distinctive and collective strengths of its member universities.

## The **Florida CARES** Mission

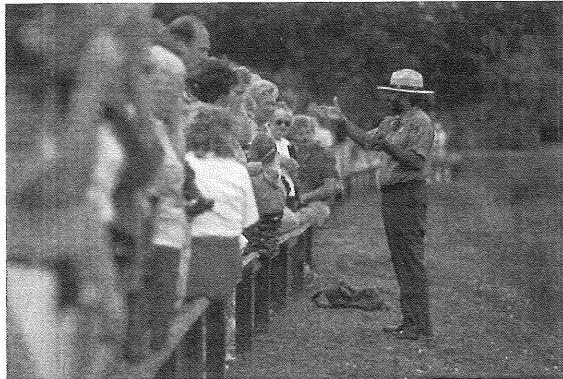
Florida CARES, in partnership with businesses and governments from Florida, will:

1. Create the preeminent **knowledge distribution network** in climate change adaptation, risk management, and resilience
2. Promote **resilience and sustainability innovation and entrepreneurship** and create strong public-private research and education partnerships
3. Enable Florida-based companies to have a **competitive edge**, by advancing applied "actionable" research and training
4. Create a **new skilled workforce** that meets the needs of the resilience and sustainability economy and addresses future challenges of climate change in Florida
5. Identify appropriate incentive and market-based mechanisms that allow and support **sustainable economic growth**.





## Outcomes



### **1. Create the preeminent knowledge distribution network in climate change adaptation, risk management and resilience**

Florida CARES will be established as the knowledge hub on climate adaptation, risk management, and resilience serving the state of Florida. It will generate and share knowledge, offer professional services and help adapt to and mitigate future threats. This will be achieved by a coordinated effort within the Florida university system directed toward education, research, policy, and practices in Florida. Florida

CARES will work closely with businesses, federal and state agencies, and communities to conduct demand-driven research to ensure that the right information is available. Its areas of focus will be detailed analysis on predicting future climate variability and change and associated risks to human life, infrastructure, economic activities, and natural systems. In addition, Florida CARES will work on the identification and development of adaptation measures to protect critical infrastructure and habitat, recommend policies for mitigation measures, and develop strategies for sustainable and resilient infrastructure and economy throughout the state.

Florida CARES will provide Floridians with a central location and e-portal to coordinate future climate resilience education and training, research, and statewide outreach. It will serve students, business leaders, and practitioners through an online platform. It will also link to existing programs offered in K-12 schools, state colleges, state and private universities, and available professional certification programs. Florida CARES will serve as a valued resource for the entire State University System and for the State's independent higher education institutions, leveraging, promoting, and branding Florida's many strengths to claim a position of national and international prominence.

### **2. Promote resilience and sustainability innovation and entrepreneurship that will create strong public-private research and education partnerships.**

Florida CARES will provide significant contributions to the growing resilience and sustainability economy in Florida and the nation. Florida CARES, in partnership with Florida businesses, will create a powerful knowledge hub in the areas of climate change adaptation, mitigation, and resilience. Florida CARES will promote resilience and sustainability innovation and entrepreneurship and will create strong public-private research and education partnerships. A major feature of the program is its multidisciplinary collaboration with industry. Major research themes will be developed in partnership with industry through an idea-driven iterative process, and industry will guide the research to ensure its commercial relevance. Florida CARES is committed to ensuring that know-how is converted into successful, profitable innovations, not only to create business, but also to solve the problems resulting from climate change and sea level rise. For example, Florida CARES will promote in-service training for over 3,000 mid-level professionals on building climate-smart technologies into their areas of professional responsibility. It is the aim of Florida CARES to stimulate the translation of know-how into business by developing decision support tools and management and outreach strategies.

### **3. Enable Florida-based companies to have a competitive edge by advancing applied “actionable” research and training**

The research and partnership links that Florida CARES forges will enable Florida-based companies to have a competitive edge. Research at Florida CARES will identify appropriate incentive and market-based mechanisms that allow and support a sustainable economy. Florida CARES will also make the state more competitive through its collaborative research and training programs, with the ability to create marketable expertise and technologies. It will develop new partnerships with local and state agencies and with the private sector to address the increasingly complex challenges and opportunities associated with these issues.

Florida CARES will:

- **Return a high yield on the State’s investment** by reducing uncertainties for businesses and promoting present and future technology investment in the state
- Create at least five adaptation spin-off companies
- Help the development and/or transfer of multiple new technologies to the marketplace.

### **4. Create a new skilled workforce that meets the needs of the resilience and sustainability economy and addresses future challenges of climate change in Florida**

Florida CARES will offer specialized training and certifications to existing professionals, ensuring that Florida’s workforce remains on the cutting edge of climate adaptation and resilience. These professional development programs will be offered to professionals in the public and private development sector, including environmental engineers, restoration ecologists, architects, developers, water resource managers, attorneys, agriculture and forestry scientists, and others through several existing programs, including the Florida Cooperative Extension Service. It will provide training for natural resource managers in the use of cutting edge climate decision tools that can enhance long-term planning efforts for increased profitability and productivity.

Florida CARES will lead the tailored education of Florida graduates to meet the new demand for professionals who can cope with the challenges of climate change. This will include development and further enhancement of undergraduate and graduate certificate programs in natural disaster response, climate change, and impact analysis. These new graduates will develop new business models, provide original products and services, utilize novel technologies, implement innovative business processes, and deliver competitive propositions to customers.

Florida CARES will achieve the following:

- In-service training for over 3,000 mid-level professionals on building climate-smart technologies into their areas of professional responsibility
- Increased numbers of undergraduate and graduate certificate programs in climate adaption and green technologies
- Development of new BSc, MA/MSc and PhD degrees, and training programs
- Creation of several thousands of jobs in the tourism, agriculture, trade, and other sectors.

## **5. Identify appropriate incentive and market-based mechanisms that allow and support sustainable growth**

Florida CARES will bring together prominent universities across the state to become a focal point for developing useful market-based adaptation strategies in support of Florida's major economic engines. Specific areas of focus will include tourism (including ecotourism, a rapidly growing economic sector), agriculture, trade, transportation, and coastal and marine resources. It will work with state and regional agencies and the business community to create an economy that is resilient to risks due to hurricane damage, periodic droughts, higher sea levels, and future climate trends.

In order to ensure that actionable and demand-driven research and development activities are undertaken, Florida CARES will establish a unique partnership with the state of Florida, the private sector, and local organizations. It will also ensure that outcomes of the Center's activities are market-based, feeding the needs of both the private and public sectors.



## Board of Governors' Priorities

Florida CARES' mission is well aligned with the goals of the State University System (SUS) for 2012-2025. It addresses the key priorities of the Board of Governors (BOG) in teaching and learning, scholarship, research and innovation, and community, as well as advancing the three major points of emphasis: excellence, productivity, and strategic priorities for a knowledge economy.

## Building on Previous Board of Governors Initiative

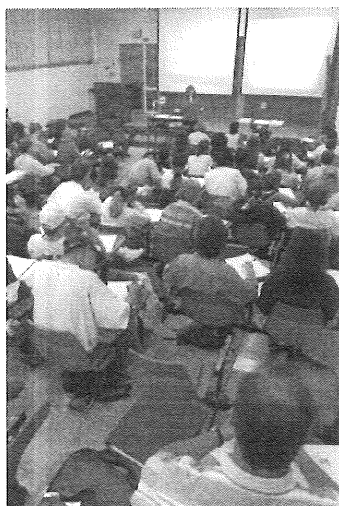


Since 2010, FCI universities have prepared themselves to lead the nation in climate readiness. The FCI was initiated by Florida State University (FSU) and University of Florida (UF) in 2009. In 2010, FSU and UF in partnership with Florida Atlantic University (FAU) were awarded a Cluster Grant by the BOG to examine the readiness of the SUS universities to deal with the pressing issues of climate extremes and variability in the state. FCI hosted two workshops, bringing together some 350 faculty from eleven state universities and the University of Miami with agency stakeholders. The outcome of this effort was the preparation of four white papers [36, 37, 38, 39] and a clear understanding that these statewide issues could only be addressed by a consortium approach bringing

together the diverse skill sets and capabilities of the whole system. A criterion for membership in an expanded FCI demanded that each University have already developed a cross-university approach linking different disciplines in a problem-focused way.

In the past year, the FCI has set up six cross-university working groups, each linked with external partners to identify the most critical issues facing the future well-being of the State, and to identify opportunities for economic advancement that await us. Florida CARES is the next phase of FCI that will address the identified key needs, develop innovative technologies, and produce the required workforce to make Florida a global leader in climate change adaptation.

## Teaching and Learning



The FCI working groups have also identified workforce gaps in the areas of civil and environmental engineering, consultancy, ecosystem management and restoration, architecture, construction, land development, water resource management, insurance, tourism, agriculture, and trade sectors in Florida. It will work toward producing graduates in these particularly high-demand STEM areas. STEM education is one of Florida CARES' strategic priorities, and will contribute to support STEM programs in a number of innovative ways. Just as important as graduate-level research, Florida CARES will provide a timely platform to emphasize relevant undergraduate STEM majors.

The importance of inter-institutional endeavors will be emphasized in STEM students' training. Key experiences will include joint lab and field work, undergraduate research experiences at partner institutions and for some, the pursuit of an advanced degree at one of Florida CARES' institutional partners. The state will benefit from students being able to

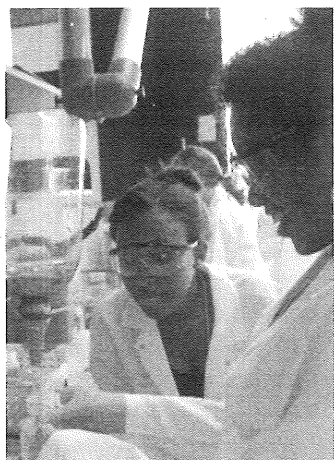
carry forward and build on experiences started at one of the partner institutions. Florida's business community will also be enlisted as partners to offer work experiences for students across the state,

contributing to increased development and awareness of resilience and sustainability jobs and areas in which innovations are needed.

As stated in its 2012-2025 strategic plan, the Florida Board of Governors [40] expects state universities “to broaden their use of the innovative methods of educational program delivery, including distance learning and digital technologies, inter-disciplinary collaboration, and academic resource sharing.” In this respect, Florida CARES will develop a catalogue of online courses that can be offered to students from various universities as well as continuing students in industry. There is ample knowledge and experience within the State University System to develop and jointly implement such courses with faculty who are prominent in their respective areas of expertise.

Florida CARES will also create professional development programs for practitioners in the public and private sectors, including environmental engineers, architects, developers, water resource managers, attorneys, and others. These focused professional development programs will be delivered through several existing vehicles, including the Florida Cooperative Extension Service.

### **Scholarship, Research, and Innovation**



Faculty in Florida CARES member universities have strong track records of research on understanding climate change, extreme events, and risks to society and the environment, to which Florida is highly vulnerable. Faculty also have expertise in the development of adaptation strategies and development of resilient communities. Florida universities have complementary strengths. UF is pre-eminent in agriculture and natural resources technology development, modeling and experimentation. FSU and UM together bring global quality experience in climate analysis and projections. USF and UCF are leaders on such topics as urban water systems, storm surge modeling and natural system management, while FAU and FIU bring expertise in sea level rise and adaptation, architecture and design, and community outreach. In the FCI universities these areas are complemented by a broad range of economic, social, and other expertise related to climate change. While each university has its particular strengths, the combination enables unique synergies.

Florida's future depends upon seizing and maintaining knowledge leadership in climate adaptation and resilience to weather-related events. While the window of opportunity for Florida to establish its leadership role, particularly for the U.S. Southeast and Gulf Coast areas, is open, it will not remain so much longer. Other states, and other university-based consortia, are already moving into competitive positions. Although for a region further north and federally-led, NASA announced on June 9, 2014 a “Mid-Atlantic Coastal Resiliency Institute” involving government agencies and more than a dozen universities.

Florida CARES will develop and use cutting-edge numerical and statistical models to predict climate and weather variability in the current and the future climate over Florida. This effort will be one of the corner stones in knowledge generation capacity of the Center that will produce much sought after next-generation modelers of weather and climate. These activities will be complimentary and beneficial to the surge of activities surrounding renewable energy generation by the Florida Energy System Consortium. Florida CARES will position itself to provide advance information on weather and climate variability and change for efficient and sustained energy generation for example, from offshore wind and solar energy sources in Florida. It will develop a state-wide climate information system and provide easy access to enable ready use of data and simulation results by the public and private sector for planning and management.

By combining the best minds on climate change topics, Florida CARES will strengthen Florida's competitive position and promote Florida as the preeminent source of knowledge, information, and expertise on climate adaptation and resilience at the national and international levels.

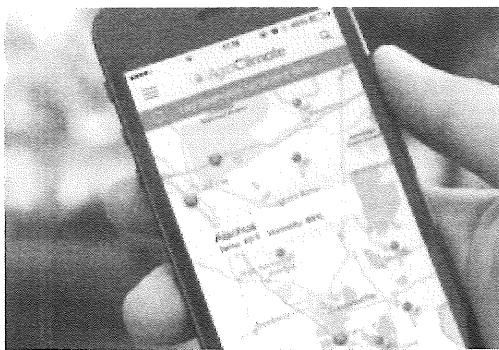
## **Community and business engagement**

One of the unique characteristics of Center will be that its research agenda is developed based on consultation with stakeholders to ensure that it is demand-driven and that research agendas are initiated from the public and private sectors that feed the job market.

For example, UF, through its agricultural extension network, is present in all counties of the state. This network can be used for dissemination of findings both in agriculture and in climate change. In the preceding cluster grant, a wide range of agencies were involved in the discussions and the white papers, including USGS, NOAA, U.S. Fish & Wildlife, FDOT, FDOE, U.S. Army Corp of Engineers, South Florida Water Management District, and the Four County Compact in Southeast Florida. Each university in the consortium has a network and partnerships which include these agencies and many others. For example, the Center for Environmental Studies (CES) at FAU coordinates a series of Technical Meetings that promote collaboration among scientists, land managers, and agencies. To support each of these efforts, CES develops a Technical Steering Committee with stakeholder members from multiple universities, USGS, Florida Sea Grant, South Florida Water Management District (SFWMD), U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Everglades National Park, and the National Park Service.

The Florida Water and Climate Alliance was developed by the Water Institute at UF working with the major water utilities in Florida and the FCI. This stakeholder-scientist partnership is working to increasing the relevance of climate science data and tools at relevant time and space scales to support decision-making in water resource management, planning, and supply operations in Florida.

Another important FCI collaborative partner, The Southeast Florida Regional Compact, works with local universities to develop community outreach efforts and vulnerability and adaptation studies. This on-going partnership has led to unified sea level rise projections for Southeast Florida which are used by the counties for planning and adaptation.



The Southeast Climate Consortium (SECC), with FCI universities UF, FSU, and UM, is working with the Florida Cooperative Extension Service to understand climate risks to agriculture and to develop information and education programs to help the agricultural community reduce those risks. This effort has laid the groundwork for increasing public-private research and education partnerships to identify risks, investigate technologies and management to develop climate-smart agricultural systems, and to develop effective learning communities with the Extension Service. Examples of innovative information systems on climate risks and risk management have been developed [21].

FCI has worked with the Department of Economic Opportunity, Division of Community Development, focusing on technical assistance through working-waterfronts preservation, post-disaster redevelopment planning, sea level rise adaption and community asset-based economic development.

We will develop many of these partnerships into a formal relationship with Florida CARES and also reach out to county authorities, city mayors, and business associations around the state.

## **Proposed Budget Summary**

This proposal requests recurring funds of \$18.0 million from the state for operating Florida CARES over a period of three years. This funding will position Florida as the national leader on adaptation and risk management, resilience, and climate-smart economic development. The initial investment from the Florida taxpayer will be used to leverage additional funds. For example, federal funding such as the new \$1 billion Climate Resilience Fund in FY 15 provides the opportunity for considerable matching funds. Finally, Florida CARES' efforts will attract investors from the construction, agricultural, and consultancy sector that can bring additional dollars to our state. The requested state funds will support the following major activities:

### **1. Expand capacity for training and education**

Florida CARES will require \$3.5 million to increase Florida's capacity in climate change workforce development through rigorous education and hands-on training. The proposed capacity building activities have two complementary objectives: (1) prepare highly-skilled and well-paid climate change professionals through enhanced access to real-world oriented multi-disciplinary degree programs, certificate programs, and professional development, and (2) attract funding from federal agencies, international organizations, and the private sector to boost climate change R&D, spur innovation and entrepreneurship, and attract industry from around the world to Florida. The training and education component will address the needs of students and professionals interested in pursuing careers in fields related to climate change, decision makers that need tools and data for planning, and professionals interested in new career or upgrading their current career.

The training and education activities will include undergraduate and graduate courses for students, as well as 1-day and 5-day integrated and specialized training short courses for professionals. The undergraduate and graduate courses will be developed and taught jointly by faculty from partner universities and will promote student and faculty exchange programs. The 1-day short courses will target high-level decision makers to provide them with state of the art knowledge and critical practice in their decision making processes. The 5-day short courses will target professionals in energy, water management, ecology, agriculture, transportation, urban planning, and coastal development, and will include specialized and integrated courses serving continuing education needs.

### **2. Stakeholder engagement for demand-led R&D**

Florida CARES will require \$0.5 million to support the exchange of knowledge and experience of the activities of partners with the key stakeholders from industry and communities. This will be done through biannual workshops with stakeholders from across Florida to ensure that the activities of Florida CARES are addressing the needs of key economic sectors and that R&D ideas are generated based on demand from the recipients of the products. In addition, high-level annual conferences will serve as a platform and incubator for the development of innovative solutions and concepts.

### **3. Develop a knowledge hub based on network of expertise on climate adaptation**

The Center will require \$12.0 million to create a strong knowledge hub to address the existing Florida-specific information and actionable research needs of industry and community stakeholders. The hub will provide a network of expertise from member universities and will draw upon the best minds on climate adaptation from within the state. Florida CARES will distribute actionable research and high-demand data and information that will help the state's economy, generating cutting edge research and development products useful for the private and public sectors in the state, and at national and

international levels. The hub will develop a one-stop knowledge and information management portal where statewide climate-related data can be accessed by both private and public stakeholders. Useful data relevant at regional and local scales will be made readily available for planning, operation, and management.

#### **4. Project Management**

Florida CARES will require \$2.0 million for project management that will include a project director and administrative support. Each partner university will also have a part-time position to coordinate the work of their respective university with Florida CARES.

## References

1. National Climate Assessment (NCA) (2014) Climate Change Impacts in the United States, [<http://nca2014.globalchange.gov>]
2. CA.GOV (2014) Governor Brown Declares Drought State of Emergency, Office of Edmund G. Brown Jr, [<http://gov.ca.gov/news.php?id=18368> Risky Business Project, 2014]
3. Risky Business (2014) The Economic Risks of Climate Change in the United States, [[http://riskybusiness.org/uploads/files/RiskyBusiness\\_PrintedReport\\_FINAL\\_WEB\\_OPTIMIZED.pdf](http://riskybusiness.org/uploads/files/RiskyBusiness_PrintedReport_FINAL_WEB_OPTIMIZED.pdf)]
4. McCue, K (2013) Insurance and Sea Level Rise, RenaissanceRe, Personal communication.
5. Harrington, J., and Walton, T (2008) Climate Change in Coastal Areas in Florida: Sea Level Rise Estimation and Economic Analysis to Year 2080. Florida State University report funded by a grant from the National Commission on Energy Policy. [<http://www.cefa.fsu.edu/content/download/47234/327898/file/FSU%208%2014%202008%20final.pdf>]
6. Kunkel, K. E., Stevens, L. E., Stevens S. E., Sun, L., Janssen, E., Wuebbles, D., Konrad, C. E., Fuhrman, II, C. M., Keim, B. D., Kruk, M. C., Billet, A., Needham, H., Schafer, M. and Dobson, J. G. (2013) Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 2. Climate of the Southeast U.S. NOAA Technical Report 142-2. 103 pp., National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, Washington D.C. [[http://www.nesdis.noaa.gov/technical\\_reports/NOAA\\_NESDIS\\_Tech\\_Report\\_142-2-climate\\_of\\_the\\_Southeast\\_U.S.pdf](http://www.nesdis.noaa.gov/technical_reports/NOAA_NESDIS_Tech_Report_142-2-climate_of_the_Southeast_U.S.pdf)]
7. Joughin, I., Smith, BE. and Medley, B (2014) Marine Ice Sheet Collapse Potentially Under Way for the Thwaites Glacier Basin, West Antarctica, Science, 344: 735-738/
8. Florida Ocean Alliance (2013) Florida's oceans and coasts: an economic and cluster analysis, [http://www.floridaoceanalliance.org/documents/OceansDay2013/FLORIDAS\\_OCEANS\\_AND\\_COASTS\\_AN\\_ECONOMIC\\_AND\\_CLUSTER\\_ANALYSIS.pdf](http://www.floridaoceanalliance.org/documents/OceansDay2013/FLORIDAS_OCEANS_AND_COASTS_AN_ECONOMIC_AND_CLUSTER_ANALYSIS.pdf)
9. Zhang, K (2011) Analysis of non-linear inundation from sea-level rise using LIDAR data: a case study for South Florida. Climatic Change 106:537-565.
10. Beever J. and Walker T (2013) Estimating and Forecasting Ecosystem Services within Pine Island Sound, Sanibel Island , Captiva Island , North Captiva Island, Cayo Costa Island, Useppa Island, Other Islands of the Sound, and the Nearshore Gulf of Mexico, [[http://www.chnep.org/2013agendas/CAC4-17-13\\_EcosystemServicesReport.pdf](http://www.chnep.org/2013agendas/CAC4-17-13_EcosystemServicesReport.pdf)]
11. Visit Florida (2013) 2012-2013 Annual Report, [<http://visitflorida.org/media/4722/yearinreview2013.pdf>]
12. Hodges, A. W., Rahmani, M. and Stevens, T. J (2013) Economic Contributions of Agriculture, Natural Resources, and Related Industries in Florida for 2010. UF IFAS EDIS Publication #FE906. <http://edis.ifas.ufl.edu/fe906>
13. Florida Seaport Transportation and Economic Development Council, (2013a) State of Florida Ports: The Seaport Effect, 2012/2013
14. Florida Seaport Transportation and Economic Development Council, (2013b) The Five Year Florida Seaport Mission Plan, 2013-2017

15. Stanton, E.A. and F. Ackerman (2007) Florida and Climate Change: The Costs of Inaction. Global Development and Environment Institute, Tufts University and Stockholm Environment Institute–U.S. Center, Tufts University, Medford, MA (November). [<http://www.ase.tufts.edu/gdae/Pubs/rp/FloridaClimate.html>]
16. Nicholls, R.J., Hanson, S., Herweijer, C., Patmore, N., Hallegatte, S., Corfee-Morlot, j., Chateau, J. and Muir-Wood, R (2007) Ranking of the World's Cities Most Exposed To Coastal Flooding Today and in the Future: Executive Summary, Organisation for Economic Co-operation and Development, Paris, France, [[http://www.centre-cired.fr/IMG/pdf/OECD\\_Cities\\_Coastal\\_Flooding.pdf](http://www.centre-cired.fr/IMG/pdf/OECD_Cities_Coastal_Flooding.pdf)]
17. Mitchum, G. T (2011) Sea Level Changes in the Southeastern United States: Past, Present and Future, 20 pp., Florida Climate Institute, Gainesville, FL. [[http://www.FloridaClimateInstitute.org/images/reports/201108mitchum\\_sealevel.pdf](http://www.FloridaClimateInstitute.org/images/reports/201108mitchum_sealevel.pdf)]
18. U.S. Senate (2012) Sea Level Rise: Senate Hearing before the Committee on Energy and Natural Resources, United States Senate 112<sup>th</sup> Congress, Second Session [<http://www.gpo.gov/fdsys/pkg/CHRG-112shrg76897/html/CHRG-112shrg76897.htm>]
19. Miami Dade Sea Level Rise task Force (2014) Miami-Dade Sea Level Rise Task Force Report and Recommendations, Scribd [<http://www.scribd.com/doc/231180380/Sea-Level-Rise-Final-Report>]
20. Miami Dade County (2009) Establishing Southeast Florida Regional Climate Change Compact, Miami-Dade Legislative Item File Number 102773 [<http://www.miamidade.gov/govaction/matter.asp?matter=102773&file=false&yearFolder=Y2010>]
21. Agro Climate (N.D) Tools for Managing Climate Risk in Agriculture [<http://www.agroclimate.org/>]
22. Staletovich, J (2014) Task force on rising seas says Miami-Dade County needs step-by-step plan, *Miami Herald* Environment [<http://www.miamiherald.com/2014/04/28/4085935/task-force-on-rising-seas-says.html#storylink=cpy>]
23. Ranger N., Surminski, S (2012) A preliminary assessment of the impact of climate change on non-life insurance demand in the BRICS economies , *International Journal of Disaster Risk Reduction*, 3:14–30
24. FEMA (2011) FEMA Fact Sheet, Mitigation Value to Society [[http://www.fema.gov/pdf/media/factsheets/2011/mit\\_value.pdf](http://www.fema.gov/pdf/media/factsheets/2011/mit_value.pdf)]
25. World Bank (2010) The Cost to Developing Countries of Adapting to Climate Change. New Methods and Estimates: The Global Report of the Economics of Adaptation to Climate Change Study Consultation Draft.[ <http://siteresources.worldbank.org/EXTCC/Resources/EACC-june2010.pdf>]
26. Oxfam America (2009) The new adaptation marketplace: Climate change and opportunities for green economic growth [<http://www.usclimatenetwork.org/resource-database/the-new-adaptation-marketplace.pdf>]
27. Khalamayzer, A (2013) Industry Reaction: Mayor Bloomberg's \$20B Plan to Shield NYC from Climate Change, PropertyCasualty360 [<http://www.propertycasualty360.com/2013/06/17/industry-reaction-mayor-bloombergs-20b-plan-to-shi>]
28. ILO (2011) Towards a Greener Economy: The Social Dimensions, International Labour Organization (ILO), International Institute for Labour Studies (IILS), Geneva, ISBN 978-92-9014-987-3

29. Morgan, C (2013) Dutch share climate change expertise with South Florida, *Miami Herald: Environment* [<http://www.miamiherald.com/2013/09/18/3635573/dutch-share-climate-change-expertise.html#storylink=cpynuary> 2014]
30. Filho, W. L (2009) Communicating climate change: challenges ahead and action needed Walter Leal International Journal of Climate Change Strategies and Management, 1(1): 6-18
31. BLS (2014) Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2014-15 Edition [<http://www.bls.gov/ooh/>]
32. U.S. Green Building Council and Booz Allen Hamilton (2009) Green Jobs Study, [<http://www.usgbc.org/ShowFile.aspx?DocumentID=6435>]
33. Dagley, M., & Datta, M (2010) The Ultimate Park Hopper: Collaborative First Year to College Advising in STEM Disciplines. NACADA Annual Conference, Orlando, FL.
34. Dagley, M. & Schneider, K (2011) "Options = A Good Fit: Increasing Success in STEM Using Multiple Models." ACUHO-I Living Learning Communities Conference, Orlando, FL.
35. The European Centre for the Development of Vocational Training, CEDEFOP (2009) Future Skill Needs for the green Economy Luxembourg, Publications Office of the European Union[[http://www.cedefop.europa.eu/EN/Files/5501\\_en.pdf](http://www.cedefop.europa.eu/EN/Files/5501_en.pdf)]
36. Berry, L., Bloetscher, F., Hernández Hammer, N., Koch-Rose, M., Mitsova-Boneva, D., Restrepo, J., Root, T., Teegavarapu, R (2011) Florida water management and adaptation in the face of climate change. State University System of Florida, Florida Climate Change Task Force.
37. Cameron Devitt, S. E., Seavey, J. R., Claytor, S., Hocter, T., Main, M., Mbuya, O., Noss, R. and Rainynet, C (2012). Florida biodiversity under a changing climate: a white paper on climate change impacts and needs for Florida. State University System of Florida, Florida Climate Change Task Force.
38. Galindo-Gonzalez, S., Berry, L., Cox, C., Edwards, A., Ellingson, R., Feldman, A., Irani, T.A. Jones, J.W. Lambert, J. Lockhart, C., Mehallis, M. and Ryan, J.G (2011) Florida climate change education and training: State University System cooperative plan. State University System of Florida, Florida Climate Change Task Force.
39. Misra, V., Carlson, E., Craig, R. K., Enfield, D., Kirtman, B., Landing, W., Lee, S.-K., Letson, D., Marks, F., Obeysekera, J., Powell, M. and Shin S.-I (2011) Climate scenarios: a Florida-centric view. State University System of Florida, Florida Climate Change Task Force.
40. Florida Board of Governors (2012) Strategic Plan 2012-2025, [[http://www.flbog.edu/pressroom/\\_doc/2011-11-28\\_Strategic\\_Plan\\_2012-2025\\_FINAL.PDF](http://www.flbog.edu/pressroom/_doc/2011-11-28_Strategic_Plan_2012-2025_FINAL.PDF)]





Office of the Vice President for Research

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July 14, 2014

Dr. James Jones  
Director  
Florida Climate Institute

**Re: Legislative Budget Request – State-wide Center for Adaptation, Resilience, and Economic Sustainability**

Dear Dr. Jones:

I am happy to provide a letter in support of your legislative budget request for a state-wide Center for Adaption, Resilience, and Economic Sustainability. In 2010, the State University System Board of Governors granted cluster funds to several Florida universities to strengthen cooperation in addressing the pressing issues of climate variability and extremes in our state. That initiative positioned universities within the state to develop and lead this new statewide effort through the Florida Climate Institute (FCI).

The proposed Center will bring together universities across the State in partnership with state and regional agencies and the business community to create an economy more resilient to risks from hurricane damage, periodic droughts and floods, higher sea levels, and future climate trends. It will develop research and deliver education programs in support of Florida's major economic engines (e.g., urban centers, tourism, agriculture, trade, and coastal marine resources). Working with partners from industries and agencies, it will help develop the workforce to manage Florida's resources while growing its economy. The Center will make Florida more competitive through its collaborative research and training programs, and create marketable expertise and technologies to meet the increasing demands of the state's future.

Good luck in submitting this Legislative Budget Request to the Board of Governors for consideration.

Sincerely,

A handwritten signature in black ink, appearing to read "David P. Norton".

David P. Norton, PhD  
Vice President for Research

**FAU**  
**DIVISION OF RESEARCH**  
Florida Atlantic University

**Division of Research**  
**John W. Newcomer, M.D.**  
Interim Vice President for Research

**Executive Vice Dean and Professor of Clinical  
Biomedical Science**  
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July 15, 2014

Dr. James Jones  
Director  
Florida Climate Institute

**Re: Legislative Budget Request – State-wide Center for Adaptation, Resilience, and Economic Sustainability**

Dear Dr. Jones,

I am happy to provide a letter of support of your legislative budget request for a state-wide Center for Adaptation, Resilience, and Economic Sustainability. In 2010, the State University System Board of Governors granted cluster funds to UF, FSU and FAU to strengthen cooperation in addressing the pressing issues of climate variability and extremes in our state. That initiative positioned our universities to develop and lead this new state-wide effort through an expanded Florida Climate Institute.

FAU has identified the issue of sea level rise and its impacts as a core research and outreach priority over the past five years because of the importance of this issue to our region and our state. This initiative, linking engineering, geo- and bio-science, architecture and regional planning, has enabled us to respond to community priorities in practical ways.

The proposed Center will bring together universities across the State in partnership with state and regional agencies and the business community to create an economy more resilient to risks from hurricane damage, periodic droughts and floods, higher sea levels, and future climate trends. It will develop research and deliver education programs in support of Florida's major economic engines (e.g., urban centers, tourism, agriculture, trade, and coastal marine resources). Working with partners from industries and agencies, it will help develop the workforce to manage Florida's resources while growing its economy. The Center will make Florida more competitive through its collaborative research and training programs, and create marketable expertise and technologies to meet the increasing demands of the state's future.

Good luck in submitting this Legislative Budget Request to the Board of Governors for consideration.

Sincerely,

  
John W. Newcomer, M.D.  
Interim Vice President for Research



THE FLORIDA STATE UNIVERSITY  
OFFICE OF THE VICE PRESIDENT FOR RESEARCH

July 15, 2014

Dr. Jan Jones  
Director  
Florida Climate Institute

Re: Legislative Budget Request – State-wide Center for Adaptation, Resilience, and Economic Sustainability

Dear Dr. Jones:

I am pleased to provide a letter in support of your legislative budget request for a statewide Center for Adaptation, Resilience, and Economic Sustainability. In 2010, the State University System Board of Governors granted cluster funds to several Florida universities to strengthen cooperation in addressing the pressing issues of climate variability and extremes in our state. That initiative positioned universities within the state to develop and lead this new statewide effort through the Florida Climate Institute (FCI). This is clearly of great importance to the State of Florida.

The proposed Center will bring together universities across the State in partnership with state and regional agencies and the business community to create an economy more resilient to risks from hurricane damage, periodic droughts and floods, higher sea levels, and future climate trends. It will develop research and deliver education programs in support of Florida's major economic engines (e.g., urban centers, tourism, agriculture, trade, and coastal marine resources) now and into the future. Working with partners from industries and agencies, it will help develop the workforce to manage Florida's resources while growing its economy. The Center will make Florida more competitive through its collaborative research and training programs, and create marketable expertise and technologies to meet the increasing demands of the state's future.

On behalf of the FSU community I wish to signal our strong support for this important initiative. Good luck in submitting this Legislative Budget Request to the Board of Governors for consideration. I remain available if I can be of further assistance.

Sincerely,

Gary K. Ostrander, Ph.D.  
Vice President for Research



July 15, 2014

Dr. James Jones  
Director  
Florida Climate Institute

**Re: Legislative Budget Request—State-wide center for Adaptation, Resilience and Economic Sustainability**

Dear Dr. Jones:

I am delighted to provide this letter in support of your legislative budget request for a state-wide Center for Adaptation, Resilience and Economic Sustainability. In 2010, the Board of Governors of the State University System of Florida granted cluster funds to several Florida universities in order to strengthen cooperation in addressing climate variability and extremes in our state. That initiative positioned universities within the state to develop and lead this new statewide effort through the Florida Climate Institute (FCI).

The proposed Center will bring together universities across the state in partnership with state and regional agencies and the business community to create an economy more resilient to risks from hurricane damage, periodic droughts and floods, higher sea levels, and future climate trends. It will develop research and deliver education programs in support of Florida's major economic engines (e.g., urban centers, tourism, agriculture, trade and coastal marine resources). Working with private and public partners from industry and agencies, it will help develop the workforce to manage Florida's resources while growing its economy. The Center will make Florida more competitive through its collaborative research and training programs, and create marketable expertise and technologies to meet the increasing demands for our state's future.

You have my strong support and I wish you all the best with this Legislative Budget Request submission to the Florida Board of Governors for consideration.

Sincerely,



Paul R. Sanberg, Ph.D., D.Sc.

Senior Vice President for Research & Innovation  
Executive Director, Center of Excellence for Aging and Brain Repair  
Distinguished University Professor

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**John L. Bixby, Ph.D.**  
Vice Provost for Research

15. July 2014

**Ben Kirtman, PhD**  
Professor of Atmospheric Science  
Associate Dean for Research  
Rosenstiel School for Marine and Atmospheric Science

**RE: Legislative Budget Request – State-wide Center for Adaptation, Resilience and Economic Sustainability**

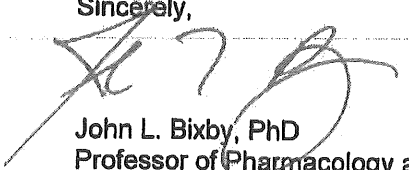
Dear Dr. Kirtman:

I am pleased to support the legislative budget request (LBR) that you and your colleagues across the state of Florida have developed to form a statewide Center for Adaptation, Resilience and Economic Sustainability (Florida CARES). The Florida Climate Institute (FCI), of which the University of Miami is proud to be a member, is ideally suited to lead this effort, and Florida CARES will ensure that the research done in Florida's universities will rapidly transition to economic and societal benefits through increased public safety and the protection of our diverse economy and infrastructure.

Florida CARES is an ambitious effort, bringing together some of the nation's best researchers, and committed to enhancing Florida's ability to respond to emerging risks associated with hurricanes, floods, droughts, sea-level rises, and future climate trends through the establishment of partnerships with both businesses and state and regional agencies. The educational component of Florida CARES will create a new skilled workforce that meets the needs of the economy and addresses the future challenges of climate change. Florida CARES will make Florida more competitive through its collaborative research and training programs, and will develop expertise and technologies that not only meet the demands of the state but also lead the nation in responding now to the challenges facing the entire US in the future.

I wish you and your colleagues the best of luck in submitting this Legislative Budget Request to the Board of Governors for consideration.

Sincerely,



**John L. Bixby, PhD**  
Professor of Pharmacology and Neurological Surgery  
Vice Provost for Research  
University of Miami



FLORIDA  
INTERNATIONAL  
UNIVERSITY  
Research

July 17, 2014

James W. Jones, PhD  
Director, Florida Climate Institute  
University of Florida  
P.O. Box 110570  
Gainesville, FL 32611-0570

Via email: [jimj@ufl.edu](mailto:jimj@ufl.edu)

Re: Legislative Budget Request—state-wide Center for Adaptation, Resilience and Economic Sustainability

Dear Dr. Jones:


Given FIU's geographical location and intense interest in the multiple hazards associated with climate challenges and adaptation, I am pleased to support a Legislative Budget Request for a state-wide Center for Adaptation, Resilience, and Economic Sustainability (CARES) as a principal part of the Florida Climate Institute (FCI).

The proposed Center will achieve much-needed coordination not only among universities but also with state and regional agencies, and the business community. With Florida's notable economic and population growth over the past 30 years, our state is more critically exposed than any other. The need to be more resilient to risks from hurricane damage, periodic droughts and floods, higher sea levels, and future climate trends is obvious and pressing.

We see the proposed Center as developing research and delivering education programs in support of Florida's major economic engines (e.g., urban centers, tourism, agriculture, trade and coastal marine resources). With private sector and agency partners, the Center will enhance the state's workforce and help manage its resources while continuing to grow its economy. More specifically, the Center will make Florida more competitive through its collaborative research and training programs, as well as create marketable expertise and technologies to meet the increasing demands of the state's future.

We wish you the best in submitting this Legislative Budget Request to the Board of Governors for consideration, and we look forward to working closely with the Center should the support materialize.

Sincerely,



Andrés G. Gil, PhD  
Vice President for Research

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Office of the Vice President for Research & Commercialization

July 15, 2014

Dr. James Jones  
Director, Florida Climate Institute

RE: Legislative Budget Request-State-Wide Center for Adaptation, Resilience, and Economic Sustainability

Dear Dr. Jones:

I am pleased to support your legislative budget request for a state-wide Center for Adaptation, Resilience, and Economic Sustainability. The 2010 SUS Board of Governor's cluster funds addressed the issues of climate variability and climate extremes in Florida. As a result, universities in the state were positioned to lead a new statewide effort through the Florida Climate Institute (FCI).

This proposed Center will allow universities in the State to partner with state and regional agencies and the business community to create an economy resilient to risks from hurricanes, droughts and floods, higher sea levels, and future climate changes. The Center will develop research and education programs in support of Florida's major economic engines. Working with partners from industry and agencies, the Center will aid in developing the workforce to manage resources while growing the economy. In addition, the Center will make Florida more competitive through its collaborative research and training programs and create expertise and technologies needed to meet the demands of the future of the State.

I wish you the best of luck with this Legislative Budget Request.

Sincerely,

A handwritten signature in dark ink, appearing to read "M.J. Soileau".

M.J. Soileau  
Vice President for Research & Commercialization