



PATEL COLLEGE  
OF GLOBAL  
SUSTAINABILITY

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ANNUAL REPORT

2021 - 2022



# 2021 - 2022 ACADEMIC YEAR HIGHLIGHTS

- ! Launched new Master of Science (M.S.) Graduate degree program in five concentrations: Sustainable Energy; Sustainable Water; Food Security and Sustainability; Sustainable Transportation; and Sustainable Entrepreneurship
- ! Increased degree requirement from 30 to 36 credit hours for both the M.A. and M.S. program
- ! Provided data and analytical support for the University that helped USF rank third in the country

# DEAN'S MESSAGE

I am delighted to present the 2021-2022 Annual Report for the Patel College of Global Sustainability (PCGS). Despite the challenges posed by the covid pandemic, PCGS continued its growth trajectory in terms of student enrollment, student success, faculty achievements and resource mobilization. The College has emerged as a preeminent academic destination for students seeking careers in sustainability within industries, governments at various levels, non-governmental organizations, and entrepreneurial ventures. In Fall 2021, PCGS launched a new Master of Science (M.S.) Graduate program in five concentrations: Sustainable Energy, Sustainable Water; Food Security and Sustainability; Sustainable Transportation; and Sustainable Entrepreneurship. Launching of the new MS degree program fulfilled one of the key recommendations of the External Evaluation Report in the area of curriculum enhancement. Increasing the graduation requirement from 30 to 36 credit hours for all Masters degrees, another recommendation of the external evaluator, was implemented in 2020-2021.

A notable achievement for the College was successfully hosting the Second Global Sustainability Conference with enthusiastic participation from several industries, Florida State officials, and local governments. We enhanced student success, raised admission standards, and revised and updated graduate curriculum to reflect the rapid changes taking place in the field of global sustainability education and research. PCGS faculty and students provided data and analytical support for the University that helped rank USF third in the country in the Times Higher Education (THE) ranking of universities for the implementation of United Nations Sustainable Development Goals.

Shortly after receiving a \$4 million gift from Dr. Kiran Patel to the PCGS Endowment Fund, which doubled the PCGS Endowment Fund, PCGS signed agreements for a multi-million-dollar promised gift from the estate of Don & Penny Butz. In 2021 and 2022, Dr. Kiran Patel provided a combined gift of \$250,000 to the College to support academic operations. In November 2021, Amy and Michael Drake donated \$106,000 to the College to establish an endowed scholarship in their name. In August 2021, Philanthropist Elizabeth Moore donated \$50,000 to the College to support research and experiential learning in sustainability to benefit PCGS students.

I look forward to enhancing the College's academic reputation and student enrollment numbers, as well as expanding partnerships with more public and private organizations in the Tampa Bay Region and beyond during the 2022-2023 Academic Year. With resilience, grit, and innovation, the College continues to serve the needs and aspirations of our students and community partners.

Govindan Parayil, Ph.D.  
Dean and Professor



# MISSION, VISION, VALUES & GOALS

## MISSION

The mission of PCGS is achieving sustainable development, both locally and globally, by fostering social, economic, and environmental sustainability; we accomplish this through teaching, research, mentoring students and community outreach, as well as by generating practical knowledge and developing innovative technologies, skills, and policies.

## VISION

Drawing from various definitions of “sustainability” we seek to ensure that these efforts both

# ADMISSION & GRADUATION

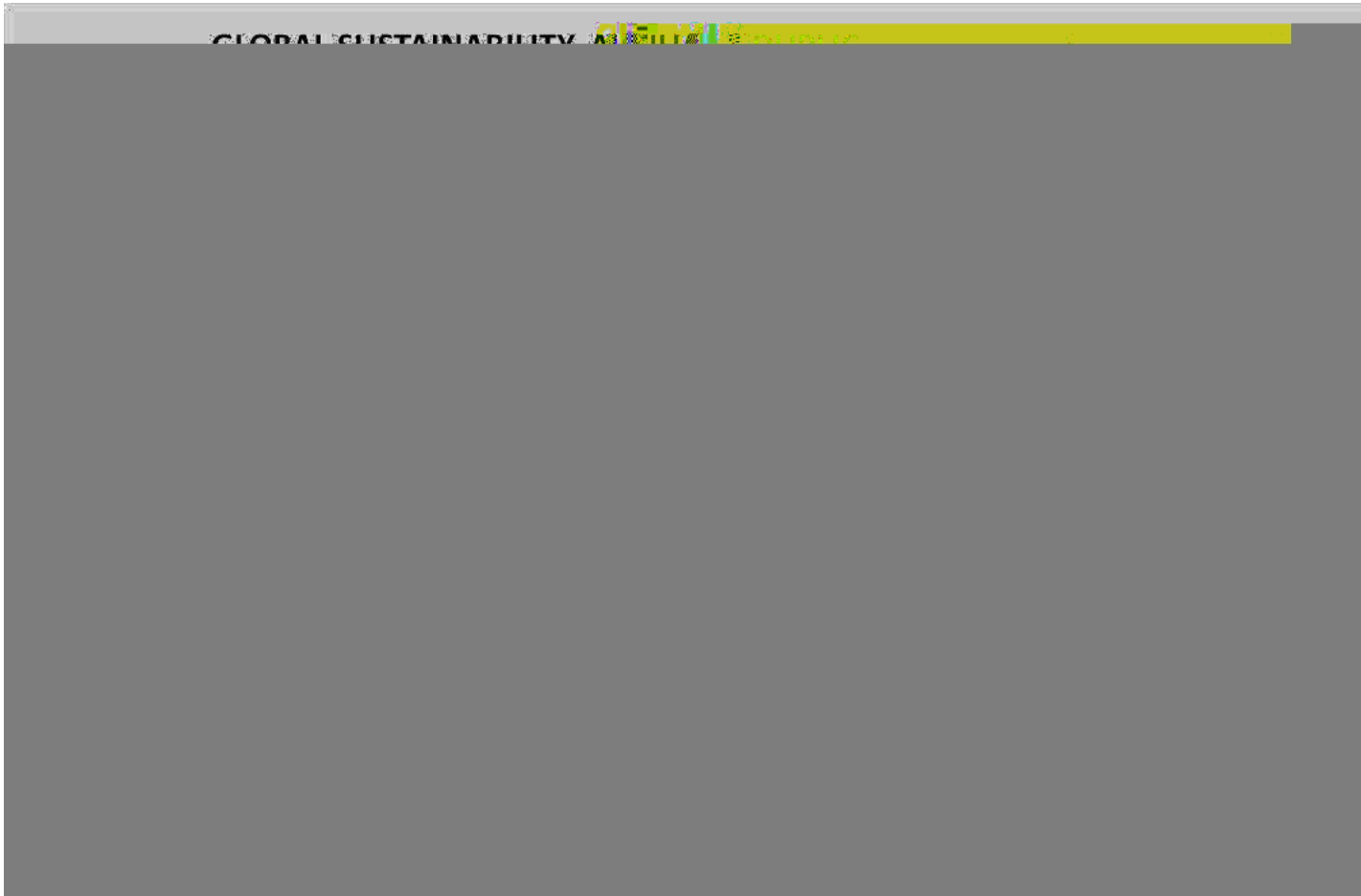
The Patel College of Global Sustainability successfully launched a new Master of Science degree in Global Sustainability effective Fall 2021. In addition, the MA degree was modified to include only the most relevant concentrations and will share a similar degree structure and credit requirement. The new MS degree compliments the existing MA degree with a shared core of courses, and both the new MS and the MA degree require 36 credit hours to complete. The five most relevant academic concentrations previously in the MA have been moved to the new MS, including: Entrepreneurship, Food Sustainability and Security, Sustainable Energy, Sustainable Transportation, and Water Sustainability. The remaining four concentrations that comprise the MA degree include: Climate Mitigation and Adaptation, Sustainable Tourism, Sustainability Policy and Sustainable Business. Our graduate instruction for either degree is available in a traditional on-campus format, blended hybrid formats, or fully online.

While the Patel College of Global Sustainability has maintained a consistent graduate student enrollment between 150-200 graduate students the last several years, the need for additional faculty and staff to support both degree programs as well as our certificate programs exists. We have hosted graduate level courses in summer and will need to continue doing so or we may face additional over-capacity issues in our classrooms. Additionally, lack of institutional funding to support faculty instruction is a constant threat, and the cancellation of those summer sections is likely should this issue arise again without additional aid.

Over the next section, the issues that the pandemic and lack of staff/faculty growth presented in 2021-22 will start to be realized, especially in recruitment and ultimately admissions and enrollments. International applications have increased but lack of necessary support to qualified admits in the form of graduate

The below figure illustrates the SCH trends the last five years for both gross/fundable hours.





(Unduplicated student headcount for an academic year based on the most recent record of the student regardless of the number of terms attended during that academic year)





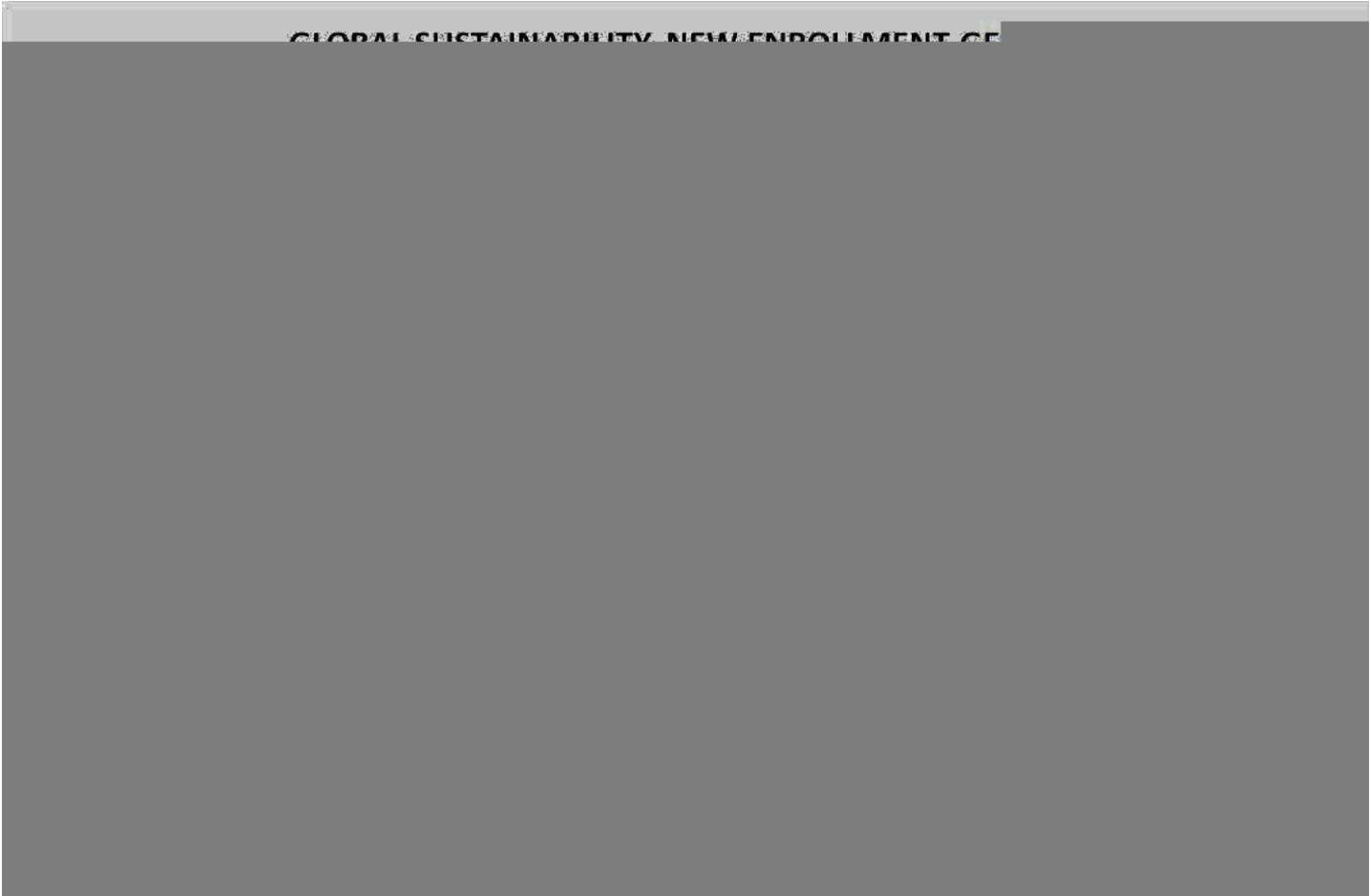
The below figure illustrates the admissions and enrollment trends over the last five years for new students.



The below figure illustrates residency and enrollment trends over the last five years for new students at PCGS. A significant percentage of non-resident and especially international students enroll, currently 30% of our new student enrollment. International student enrollment the last five years has been as high as 40% of our new student body (2017-18) and is currently averaging around 20%.



The below figure illustrates the gender distribution in enrollment trends over the last five years for new students. PCGS has a significant percentage of female students (over 50%) every year, with 2019-2020 being the highest at over 70% enrollment.



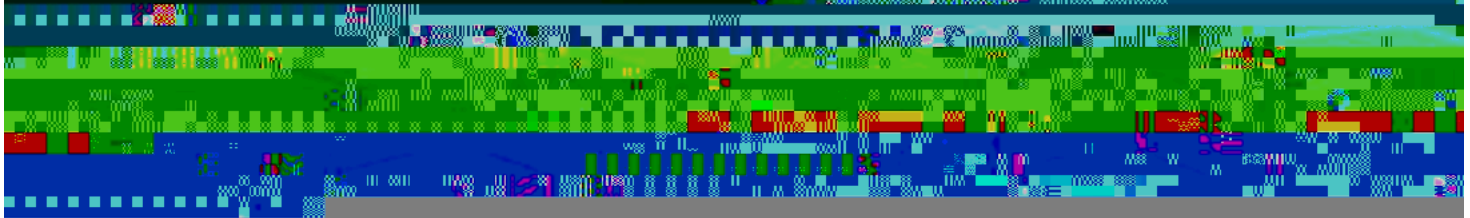
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The below figures illustrate the degrees awarded trends across the last five years. The largest enrollment in 2017-2018 resulted in increased degrees subsequently awarded in 2018-2019. As anticipated, degree completions have risen the last year, but we expect a decline over the next year due to decreased enrollment this year.





# GLOBAL SUSTAINABILITY DEGREES AWARDS



# INTERNSHIP / RESEARCH PROJECTS

All graduate students are required to complete a 6-credit hour final project as either an internship



## SUSTAINABILITY POLICY

The Sustainability Policy concentration brings together courses and expertise from Patel College of Global Sustainability, School of Geosciences, and School of Public Affairs. The Sustainability Policy Concentration ties all other PCGS concentrations together, as policy (or lack thereof) directs all aspects of sustainability. Students will advance their knowledge of policy, public administration, governance, and sustainable development on an integrated platform. The demand for educated, certified and informed professionals in areas of sustainability policy continues to grow. Private/public companies, federal and state government departments, United Nations Agencies, international aid organizations, environmental NGOs, and city governments are keen to remain abreast of the ever-changing policies and governance issues related to sustainability.

## SUSTAINABLE TOURISM

The Global Sustainability concentration in tourism enables students to learn knowledge and skills, as well as obtain personal experience, in the field of sustainable tourism. Tourism is one of the largest industries in the world, accounting for 9% of the world GDP and 10.5% of the world's workforce. Since the pandemic, the industry has taken stock and many sectors vow to build back better with sustainability and equity in mind. Taking advantage of the Florida environment, the concentration focuses, specifically, on coastal habitat and marine environmental issues related to tourism. The program also educates students in the concepts of the Global Sustainable Tourism Council Criteria, key certifications for sustainable tourism and ecotourism, and provides many experiential learning opportunities, including, but not limited to, tourism-centered municipalities, non-profit sustainable tourism organizations, aquariums, and major destination marketing organizations such as Visit Florida and Visit Tampa Bay.

## MASTER OF SCIENCE PROGRAM

### SUSTAINABLE ENERGY

The Sustainable Energy Concentration uses expert knowledge and real-world expertise to prepare students for the growing field of renewable energy, which is expected to increase dramatically over the next decades, as the U.S. and other countries seek to become energy independent by increasingly switching to renewable fuels and power. Students are prepared for private and public sector positions of leadership and

and the livability of urban areas. The predominant focus on automobile transportation has led to a variety of consequences that are less than sustainable such as urban sprawl, rising rates of obesity, growth in greenhouse gas emissions, habitat degradation, dependence on fossil fuels, and equity concerns. Students take concentration core courses offered by the College of Engineering.

#### WATER SUSTAINABILITY

The Water Sustainability Concentration prepares students to find solutions to one of the greatest challenges on the planet, the availability of safe and clean water for sustaining life. It educates them to understand the complex local, regional, and global water-related sustainability challenges and to develop innovative and sustainable solutions. Students will develop skills necessary for planning and management of sustainable water resources and green infrastructure systems. The program prepares students for careers in the public and private sectors in national and international organizations.

#### ENTREPRENEURSHIP

The M.S. in Global Sustainability concentration in Entrepreneurship provides students with a





## SUSTAINABLE TRANSPORTATION

The predominant focus on automobile transportation has led to a variety of consequences that are less than sustainable such as urban sprawl, rising rates of obesity, growth in greenhouse gas emissions, habitat degradation, dependence on fossil fuels, and equality concerns. The goal of this certificate is to provide students with the knowledge, literacy, skills, and tools they need to develop plans for sustainable transportation.

The certificate in Sustainable Transportation teaches methods for achieving a more sustainable transportation system and how that system fits into efforts to improve community design and the livability of urban areas.

## WATER SUSTAINABILITY

Skilled sustainability professionals are needed in order to create effective solutions to the complex global water challenges. This certificate program will equip students with the theory, practice, and skills to guide communities and the different sectors in issues of water resources planning and management. It will enable students to understand the complex regional and global water-related challenges and to develop innovative and sustainable solutions. This program strives to meet the demands of graduates and professionals who would like to gain the necessary knowledge and skills to enhance their career opportunities in a reasonable time. The program is also attractive to many students who would like to use this as a path towards their M.S. degree in global sustainability.



## II. INTERDISCIPLINARY RESEARCH AT PCGS

The Patel College of Global Sustainability conducts applied research that creates sustainable solutions for achieving sustainable development in a rapidly changing world. The research is based on USF's broad, interdisciplinary expertise in the areas of energy, water, policy, global security, and social equity. This interdisciplinary approach provides a strong foundation for the development of unique solutions to emerging and existing problems.

### KEY RESEARCH AREAS

Renewable energy, fuels, and products

Global climate change and the associated uncertainties

Urban water - integrated urban water management, appropriate and low-cost technologies

Sustainable Tourism - practical training in conducting sustainable tourism certifications, climate change risk assessments to the tourism industry, and business sector analyses of the impact of tourism locally and around the globe.

Elimination of "wastes" through nexus thinking and circular economy best practices.

Nanotechnology and sustainable manufacturing.

## BIOFUELS AND BIOPRODUCTS FROM BIOMASS

Biomass is an abundant and inexpensive domestic feedstock for biorefineries designed to produce value-added products and clean power. Florida generates sugar cane bagasse and yard waste in South Florida, citrus peel and agricultural residues in Central Florida, and wood biomass in Northern Florida.

We test and optimize the conversion of various biomass species, such as sweet sorghum and sugarcane bagasse, to sugars in scalable and cost-effective ways through biochemical conversion. First, biomass is pretreated using mild



Dr. Culhane spends his "spring break" time in environmental justice service somewhere in the world and this year he did that service work in the Egun-Yefolja Ecovillage deep in the forests of Alabama in the ancestral hunting grounds of the Creek Indians.

<https://www.ekvn-yefolecv.org/>

Dr. Culhane and PCGS students are currently engaged in a Food/Energy/Water Nexus and Zero Waste service project with the Muscogee Nation, acting as chief advisor and as a foreman and hands-on green builder and imparting his expertise in the construction of three large Chinese Puxin concrete biodigesters inside the Muscogee food security greenhouse and consulting with tribal elders and community leaders on how we can achieve a lifestyle that can "meet the needs of the present without compromising future generations.

This multi-year project ties together

Prayer Day at the Rosebud Continuum, Summer 2022.

### Tackling the Nexus Challenges: "Upcycling" of household plastic wastes into valuable products

Dr. T.H. Culhane and Dr. Brooke Hansen continue working with PCGS students in their classes (Waste Not, Want Not: Reconsidering Refuse as Resource and Sustainable Tourism) and in the student organization GLOBE, on creating a "Precious Plastics" Hub for the Tampa Area. Precious Plastics is an internationally recognized "Zero-Waste Community Based Plastics Recycling" Initiative, turning HDPE, LDPE, Polystyrene and Polypropylene plastic wastes such as bottle caps, milk and detergent jugs and plastic bags into durable and useful products. They are also working on 3D printing using recycled plastics.



Water Sanitation and Hygiene

FUNDER:

and Education submitted a proposal to conduct a workshop at the Association of Environmental Engineering Science Professors (AEESP) annual conference in St Louis, Missouri. The proposal was accepted,

tourism (SDG 12.b) and the impacts of climate change in coastal tourist destinations (SDG 13). The challenges of sustainable tourism development are now compounded by the massive impact of COVID-19 on tourism.

Focus Area: Sustainable Energy, Innovation, Entrepreneurship and Policy

Community Projects:

Students and PCGS have continued to work with local communities as a continuation of the "The Clear Sky Tampa Bay" project and work with Hillsborough and Pinellas counties to use new economic tools to develop case studies for local government partners. The framework and technical and economic tools enable municipalities, nonprofit organizations, and businesses to identify potential high-value sites for installing solar energy systems for sustainability and to lower costs. The student teams worked on multiple facilities that included: Solid Waste Sites, the Airport Parking Lot, Administrative Buildings and Justice Center, Communications Center, Water Reclamation etc. By gaining experience in conducting economic assessments for solar installation, the students gain critical new skills, which are of high value.

Dr. Pradeep Haldar traveled to Coimbatore, India to complete his final assignment of his prestigious Fulbright-Nehru Fellowship at the PSG College of Technology in April-May 2022. His work involves developing a comprehensive teaching, research, and entrepreneurship environment to encourage commercialization of sustainable energy related technologies by initiating collaboration amongst industry and academia in the US and India. His visit will help advance the science and engineering research base of sustaina



*Picture: A visitor experiences the Egmont Key Pop-Up VR Exhibit, funded by a USF Creative Scholarship Grant. Credit: Dr. Brooke Hansen*

The USF Egmont Key Project is using innovative technologies, education, and citizen-science site monitoring

# COMMUNITY

## Florida Gulf Coast Hope Spot Festival Involves PCGS Faculty and Students

On Saturday Feb. 12, PCGS faculty and students came together to support the [Florida Gulf Coast Hope Spot](#) in Dunedin. The Hope Spot is one of Dr. Sylvia Earle's designated regions that highlight conservation, education, and restoration of key global ecosystems. Dr. Earle is the founder of the organization Mission Blue and a documentary about her work, also called Mission Blue, can be viewed on Netflix. Organized by the non-profit Blue Green Connections, the festival featured zero waste stations overseen by Dr. TH Culhane and Dr. Joseph Dorsey and a virtual reality showcase of the USF Egmont Key Project led by Dr. Brooke Hansen and Dr. Laura Harrison, along with PCGS Sustainable Tourism students Sophia Annis and Samantha Vorce.



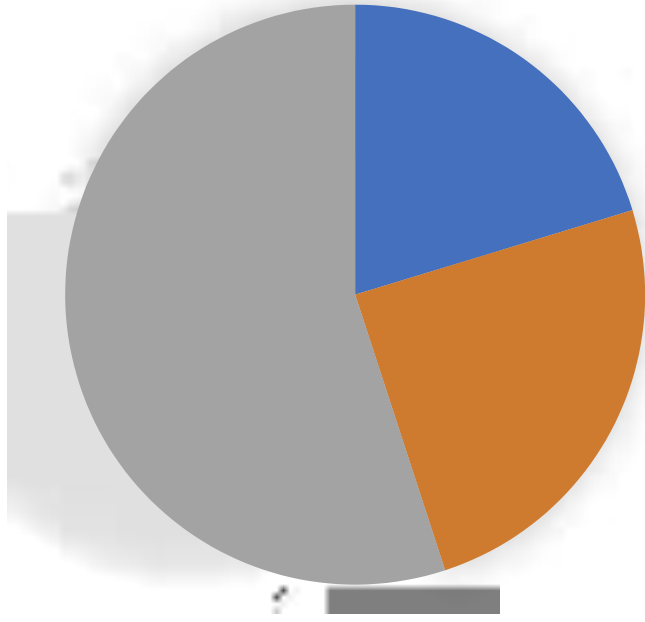
*Picture: Sustainable Tourism student interns Sophia Annis and Samantha Vorce engage in community outreach and education at the Florida Gulf Coast Hope Spot Festival with Dr. Hansen, Dr. Harrison and Richard Sanchez, President of the Egmont Key Alliance. Credit: Dr. Brooke Hansen*

Dr. Pradeep Haldar Completed a research study on "Public Impacts of Florida's Property Assesses Clean Energy (PACE) Program" in collaboration with Dr. T.H. Culhane and graduate student Zachary Oliphant. The report built on previous research and to explore the impact of PACE investment flowing into Florida since the conclusion of that research in July 2018 through November 2019. The research was funded by Ygrene.

# STUDENT DEVELOPMENT

The Office of Student Development at PCGS offers student development advising to all students and alumni to prepar

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OFFICE OF STUDENT  
DEVELOPMENT- SUSTAINABILITY  
SPEAKER SERIES

SUSTAINABILITY SPEAKERS SCHEDULE (Fall 2021)

September 22<sup>nd</sup> - MOTE Red Tide Institute - Dr. Cynthia Heil

October 13<sup>th</sup> - Conservation Law Foundation - Lauren Fernandez

# FACULTY PUBLICATIONS

1. Pathak, Y.V., Parayil, G, Patel, J.K. (2022), *Sustainable Nanotechnology: Strategies, Products, and Applications*, Hoboken, NJ: John Wiley & Sons (First Edition March 2022).
2. Puri, T., Pathak, Y., Parayil, G



# FACULTY PRESENTATIONS

1. Martin, J., Arora, N., Philippidis, G.P. "Cultivation of *Chlorella vulgaris* in *Brassica carinata* meal hydrolysate for enhanced lipid and lutein production", Bioresource Technology Conference (2021).
2. Tsarpali, M., Arora, N., Kuhn, J., Philippidis, G.P. "An integrated approach for reuse of the aqueous phase generated during hydrothermal carbonization of algae as nutrient source for algae cultivation", Bioresource Technology Conference (2021).
3. Lo, E., Arora, N., Philippidis, G.P. "Spent media recycling for microalgae cultivation", Bioresource Technology Conference (2021).
4. Hansen, B. (2022). BASIS7-ANEP. Virtualization Technologies for Interpreting Anthropogenic Risks to Natural and Cultural Resources at Egmont Key. Co-presented with Laura Harrison, Richard Sanchez, Sophia Annis and Samantha Vorce. Bay Area Scientific Information Symposium & The Association of National Estuaries Program. March 3.
5. Hansen, B. (2021). Aligning the City of Tampa with the Sustainable Development Goals: Lessons Learned and Future Directions. Co-presented with Brittney Glennon and Luke Westlake. World Sustainability Conference, Nov. 13.
6. Hansen, B. (2021). Virtualization Technologies for Sustainable Tourism: Adapting the Matterport 360 Platform to Showcase the UN Sustainable Development Goals in Tampa Bay, Florida. Co-presented with Sophia Annis and Samantha Vorce. World Sustainability Conference, Nov. 13.
7. Hansen, B. (2021). LEED for Cities and Communities: Summer 2022 Professional Development Seminar Overview. One Bay Working Group, Tampa Bay Regional Planning Council. Nov. 12.
8. Hansen, B. (2021). Sustainable Development in Tourism through the UN SDGs: Case Studies from Florida. Presentation for the Department of Geography, Tourism and Hotel Management, University of Novi Sad, Serbia. Nov. 8.
9. Hansen, B. (2021). Sustainable Agritourism in Florida. Presentation at the FoodTreX Researc(D)-1(e)-1(n)eX-1(

## FACULTY GRANT AWARDS

1. Hansen, B. Co-P.I. April 2022. USF Creative Scholarship Grant with Dr. Hariom Yadav and Dr. Chrisitan Brechot. The USF Metropolitan Food Project: Forging Connections Between Microbiomes and Promoting Human & Planetary Health. \$9,930.
2. Hansen, B. Co-P.I. April 2022. USF Creative Scholarship Grant with Dr. Cihan Cobanoglu and Dr. Faizan Ali. Augmented Reality for Sustainable Heritage Tourism at Egmont Key. \$10,000.
3. Philippidis, G. P.I. March 2022. Isolation of natural algicidal bacteria associated with Harmful Algal Blooms to develop a mitigation strategy for red tides, internal award received from USF Microbiomes Institute. \$30,000.
4. Philippidis, G. P.I. January 2022. Red tide mitigation through natural algicidal bacteria suppression of *Karenia brevis* during harmful algal bloom (HAB) progression, funded by the Florida Fish & Wildlife Conservation Commission (FWC). \$110,031.
5. Joseph Dorsey, P.I. April 2022. I-Corps Site at USF, internal award received from USF Research & Innovation. \$3,000.
6. Philippidis, G.P. P.I.: "Isolation of natural algicidal bacteria associated with Harmful Algal Blooms to develop a mitigation strategy for red tides" funded by the Florida Fish and Wildlife Conservation Commission: \$21,800 (2021-2022).

## FACULTY ONGOING PROJECTS

1. Philippidis, G.P. Co-P.I.: "Southeast Partnership for Advanced Renewables from Carinata" funded by the US Department of Agriculture, USF share: \$1,247,000 (2017-2022).
2. Philippidis, G.P. P.I.: "Large-scale Development of an Innovative Algae Technology as a Sustainable Source of Renewable Energy and Products to Enhance and Diversify Florida's Economy" funded by the Florida Department of Agriculture and Consumer Services: \$476,000 (2019-2021).
3. Philippidis, G.P. Co-P.I.: "Automated Modular Algae Cultivation System for Aquaculture" funded by USDA Small Business Innovative Research (SBIR), USF share: \$31,000 (2019-2021).
4. Philippidis, G.P. Co-P.I.: "Sustainability Superheroes: Developing Global Citizens for a Sustainable Economic Future" funded by the Coca-Cola Foundation: \$200,000 (2019-2021).
5. Ghebremichael, K. P.I.: Enhancing performance of biosand filters and community engagement, Joy McCann Foundation (\$40,000, 2019-2021)
6. Ghebremichael, K. Co-P.I.: Laying the groundwork for 'Getting to Neutral' in the State of Florida, Environmental Defense Fund (\$150,000, 2021-2022)
7. Ghebremichael, K. Co-P.I.: Water Sanitation and Hygiene (WASH) research project, NSF-IRES (\$284,000, 2019-2023)

## FACULTY PROPOSALS SUBMITTED

1. Philippidis, G.P. P.I.: "Bioprospecting of natural algicidal bacteria associated with Harmful Algal Blooms to develop a sustainable mitigation strategy for red tides" to the Florida Fish and Wildlife Conservation Commission: \$110,000 (2022-2023).
2. Philippidis, G.P. P.I.: "Alliance for Superior Algae Productivity: A multifaceted strain improvement strategy to achieve high algae productivity and resilience for biofuels" to the Department of Energy: \$3,200,000 (2022-2026).
3. Ghebremichael, K. Co-P.I.: Understanding the dual threats of on-site sanitation and saltwater

- intrusion on shallow groundwater quality in Cape Coast, Ghana, NSF IRES (\$297,780, 2021-2024)
4. Parayil, G. P.I., Haldar, P. Co-P.I.: Florida's Clear Sky Ecosystem, US Department of Commerce, EDA (\$499,882 for Phase I and \$74,000,000 for Phase II) in collaboration with Tampa Bay Regional Planning Commission.
  5. Mondy, W. P.I., Haldar, P. Co-P.I.: A Novel Treatment for Chronic Diabetic Foot Ulcers, National Science Foundation, SBIR, (\$253,437 for Phase I) in collaboration with Adiana Research and Development.
  6. Globe Eco. P.I., Haldar, P. Co-P.I.: Carbon Removal from Coconut Plantations, XPRIZE CARBON REMOVAL (\$1,000,000 Milestone Prize) in collaboration with Globe Eco.
  7. Custom Electronics Inc. P.I., Haldar, P. Co-P.I.: Innovative Microgrid Integrated Redox Flow Battery, New York State Energy Research & Development Authority (\$998,000 for Phase I) in collaboration with Custom Electronics, GridEdge Networks, VFlow Technologies.

