PATEL COLLEGE OF GLOBAL SUSTAINABILITY

ANNUAL REPORT

2020 - 2021

UNIVERSITY of SOUTH FLORIDA
Patel College of Global Sustainability

2020 - 2021 ACADEMIC YEAR HIGHLIGHTS

- Based on the work of faculty and students of the Patel College of Global Sustainability on implementing the United Nations Sustainable Development Goals (UNSDGs), USF ranked third in the country in the latest Times Higher Education (THE) ranking of universities for global sustainability.
- Dr. Kiran Patel donated $150,000 for the College operating fund to mitigate University mandated cut in annual E&G allocation; the College will receive multi-million-dollar gifts from the estate plans of four generous friends of the College.
- PCGS hosted Second Global Sustainability Conference on the theme of "Sustainability & Resiliency during the Pandemic."
- Increased student enrollment and enhanced student success indicated by strong graduate placements.
- Won a Phase I Small Business Innovation Research (SBIR) grant from the US Department of Agriculture in partnership with industry.
- Executed two projects on sustainability with the City of Dunedin (carbon footprint, solar).
- Graduated third Coverdell Fellow; Appointed new Coverdell Fellows.
- Faculty member elected senior member of the National Academy of Inventors (NAI)
- Signed collaboration agreements with foreign universities in Taiwan, Japan and Turkey.
- Created a new United Nations Sustainable Development Goals partnership in January 2020 with the establishment of the USF SDG Action Alliance.

DEAN'S MESSAGE

I am delighted to present the 2020-2021 Annual Report for the Patel College of Global Sustainability. Despite the challenges posed by the covid pandemic, PCGS continued its growth trajectory in terms of student enrollment, student success and faculty achievements. The College has emerged as a preeminent academic destination for students seeking careers in sustainability within industries, governments at various levels, and non-governmental organizations. Despite the slowdown in the economy caused by the pandemic, our graduates have been highly successful in finding jobs and achieving career success. Our enrollment and admission numbers also remained robust. A notable achievement for the College is successfully hosting the Second Global Sustainability Conference in April 2021 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. Starting in the Fall of 2021, PCGS will be launching its first-ever Master of Science degree in five concentrations. The Patel College provided data and analytics for the University that catapulted USF to frank third in the country in the Times Higher Education (THE) ranking of universities for the implementation of United Nations Sustainable Development Goals (UNSDGs) in academic practices.

The academic mission of PCGS is achieving sustainable development, both locally and globally, by fostering social, economic and environmental sustainability. We accomplish this mission through teaching, research, student mentoring and community and industry engagement, as well as by generating practical knowledge and developing innovative technologies, skills and policies. This mission is aligned to support the strategic priorities of the University of South Florida as a preeminent global research university and its AAU aspirations. The College is engaged in education, research, and service activities that create solutions to sustainable development in a rapidly-changing world, drawing on USF's broad interdisciplinary expertise in renewable energy, water, climate science, public health, energy, transportation, global security, and social equity, among others. This interdisciplinary approach well prepares our students for career options and professional opportunities with industries, governmental agencies (at city, county, state and federal levels), international organizations and NGOs that are seeking solutions to sustainability challenges.

The College of Global Sustainability has been successful in enhancing its role as the hub for sustainability-related research and teaching across the USF campuses. The College won a 2-year competitive award from the Florida Department of Agriculture and Consumer Services to develop algae technology and partnered with the Stavros Center in the College of Education to jointly win a 2-year education grant from the Coca Cola Foundation to mentor K-12 educators in sustainability. This project was successfully completed in the Summer of 2020. It has also teamed up with industry to win a Phase I SBIR grant from the US Department of Agriculture on automating commercial algae operations.

The College successfully hosted two conferences and the College faculty and students worked on several projects involving community partners. The College is in the process of implementing the recommendations of the External Evaluation Report submitted in the Spring of 2018, especially in the area of curriculum enhancement with the launching of a Master of Science (MS) degree in five concentrations.

Shortly after receiving a $4 million gift from Dr. Kiran Patel to the PCGS Endowment Fund, which doubled his previous donation and the PCGS Endowment Fund, we signed agreements for a multi-million-dollar promised gift from the estate of Don & Penny Butz, as well as a $50,000 gift for student scholarships from the estate of Amy & Michael Drake. Agreements for these gifts were signed by the concerned parties.

I look forward to enhancing the College's academic reputation and student enrollment numbers, as well as expanding partnership with more public and private organizations in the Tampa Bay Region and beyond during the next Academic Year. With resilience, grit and innovation, we are determined to serve the needs and aspirations of our students and community partners by overcoming the challenges thrown up by the coronavirus pandemic. As a College that has been innovative and forward-looking since its establishment, the Patel College is well-equipped to adapt and thrive in the challenging months ahead of us during this and the next academic year.

Govindan Parayil, Ph.D.
Dean and Professor

ESTABLISHMENT & BRIEF HISTORY

The Patel College of Global Sustainability was established in 2014 as the newest degree-granting college of the University of South Florida based on the Patel Center of Global Sustainability, which was founded in 2009. The college is engaged in education, research, and service activities that create solutions for achieving sustainable development in a rapidly changing world by drawing on USF's broad interdisciplinary expertise in the areas of renewable energy, water, climate change, public health, transportation, global security, and social equity.

The Patel College of Global Sustainability comprises the M.A. Program in Global Sustainability, Patel Center for Global Solutions, and the Graduate Certificate Program in Sustainability. It is an inclusive and collaborative academic unit with an interdisciplinary research, teaching and service focus, and has partnered with several USF Colleges to carry out these activities.

One of the unique features of the college enshrined in its mission is to work as the hub for sustainability-related research and teaching across the USF campus; thus far, the College has collaborated with five other USF Colleges – College of Arts & Sciences (especially the School of Geosciences and the School of Public Affairs), College of Engineering, College of Business, College of Marine Sciences, and the College of Public Health.

Two significant leadership changes since the establishment of the college was the appointment of Richard Berman as the Interim Dean in August 2015, and the appointment in July 2017 of Govindan Parayil as the permanent Dean.

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.

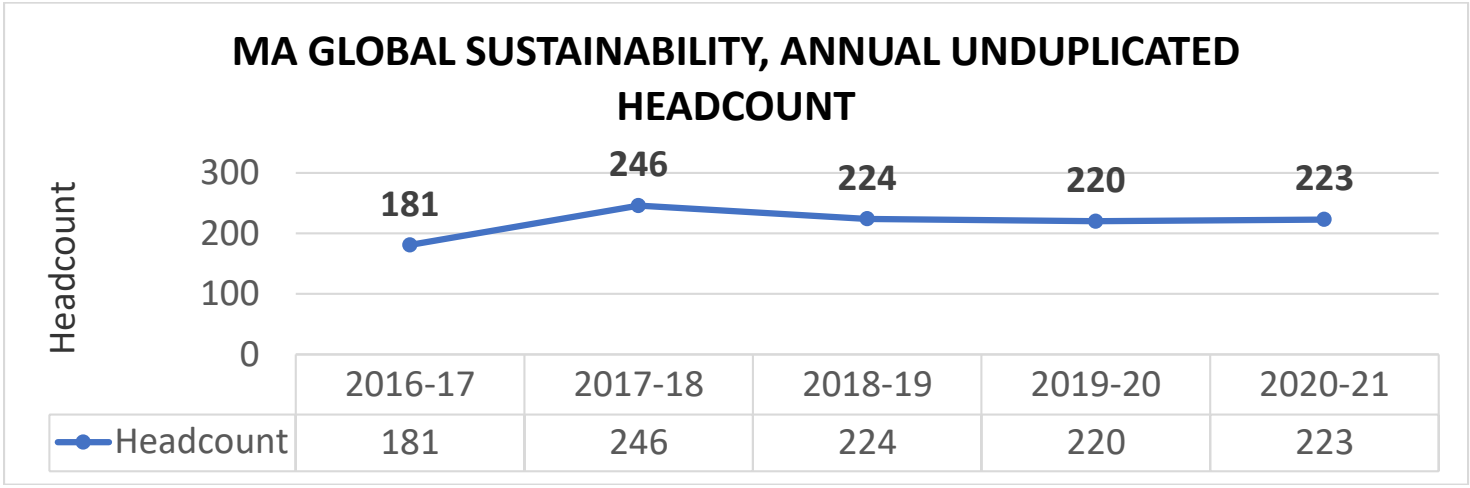
VISION

Drawing from various definitions of “sustainability” we seek to ensure that these efforts both endure and dramatically expand at USF; that they encourage the natural interconnections among those groups on campus addressing ecology, economics, politics and culture; that they recognize the essential contributions of scholars and professionals in engineering, business, architecture and urban planning, transportation, health, global studies and the natural and social sciences; and, that they serve to create and maintain the conditions under which humans and nature can exist in productive harmony, fulfilling the social and economic requirements of present and future generations.

ADMISSION & GRADUATION

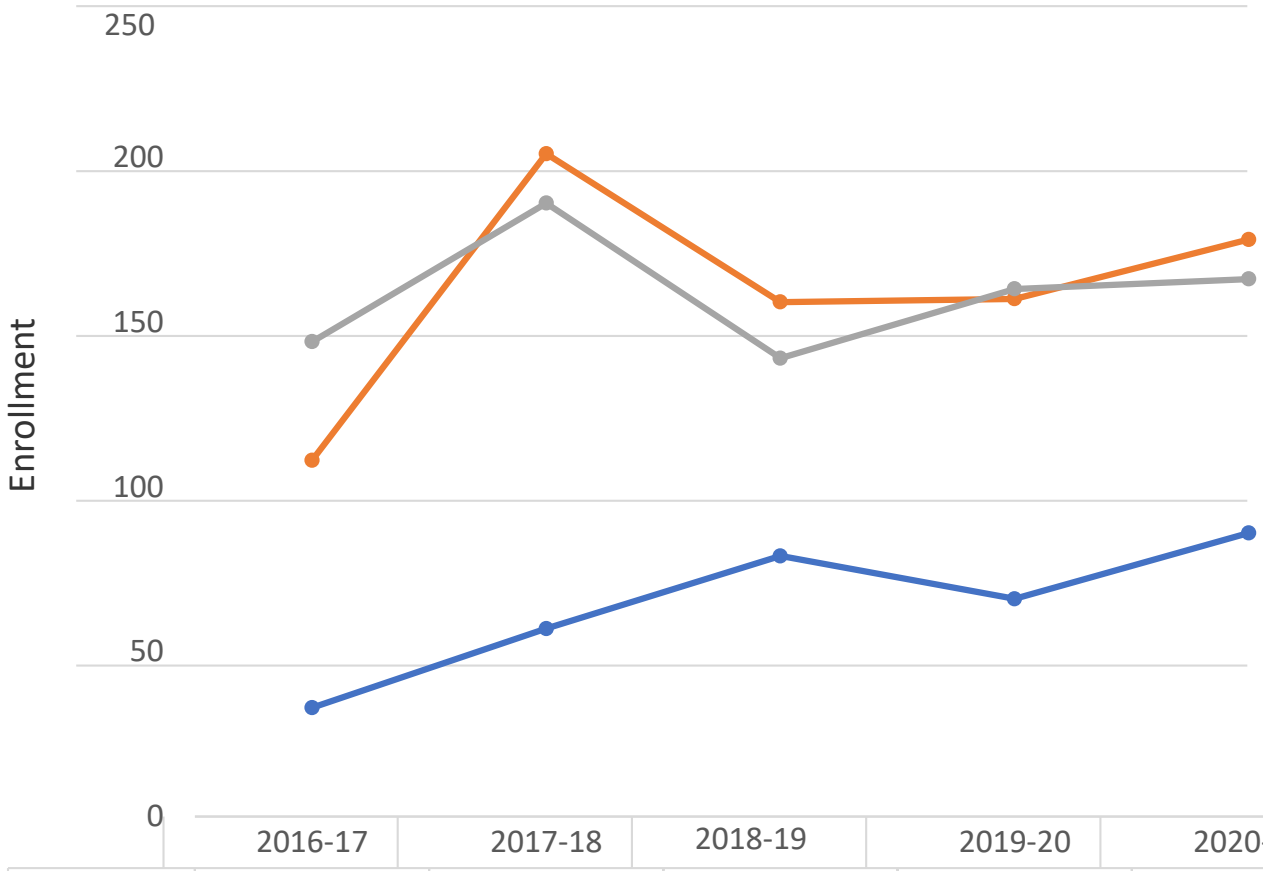
PCGS currently has staff and faculty to maintain graduate student enrollment between 150-200 graduate students, and we have plans to add an additional graduate degree. We can successfully support larger enrollment (and increasing degree credit requirements) by increasing the number of our faculty and support staff. Total enrollments have exceeded capacity the last four recruitment and admission cycles (since 2017). We have alleviated the bottleneck by hosting additional graduate level courses in Summer and will need to continue doing so or we may face additional over-capacity issues in our classrooms.

Despite the year-long pandemic our total enrollment for 2020-21 met our goals. 2021-22 will be challenging as there have been many restrictions over the last year which have significantly impacted international applications due to visa and travel issues. We anticipate increased international enrollment once the pandemic recedes. Despite all the challenges we have faced, PCGS has endured and continues to produce desired SCH, an impressive time to graduation, and opportunities for instructors to develop and facilitate new courses and research. The figures below indicate five years of student enrollment numbers at PCGS.

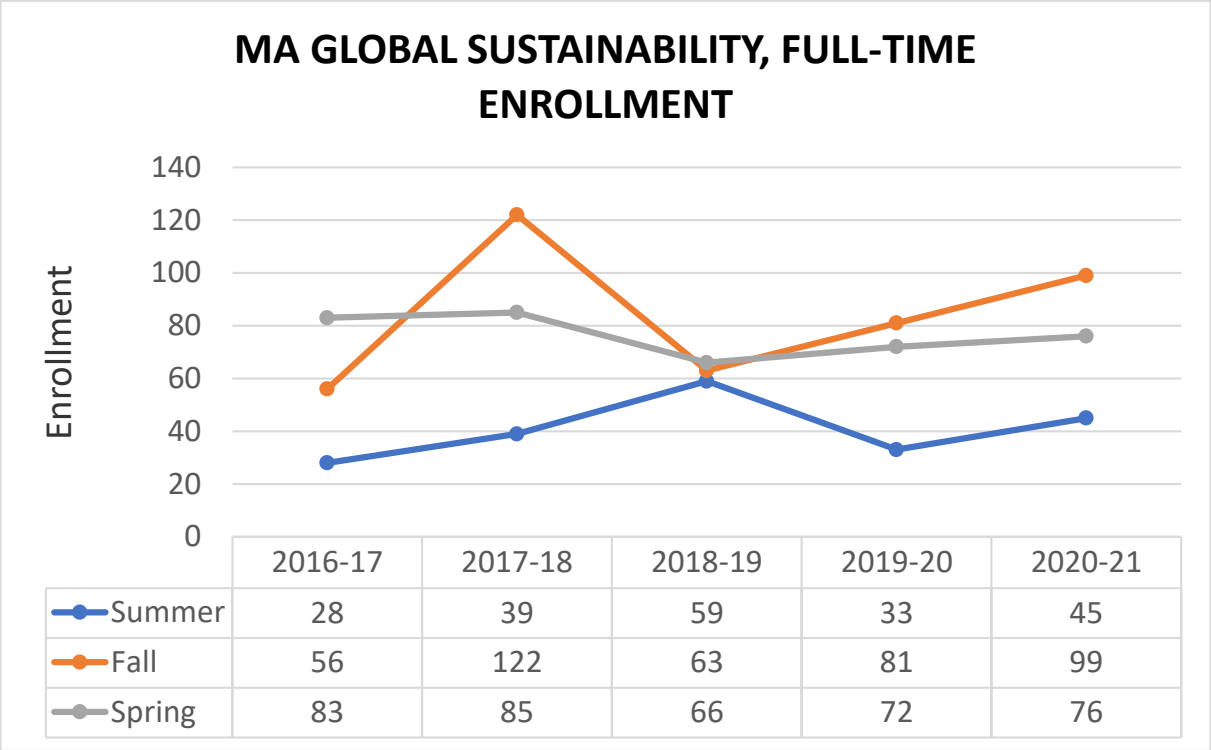


(Unduplicated student headcount for an academic year based on the most recent record of the student regardless of the number of terms attended during that academic year)

MA GLOBAL SUSTAINABILITY, TOTAL ENROLLMENT

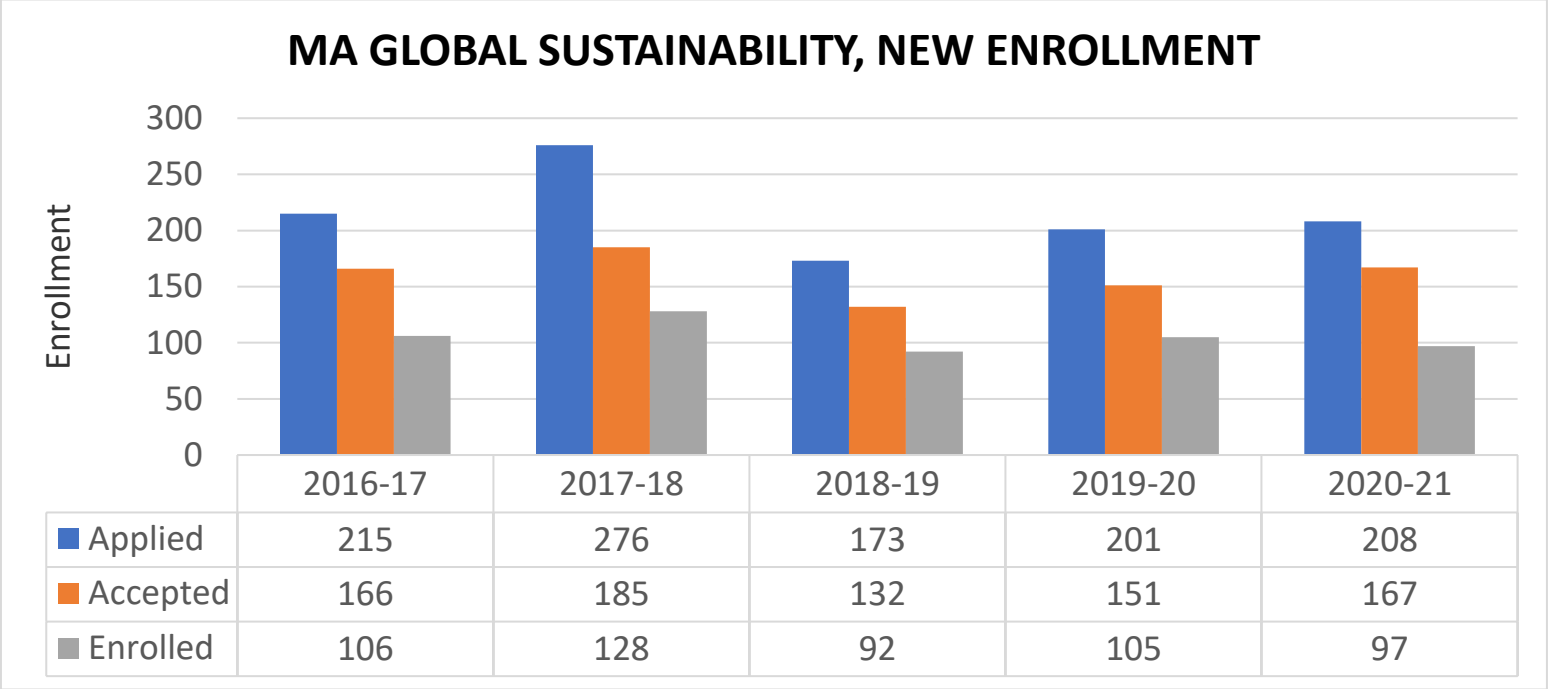


	2016-17	2017-18	2018-19	2019-20	2020-21
Summer	33	57	79	66	86
Fall	108	201	156	157	175
Spring	144	186	139	160	163



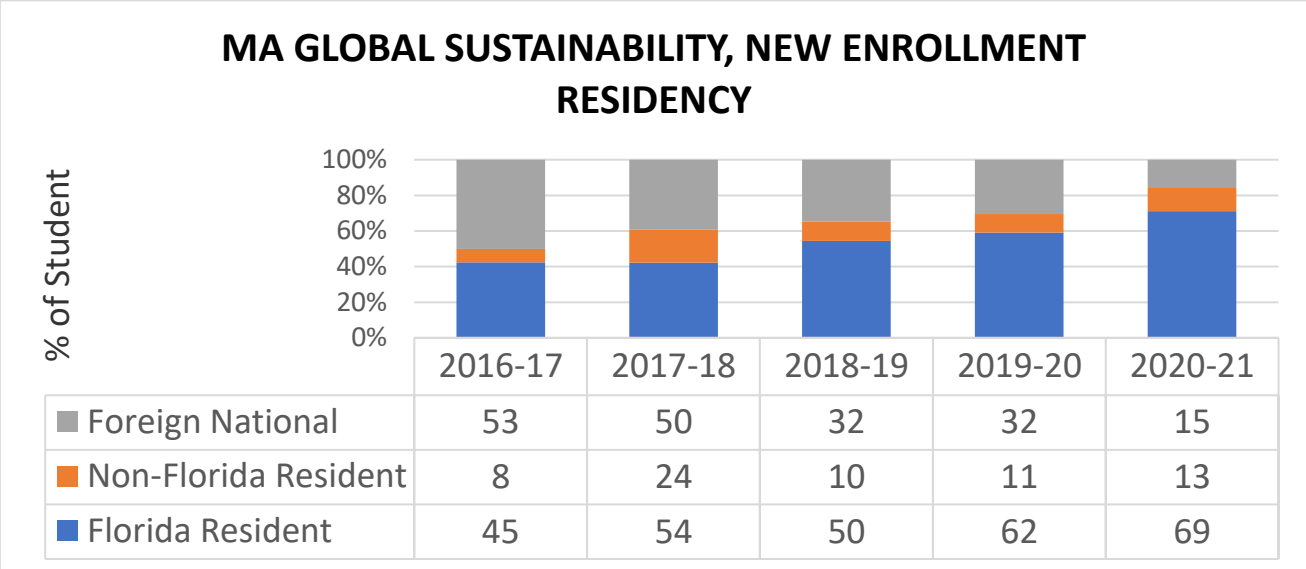
	2016-17	2017-18	2018-19	2019-20	2020-21
Summer	28	39	59	33	45
Fall	56	122	63	81	99
Spring	83	85	66	72	76

The below figure illustrates the admissions and enrollment trends over the last five years for new students. There has been a steady renewal of new student enrollments each year due to consistently high numbers of qualified applicants that subsequently commit.



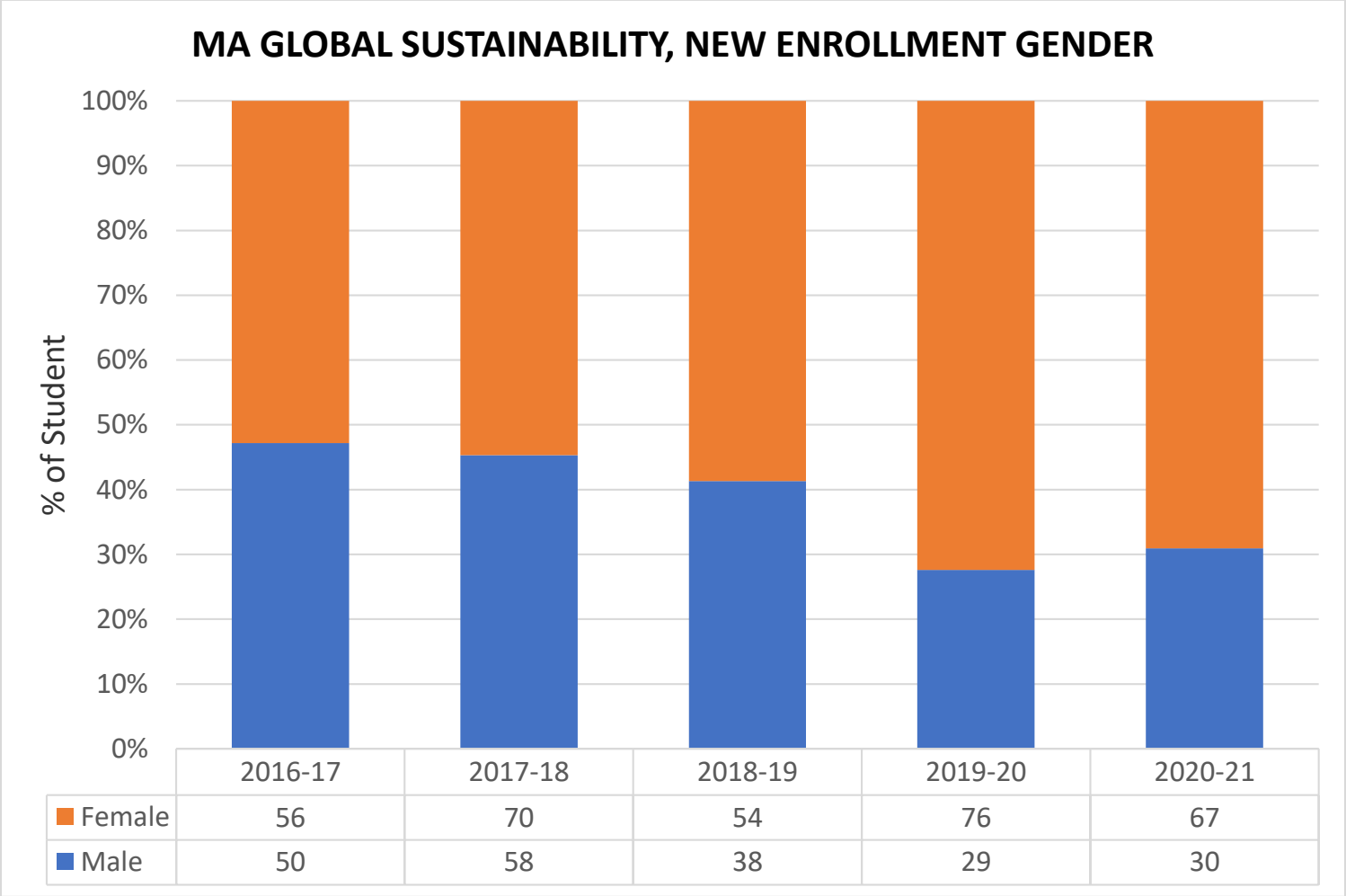
	2016-17	2017-18	2018-19	2019-20	2020-21
Applied	215	276	173	201	208
Accepted	166	185	132	151	167
Enrolled	106	128	92	105	97

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 50% of our new student body (16-17), and is currently averaging around 15%, down as a result of the ongoing pandemic.



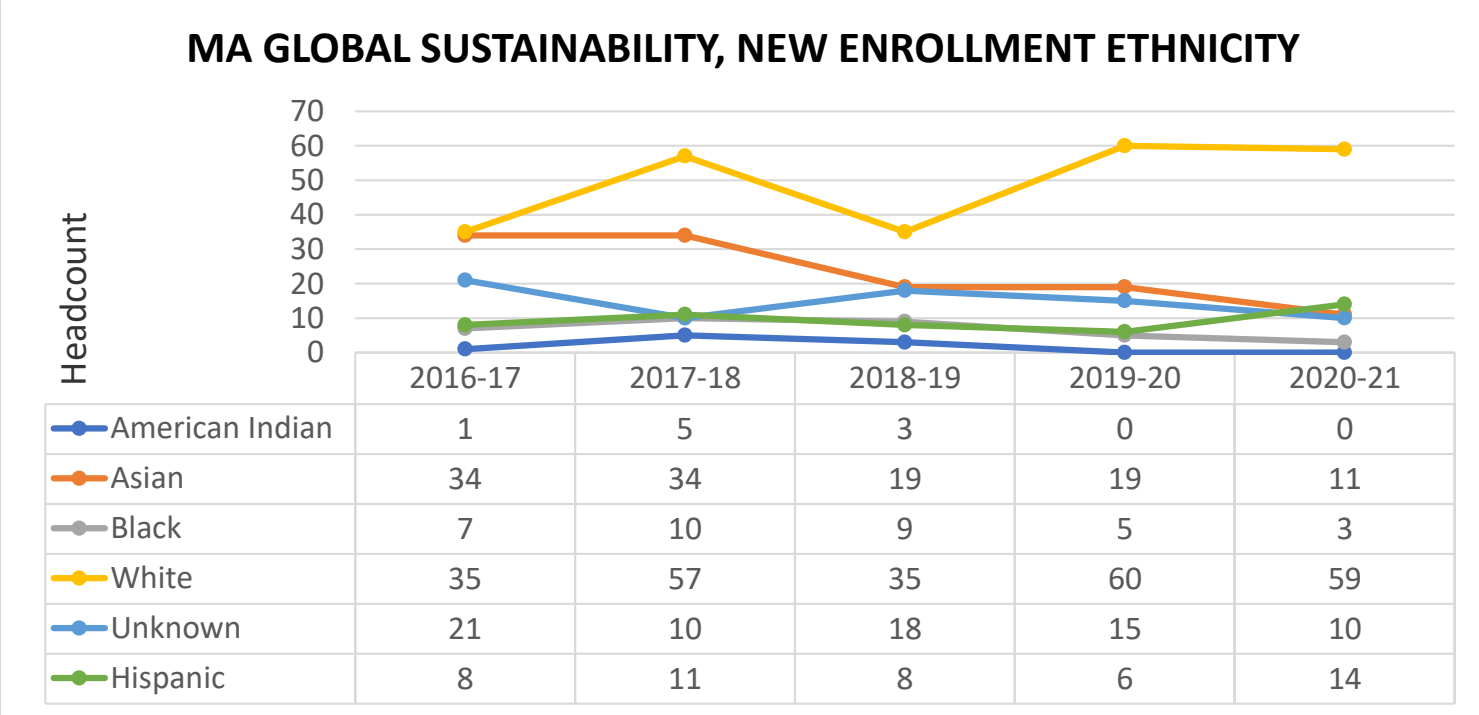
	2016-17	2017-18	2018-19	2019-20	2020-21
Foreign National	53	50	32	32	15
Non-Florida Resident	8	24	10	11	13
Florida Resident	45	54	50	62	69

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.



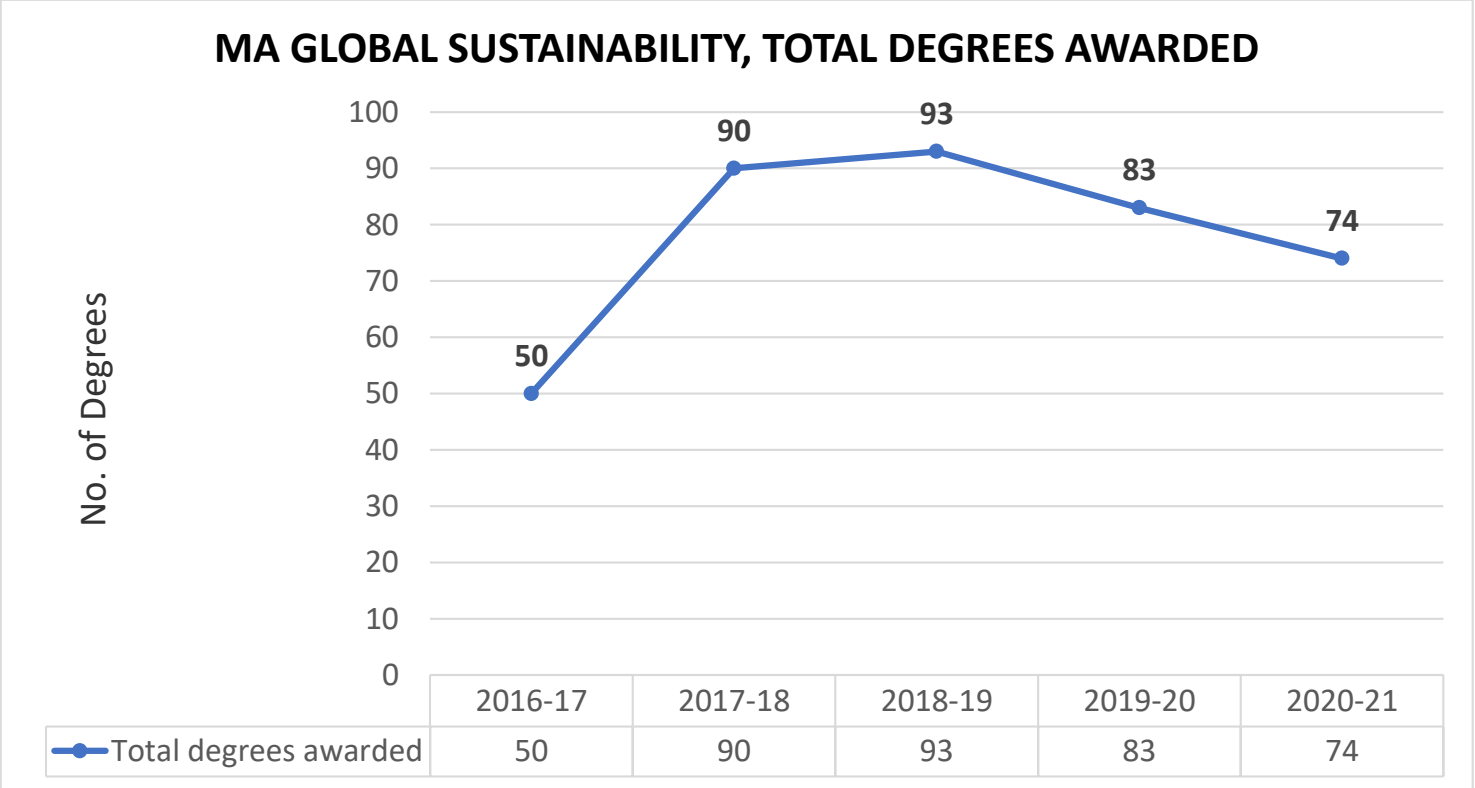
	2016-17	2017-18	2018-19	2019-20	2020-21
Female	56	70	54	76	67
Male	50	58	38	29	30

The below figure illustrates the ethnicity distribution for MA student enrollment the last five years. One can observe from this figure that there is a direct correlation between international student enrollment growth and ethnicity growth.

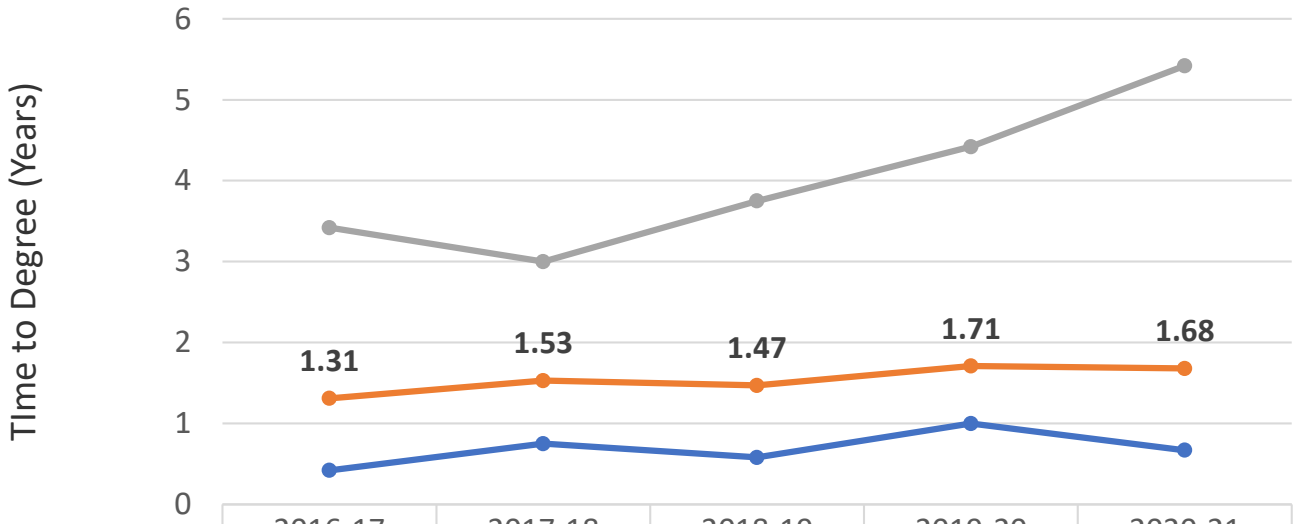


	2016-17	2017-18	2018-19	2019-20	2020-21
American Indian	1	5	3	0	0
Asian	34	34	19	19	11
Black	7	10	9	5	3
White	35	57	35	60	59
Unknown	21	10	18	15	10
Hispanic	8	11	8	6	14

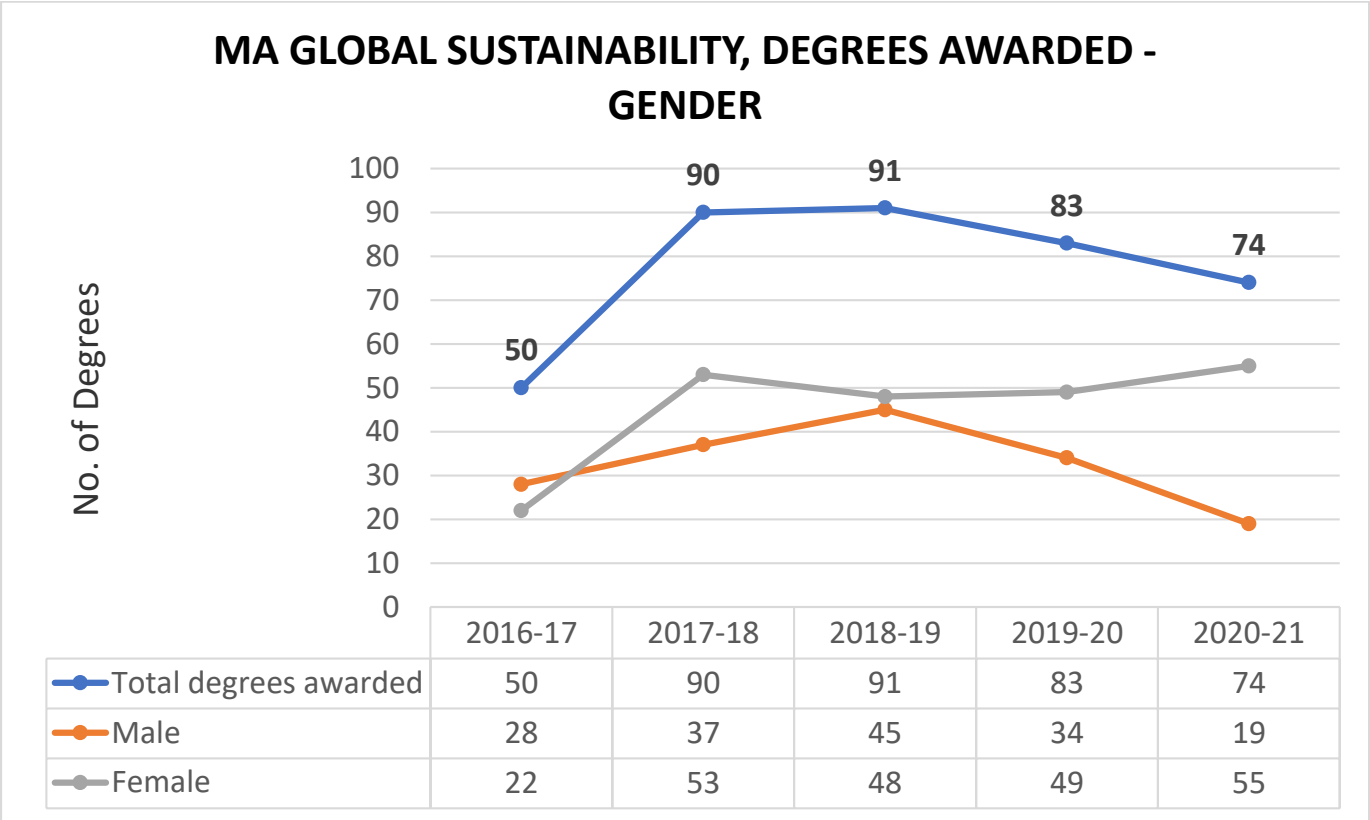
The below figures illustrate the degrees awarded trends the last five years as the program has also grown in admissions and enrollment. The largest enrollment in 2017-2018 resulted in increased degrees subsequently awarded in 2018-2019. We anticipate degree completions to resume growth as the pandemic ends and as we expand our degree offerings.



MA GLOBAL SUSTAINABILITY, TIME TO DEGREE TRENDS



	2016-17	2017-18	2018-19	2019-20	2020-21
Minimum	0.42	0.75	0.58	1	0.67
Mean	1.31	1.53	1.47	1.71	1.68
Maximum	3.42	3	3.75	4.42	5.42

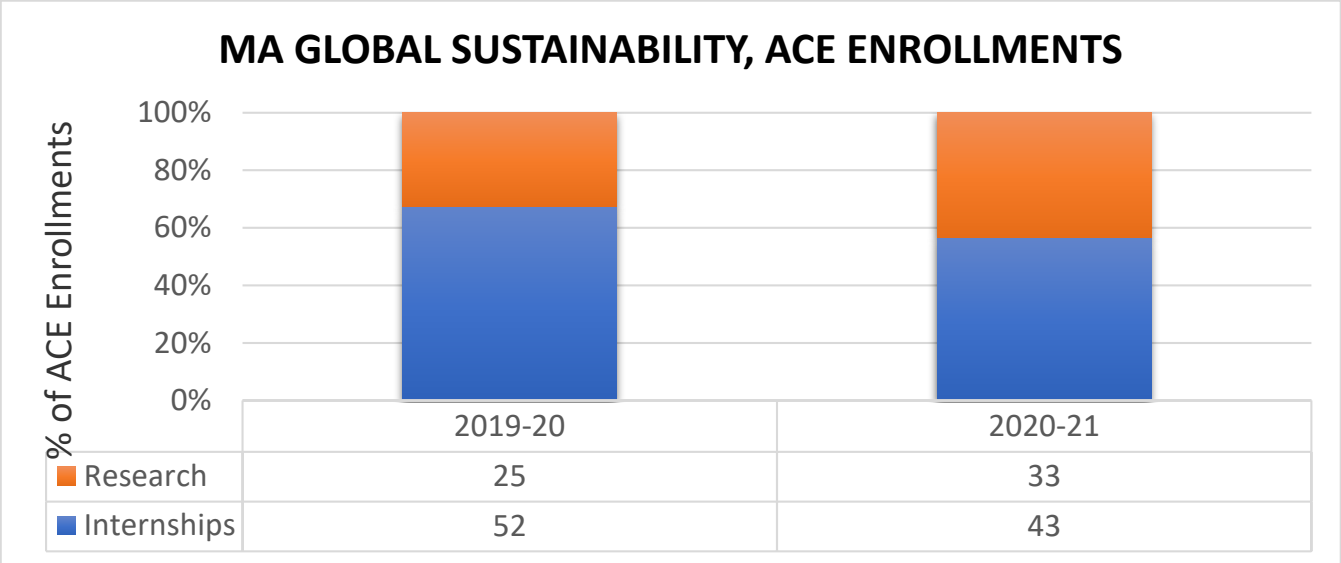


	2016-17	2017-18	2018-19	2019-20	2020-21
Total degrees awarded	50	90	91	83	74
Male	28	37	45	34	19
Female	22	53	48	49	55

INTERNSHIP / RESEARCH PROJECTS

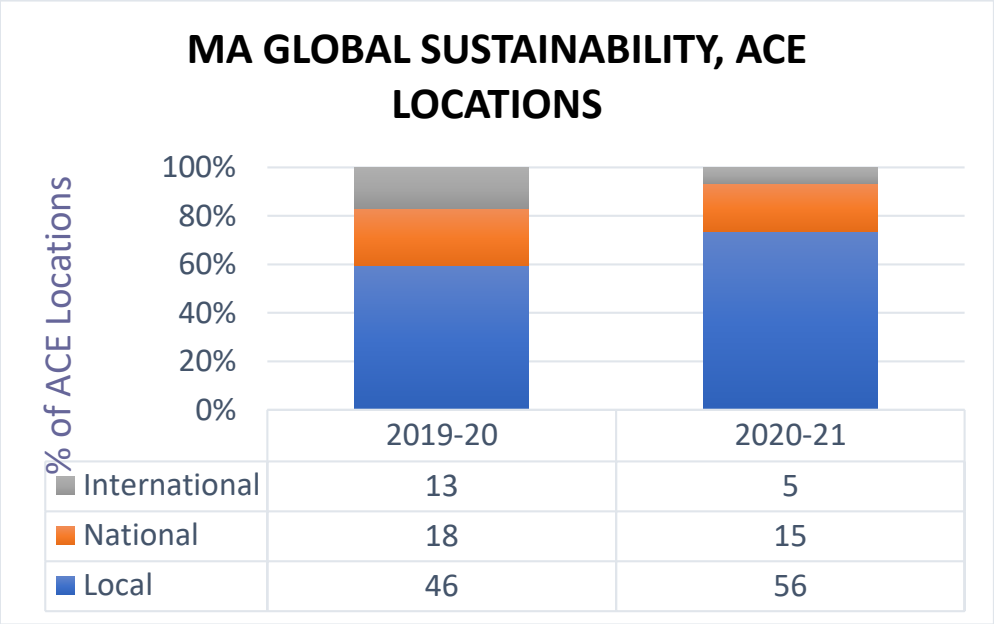
All graduate students are required to complete 3 to 6 credit hours of internship or research project as part of their graduation requirement. Our students conduct their internships at many exciting places across the globe. The Patel College of Global Sustainability internship program allows students to gain both international, regional and local perspective on sustainability while implementing program knowledge and research on-the-ground to solve real world problems.

This academic capstone experience or ACE program is typically completed the semester the student graduates. This can be completed during spring, summer or fall. Normally almost 70% of students elect to complete the project as an internship project as hands-on experience is usually preferred. However, during the past year with the ongoing pandemic our research projects have gained strength as a viable option, comprising over 40% of projects.



	2019-20	2020-21
Research	25	33
Internships	52	43

The following graph summarizes projects undertaken locally within Florida, nationally, and internationally. Normally, over 40% of students elect to complete national/international projects. However, with the ongoing pandemic restrictions, local opportunities (including research) increased to around 75% of projects the last year.



TEACHING & RESEARCH

EDUCATIONAL PROGRAMS

MASTER OF ARTS PROGRAM

The M.A. in Global Sustainability offers nine concentrations, available in a traditional on-campus format, and seven of which are available in fully online and blended formats. The graduate program is designed to prepare students to address complex regional, national, and global challenges related to sustainability and the ability to innovate in diverse cultural, geographic, and demographic contexts. The Patel College of Global Sustainability strives to offer a dynamic curriculum, top- notch internship experiences, and overall superior education for our students.

GRADUATE DEGREE CONCENTRATIONS

CLIMATE CHANGE AND SUSTAINABILITY

The Climate Change and Sustainability concentration provides an interdisciplinary approach by providing the knowledge and skills necessary to assess the impacts of climate change and vulnerability, as well as developing expertise in climate change mitigation and adaptation measures for both developed and developing nations. The concentration explores the contemporary perceptions, attitudes, and beliefs associated with the climate debate by defining the issues and framing the localized nature of impacts. Analyses of different regions around the globe provide insight on climate change mitigation policy, climate change impacts and vulnerabilities, adaptation planning, and societal resilience. The concentration emphasizes the translation of policy and research into climate-smart mitigation and adaptation strategies that will yield sustainable and resilient communities.

FOOD SUSTAINABILITY & SECURITY

The M.A. in Global Sustainability concentration in Food Sustainability and Security provides students with a solid understanding of key issues in food systems design, development, application and management. Focus areas include sustainable food production, food supply chains, food security and protection, food safety, health and nutrition, food waste management, and food resource development. The food sustainability and security concentration also focuses on forward thinking food systems research, developing ground-breaking food resource technologies, and fostering and strengthening collaborative partnerships with corporations, businesses, academic institutions, and non-profits in local, regional, national and global food system networks.

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 BUSINESS

The Global Sustainability concentration in Sustainable Business will provide a foundation for designing sustainable organizations and businesses and related concepts pertaining to sustainability. Organizations and businesses from all sectors need to develop sustainable practices and models to minimize their environmental footprint and maximize their social responsibility to all stakeholders to meet the requirements of a sustainable low carbon economy. The goal of this concentration is to provide participants with the knowledge, expertise, skills and tools they need to create more sustainable business enterprises.

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 will be prepared for private and public sector positions of leadership and responsibility in the biofuels, solar, wind, biomass, and other renewable energy sectors. The concentration is designed for students from a wide range of backgrounds.

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. Tourism is also the fastest growing industry in the world and the ecotourism/ sustainable tourism sector is the fastest growing sector in the tourism industry. 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. The first cohort of students completed Ocean Friendly Certification Training in the fall of 2019 so they can be auditors for the Ocean Allies certification program.

SUSTAINABLE TRANSPORTATION

The Global Sustainability concentration 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. 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 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.A. in Global Sustainability concentration in Entrepreneurship provides students with a comprehensive understanding of concepts, tools, and skills of sustainability and green technology. Focus areas include green technology, development, transportation, energy, and sustainable enterprise.

I. GRADUATE CERTIFICATES

Graduate certificates can be earned with 12 credit hours (four courses) and are perfect for professionals looking to enhance their skills and expertise, boost career advancement potential, and facilitate the advancement of new skills.

Certificates also function as a gateway into the Patel College M.A. program as all credits can transfer directly into the degree program.

The Patel College currently offers eight graduate certificate programs, all of which are offered fully online and on-campus.

CLIMATE CHANGE

The concentration/certificate program is intended to prepare students to address complex regional, national and global challenges associated with climate change adaptation and resilience. This concentration/certificate program is unique as the curriculum is fully integrated to provide a systems perspective for learning and the development of an analytical perspective that will focus specifically on climate change, climate vulnerability, adaptive capacity and pathways of climate adaptation/resilience.

The target student audience can come from a diverse array of backgrounds and career interests as the concentration/ certificate program provides a sustainability framework to be used as a foundation for any career. The primary goal of the concentration/certificate program is to foster sustainability principles and critical thinking, equipping any student with the tools needed to enact sustainable change.

ENERGY SUSTAINABILITY

Concerns about future economic growth, standards of living, and environmental quality have made sustainable energy a top priority worldwide. The goal of this program is to provide students with a solid understanding of the key principles of sustainability, its economics, and how it is practiced by the energy industry in the form of sustainable transportation fuels and electricity from natural resources with a small carbon footprint. The program will prepare students for careers in sustainability and sustainable energy.

The certificate program will provide a general foundation in sustainability and thorough understanding of all forms of energy that can support a sustainable economy. It is designed to appeal to an audience with a wide range of backgrounds and career interests by addressing energy from all angles (technology, business, economic, policy, social) unlike similar- sounding programs at other institutions, which are designed narrowly for engineering and hard science students.

FOOD SUSTAINABILITY

Concerns about the sustainability of our planet have made food sustainability and security a top priority worldwide. The goal of this program is to provide students with a foundation in sustainability principles, economics and finance, and, within this context, with a specialized analysis of food systems, policy, and public health issues.

This certificate program will provide a general foundation in sustainability and a solid understanding of key issues in food systems and safety/security. The program will cover (1) the concepts, principles, economics, and finance of sustainability, as well as transition towards a green economy; (2) food production, distribution, marketing, disposal, and policy; and (3) food safety and security regarding biological, chemical, and physical threats. It is designed for an audience of a wide range of backgrounds with career interests in the field of food sustainability and security.

GLOBAL SUSTAINABILITY

The certificate program in Global Sustainability ensures understanding of the principles of sustainability and the interdependence of the environment, the economy, and social systems to become effective stewards of natural resources and the environment. The program seeks to advance students' ability to understand and address real-world environmental problems; apply systems approach to manage social-ecological systems; and develop critical thinking skills for affection decisions involving environmental policy, resource management, biodiversity conservation, and human health. The program takes a pragmatic systems perspective and holistic approach to address issues of sustainability that consider water, energy, and food sustainability and security.

Students completing the certificate will achieve an advanced understanding of the sciences of sustainability; its real-world application; and increase opportunity for job advancement. The program will allow students from diverse backgrounds to pursue interests in sustainability sciences in some depth without requiring the breadth of course work and extensive research required for the Master's degree.

SUSTAINABLE BUSINESS

The Sustainable Business graduate certificate will provide a foundation for designing sustainable organizations and businesses and related concepts pertaining to sustainability. Organizations and businesses from all sectors need to develop sustainable practices and models to minimize their environmental footprint and maximize their social responsibility to all stakeholders to meet the requirements of a sustainable, low carbon economy. The goal of this certificate is to provide participants with the knowledge, literacy, skills and tools they need to create more sustainable organizations.

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. Tourism is also the fastest growing industry in the world and the ecotourism/ sustainable tourism sector is the fastest growing sector in the tourism industry. The goal of this certificate program is to provide students with the knowledge, skills and tools to develop sustainable tourism programs that meet Global Sustainable Tourism Criteria.

This certificate program will provide a general foundation of sustainable tourism and related concepts of sustainability. It is designed to appeal to an audience with a wide range of backgrounds and interests in the tourism and hospitality industry. The curriculum will be of particular interest to those related to global tourism movements such as the United Nation's World Tourism Organization, the International Ecotourism Society, and the Global Sustainability Tourism Council.

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 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 defend of graduates and professions who would like to gain the necessary knowledge and skills to enhance their career opportunities in a reasonable time. The program is also attractive for many students who would like to use this as a path towards their M.A. program 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, public health, 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.
- Nano-technology and sustainable manufacturing.

FOCUS AREAS

ALGAE TECHNOLOGY

Algae represent a promising source of alternative fuels and bio-products, but with the added benefit of serving as a sink for carbon dioxide and wastewater. Using our experience in algae engineering for the production of chemicals and fuels, we use native algae strains in our lab and outdoor facilities to generate and commercialize algal products under real-world conditions.
Algae synthesize omega-3 fatty acids, which are essential to human nutrition and health. Algal lipids can be converted to biodiesel and jet biofuel via chemical processing, whereas phospholipids (found in algal cell membranes) are valuable in the cosmetics industry. Live algae fed to fish result in higher aquaculture production and algal protein can serve as animal feed and fish meal.
Our applied research closes the gap between innovative ideas and the marketplace.

OUR EFFORTS ARE FOCUSED ON:

- Design of cost-effective cultivation platforms
- Scale-up and operation of algae production systems
- Water, nutrient, and energy management
- Product development (fuels, cosmetics, nutraceuticals)
- Intellectual property management

BIOFUELS AND BIOPRODUCTS FROM BIOMASS

Biomass is an abundant and inexpensive domestic feedstock for bio-refineries 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 conditions and green chemistry principles. Then, cellulase enzymes are employed to convert cellulose to simple sugars. Those sugars can form the basis of a sustainable green economy, as they are readily convertible via fermentation to a variety of chemical precursors, such as organic acids for the manufacture of biofuels, plastics, resins, and other renewable products. In essence, biomass can replace oil as the source of chemicals essential for consumer products.

BIODIESEL AND JET BIOFUEL

Fuel diversification is needed for diesel and jet engines. The United States consumes 57 billion gallons of diesel and 20 billion gallons of aviation fuel annually, hence depending significantly on foreign oil. Such dependence renders the United States vulnerable to political instability around the world. Domestic biofuels can make the country more energy self-sufficient.

We have technical and business expertise in biofuel production with a focus on sustainable technologies and resources:

- Biodiesel production using super critical fluid technology
- Biodiesel from used vegetable oils
- Biodiesel from algal lipids
- Jet biofuel from Brassica carinata

Production of biofuels is conducted in batch and continuous modes. We are available to assist entrepreneurs, companies, and communities in the production, distribution, and marketing aspects of their biofuel business.

FOCUS AREAS

Transformation of urban food waste and other post-consumer organic residuals into fuel and fertilizer for urban food production in Florida and abroad

FUNDERS: Fat Beet Farm/Nobel Crust Restaurants (Curci Family), Rosebud Continuum Sustainbility Education Center/Bishop Construction Company (Bishop family), and Florida Gulf Coast University.

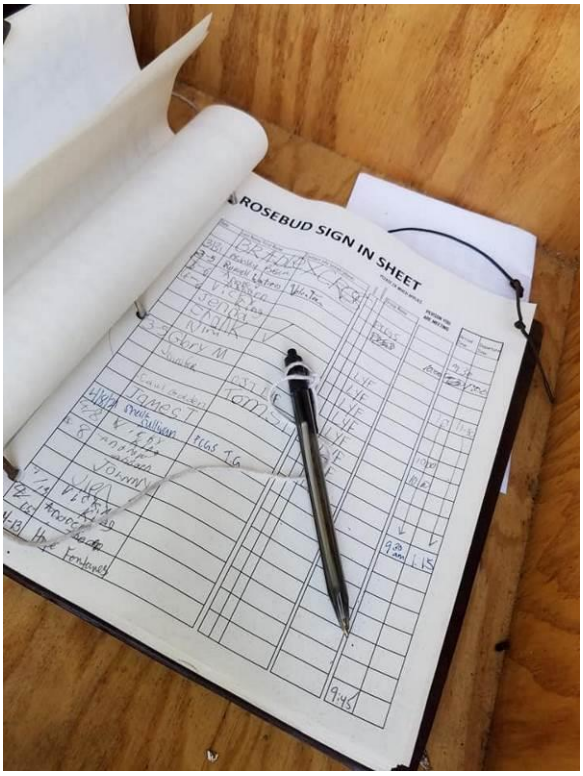
GOAL: This ongoing project in Oldsmar and Land O Lakes, and FCGU Florida engages USF faculty and students in the construction and operation of integrated solar heated anaerobic digestion and food production systems that "close the loop" transforming all organic "wastes" on the properties into fuel and fertilizer. The lessons learned are applied to workshops and implementations around the world with funding from the US State Department, National Geographic, Solar CITIES and other NGO partners.

ONGOING AND PLANNED ACTIVITIES

Despite the pandemic, Dr. T.H. Culhane and his Patel College students and graduates, as well as many of Dr. Joseph Dorsey and Dr. Kebreab Ghebremichael students have continued to safely work on existing projects and expand into new out-door hands-on ACE projects at the Rosebud Continuum Eco-Science Sustainability Center in Land O Lakes, observing recommended health protocols (strict mask wearing, physical distancing of six feet or more, hand washing etc.) The property has a sign in sheet and ubiquitous signage to remind visitors of the responsible way to keep our communities safe.

Students have completed projects such as "Retrofitting electric golf carts to run on student installed solar panels", "Research into the construction and use of 3-axes additive manufacturing equipment", "Eliminating food waste and the need for composting by increasing the surface area to volume ratio through grinding", "Biodigestion combined with Hugelkultur as a Septic Alternative", "Self-built aeroponics systems for vertical agriculture" and "hand-made thermosiphon solar hot water system for washing cloth diapers" among others. All are related to "life-testing" the circular economy in our local region.

At Rosebud they have learned how to do field-work and field videography, including green screen and drone videography (Culhane has provided the necessary equipment). A new group of PCGS students were oriented by the outgoing students and seamlessly took over responsibilities for the long-term projects. One of the highlights has been seeing PCGS students act as instructors, facilitators and docents for the on-going "food-forest field trips" and food security garden activities for special needs youth from Lyf school.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To increase his ability to teach these field skills, T.H. Culhane enrolled in the USF Zimmerman School of Media and Communications course in Drone Videography and earned his FAA PIC (Pilot in Command) Drone Operator's License. For the past year he has been able to train and supervise unlicensed students. Dr. Culhane purchased two professional DJI drones -- a larger drone that requires registration and a smaller "travel drone" that does not need registration and that he has been able to supervise students flying. He was able to involve students in the production of Curricular Videos and traveled to Germany to gain professional development experience in urban drone flight.

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

Dr. T.H. Culhane and Dr. Brooke Hansen continue working with Patel 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, like the weatherproof educational signage they have been creating for the Rosebud Continuum Sustainability Education Center. They are also working on 3D printing using recycled plastics. The US Embassy donated the $13,000 Japanese BLEST plastic-to-oil machine to Culhane's research into turning the unrecyclable #7 mixed waste plastic into a reliable fuel for running garden and lawn equipment and the Bishop family has supplied the field laboratory, the convection oven and the $2,500 X-Carve Robotic CNC sign making machine and the $2000 Snapmaker 3-in-1 3d printer and laser etcher/CNC mill, while PCGS supplied the $5000 Ultimaker S5 3D printer and, this semester, a $2000 Protocycler 3d filament extruder.

Water Sanitation and Hygiene

FUNDER: National Science Foundation GOAL: This project engages USF faculty and US- based students to conduct WASH research in partnership with faculty, student and communities in Ghana. The project includes research activities in water treatment, sanitation, community engagement and micro financing. In the first year of the project USF faculty and students collaborated with faculty and students at the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi, Ghana and public schools to develop and implement the technologies and engage the community. Currently we are partnering with the University of Cape Coast (UCC) and a local high school in Cape Coats, Ghana.

ONGOING AND PLANNED ACTIVITIES

Although the planned trip to Cape Coast in summer 2021 has been cancelled due to COVID-19 travel restrictions, we have been preparing the selected 7 students for the project. The students have been selected from different universities in the US. Over the past 10 months we conducted monthly workshops to introduce the students to Ghanaian culture and to concepts of WSAH. The students will conduct research under the supervision of faculty from UCC and will work with a high school students and teachers on authentic science project. The project will focus on sanitation technology research based on biodigesters as part of their school curriculum.

Focus Area: Appropriate technologies for water and wastewater treatment

Funding Source: The Joy McCann Foundation

Globally close to a billion people do not have access to safe drinking water and more than 2.6 billion lack appropriate sanitation, mostly in developing countries. This has led to widespread public health issues and environmental pollution. One of the major reasons leading to these issues is lack of affordable and appropriate technologies for water and wastewater treatment. Researchers at the Patel College of Global Sustainability are addressing some of these concerns through the development of efficient and low-cost technologies for water and wastewater treatment. Research activities in this area include the following: Enhancing the design and performance of the conventional biosand filter technology for household water filtration, modifying locally available filter media to remove multiple contaminants such as fluoride, arsenic, pathogens, and using indigenous biomaterials.

Currently PCGS-led faculty are working on a project funded by the McCann Foundation to address these issues. This multidisciplinary research project is being conducted by faculty and students from the Patel College of Global Sustainability, the College of Engineering and the College of Education. The project team is implementing the biosand filtration (BSF) technology at three high schools (King high school, Brandon high school, Middleton high school) and one magnet middle school (Dowdell Middle school) in Hillsborough county. The middle and high school students have designed and built the BSFs and are conducting research as part of their curriculum. At the same time USF students from Engineering and Education are conducting research to develop modified BSF for fluoride removal and the incorporation of evidence-based science research in public schools' curriculum.

Focus Area: Wastewater treatment and Systems thinking.

PhD Research

The PCGS faculty is also collaborating with faculty at the college of engineering as a co-supervisor of masters and two PhD students. One of the PhD research focuses on onsite wastewater treatment for pathogens and nutrients removal and enable to reuse treated wastewater non-potable purposes such as irrigation. The second PhD study is on the application of systems thinking to assess the management of multifunctional plants/crops. This includes studies on life cycle assessment and systems modelling.

The PCGS faculty is also involved in a NSF funded Research Experience for Undergraduate Students (REU) as a senior faculty. The faculty will supervise research activities of undergraduate students and provide audit access to some of the students in his course.

Focus Area: Applying Sustainable Tourism in Tampa Bay with Digital Technologies and Collaborative Partnerships

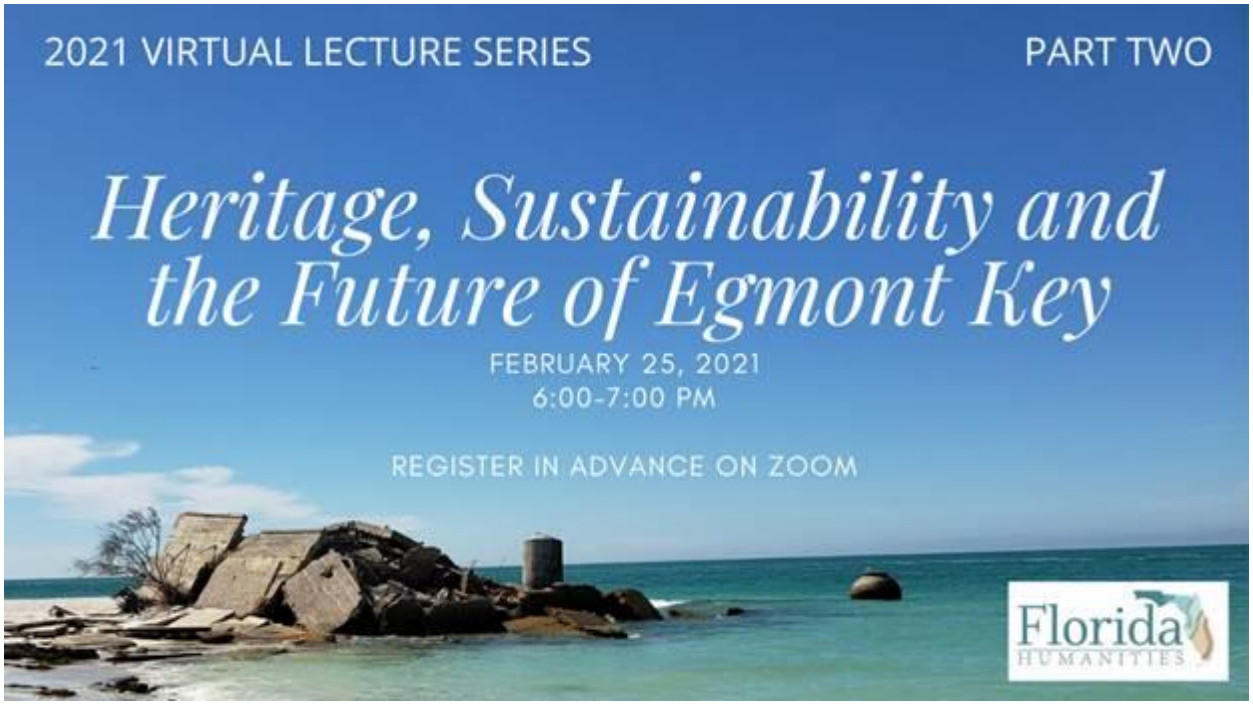
Dr. Brooke Hansen (Director, PCGS Sustainable Tourism Concentration) has been working with a number of university, community, and industry partners to further sustainable tourism in Tampa Bay and provide students with hands-on experiences in the latest visualization technologies and interpretation platforms. The USF Egmont Key Project is located on an island at the mouth of Tampa Bay that is both a Florida State Park and a National Wildlife Refuge visited by over 200,000 people a year seeking ecotourism experiences, cultural heritage tourism, and island recreation. Project partners include the University of South Florida (PCGS and the Access 3D Lab), the Florida Public Archaeology Network, and a local non-profit organization, the Egmont Key Alliance. Guided by the United Nations Sustainable Development Goals, the project aims to protect cultural and natural heritage (SDG 11.4) and develop and implement tools to monitor sustainable 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.

In the past 150 years, about half of Egmont Key has eroded into the sea, leaving the current land area at 2 square kilometers. With the loss of land comes the disappearance of important habitat for thousands of nesting shorebirds and the destruction of irreplaceable cultural heritage sites that attest to Tampa Bay's rich history. In 2018, the Florida Trust for Historic Preservation named Egmont Key one of the most endangered sites in the state of Florida.

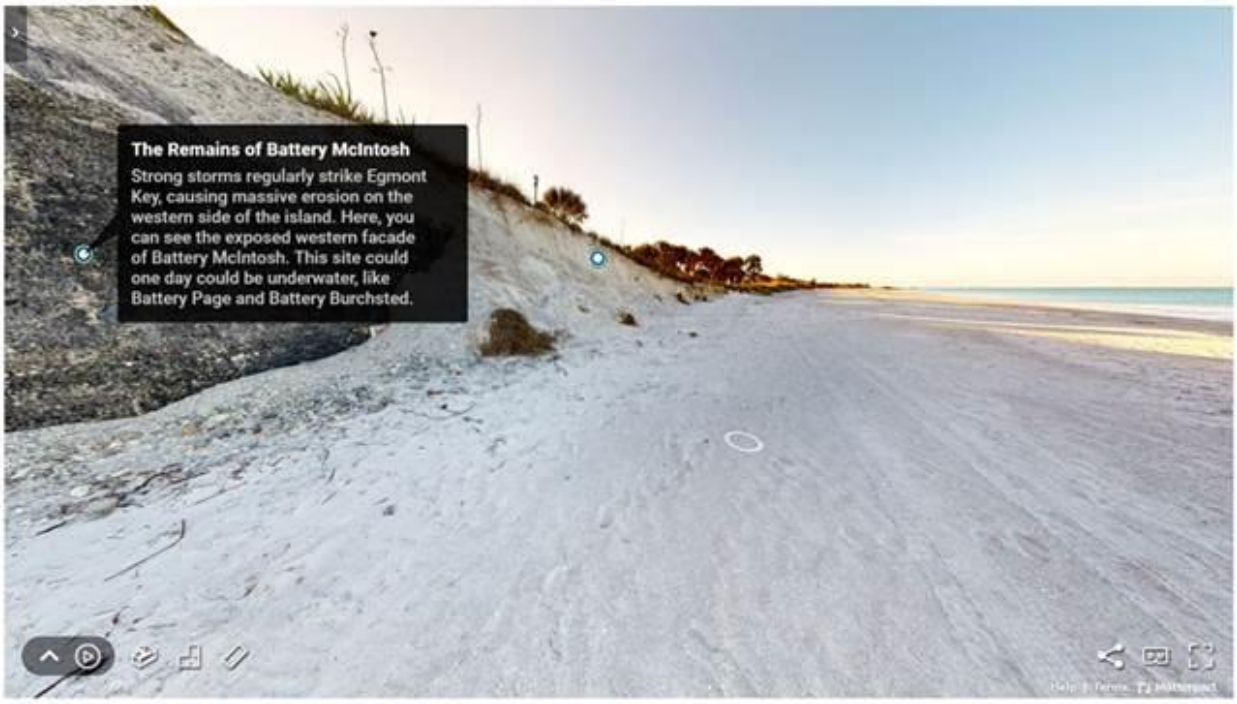
Picture: Power plant that used to be in the center of the island washing into the sea from the Ft. Dade period at Egmont Key. Credit: Dr. Brooke Hansen

Through grants from the Florida Humanities Council and USF, Dr. Brooke Hansen and Dr. Laura Harrison (Director, USF Access 3D Lab) have worked with project partners and students to develop an interactive touch screen experience of the many histories of Egmont Key. These histories span early indigenous presence and Spanish explorers to Union occupation during the Civil War and militarization of the island during and after the Spanish American War. The remnants and ruins of Ft. Dade are a very popular tourist attraction today. One of the little known histories of the island include its use as a concentration camp for Seminole people from 1856-1858 during the last chapter of Indian Removal. It is a very dark period for many Seminole people who refer to the island as the "dark place." Many of these histories are invisible and inaccessible to visitors, due to limited tourism interpretation. Furthermore, intense erosion, compounded by sea level rise, storms, and the dredging of the Egmont Channel for commercial shipping into Tampa, threatens to erase these valuable histories and many others.

The USF Egmont Key Project is using innovative technologies, education and citizen-science site monitoring to raise awareness about heritage at risk and promote mitigation strategies. During the spring of 2021, a three-part virtual series was organized by Dr. Brooke Hansen and Dr. Laura Harrison to share with the public the many lessons that Egmont Key holds from indigenous histories and climate change to mitigating overtourism.



Digital technologies enhance the tourist experience by offering engaging, interactive content and reaching new audiences. Geoinformatics efforts using laser scanning, photogrammetry, 3D photography, and GIS modeling, can be used at sites like Egmont Key to manage at-risk heritage, monitor erosion along the rapidly shifting coastline, address the challenges of overtourism and ecological vulnerability, and reach new audiences. The COVID-19 pandemic has highlighted the importance of virtual accessibility to heritage sites and sustainability monitoring at a time when social distancing and remote learning are more important than ever. Allowing access to such sites virtually also highlights issues of equity for those without the financial or physical abilities to visit an island tourist destination such as Egmont Key which is only accessible by boat and lacks basic infrastructure such as running water, bathrooms, electricity, and wireless Internet.



View of an educational hotspot within a 360 virtual tour of Egmont Key's eroding western shoreline, showing the exposed architecture of Battery McIntosh. Credit: Laura K. Harrison/Access 3D Lab.

The next steps in the Egmont Key project include a May 2021 workshop to gather more virtualization data from Egmont Key with the Access 3D Lab's Matterport 360 under the direction of Dr. Laura Harrison and the deployment of citizen science and erosion monitoring stations being organized by Dr. Brooke Hansen and the Florida Public Archaeology Network in collaboration with the Egmont Key Alliance. Next steps also include the full development and implementation of the Florida Humanities Council funded digital touchscreen exhibit that brings Egmont Key's many histories to life in a digital storytelling framework, including the Seminole internment. Another project centers on the development of a pop-up virtual reality experience that provides an immersive, 3D tour of the lighthouse as well as an introduction to concepts of sustainability and heritage management. The goal is to scale up these pilot projects for full implementation in educational and tourism venues throughout Florida and beyond. These efforts will continue to engage multiple communities and organizations, such as the Seminole Tribal Historic Preservation Office and the Florida Public Archaeology Network's Heritage Monitoring Scouts program, to fully represent the diverse histories at Egmont Key and monitor the environmental threats that the island faces.

The current challenges to sustainable tourism development during and after COVID-19 in the context of climate change can be addressed with powerful shared frameworks such as the UN Sustainable Development Goals and the use of geoinformatics and visualization tools. Digital technologies can help to monitor cultural and natural heritage sites at risk, provide data for tourism planning and management, engage the public with citizen science, and empower access to tourism sites. Collaborations are key, as stated in SDG 17 Partnerships for the Goals, and the case study of Egmont Key is an example that can be used in other locations as well to assist in building back better after the pandemic with sustainability in mind.

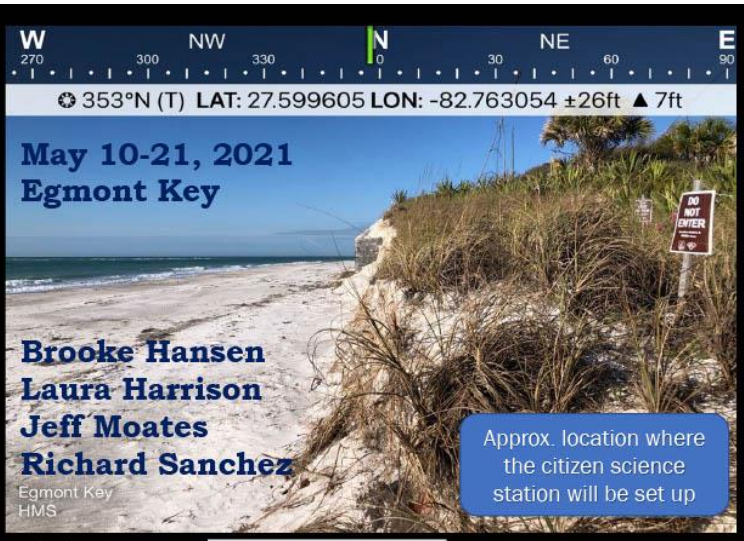
Sustainable Tourism Interpretation & Citizen Science Workshop

Participants will receive training in:

Heritage Monitoring Scouts

National Park Service tourism interpretation

Matterport 360 3D Imaging



FLORIDA PUBLIC ARCHAEOLOGY NETWORK

UNIVERSITY OF SOUTH FLORIDA

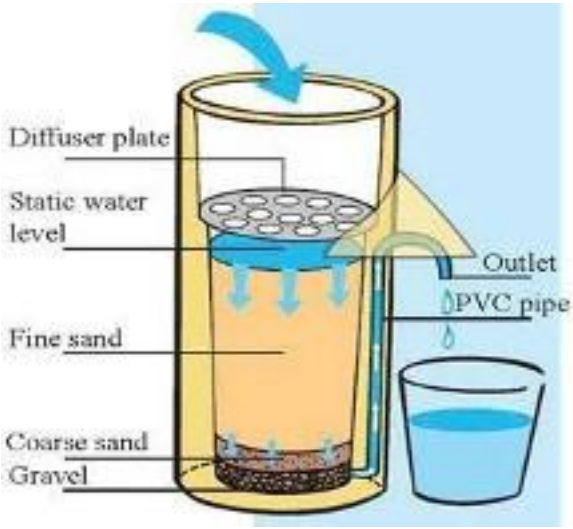
Workshop fee: $500; on-site training at Egmont Key with virtual training classes

Info: kbhansen@usf.edu

ONGOING AND PLANNED ACTIVITIES

The second batch of five students for the second year have been selected. Although the travel to Ghana has been postponed because of COVID-19, plans for summer 2021 are ongoing where the selected students are doing pre-travel workshops. The students will conduct research under the supervision of faculty from Cape Coast and USF and will work with the selected schools to develop the research activities at the schools. The project for summer 2021 will focus on sanitation technology research based on biodigesters and incorporating authentic science research in K-12 education curriculum. The project will involve a group of high school students and teachers who will work together with the US and Ghanaian university researchers (Undergraduate and graduate students and professors).

Appropriate technologies for water and wastewater treatment



Globally close to a billion people do not have access to safe drinking water and more than 2.6 billion lack appropriate sanitation, mostly in developing countries. This has led to widespread public health issues and environmental pollution. One of the major reasons leading to these issues is lack of affordable and appropriate technologies for water and wastewater treatment. Researchers at the Patel College of Global Sustainability are addressing some of these concerns through the development of efficient and low-cost technologies for water and wastewater treatment.

Research activities in this area include the following: Enhancing the design and performance of the conventional biosand filter technology for household water filtration, modifying locally available filter media to remove multiple contaminants such as fluoride, arsenic, pathogens, and using indigenous biomaterials.

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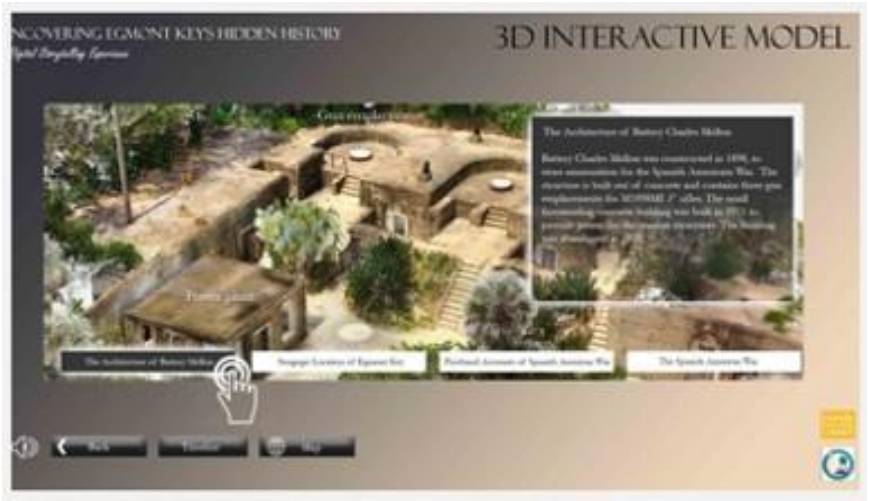
PCGS faculty is also partnering with faculty at the college of engineering on onsite wastewater treatment for pathogens and nutrients removal. This research focuses on the treatment of onsite wastewater for non-potable reuse for irrigation.

SUSTAINABLE HERITAGE TOURISM AT EGMONT KEYL BRIDGING SCIENCE, SOCIAL SCIENCE AND THE HUMANITIES WITH VIRTUAL REALITY

Dr. Brooke Hansen is the co-director of this project in collaboration with Dr. Laura Harrison (Director, Access 3D Lab, College of Arts and Science, USF), Dr. Paul Backhouse (Director, Ah-Tah-Thi-Ki-Museum, Seminole Tribe of Florida), David Scheidecker (THPO, Seminole Tribe of Florida), Richard Sanchez (President, Egmont Key Alliance), Lacee Cofer (THPO, Seminole Tribe of Florida),and April Min (M.A. candidate, Anthropology, USF). The goal of the project is to utilize digital humanities and virtualization technologies to assess sustainability, model climate change and anthropogenic activities, and raise awareness of heritage at risk at this remote tourist site in Tampa Bay. The United Nations Sustainable Development Goal # 11, Sustainable Communities, has designated target 11.4 to strengthen efforts to protect and safeguard the world's cultural and natural heritage and this project is aligned with that target.

Through terrestrial LiDAR data collection and FARO laser scanners the team is developing a virtual interactive model of Egmont Key that can be used in a variety of applications, from touch screen interactive displays to VR goggle experiences featuring the long and varied history of the island. Steven Fernandez (School of Public Affairs, USF) is also collaborating on the project with GIS mapping of Egmont Key's disappearance from erosion, storms, and channel dredging. Over half the island has already eroded into the sea, taking with it innumerable artifacts and histories of Spanish explorers, Civil War occupation, yellow fever quarantine in the Spanish American War, Seminole incarceration, and more.



The team is working on archival research, sustainable tourism development planning, and developing classes and workshops so students and interested community members can learn how to use the latest technologies to engage the public, both visitors and residents, in compelling digital storytelling. The first Applied Heritage and Sustainability Research class and workshop was held in May 2019 (pictured below) where key parts of the island were scanned, including the lighthouse, cemetery, and estimated internment site of hundreds of Seminoles in the 1850s during the tail end of Indian Removal. The work continues this summer during the Maymester with a class and professional training workshop.

The Egmont Key Project has been funded by the Florida Council for Humanities Community Project Grant (awarded September 2019) and the USF Creative Scholarship Grant (awarded April 2020) for the creation of virtual reality applications.

COMMUNITY ENGAGEMENT & OTHER ACTIVITIES

George Philippidis, Kebreab Ghebremichael, Joseph Dorsey, Heather Rothrock through the USF Office of Community Partnerships, mentored and supervised several teams of PCGS students (more than 40 students in total) assisted the Manatee County in (1) Assessing the city's Green House Gas emissions and recommending ways to reduce carbon emissions from city operations; (2) Assessing the solar power potential of the city to replace part of its energy consumption with renewable solar energy. The carbon emissions project was executed by three teams of students from the courses "Renewable Power Portfolio" under Dr. G. Philippidis and "Systems Thinking: The Key to Sustainability" under Dr. K. Ghebremichael. The solar project was executed by a team of students from the course "Concepts and Principles of Sustainability" under Dr. J. Dorsey. Reports were submitted to the Manatee County and the findings were presented to the Council.

Kebreab Ghebremichael worked with four Hillsborough County public schools to incorporate authentic science research in their course curriculum.

Heather Rothrock joined the Sustainable Urban Agriculture Coalition (SUAC)'s Board of Directors. SUAC is a non-profit organization, operating within the Tampa Bay region, with a mission to "provide education and volunteer assistance to the community in order to facilitate sustainable urban agriculture to create healthy, affordable food, local jobs, and economic stimulus". An additional goal is to involve PCGS students in active urban agriculture education, projects, and policy-formation.

As faculty advisor, **Heather Rothrock** led USF's student organization Climate Action Coalition (CAC) to engage in climate action education and advocacy within USF and the surrounding communities.

For **T.H. Culhane**, this has been a year of intense online professional development. Innovative Education and Adobe equipped Culhane with a site license for the professional Adobe Creative Suite software due to course needs for the new "Envisioning Sustainability" course. Culhane has spent much of the pandemic year in on-line training programs for advanced Distance Learning (Perusall, Hypothes.is, EngageVR, Zoom and Microsoft Teams), Video Production (Adobe and Camtasia) and World Building/Gamification and Programming (Unity 3D Education's C# Programming Language and Modeling, Roblox Studio Lua Programming Language and Modeling, Altspace for Educators creator training, Minecraft Education Python Programming Language and Modeling, Snapmaker, Protocycler, Ultimaker, Lens Studio, Cuebase, Audacity and Fortnite Creativity). Innovative Ed also produced a complete revision of Culhane's Climate Mitigation and Adaptation course this year in which students also use Adobe Creative Suite to co-create class lecture videos in tune with the "user created content" zeitgeist.

This has been a landmark year for student centered curricula "of the students and faculty, by the students and faculty for the students and faculty", facilitated by both creative use of Microsoft Teams and a creative and true team spirit among the students and faculty.

Working with the USF Digital Task Force, Brooke Hansen and T.H. Culhane have been able to optimistically recommend that if equity issues are addressed (ensuring all students have access to reliable broad band internet and powerful enough computers with the requisite software) there is no reason that any future restrictions on in-classroom meetings should have any deleterious impact on student achievement. In fact, from a sustainability perspective, it could be said that this year has had clear environmental benefits -- no need for the fossil fuel using and heavily polluting daily commute with its concomitant safety and health risks and time losses to traffic and wear and tear on vehicles and roads, no need for massive expenditures

on HVAC and lighting for buildings we no longer need.

PCGS has adapted to this greener “new normal” with flying colors.

Pandemic Resilience

While students, young and old, have continued to be able to come to Rosebud, visits to traditional schools have of course been precluded. Nonetheless, working with Cengage Learning/National Geographic Learning and the Stavros Center for Economic Education and the Coca Cola Foundation we have continued to visit schools and communities virtually. Locally and around the world we have used cutting edge online technology (Microsoft Teams, AltSpace VR, HTC Vive, Oculus, Unity, Roblox) to train teachers and students on how to “Be the Nexus” and become “Sustainability Superheroes”, through systems thinking, biomimicry and construction of low cost food-energy-water and zero waste systems and the creation of STEM/STEAM sustainability curricula and hands-on activities that blend creativity, music and the arts to enhance science content delivery at the top levels of Bloom’s Taxonomy.

What the pandemic restrictions on travel and in-classroom instruction revealed is that in this century's second decade faculty and students at PCGS are already high functioning "digital natives", fully equipped both philosophically and technologically, with the needed skill sets to make synchronous and asynchronous on-line education, outdoor field education and experiential learning (as well as hybrid education) not just adequate replacements for traditional classroom instruction, but experiences that often surpass the way we used to teach and learn.

T.H. Culhane continues working with Brooke Hansen, Joseph Dorsey and Dr. Laura Harrison and with USF Innovative Education to create interactive 3D models of the Patel College and Rosebud Continuum, Egmont Key and other spatial geography linked environments and to produce VR/AR content that allows students during the Covid-19 Quarantine and Travel Restrictions to visit both the classroom and the field research sites in virtual reality and then trigger video content, 3d models and text annotations using a cell phone or tablet.

PCGS supplied two Oculus Quest VR headsets and VR development computers signed out to T.H. Culhane and Joseph Dorsey for research into immersive 3D Experiential pedagogy. Some of the technologies ($60 per month Zapworks Studio/Zappar licenses) are supplied by USF Innovative Education so that PCGS students and faculty can create embedded digital engagement content. Culhane has created virtual versions of the PCGS building and of Rosebud Continuum Eco-Science Center in popular interactive multiplayer formats such as Roblox, Minecraft, Unity 3D, Altspace VR, VRChat and Flipside Studio.

In addition to assigned courses, Culhane holds extra-credit class meetups in these immersive 3D spaces every week, and he and Joseph Dorsey hold a weekly training seminar on Thursday afternoons that is simultaneously broadcast in Microsoft Teams and open to any interested students and faculty, including members of the USF Digital Task Force, convened for improving on-line curricula and engagement and equity during the Covid-19 crisis.

insinkerator

Grind2Energy® Webinar Series

Summary

Please join us for our next Grind2Energy Series: ***"Food Waste to Fuel & Fertilizer. Please Do Try This at Home"*** with guest speaker Thomas Henry (T.H.) Culhane, Ph.D.

During the webinar, T.H. will take us on a virtual tour of the University of South Florida's Rosebud Continuum Sustainable Education Center. Hear about the latest research, techniques and technologies that are underway to create both real and virtual food/energy/water and zero waste systems.

T.H. is a National Geographic Emerging Explorer with a Ph.D. in Urban Planning. He is a field practitioner who specializes in environmental services technologies, particularly in developing countries. T.H. has devoted his intellect, energy and passions to helping societies reach agreed upon UN Sustainable Development Goals and Carbon Drawdown solutions. His research is focused on Eliminating Food Waste and Large and Small Biodigesters.

In addition to his abundant global contributions as a teacher, practitioner and consultant in interdisciplinary sustainable development praxis, T.H. is a full-time Professor and the Director of the Climate Change Mitigation and Adaptation Concentration at the University of South Florida Patel College of Global Sustainability.
At the university, T.H. develops courses and teaches climate solutions and nexus thinking, working in interdisciplinary synergy with the department of Innovative Education; the Stavros Center for Economic Education, Engineering, Public Health, Sociology, the Arts; the USF 3D Access lab; and the Rosebud Continuum Sustainable Education Center to deploy the latest techniques and technologies in the service of training students to create both real and virtual food/energy/water and zero waste systems and communicate sustainability effectively.

Overview

Title: Grind2Energy Webinar Series: Food Waste to Fuel & Fertilizer. Please Do Try This at Home

Date: Wednesday, September 23, 2020

Time: 02:00 PM Eastern Daylight Time

Duration: 1 hour

Attend

This presentation will begin on Wednesday, September 23, 2020 at 02:00 PM Eastern Daylight Time.

Audience members may arrive 15 minutes in advance of this time.

Outlook/ICal Google Calendar

This year Culhane conducted webinars on the utility of the VR/AR revolution in education using the simulacra he has created to present to and train hundreds of teachers with Cengage, National Geographic, Insinkerator Grind2Energy, Mercy College, The Cleo Institute and of course the USF community. He continues his research and authoring with Dr. Seneshaw Tsegaye, formerly of PCGS and now head of the 3D VR VIPER lab at Florida Gulf Coast University. Together they are writing a book on how VR/AR are improving engineering and sustainability education.

PCGS Contributes to Sustainability for Super Bowl LV in Tampa PCGS graduate and Our Climate field organizer Laura Stargel ('20) and **Dr. Brooke Hansen** served on the committee for the Tampa Bay Super Bowl LV Host Committee's (TBSBLVHC) Sustainability Program presented by Tampa Electric in partnership with NFL Green. The events and initiatives focused on mitigating environmental impact of the game and corollary activities, elevating community engagement and ultimately leaving a lasting legacy. Accomplishments included diversion of solid waste from local landfills, reduction of food waste, grants for food security, material recovery and reuse efforts, offsetting energy through the purchase and retirement of renewable energy certificates (RECs), and greening projects through tree planting, community garden builds, and pollinator habitat creation. Projects highlighted working on climate resiliency, recycling and supporting local sustainability efforts, especially among youth. On Jan. 24th, as part of Super Clean-Up sponsored by Keep Tampa Bay Beautiful, Dr. Hansen was on the water doing clean-up by kayak in the Hillsborough River while a land crew did the same around River Walk. Laura Stargel created a Digital Green Team platform for PCGS students and others to join the Green efforts and promote NFL Green's Forever 55 campaign.

The SDG Action Alliance: Contributing to USF's Sustainability Rankings and Promoting Climate Action and Community Outreach. The SDG Action Alliance, founded in January 2020, made major contributions to USF and the community in 2020-2021. In the fall of 2020, Dr. **Brooke Hansen** (SDG Action Alliance Director), student interns and a project group from the class titled Implementing the UN SDGs worked together on USF's entry for the 2021 edition of the Times Higher Education Impact Rankings – the only higher education ranking system based solely on the United Nations 17 Sustainable Development Goals. With high rankings in 2019 and a decline in 2020, the team was dedicated to showing the world USF's great accomplishments across the platform, from SDG 1 No Poverty and SDG 9 Industry Innovation to SDG 10 Life Below Water. They also wanted to assess where USF is lagging so improvements can be made. The April 2021 announcement of the rankings revealed that USF scored high and took top ten rankings in the world for several of the SDGs. For full details see https://www.timeshighereducation.com/impactrankings#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/undefined

For the second year in a row, the SDG Action Alliance, representing the Patel College of Global Sustainability and USF, teamed up with the CLEO Institute to co-host the global webinar event Solve Climate by 2030. Beginning April 7, across the world and in every US state, over 125 universities hosted webinars on a Green Recovery, Climate Solutions, and a Just Transition. From Austria to Alabama, Kyrgyzstan to Kentucky, Colombia to Colorado, and Malaysia to Minnesota, we heard from local climate experts about concrete steps that can really move the needle on climate change. The State of Florida power dialog featured introductions by Dr. Hansen and Yoca Arditi-Rocha, Executive Director of The CLEO Institute, and a statement by Mayor Daniella Levine Cava of Miami-Dade County. The moderators were CLEO's House on Fire Podcast Co-Hosts Gabriela Rodriguez & John Paul Mejia. Speakers included Jill Horwitz, Climate Resiliency Officer, Heritage and Environment Resources Office, Seminole Tribe of Florida and Salome Garcia, Policy and Campaigns Manager, The CLEO Institute.

The event finished with a youth statement by Lisandra Morales, GenCLEO and new member of Tampa Mayor Jane Castor's Sustainability and Resiliency Advisory Team, and updates from Crystal Boutwell and Liam Summers from Florida PIRG Students at USF and their efforts to mobilize around the state for 100% renewable energy.

In the spring 2021, the SDG Action Alliance brought on three new interns from PCGS -- Sheila Sullivan, Jasmine Seitz, and Timothy Penoyer. They have worked on a variety of projects from heading up the statewide Solve Climate 2030 power dialog on April 7th to fundraising and other SDG related projects focused on sustainable fabrics, textile composting and reducing single use plastics in local businesses. Continuing intern Leah Mowery, Communications and Project Coordinator, and Dr. Hansen had a successful public fall Sustainability Film Series with films such as Mission Blue, The Last Green Thread and Mossville: When Great Trees Fall to highlight issues of marine degradation, loss of green spaces in Florida, and the exponential effects of environmental racism associated with the fossil fuel energy industry. The spring slate of virtual films and discussions was organized around the theme Hopeful Futures and featured I am a Girl and Biggest Little Farm to highlight SDG 5 Gender Equality and SDG 3 Good Health and Well-being, respectively. The films were included in the SDG focused events promoted by USF's Global Citizens Project with help from SDG Action Alliance Youth and Global Citizens Coordinator Courtney Wright.

Other accolades for the SDG Action Alliance include the feature by Sustainable Development Solutions Network's Mobilize Member Mondays and Dr. Hansen's appointment in March of 2021 to the Scientific Committee of the International Conference on Sustainable Development (Sept. 20-21, 2021). She is sponsoring a session on Resetting Tourism after COVID-19 with the SDGs and co-editing the conference proceedings which will be published.


SDG ACTION ALLIANCE
PRESENTS
Hopeful Future
SPRING 2021
SUSTAINABILITY FILM SERIES
3RD THURSDAY EACH MONTH, 7 PM, WEBEX
JANUARY 21
Commemoration of Decade of Action
Living the Change
MARCH 18
Gender Equality
I am a Girl
FEBRUARY 18
Reduced Inequality
What is Intersectional Environmentalism?
APRIL 22
Good Health and Well-being
Biggest Little Farm
MAY 20
Biological Biodiversity
David Attenborough: A Life on Our Planet
FOR EVENT AND RSVP INFORMATION VISIT
THE SDG ACTION ALLIANCE FACEBOOK PAGE
https://www.facebook.com/sdgactionalliance

Sustainable Tourism Program Supports Global and Local Efforts to Build Back Better After COVID-19. The PCGS Sustainable Tourism Program, directed by Dr. Brooke Hansen, continued to be recognized as an Academic Affiliate of CREST, the Center for Responsible Travel, where two PCGS interns served during 2020-2021 (Kristina Rocks and Tatiana Villa-Holmes). The February 2021 meeting of the global affiliates focused on the Future of Tourism Coalition and the recent CREST reports on the pandemic's impact on travel and destinations (Academic Affiliates | Center for Responsible Travel). Dr. Hansen also joined B Tourism, a global movement, founded by Jared Meyers of Florida for Good and Legacy Vacation Resorts, geared to leverage the impact of B Labs and the B Corp movement to connect and support global tourism for best practices now and into the future. Dr. Hansen presented to the B Tourism consortium on February 10th about cultural heritage tourism and the inclusion of indigenous land acknowledgements following the example of USF's land acknowledgement statement that was created in conjunction with the Seminole Tribe of Florida. Legacy Vacation Resorts took the task to heart and has installed a land acknowledgement statement in their resort lobbies. At the local level, the PCGS Sustainable Tourism Program will be playing a partnership role in the newly formed Hospitality Eco-Partnership led by Ocean Allies, Visit St. Pete/Clearwater and Keep Pinellas Beautiful. Dr. Hansen is collaborating with the partners to support this new initiative with interns and expertise on the development of new ecotours in the Tampa Bay region.

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.

Dr. Haldar participated in Fulbright Fellowship (Phase I: Dec 7, 2019 to Jan 15, 2020): Advance and grow the science and engineering research base of nanotechnology innovations at PSG-IAS in textiles, sustainability, medical devices and electronics. Provide training and mentoring to create an entrepreneurial ecosystem within this field in India. Serve as an ambassador to build collaborative networks between US/Indian academic institutions and industry.

STUDENT DEVELOPMENT

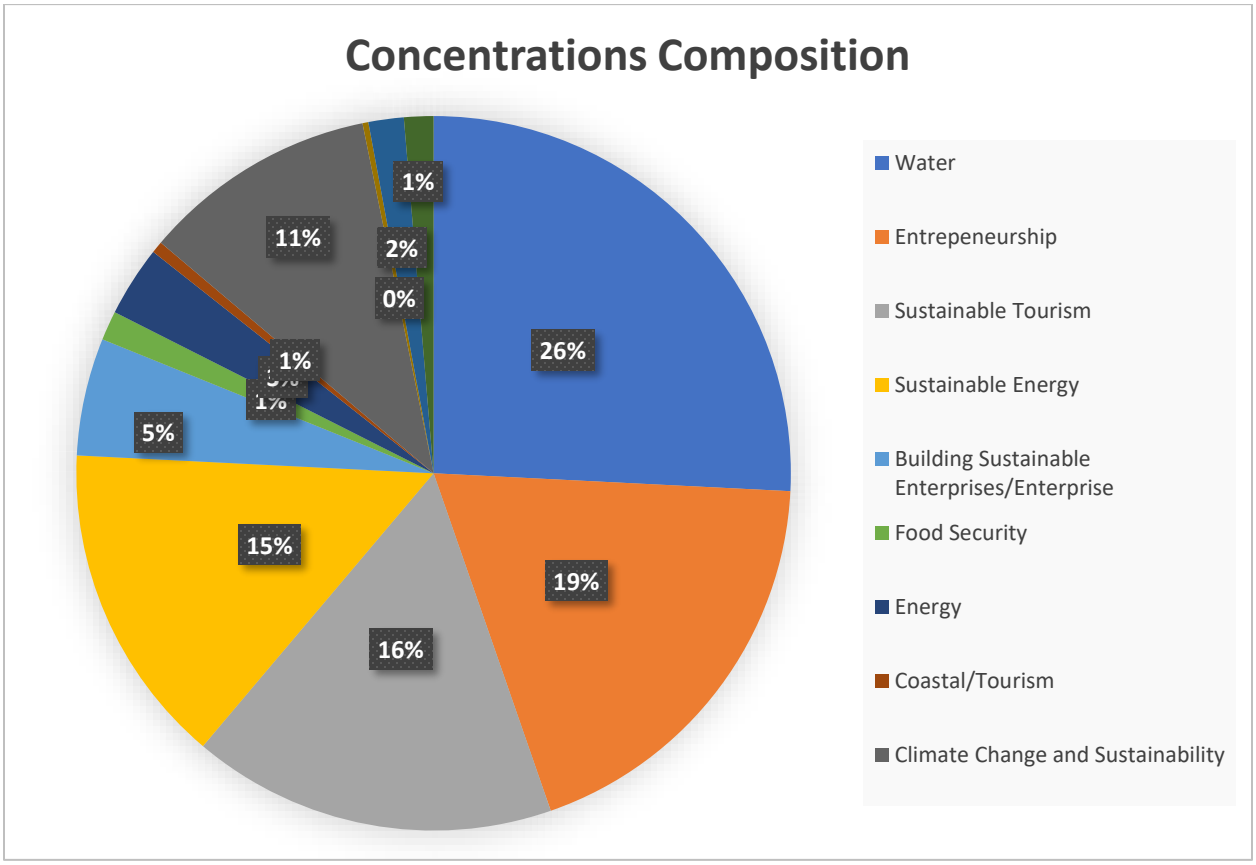
The Patel College of Global Sustainability maintains an Office of Student Development which offers student development advising to all students and alumni to assist them in preparing for careers in the sustainability field. These personalized advising sessions include crafting Student Action Plans, which highlight particular skill sets which can be acquired during the student's time at the college; In addition to assisting students which soft skills, including résumé building assistance, résumé reviews, career search advising, and networking opportunities, customized job searches are offered for graduating students.

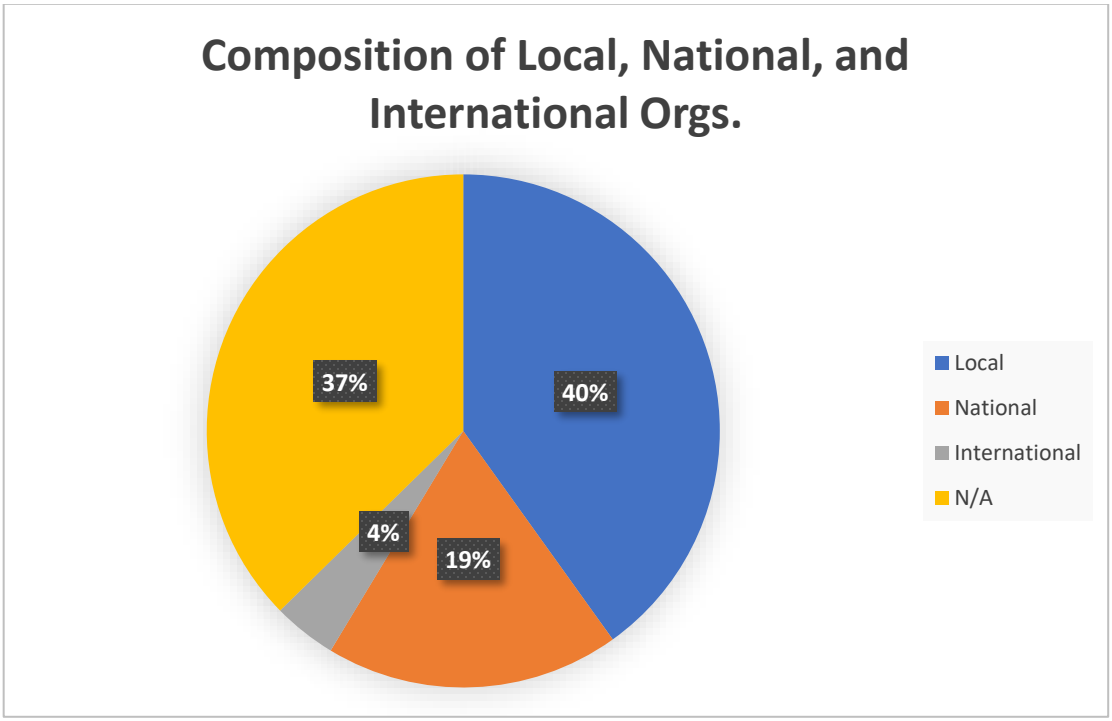
Students are also provided with a PCGS Student Development Handbook, which includes details about suggested certifications, relevant professional organizations, and specific companies that are hiring graduates in the field of sustainability, as well as information about the University's Career Services—all of which are always accessible via the college's website. In addition to this important information, the Student Development program offers several workshops each semester that focus on building students' professional skills and making them more valuable in the job market. The program also hosts a Sustainability Speaker Series each semester, bringing sustainability professionals to the college to speak with students about working in the field and create the opportunity for students to build their network with professionals. These sustainability speakers have represented organizations to include: Coca-Cola Florida, Jacobs Engineering, Florida Fish and Wildlife Conservation, NOAA, local Environmental Protection Commissions and large Corporations such as MOSAIC, Duke Energy, and Tampa Electric, among others. The Student Development program also organizes trainings at the college for relevant environmental and sustainability certifications such as LEED GA , Envision ENV SP, WELL AP and courses in Lean Sigma Six.

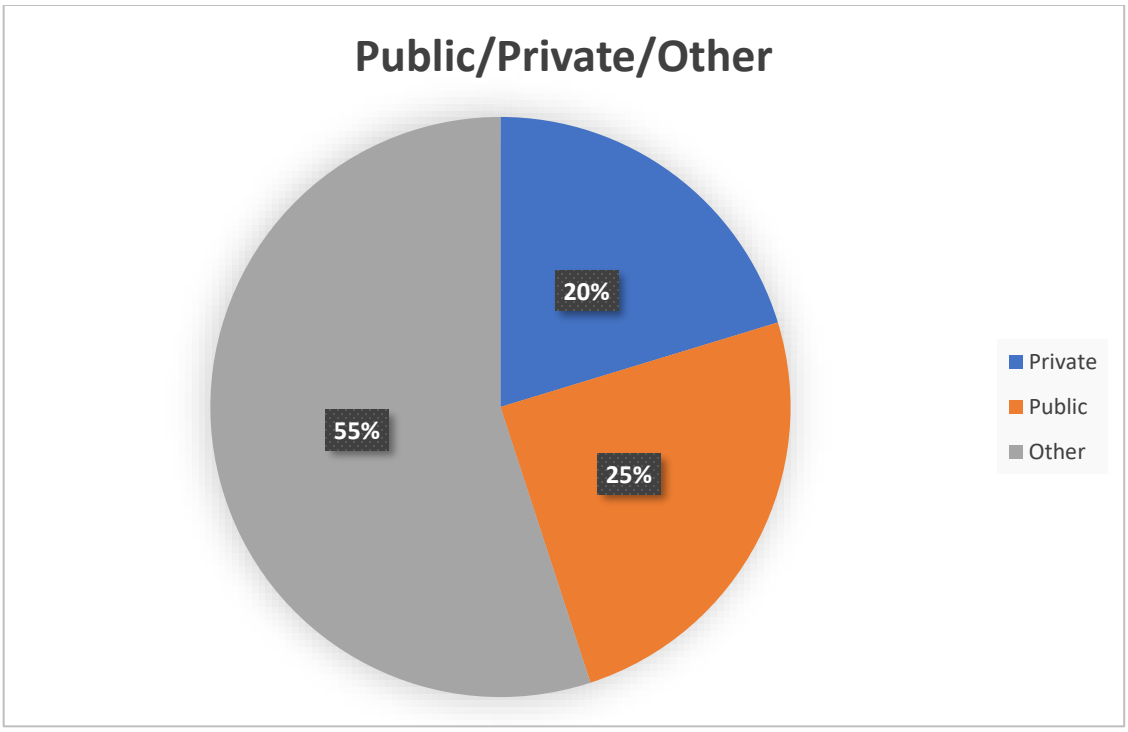
RECENT ALUMNI HIRES

- Black Hills Energy, Rapid City, South Dakota
- County Government, Florida
- Sustainability Specialist, Greater Tampa Bay Area
- Tampa Bay Clean Cities
- USF Center for Urban Transportation Research, Tampa, Florida
- Albertsons Companies-Boise, Idaho, United States
- The CLEO Institute, Tampa, Florida
- Pinellas County Government, St Petersburg, Florida
- City of West Palm Beach, FL
- California State University Northridge California
- Human Trafficking, Equity, and Juvenile Justice, Tampa, Florida
- Cenergistic,Tampa, Florida
- Goodwill Industries of Michiana, Greater Chicago Area
- Green Business Bureau, St Petersburg, Florida
- Lumos Marketing Group, Dallas, Texas
- Keep Tampa Bay Beautiful, Tampa, FL
- Infinite Elements, Los Angeles, CA
- Con Edison,Houston, Texas
- University of South Florida St. Petersburg, FL
- City of Orlando, FL

Alumni Charts






Public/Private/Other
20%
25%
55%
Private
Public
Other

OFFICE OF STUDENT DEVELOPMENT- SUSTAINABILITY SPEAKER SERIES

SUSTAINABILITY SPEAKERS SCHEDULE (FALL 2020)

September 9th- Sustainable Development Education- Spencer Jourdain
September 16th- Pall Corporation- Maria Watson
September 23tht- Tampa Bay Regional Planning Council- CJ Reynolds
October 14th- Clean the World- Rob Keefe
October 28th- Entrepreneurship- Michael Fountain

SUSTAINABILITY SPEAKERS SCHEDULE (SPRING 2021)

February 3rd- Center for Responsible Tourism- Kelsey Frankiel
February 17th- Ecoterium- Alvaro Lachman
February 24th- UF/IFAS- Randall Penn
March 3rd- Sarasota County Sustainability- Sarah Kane
March 24th- Clean Cities Coalition- Austin Sipiora
March 31st- Tampa Innovation Partnership- Mark Sharpe

SECOND GLOBAL SUSTAINABILITY CONFERENCE

The focus of the conference was to bring together sustainability thought leaders, practitioners and experts to address the challenges that industries, organizations and the general public at large face because of the COVID pandemic. They shared lessons learned and identified the best practices necessary to continue the journey of resiliency and sustainability in the future. Participants learned how the pandemic impacted areas to include supply chain processes, organizational changes, stakeholder issues, brand loyalty, and what processes may look like after the pandemic. The 2-day conference showcased seven industry panels, which were Renewable energy, Transportation, Food Security, Environmental Protection, Engineering, Sustainability Consulting and Tourism.

Keynote Speakers:
Tesla, Inc. (formerly, Tesla Motors) - Albert Gore- Director, North America, Policy and Business Development. Bristol Myers Squibb (BMS)- Dr. Victoria Emerick, Director of Global Environment, Health, Safety, and Sustainability Mosaic Company - Natali Archibee, Director, Global Sustainability Coca-Cola Beverages Florida - Erin Black- VP, Sustainability, Risk Management & Facilities Yara- Don Smith- VP, Social & Environmental Responsibility

Participating Corporations, Organizations & Sponsors:
Tesla, Inc., Coca Cola Beverages; Mosaic Company, Jacobs Engineering; Bristol Myers Squibb (BMS); Interpolymer Group (IPG); GHD; FL DOT, FL DEP, FL Chief Science Officer, JTA, Ygrene; TBRPC, Hillsborough MPO, City of Orlando; City of Tampa; CREST, B-Tourism, Ocean Allies

FACULTY PUBLICATIONS

1. Ammar, E.M., Arora, N., **Philippidis, G.P.** (2020) "The Prospects of Agricultural and Food Residue Hydrolysates for Sustainable Production of Algal Products", Energies 13:23, 6427, doi: 10.3390/en13236427.
2. Ammar, E.M., Martin, J., Brabo-Catala, L., **Philippidis, G.P.** (2020) "Propionic acid production by Propionibacterium freudenreichii using sweet sorghum bagasse hydrolysate", Applied Microbiology and Biotechnology 104:22, 9619, doi:10.1007/s00253-020-10953-w.
3. Can, M., Demirci, S., Sunol, A.K., **Philippidis, G.,** Sahiner, N. (2020) "PEI modified natural sands of Florida as catalysts for hydrogen production from sodium borohydride dehydrogenation in methanol", International Journal of Energy Research 45:3, 4048, doi:10.1002/er.6060.
4. Arora, N., Yen, H.-W., **Philippidis, G.P.** (2020) "Harnessing the Power of Mutagenesis and Adaptive Laboratory Evolution for High Lipid Production by Oleaginous Microalgae and Yeasts", Sustainability 12:12, 5125, doi:10.3390/su12125125.
5. Can, M., Demirci, S., Sunol, A.K., **Philippidis, G.,** Sahiner, N. (2020) "Natural celluloses as catalysts in dehydrogenation of NaBH4 in methanol for H2 production", ACS Omega 5:25, 15519, doi: 10.1021/acsomega.0c01653.
6. Dogaris, I., Ammar, E., **Philippidis, G.P.** (2020) "Prospects of integrating algae technologies into landfill leachate treatment", World Journal of Microbiology and Biotechnology 36:39, doi:10.1007/s11274-020-2810-y.
7. Lo, E., Brabo-Catala, L., Dogaris, I., Ammar, E.M., **Philippidis, G.P.** (2020) "Biochemical conversion of sweet sorghum bagasse to succinic acid", Journal of Bioscience and Bioengineering 129:1, 104-109, doi:10.1016/j.jbiosc.2019.07.003.
8. Kusmayadi, A., **Philippidis, G.P**., Yen, H.-W. (2020) "Application of computational fluid dynamics to raceways combining paddlewheel and CO2 spargers to enhance microalgae growth", Journal of Bioscience and Bioengineering 129:1, 93-98, doi:10.1016/j.jbiosc.2019.06.013.
9. Henderson, M. Ergas, S., **Ghebremichael, K.,** Ronen, Z., and Gross, A (2020) Antibiotic Resistant Bacteria and antibiotic resistant genes in greywater reuse (Under preparation for submission to the special issue of *Water Journal)*
10. Authentic Science and Engineering with Biosand Filters for Water Purification (2020). *Journal of The Science Teacher* (Under review).
11. Tsegaye, S, **Culhane T.** et al. The Future of Creative Engineering Education: Application of 2 Virtual Reality for Water-Energy- Food Nexus American Society for Engineering Education Conference, 2020
12. Oliphant, Z., **Culhane, T., Haldar, P.,** (2020) PUBLIC IMPACTS OF FLORIDA'S PROPERTY ASSESSED CLEAN ENERGY (PACE) PROGRAM, Published Study partially sponsored by Ygrene Energy Fund. https://www.usf.edu/pcgs/documents/pace-report-final.pdf
13. Oliphant, Z., **Culhane, T., Haldar, P.,** (2021) CREATING A MORE RESILIENT FLORIDA WITH PACE, Published Study partially sponsored by Ygrene Energy Fund. https://www.usf.edu/pcgs/documents/pace-final.pdf
14. **Hansen, B**., Stiling, P., Uy, W.F. (2021) "Innovation in SDG Integration and Reporting at the University of South Florida." Accepted for the forthcoming special issue of the International Journal of Sustainability in Higher Education.
15. Harrison., L, **Hansen, B.(**2020) "Using Geoinformatics to Document Heritage at Risk and Climate Change at Egmont Key." The Forum. Aug. 25: Institute for the Advanced Study of Culture and the Environment https://www.usf.edu/arts-sciences/institutes/iasce/the-forum/index.aspx

FACULTY PRESENTATIONS

1. Arora, N., **Philippidis, G.P**. "Deciphering the cellular mechanism for glucose update in Chlorella vulgaris using multi-omic approaches for sustainable bioproduct applications", Alga Europe (2020).
2. Tsarpali, M., Kuhn, J., **Philippidis, G.P.** "Hydrothermal carbonization of lipid extracted Picochlorum oculatum for hydrochar production and aqueous phase utilization for microalgae growth", Alga Europe (2020).
3. Arora, N., **Philippidis, G.P.** "Mixotrophic cultivation of C. vulgaris using sweet sorghum bagasse to reduce cost and enhance sustainability", Algae Biomass Summit, San Diego, CA (2020).
4. Tsarpali, M., Kuhn, J., **Philippidis, G.P.** "Lipid extraction of microalgae and hydrothermal carbonization of the residual algal biomass for sustainable hydrochar production", Algae Biomass Summit, San Diego, CA (2020).
5. Allan Feldman, Sarina Ergas, **Kebreab Ghebremichael** (2020) 2020 STEM For All Video Showcase, Based on the Authentic Science project with high Schools
6. **Culhane T.** (2020) Featured speaker, Elders Climate Action "Remembering Earth Day" Webinar, including student representatives from University of Florida and United Religions Initiative.
7. **Culhane T.** (2019, 2020) Presentations and Workshops for Pasco Country schools at Rosebud Continuum Sustainbility Education Center and Academy at the Lakes High School
8. **Culhane T.** (2019/2020) Developed "Envisioning Sustainability" Course with USF Innovative Education Department, Approved and Launched Spring 2020.
9. Harrison, L. **Hansen, B**. (2021). Digital Approaches to Heritage at Risk and Sustainability at Egmont Key, FL. Society for American Archaeology 86th Annual Meeting April 15-17, 2021
10. **Hansen, B.,** Moates, J., Sanchez, R. (2021). Heritage, Sustainability and the Future of Egmont Key. Presentation with the Florida Public Archaeology Network and Egmont Key Alliance. Funded by a grant from the Florida Humanities Council. Feb. 25.
11. **Hansen, B.** (2021). Cultural Heritage Tourism, the UN SDGs and Building Back Better. Presentation for B Tourism. Feb. 10.
12. **Hansen, B.** (2020). Agriculture and Climate Resilience. Presented at Climate & Health: The CLEO Institute's 10th Annual Empowering Capable Climate Communicators Symposium. Nov. 19.
13. **Hansen, B**. Dripps, W., Raghaven, S., Sklarew, D. (2020). Integration of the SDGs Across Curricular/Co-Curricular Programs: Shared Best Practices. AASHE, Global Conference on Sustainability in Higher Education, Oct. 21.
14. **Hansen, B.** (2020). Food Sovereignty and the University: Challenging Paradigms & Forging Partnerships. Presentation for the 2nd Annual Tampa Bay Urban Food Sovereignty Summit. Oct. 20.
15. **Hansen, B.** (2020). Seeking Validation: Sustainable Business Certifications. Co-presented with Tom Permatteo, President and CEO Green Business Bureau, and Sarah Reice, Standards Analyst, B-Lab. For Sustainability@Work: Workshops for Small Businesses sponsored by the Sustany Foundation, Aug. 28. https://sustany.org/sustainabilitywork/
16. **Hansen, B. Dorsey, J., Culhane, T.H.** (2020). Climate and Food Justice, special event sponsored by The CLEO Institute, July 9 & 30.
17. **Hansen, B.** (2020). Careers in Climate Crisis. Presentation for the CLEO Institute, May 28. https://www.youtube.com/watch?v=RZ7KxZwfFOs

FACULTY GRANT AWARDS

1. Arora, N., **Philippidis, G.P.** "Deciphering the cellular mechanism for glucose update in Chlorella vulgaris using multi-omic approaches for sustainable bioproduct applications", Alga Europe (2020).
2. Tsarpali, M., Kuhn, J., **Philippidis, G.P.** "Hydrothermal carbonization of lipid extracted Picochlorum oculatum for hydrochar production and aqueous phase utilization for microalgae growth", Alga Europe (2020).
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PATEL COLLEGE OF GLOBAL SUSTAINABILITY FY2020-2021 FUNDING OVERVIEW

Funding Source	TOTAL 2020-2021 Allocation/Revenue	TOTAL PROJECTED FY2020-2021 EXPENSES
E&G	$ 1,043,832	$ 1,043,832
Carryforward	26,882	17,554
Auxiliary	100,404	68,500
Research F&A	141,151	14,836
Contracts & Grants	558,048	498,048
Federal Work Study	31,500	27,860
Foundation*	994,711	578,988
	$ 2,896,528	**$ 2,249,618**

***Additional Foundation Funds of $7,819,046 as follows:**

Endowments - $7,577,988
Foundation Construction Fund - $241,058