



# PATEL COLLEGE OF GLOBAL SUSTAINABILITY

---

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 in the Times Higher Education (THE) ranking of universities for the implementation of United Nations Sustainable Development Goals (UNSDGs) in academic practices
- Established the Amy and Michael Drake Endowed Scholarship to support talented PCGS students who show passion for supporting the Tampa Bay region's sustainability transition
- The Patel Family Foundation gifted funds to support Summer 2022 programs
- Philanthropist Elizabeth Moore gifts funds to support sustainability research and community outreach efforts of PCGS faculty and students
- In collaboration with NASP Solar and with generous support from the Elizabeth Moore Foundation, designed and put into operation Florida's first "Mobile Disaster Resiliency Solar Power Station"
- Increased student enrollment and enhanced student success indicated by strong graduate placements
- Won a grant award from the Florida Fish & Wildlife Conservation Commission (FWC) to investigate a mitigation strategy for red tides
- Graduated two more Coverdell Fellows; Appointed new Coverdell Scholarships
- Submitted several grant proposals to federal and state agencies

# 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 (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. 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 prepares our students for career options and professional opportunities within industries, governmental agencies (at city, county, state, and federal levels), international organizations and NGOs that are seeking solutions to sustainability challenges.

The Patel College of Global Sustainability has been successful in enhancing its role as the hub for sustainability-related research and teaching across the USF campuses. It has also teamed up with the Mote Marine Laboratory to collaborate in externally funded research on mitigating Florida's red tide problem.



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

# 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 at 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, policy, transportation, global security, and social equity.

The Patel College of Global Sustainability offers Master of Arts (M.A.) and Master of Science (M.S.) Programs in Global Sustainability and a Graduate Certificate Program in Sustainability. It is an inclusive and collaborative academic unit with 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 scholarship across the USF campus. Thus far, the Patel 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 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

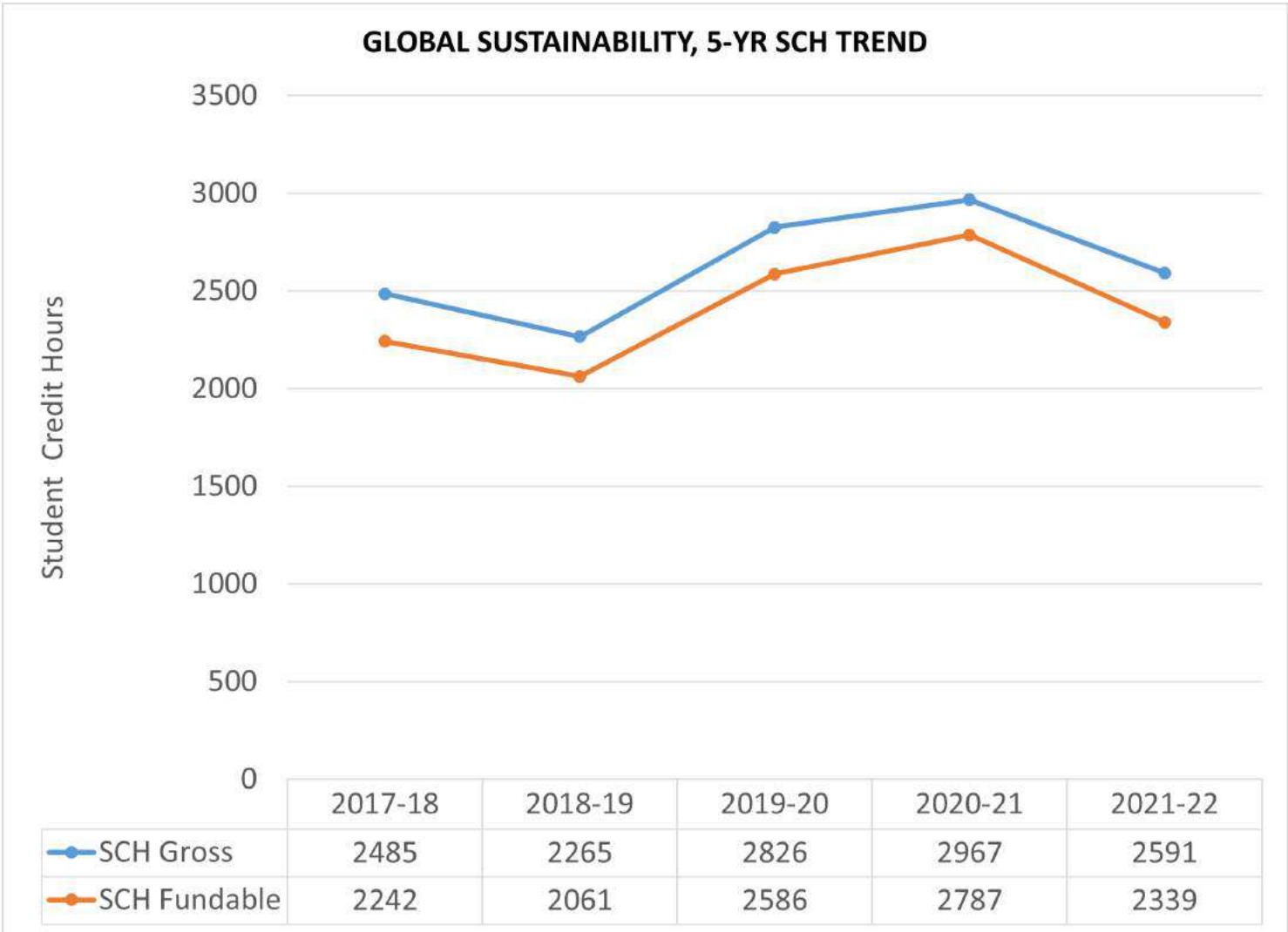


The Patel College of Global Sustainability successfully launched a new Master of Science degree in Global Sustainability effective Fall 2021. In addition, the MA degree was modified to include only the most relevant concentrations and will share a similar degree structure and credit requirement. The 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.

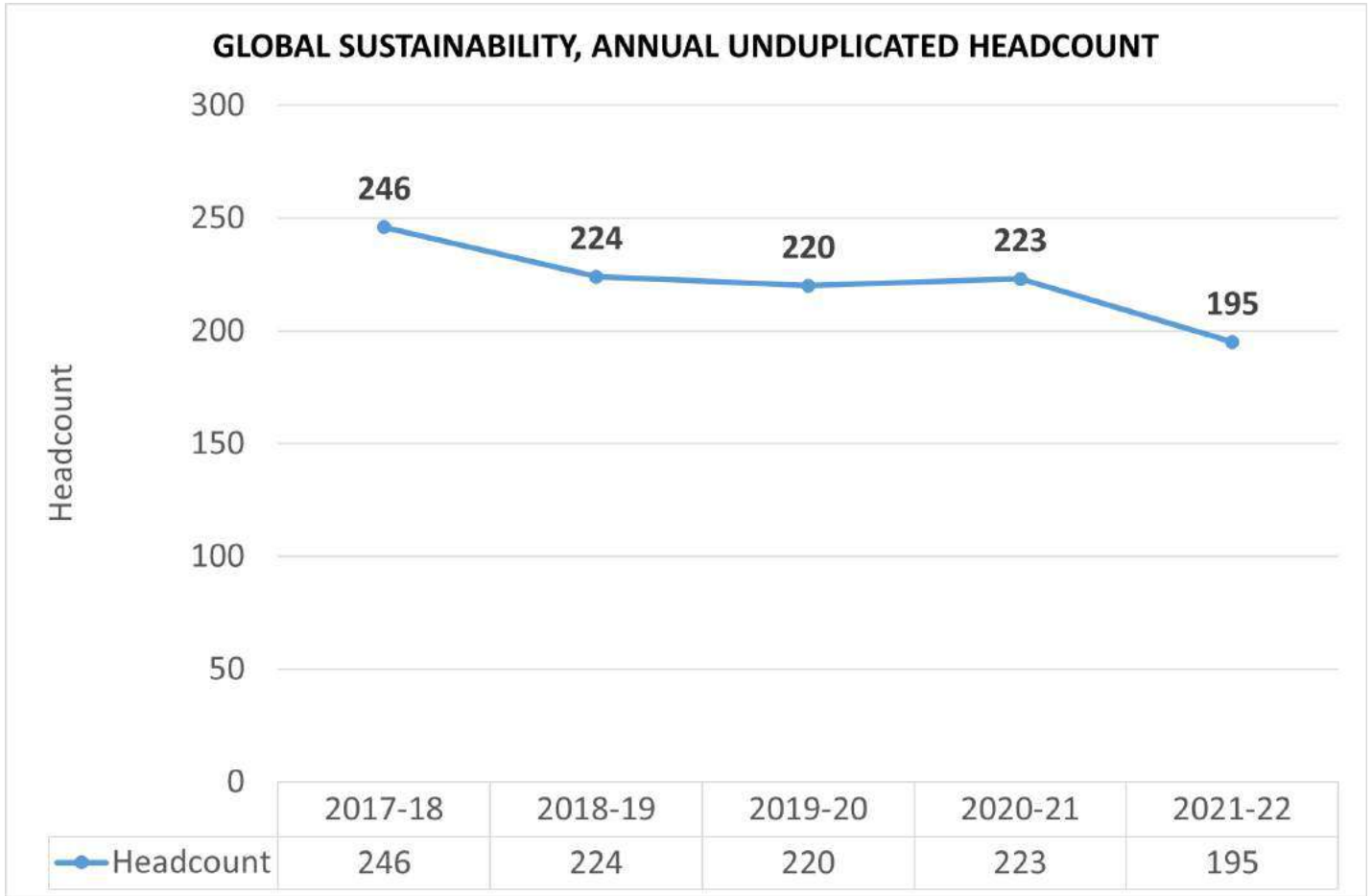
While the Patel College of Global Sustainability has maintained a consistent graduate student enrollment between 150-200 graduate students the last several years, the need for additional faculty and staff to support both degree programs as well as our certificate programs exists. We have hosted graduate 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 assistantships, scholarships and similar funding opportunities cause many to cancel their admission in favor of other programs with deeper pockets. PCGS has endured numerous challenges the last several years, and while we continue to produce needed SCH and opportunities for instructors to develop and facilitate new courses and research, the replenishment of student numbers is a priority that will require a more sustainable model, increased resources, and further investment. The figures below indicate five years of student enrollment numbers at PCGS.

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

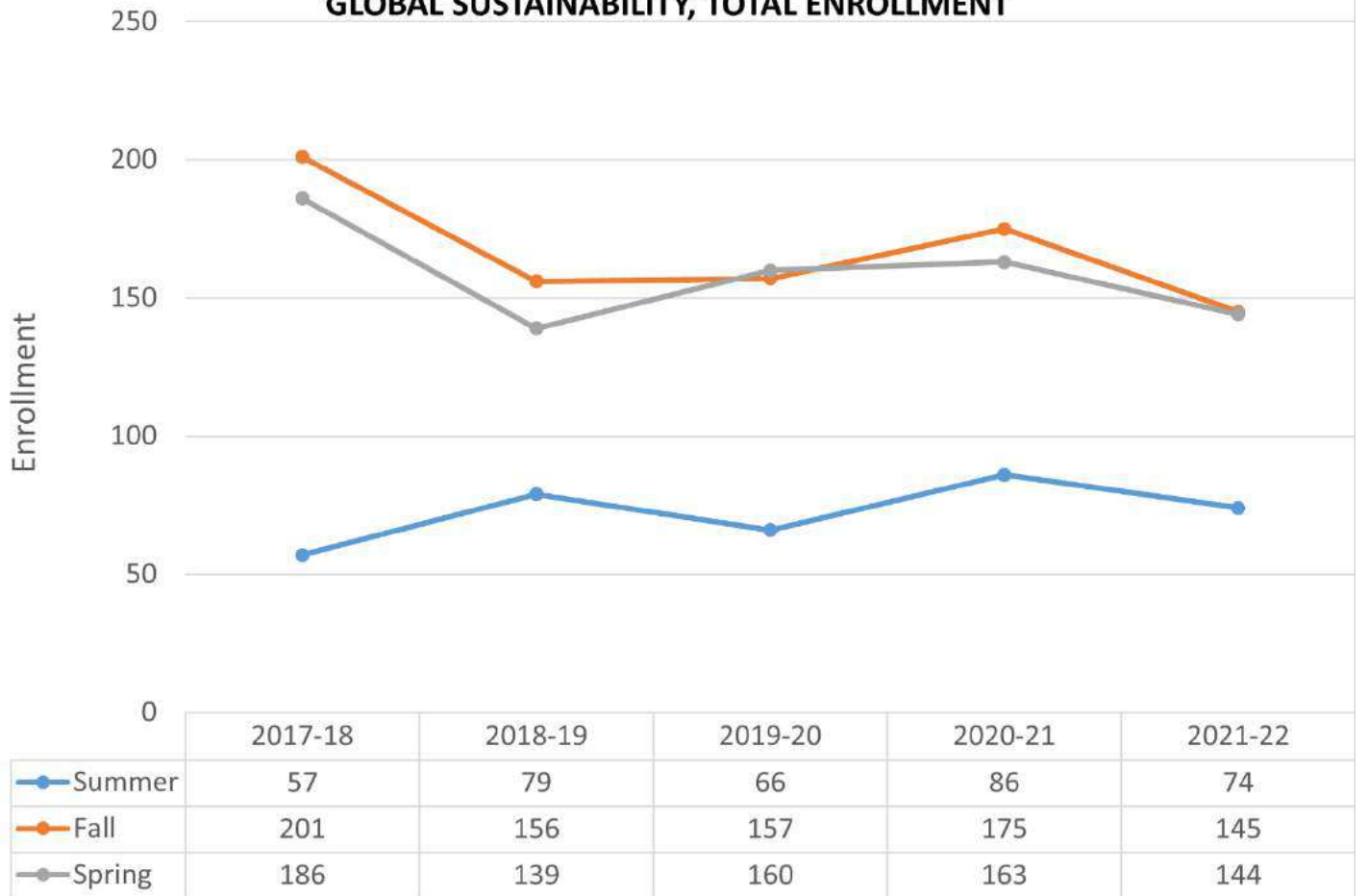




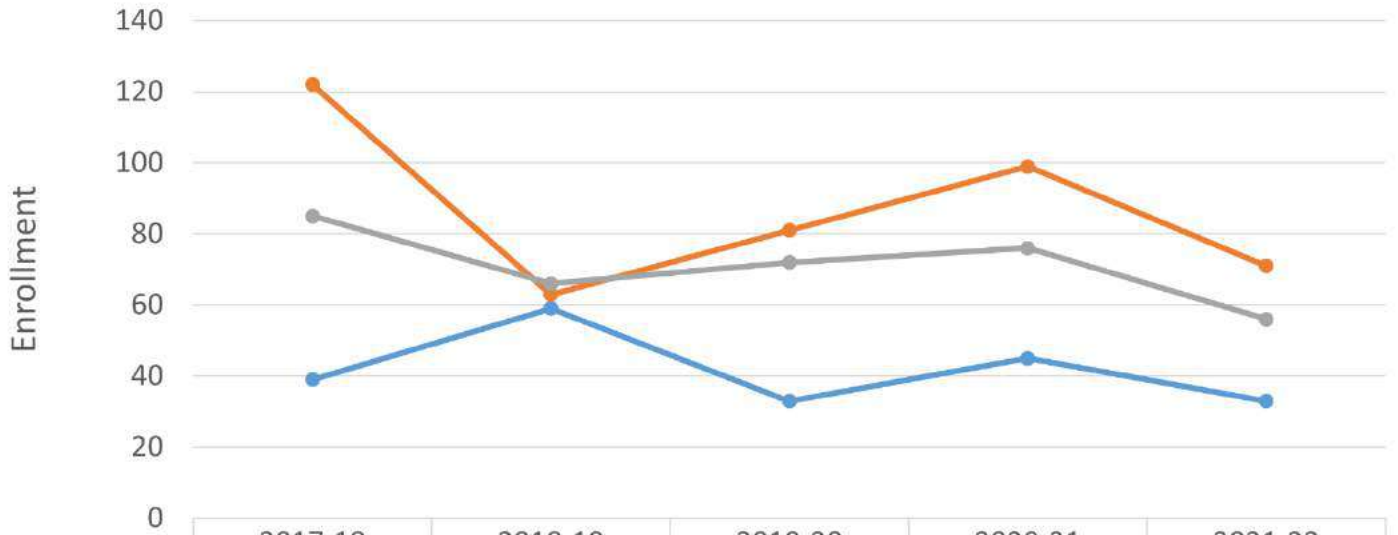


(Unduplicated student headcount for an academic year based on the most recent record of the student regardless of the number of terms attended during that academic year)

### GLOBAL SUSTAINABILITY, TOTAL ENROLLMENT

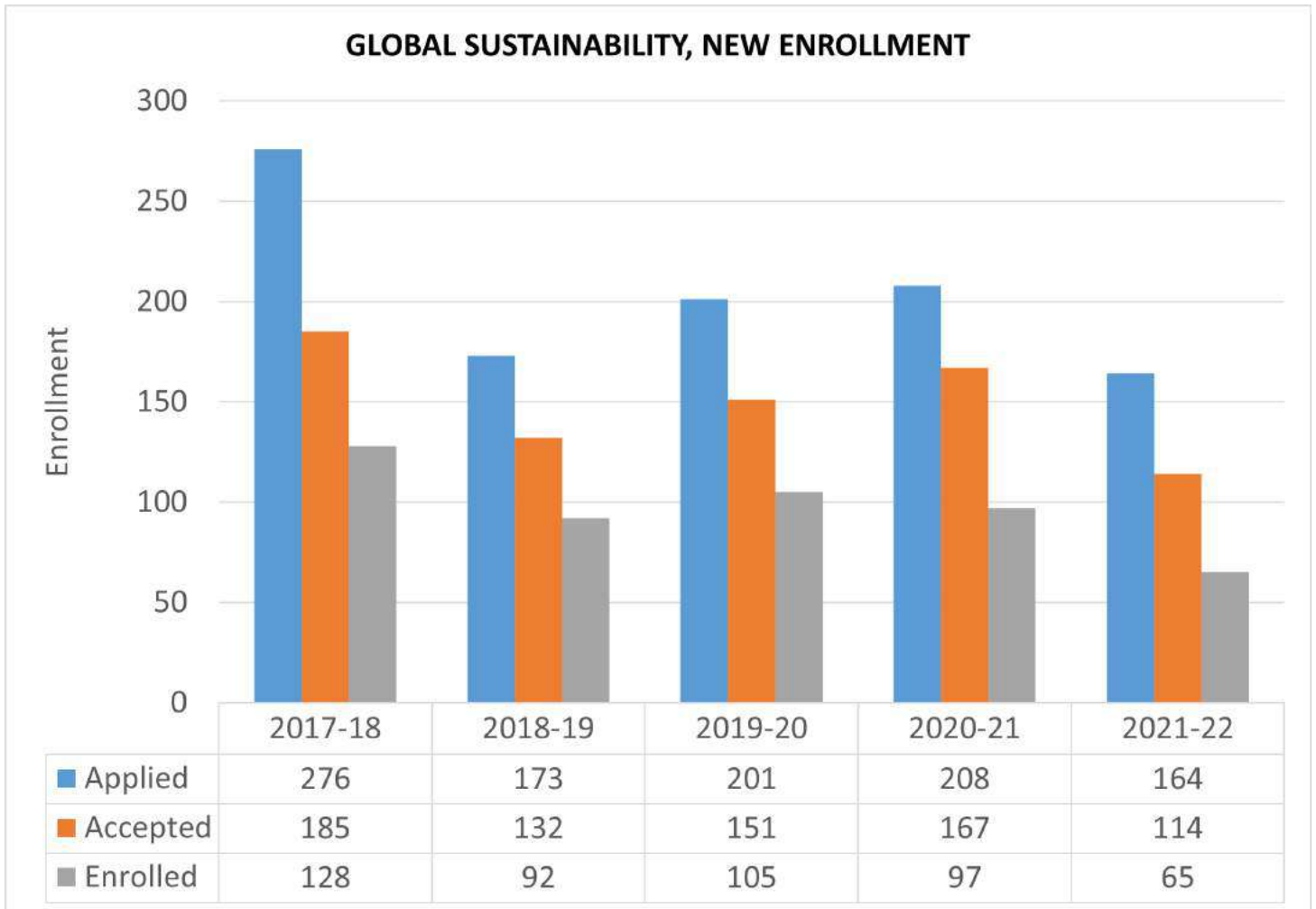


### GLOBAL SUSTAINABILITY, FULL-TIME ENROLLMENT



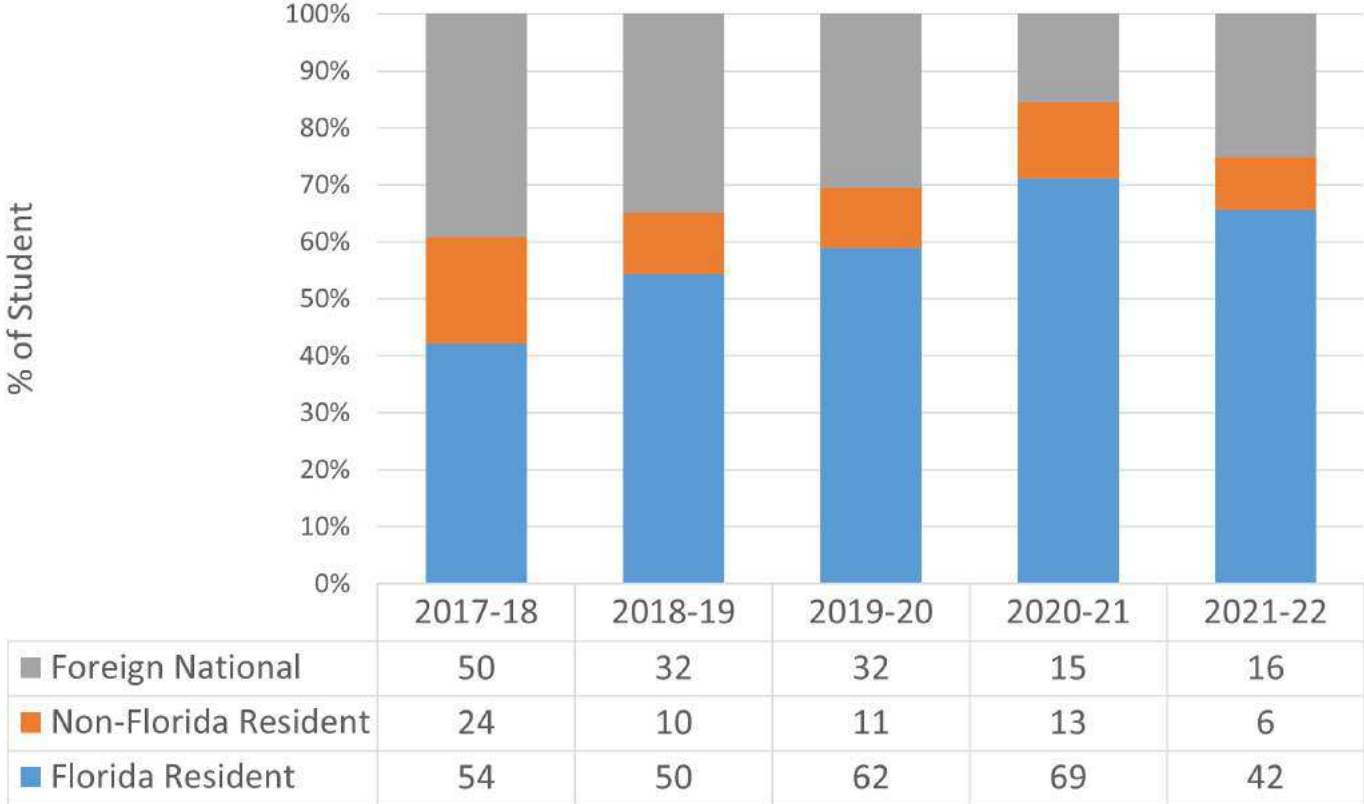
	2017-18	2018-19	2019-20	2020-21	2021-22
Summer	39	59	33	45	33
Fall	122	63	81	99	71
Spring	85	66	72	76	56

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

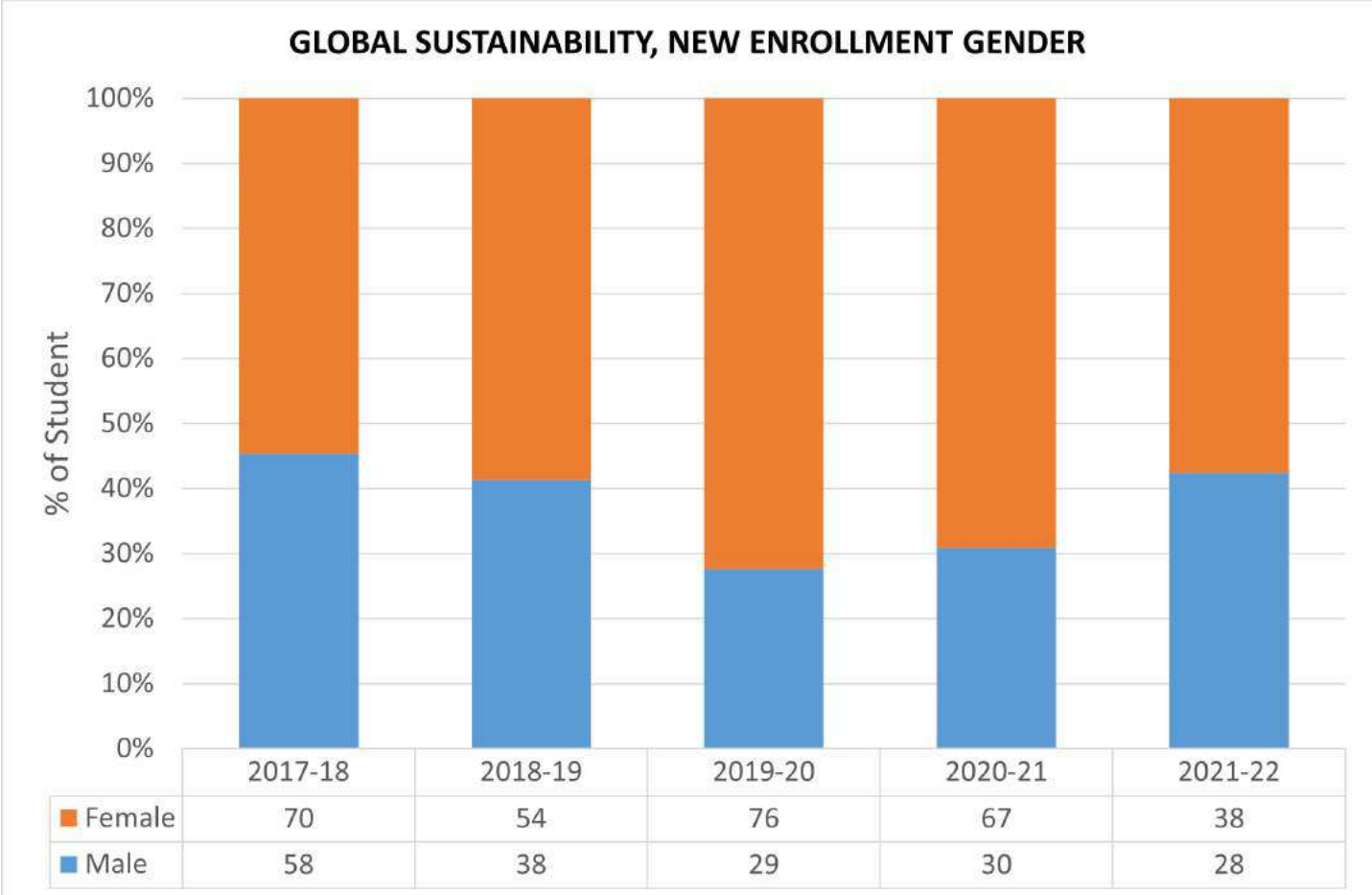


The below figure illustrates residency and enrollment trends over the last five years for new students at PCGS. A significant percentage of non-resident and especially international students enroll, currently 30% of our new student enrollment. International student enrollment the last five years has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

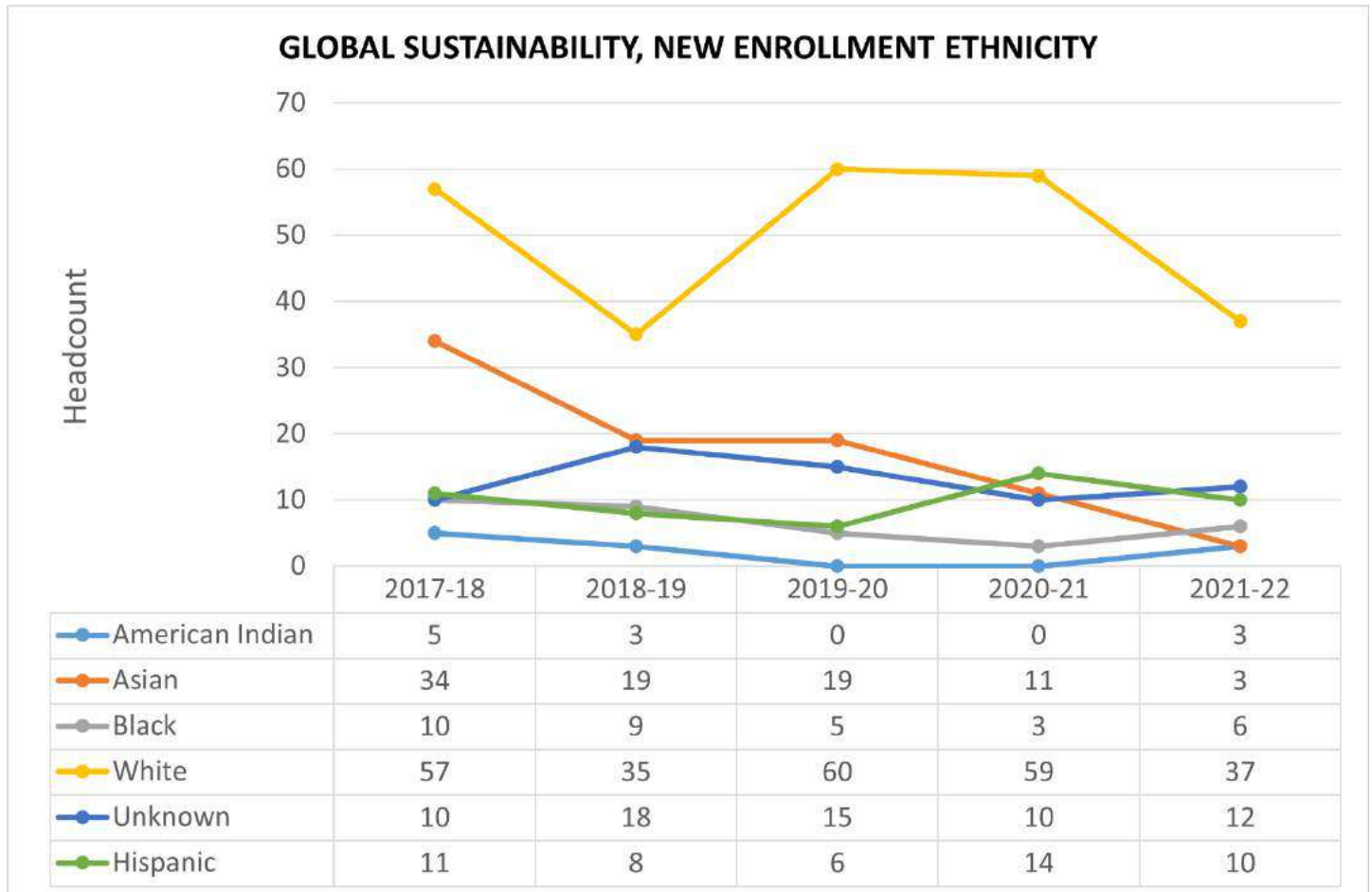
**GLOBAL SUSTAINABILITY, NEW ENROLLMENT RESIDENCY**



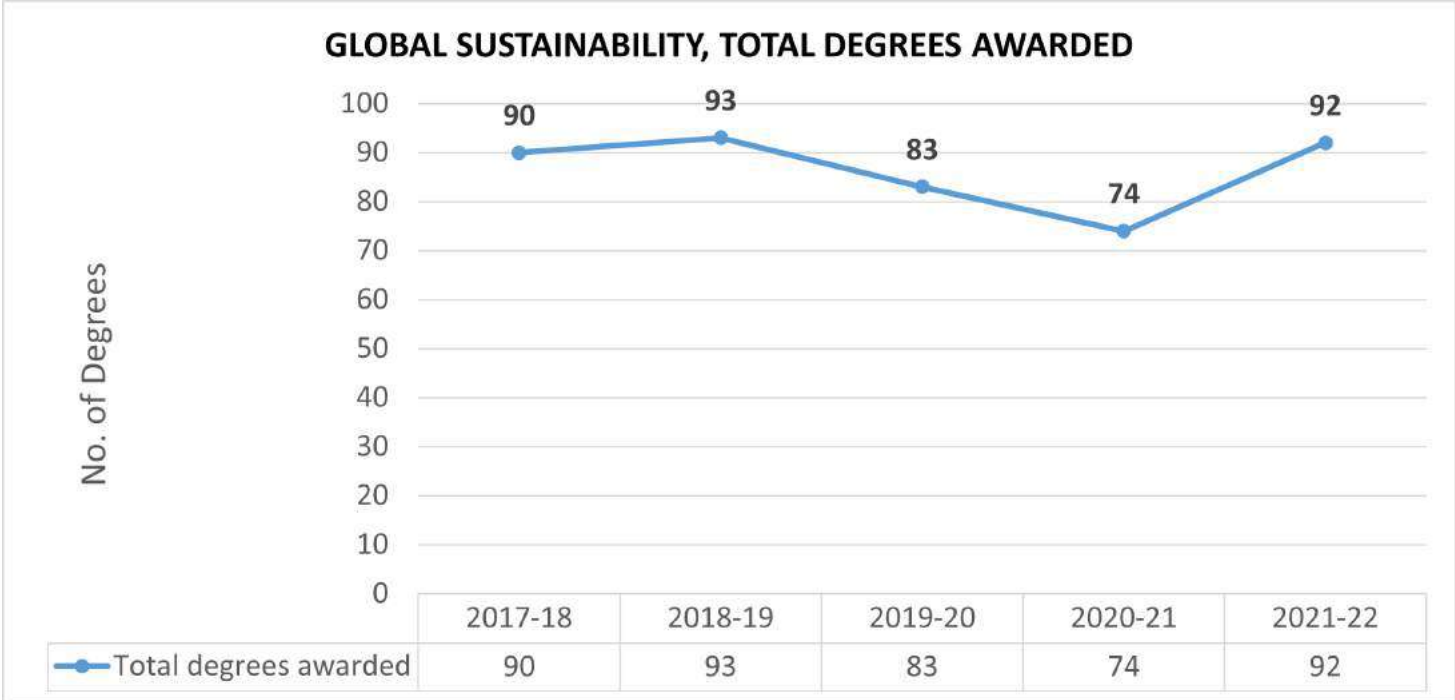
The below figure illustrates the gender distribution in enrollment trends over the last five years for new students. PCGS has a significant percentage of female students (over 50%) every year, with 2019-2020 being the highest at over 70% enrollment.



The below figure illustrates the ethnicity distribution for student enrollment the last five years. Ethnicity, race, and nation reporting have some gaps and others have multiple crossovers (Hispanic-white, Hispanic-American Indian, etc.). Most foreign students show as unknown, and one can assume students from countries such as China, Taiwan etc. should show in the report as Asian, not unknown.

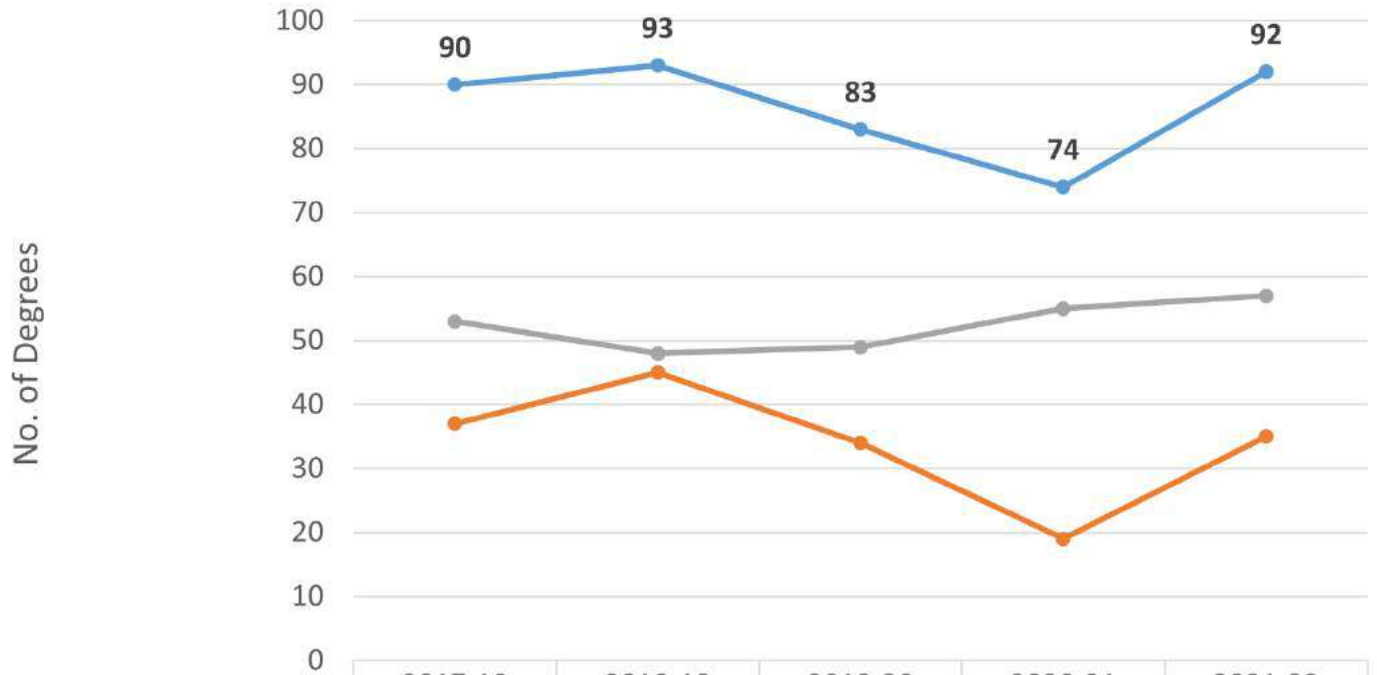


The below figures illustrate the degrees awarded trends across the last five years. The largest enrollment in 2017-2018 resulted in increased degrees subsequently awarded in 2018-2019. As anticipated, degree completions have risen the last year, but we expect a decline over the next year due to decreased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





### GLOBAL SUSTAINABILITY, DEGREES AWARDED - GENDER

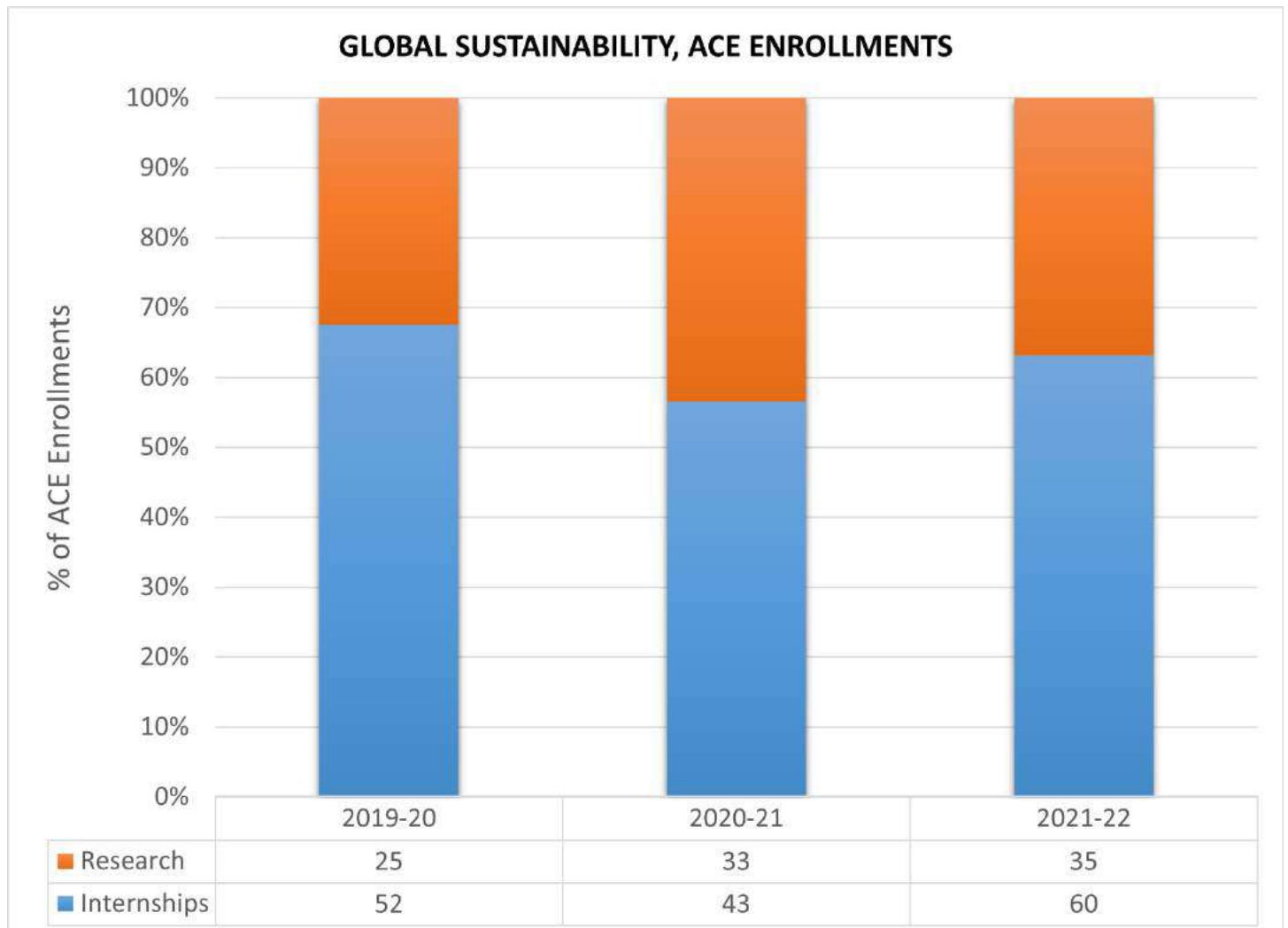


	2017-18	2018-19	2019-20	2020-21	2021-22
Total degrees awarded	90	93	83	74	92
Male	37	45	34	19	35
Female	53	48	49	55	57

# INTERNSHIP / RESEARCH PROJECTS

All graduate students are required to complete a 6-credit hour final project as either an internship or research project as part of their graduation requirements. PCGS students conduct these projects 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. Approximately 60-70% of students elect to complete the final project as an internship with hands-on experience.



# TEACHING & RESEARCH



## EDUCATIONAL PROGRAMS

The Patel College of Global Sustainability offers nine concentrations available in a traditional on-campus format with seven of them also available as 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 through two Master's degree programs, top-notch internship and research experiences, and an overall superior sustainability education for our students.

### MASTER OF ARTS PROGRAM

#### CLIMATE CHANGE AND SUSTAINABILITY

The concentration emphasizes local bioregional applications of the hundred "Drawdown" solutions and better communication to the public of these and other best practices coherent with the UN Sustainable Development Goals, as well as the translation of policy and research into climate-smart mitigation and adaptation strategies that will yield sustainable and resilient communities.

Climate Mitigation and Adaptation is a no-nonsense action-oriented course focusing on how individuals, communities, and society as a whole can better implement the practical greenhouse gas "Drawdown" solutions that scientists and policymakers have agreed to. While emphasizing the urgency of the climate change problem, our course uses a hope-inspiring, real-world case study/field application and interdisciplinary approach that enables us to sidestep debate, and delay and focus on the strategic application of ancient and indigenous wisdom, good science, and both time-tested and emerging new technologies that bring all 17 UN Sustainable Development Goals within reach and can create a "just transition" to a net-zero circular economy.

The course uses state-of-the-art educational and data-visualization technologies, from Perusall to Multi-media Production to VR and AR, to help all students become powerful critical thinkers, science communicators and well-grounded, science and economics informed climate activists.

#### 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, understand evolving corporate social responsibility as well as environment, social and governance regulations.

## **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 responsibility in the biofuels, solar, wind, biomass, and other renewable energy sectors. The concentration is designed for students from a wide range of backgrounds.

### **FOOD SUSTAINABILITY & SECURITY**

The M.S. 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 focus on forward thinking food systems research, developing ground-breaking food resource technologies, and fostering and strengthening collaborative partnerships with corporations, businesses, academic institutions, and not for profit organizations in local, regional, national, and global food system networks.

### **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 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 comprehensive understanding of concepts, tools, and skills of sustainability and green technology. Focus areas include innovations and novel business opportunities in green technology, development, transportation, energy, and sustainable enterprise. The goal is to train the next generation of leaders with the ability to develop a strategic climate-focused vision, including market assessment, product design, financing, capital projects, net-zero supply chain, manufacturing operations, and talent strategy.

# 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. and M.S. programs 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 emphasizes local bioregional applications of the hundred "Drawdown" solutions and better communication to the public of these and other best practices coherent with the UN Sustainable Development Goals, as well as the translation of policy and research into climate-smart mitigation and adaptation strategies that will yield sustainable and resilient communities

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.

Climate Mitigation and Adaptation is a no-nonsense action-oriented course focusing on how individuals, communities, and society as a whole can better implement the 100 very practical best-practice greenhouse gas "Drawdown" solutions that scientists and policymakers have agreed cannot merely stop global warming but even reverse it. While emphasizing the urgency of the climate change problem our course uses a hope-inspiring, real-world case study/field application and interdisciplinary approach that enables us to sidestep debate and delay and focus on the strategic application of ancient and indigenous wisdom, good science, and both time-tested and emerging new technologies that bring all 17 of our UN Sustainable Development Goals within reach and can create a "just transition" to a net-zero circular economy.

The course uses state-of-the-art educational, creativity, and data-visualization technologies, from Perusall to Multi-media Production to VR and AR, to help all students become powerful critical thinkers, science communicators and well-grounded, science and economics informed climate activists.

## 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 prepares students for careers in sustainability and sustainable energy.

The certificate program provides 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 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.

## FOCUS AREAS

Dr. George Philippidis

### ALGAE TECHNOLOGY

Algae represent a promising source of alternative fuels and bioproducts, 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 sustainable aviation fuel (SAF) 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 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 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 manufacturing biofuels, plastics, resins, and other renewable products. In essence, biomass can replace oil as the source of chemicals essential for consumer products.

## **BIODIESEL AND SUSTAINABLE AVIATION FUEL (SAF)**

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 country 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 supercritical fluid technology
- Biodiesel from used vegetable oils
- Biodiesel from algal lipids

- SAF from the inedible cover crop *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.

**Dr. Thomas Culhane**

## **FOOD-ENERGY-WATER NEXUS IN THE CONTEXT OF CLIMATE CHANGE**

Climate resiliency, renewable energy and transformation of urban food waste and other post-consumer organic residuals into fuel and fertilizer for urban food production in Florida, in Native American Villages, impoverished urban areas and abroad.

**FUNDERS:** Rosebud Continuum Sustainability Education Center/Bishop Construction Company (Bishop family), the Elizabeth Moore Foundation and Florida Gulf Coast University.

**GOAL:** This ongoing project in problem solving to meet the challenges of climate change continues to expand in scope and innovation, integrating food/energy/water and zero waste ideas and innovating new nexus technologies. The lessons learned are applied to workshops and implementations around the world with additional funding from the Serbian Royal Family, the Serbian Government, the US State Department, National Geographic, Solar CITIES, and other NGO partners.

## **ONGOING AND PLANNED ACTIVITIES**

PCGS faculty and students worked with NASP Solar CEO Mike Kozdras, with generous support from the Elizabeth Moore Foundation, to design and implement Florida's first "Mobile Disaster Resiliency Solar Power Station". This exciting device is comprised of two wheeled carts, each with a 1 kW solar roof that are pulled train-like by solar golf carts. One of the carts seats students and visitors to the Rosebud Continuum, the second cart houses a state of the art 5 kilowatt on-grid/off-grid hybrid inverter and 5 kW Lithium Iron Phosphate Battery Backup along with a 5-kW backup generator. With its 220/110 V output this provides mobile power to run houses or machine tools wherever it is needed.

Dr. Culhane, initiated a community scale biodigester project that has been so successful at the Rosebud and Fat Beet Farm sites in Tampa has now led to the first Ecovillage installation of a completely integrated nexus system in a state of the art off grid food production greenhouse in Alabama where first nations people depend on it for all their waste treatment and fertilizer needs.



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 Dr. Culhane's earlier projects at Standing Rock and on Indian reservations conducted when he first joined PCGS.

Dr. Culhane also advises the Cengage Learning team from National Geographic on projects of interest to K-12 students of environmental science and geography around the world so they can understand how different cultures are adapting to climate change.

Dr. Culhane's work with Indigenous Peoples dovetails with work that Dr. Brooke Hansen has been doing with the Seminole people of Egmont Key and goes back to his undergraduate work with tribal peoples in Venezuela, Borneo, and Sumatra, and his graduate work with tribal groups in Guatemala, Mexico and Palestine, Israel, and Egypt and brings a special dimension to his assigned duties at USF, informing his lectures and practices so that our students understand the political ecology of sustainability studies from a truly lived expertise based on participant observation. Dr. Joseph Dorsey and Dr. Culhane visited indigenous Eco-Tourism sites in the Everglades with PCGS student Enas Abdel Rahman and they and their students are working with Chief Arvol Looking Horse to host International Indigenous World Peace and

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:** 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

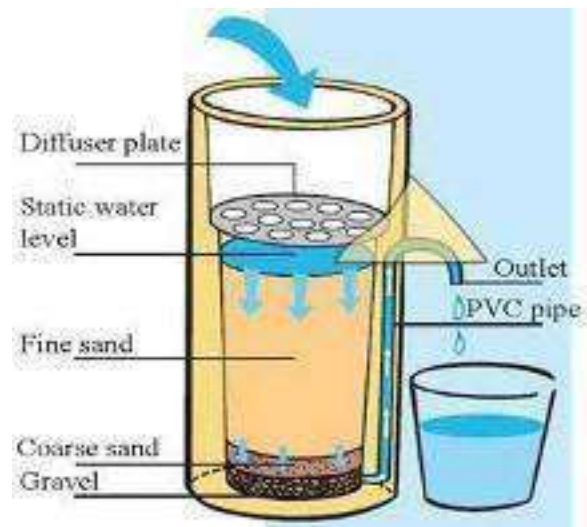
Although the planned trip to Cape Coast in summer 2021 has been canceled due to COVID-19 travel restrictions, we have been preparing the 7 selected students for the project. The students have been selected from different universities in the US. Over the past 10 months we conducted monthly workshops to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

**Focus Area:** Appropriate technologies for water 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.



The project was funded by the McCann Foundation to address these issues. This multidisciplinary research project was 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 implemented 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. Based on this project work, the faculty from PCGS, Engineering

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, and the workshop will run at the end of June in 2022. Similarly, an abstract for conference presentation was also submitted to the same conference on the topic of enhancement performance of the biosand filter.

PCGS faculty also partner 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.

### **Focus Area: Water and wastewater treatment and Systems thinking**

#### **MS and PhD Research**

PCGS faculty also collaborate 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 that would allow reuse of treated wastewater for 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 modeling.

**Dr. Heather Rothrock** has been serving on a doctoral committee, within the Civil and Environmental Engineering Department, and through this appointment she has been collaborating with several faculty and a PhD candidate on research involving investigating the viability of using pressure retarded osmosis as an energy recovery/brine management scheme for seawater desalination. A publication is forthcoming.

The PCGS faculty is also co-supervising an MS student at the College of Engineering on technology development of small-scale water treatment systems. This research focuses on the modification of the biosand filters to remove multiple contaminants simultaneously. Particularly it focuses on the use of aluminum oxide coated filter media (pumice and biochar) for fluoride removal.

The PCGS faculty has been engaged in securing funding for a full PhD study from Tampa Bay Water. Availability of the fund has been ensured and the faculty is working with a colleague in the Department of Civil and Environmental Engineering to identify a strong student and register in their PhD program.

**Dr. Ghebremichael** has also collaborated with faculty at the University of Shippensburg in Pennsylvania and submitted an NSF IRES proposal. The project will involve 15 students over a period of three years, and they will travel to West Africa for international research experience on the impact of onsite sanitation and saltwater intrusion on shallow ground waters in coastal communities.

### **Focus Area: Greenhouse Gas (GHG) emissions inventory and Projections**

**Dr. Ghebremichael** has been involved in the Greenhouse Gas (GHG) emissions inventory and projections for the State of Florida in collaboration with several faculty with the Florida Climate Institute (FCI). The project was funded by the Environmental Defense Fund and has the objective to develop recommendations for actions for the State that will lead to Net-zero GHG by 2050.

### **Focus Area: Virtualization Technologies for Sustainable Tourism Development in Tampa Bay**

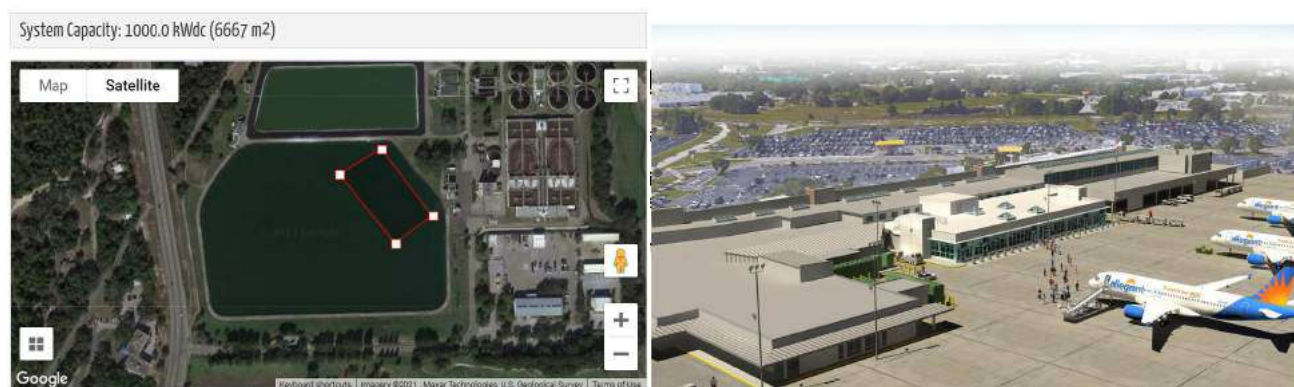
**Dr. Brooke Hansen** (Director, PCGS Sustainable Tourism Concentration) has been working with a number of university, community, and industry partners to further sustainable tourism in Tampa Bay and provide students with hands-on experiences in the latest visualization technologies and interpretation 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.

## 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 sustainable energy innovations.

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 history of Egmont Key. It spans 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 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.” 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.





*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 to raise awareness about heritage at risk and promote mitigation strategies. In 2021, the project was featured in global presentations and in several media and scholarly publications that included faculty and project interns. In May 2022, the yearly training workshops continue with the offering of the Cultural Heritage and Climate Change Geomatics Workshop led by Drs. Harrison and Hansen.

# COMMUNITY ENGAGEMENT & OTHER ACTIVITIES

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

**Heather Rothrock** continues to serve on 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.

**T.H. Culhane** has been engaged in on-line training programs for advanced Distance Learning (Perusall, Hypothesis, 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, Altspac for Educators creator training, Minecraft Education Python Programming Language and Modeling, Snapmaker, Protocycler, Ultimaker, Lens Studio, Cuebase, Audacity and Fortnite Creativity).

**T.H. Culhane** works with **Brooke Hansen**, **Joseph Dorsey** and Dr. Laura Harrison and 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.

**T.H. 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 the USF community. He continues his research with Dr. Seneshaw Tsegaye at Florida Gulf Coast University.

**Dr. Brooke Hansen** was inducted into the CLEO Institute's Leadership Circle at a benefit dinner held at Miami-Dade College on November 10, 2021. Every year, the CLEO Institute recognizes individuals in the community who have gone above and beyond to help move CLEO's mission forward. Those honored are climate warriors who not only collaborate with CLEO, but who set an example in their communities of what climate advocacy and leadership look like. Dr. Hansen consults with CLEO as a featured speaker, collaborator on events such as the global Solve Climate by 2030 annual teach in, and co-producer of the summer climate and food justice community class. <https://cleoinstitute.org/>

## **SDG Action Alliance Director and PCGS Students Presented at the World Sustainability Conference**

Organized by SDG Action Alliance Director **Dr. Brooke Hansen** and PCGS students presented at the World Sustainability Conference on Nov. 13, 2021. Luke Westlake and Brittney Glennon shared their work on aligning the UN Sustainable Development Goals with the City of Tampa's sustainability initiatives. Courtney Wright (PCGS '21) presented on the work she did with the Tampa Bay Regional Resiliency Coalition. Sustainable tourism interns Ali Farr, Jesse Coates, Samantha Vorce and Sophia Annis prepared a joint presentation on using virtualization technologies to showcase heritage at risk and the SDGs in Tampa Bay. Composting projects led by Sheila Sullivan and alum Ericka Leigh were also featured. The papers for the conference were peer reviewed and accepted for publication in *The Green Journal*.

## 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

---

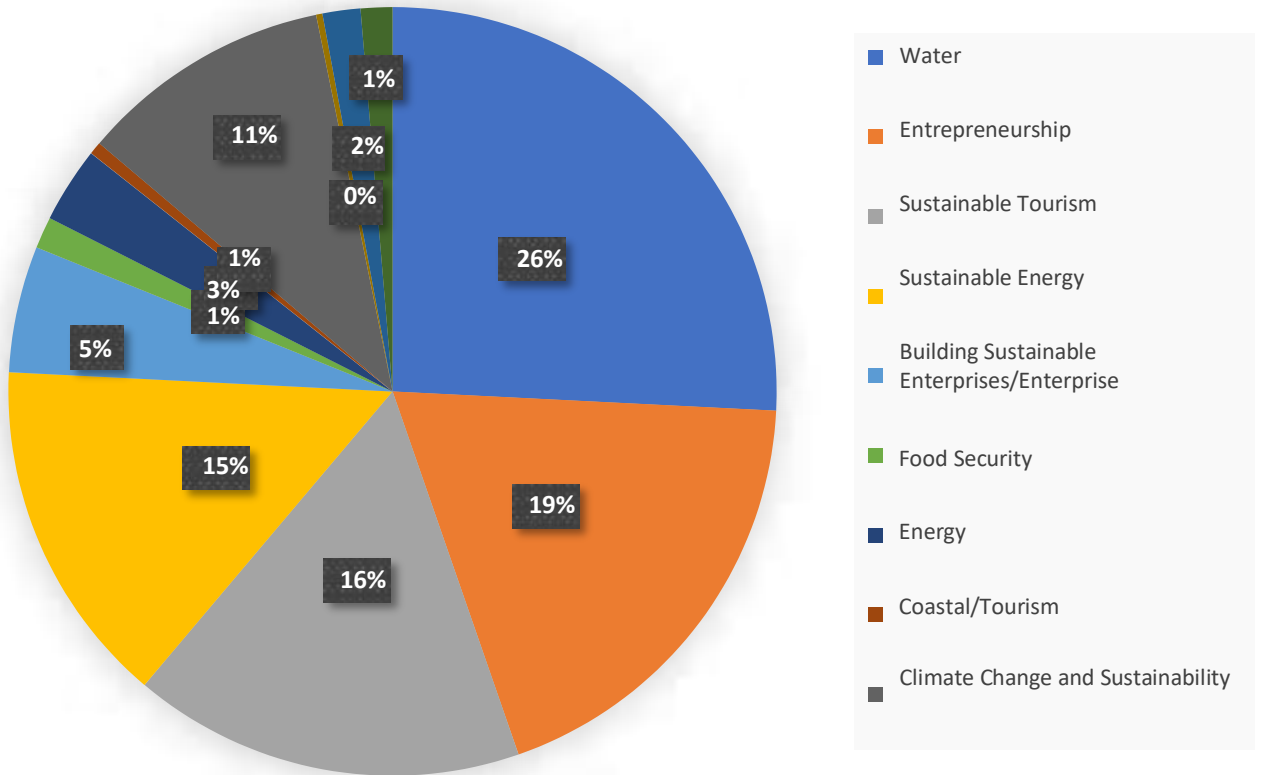
The Office of Student Development at PCGS offers student development advising to all students and alumni to prepare them for careers in the sustainability field. These personalized advising sessions include crafting Student Action Plans, which highlight particular skill sets which can be acquired during the student's time at the College. Students 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 accessible via the college's website. The Student Development offers several workshops each semester that focus on building students' professional skills. The program hosts a Sustainability Speaker Series each semester, bringing sustainability professionals to the College. Speakers have represented a variety of organizations, such as Coca-Cola Florida, Jacobs Engineering, MOSAIC, Duke Energy, Tampa Electric, Florida Fish and Wildlife Conservation, NOAA, local Environmental Protection Commissions 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

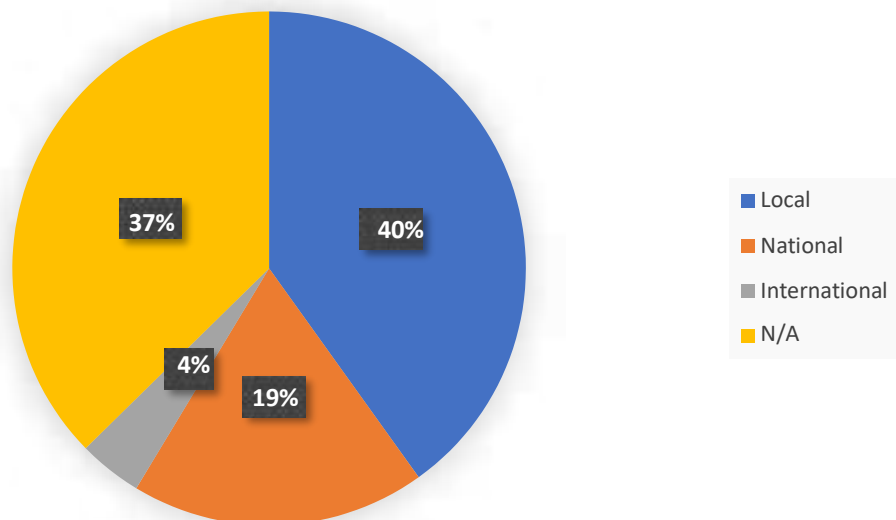
- Black Hills Energy, Rapid City, South Dakota
- Orange County School District, Florida
- Sustainability Specialist, Greater Tampa Bay Area
- Tampa Bay Clean Cities
- USF Center for Urban Transportation Research, Tampa, Florida
- Albertsons Companies-Boise, Idaho, United States
- The CLEO Institute, 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

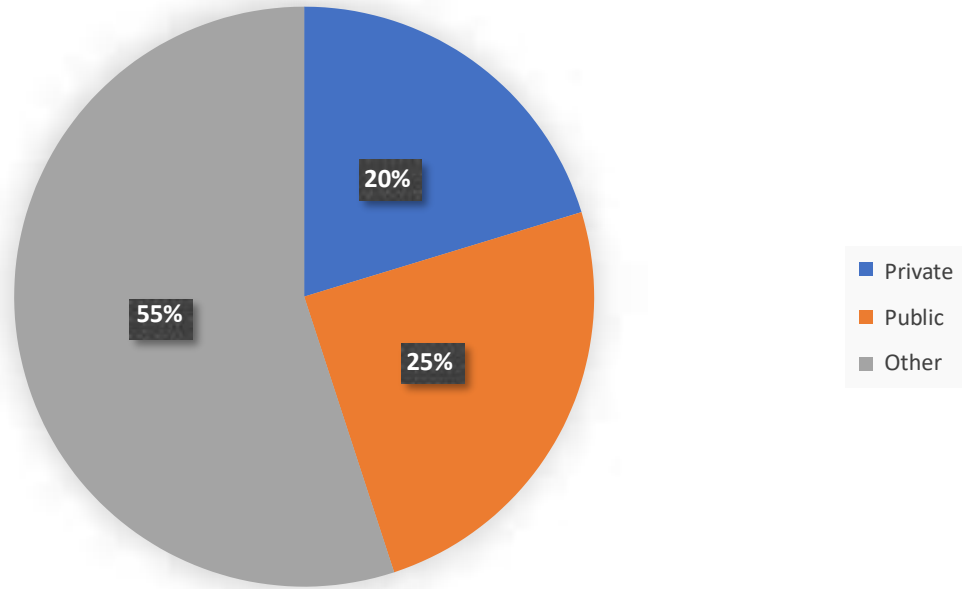
### Concentrations Composition



### Composition of Local, National, and International Orgs.



## Public/Private/Other



# 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

October 20<sup>th</sup> - Jacobs Engineering - Susy Torriente

October 27<sup>th</sup> - Global Warming Mitigation Project - Saige Middleton

November 3<sup>rd</sup> - Office of Land Conservation, Alachua County, FL - Charlie Houser

## **SUSTAINABILITY SPEAKERS SCHEDULE (SPRING 2022)**

February 9<sup>th</sup> - US EPA - Laura Stargel

February 16<sup>th</sup> - Environmental Defense Fund - Ilissa Ocko

February 23<sup>rd</sup> - Institute for Sustainable Communities - Sonia Joshi

March 2<sup>nd</sup> - Climate Adaptation Center - Robert Buntin

March 9<sup>th</sup> - Plant-Based Lifestyle Movement - Dr. Angela Reddy

# 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. (2022), “Nanotechnology-Based Research Priorities for Global Sustainability,” in Pathak, Y.V., Parayil, G, Patel, J.K. (2022), *Sustainable Nanotechnology: Strategies, Products, and Applications*, Hoboken, NJ: John Wiley & Sons (First Edition March 2022), pp. 1-15.
3. Lo, E., Arora, N., Philippidis, G.P. (2021) “Deciphering metabolic alterations in algae cultivated in spent media for enhancing algal biorefinery sustainability”, *Bioresource Technology* 342, 125890, <https://doi.org/10.1016/j.biotech.2021.125890>.
4. Tsarpali, M., Arora, N., Kuhn, J.N., Philippidis, G.P. (2021) “Beneficial use of the aqueous phase generated during hydrothermal carbonization of algae as nutrient source for algae cultivation”, *Algal Research* 60, 102485, <https://doi.org/10.1016/j.algal.2021.102485>.
5. Ammar, E.M., Philippidis, G.P. (2021) “Fermentative Production of Propionic acid: Prospects and Limitations of Microorganisms and Substrates”, *Applied Microbiology and Biotechnology*, 105, 6199-6213, <https://doi.org/10.1007/s00253-021-11499-1>.
6. Arora, N., Philippidis, G.P. (2021) “Unraveling metabolic alterations in *Chlorella vulgaris* cultivated on renewable sugars using time resolved multi-omics”, *Science of the Total Environment* 800, 149504, <https://doi.org/10.1016/j.scitotenv.2021.149504>.
7. Zhao, C., Colson, G., Karali, B., Philippidis, G.P. (2021) “Drop-in Ready Jet Biofuel from *Carinata*: A Real Options Analysis of Processing Plant Investments”, *GCB Bioenergy* 13, 1624-1635, <https://doi.org/10.1111/gcbb.12873>.
8. Tsarpali, M., Arora, N., Kuhn, J.N., Philippidis, G.P. (2021) “Lipid-extracted algae as a source of biomaterials for algae biorefineries”, *Algal Research* 57, 102354, <https://doi.org/10.1016/j.algal.2021.102354>.
9. George, S., Seepaul, R., Geller, D., Dwivedi, P., DiLorenzo, N., Altman, R., Coppola, E., Miller, S.A., Bennett, R., Johnston, G., Streit, L., Csonka, S., Field, J., Marois, J., Wright, D., Small, I., Philippidis, G.P. (2021) “A regional inter-disciplinary partnership focusing on the development of a carinata-centered bioeconomy”, *GCB Bioenergy* 13:7, 1018-1029, <https://doi.org/10.1111/gcbb.12828>.
10. Arora, N., Philippidis, G.P. (2021) “Insights into the physiology of *Chlorella vulgaris* cultivated in sweet sorghum bagasse hydrolysate for sustainable algal biomass and lipid production”, *Scientific Reports* 11, 6779, <https://doi.org/10.1038/s41598-021-86372-2>.
11. Orejuela-Escobar, L., Gualle, A., Ochoa-Herrera, V., Philippidis, G.P. (2021) “Prospects of Microalgae for Biomaterial Production and Environmental Applications at Biorefineries”, *Sustainability*, 13:6, 3063, <https://doi.org/10.3390/su13063063>.
12. Ammar, E.M., Martin, J., Philippidis, G.P. (2021) “Biochemical conversion of *Brassica carinata* biomass to organic acids”, *GCB Bioenergy*, 13:4, 618-626, <https://doi.org/10.1111/gcbb.12812>.
13. Arora, N., Philippidis, G.P. (2021) Life cycle assessment of photosynthetic microalgae for sustainable biodiesel production. In: Azad, A.K., Khan, M.M.K. (eds) *Bioenergy Resources and Technologies*, Academic Press, London, United Kingdom, 369-387.
14. Arora N., Philippidis G.P. (2021) Fucoxanthin Production from Diatoms: Current Advances and Challenges. In: Mandotra S.K., Upadhyay A.K., Ahluwalia A.S. (eds) *Algae: Multifarious Applications for a Sustainable World*, Springer, Singapore, doi:10.1007/978-981-15-7518-1\_10
15. 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>
16. Hansen, B. Annis S, Vorce S, Coates J and Farr A (2022) Virtualization Technologies for Sustainable Tourism: Adapting the Matterport 360 Platform to Showcase the UN Sustainable Development Goals in Tampa Bay, Florida. *SustainE*. 1:2001. doi: 10.3389/fclim.2021.785641.
17. Hansen, B, (2021).2021. *Sustainable Agritourism in Florida*. In Wolf, E. (Ed.) Proceedings of the 2021 FoodTreX Food Travel Research Summit. World Food Travel Association.



# 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 Research Summit, World Food Travel Association. Oct. 14.
10. **Hansen, B.** (2021). Resetting Tourism after COVID-19 with the SDGs. Session Organizer with Dr. John Bushman, Chaplin School of Hospitality and Tourism Management, FIU. International Conference on Sustainable Development, Sept. 21.
11. **Dorsey, J.** (2021). “Restorative Environmental Justice: Climate, Poverty and Sustainability.” Keynote Speaker at Social Justice Speaker Series, sponsored by Pasco-Hernando State College, New Port Richey, Florida, April 21 (Zoom Presentation).
12. **Dorsey, J.** (2021). “Social Consequences of Technology: Designing a Sustainable Future from an Unsustainable Past,” PHY 2036 Sec. 601 - Physics of Sustainability course, College of Arts and Sciences, University of South Florida, St. Petersburg, Florida, November 16.
13. **Dorsey, J.** (2021). “Community-Based Activism and Environmental Justice,” Rooted in Place: JGHC Community Garden Service-Learning course, Judy Genshaft Honors College, University of South Florida, Tampa, Florida, September 28.
14. **Parayil, G.** (2021). “Forging a Fair and an Equitable Global Community: Asian Responses to Contemporary Innovation Challenges,” Association for Asian Studies 2021 Annual Conference, 2021 (Seattle, WA).

## 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.

## PATEL COLLEGE OF GLOBAL SUSTAINABILITY FY2021-2022 FUNDING OVERVIEW

<u>FUNDING SOURCES</u>	<u>TOTAL FY2021-2022 ALLOCATION/REVENUE</u>	<u>TOTAL PROJECTED FY2021-2022 EXPENSES</u>
E&G	\$ 1,141,256	\$ 1,141,256
Carryforward	135,675	67,684
Auxiliary	79,475	53,356
Research F&A	168,527	95,292
Contracts & Grants	201,177	122,452
Federal Work Study	31,500	18,164
Endowment Earnings* and Gifts	874,566	510,048
	<b>\$ 2,632,175</b>	<b>\$ 2,008,250</b>

### 2021-2022 Allocation/Revenue

