

PATEL COLLEGE OF GLOBAL SUSTAINABILITY

ANNUAL REPORT

2022 - 2023



UNIVERSITY of
SOUTH FLORIDA
Patel College of
Global Sustainability



2022 - 2023 ACADEMIC YEAR HIGHLIGHTS



- The Master of Science (M.S.) Graduate degree program, started in 2021, in five concentrations – Sustainable Energy, Sustainable Water, Food Security and Sustainability, Sustainable Transportation, and Sustainable Entrepreneurship – is a great success as attested by admissions and graduation trends.
- Dean Parayil’s co-authored book, *Sustainable Nanotechnology: Strategies, Products, and Applications*, was published by John Wiley & Sons in 2022.
- Solar C³ITIES Solutions, an organization founded by PCGS Professor Dr. T.H. Culhane, won four awards in three categories at the 2023 AD and Biogas Industry Awards, organized by the Anaerobic Digestion and Bioresources Association and the World Biogas Association in Birmingham, England.
- PCGS faculty and students 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 transition to sustainability.
- The Patel Family Foundation gifted funds to support summer 2022 and 2023 programs.
- Philanthropist Elizabeth Moore gifted funds to support sustainability research and community outreach efforts of PCGS faculty and students.
- In collaboration with NASP Solar and with generous support from philanthropist Elizabeth Moore, designed and put into operation Florida’s first Mobile Disaster Resiliency Solar Power Station.
- Won another grant award from the Florida Fish & Wildlife Conservation Commission (FWC) to investigate a mitigation strategy for red tides.
- Graduated two more Coverdell Fellows, a scholarship program for returning Peace Corps volunteers.

DEAN'S MESSAGE




I am delighted to present the 2022-2023 Annual Report for the Patel College of Global Sustainability (PCGS). Despite the challenges posed by the COVID-19 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. The newly launched PCGS Master of Science (M.S.) graduate program in five concentrations – Sustainable Energy, Sustainable Water, Food Security and Sustainability, Sustainable Transportation, and Sustainable Entrepreneurship – is doing well as attested by admissions and graduation trends. Launching of the MS degree program fulfilled one of the key recommendations of the External Evaluation Report in the area of curriculum enhancement. An increase in the graduation requirement from 30 to 36 credit hours for all Master's degrees, another recommendation of the external evaluator, was also implemented.

A notable achievement for the College was successfully hosting the Third Global Sustainability Conference in November 2022 with enthusiastic participation from several industries, Florida State officials, local governments, and USF students and faculty. 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 leading 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 that 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, and scholarships have been granted to students during the 2021-2022 and 2022-2023 academic years.

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 2023-2024 Academic Year. The Patel College is preparing to celebrate its tenth founding anniversary in November 2023. 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 2013 as the newest degree-granting college of the University of South Florida based at the Patel Center for Global Solutions, 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 Science, and College of Public Health.

Two significant leadership changes since the establishment of the college were 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 our new Master of Science degree in Global Sustainability in fall 2021 in five concentrations: Entrepreneurship, Food Sustainability and Security, Sustainable Energy, Sustainable Transportation, and Water Sustainability. The success of the MS program is readily apparent with more than 40% of our current active student body electing to study this degree option in just the first year, as well as comprising 34% of our degrees conferred since the launch.

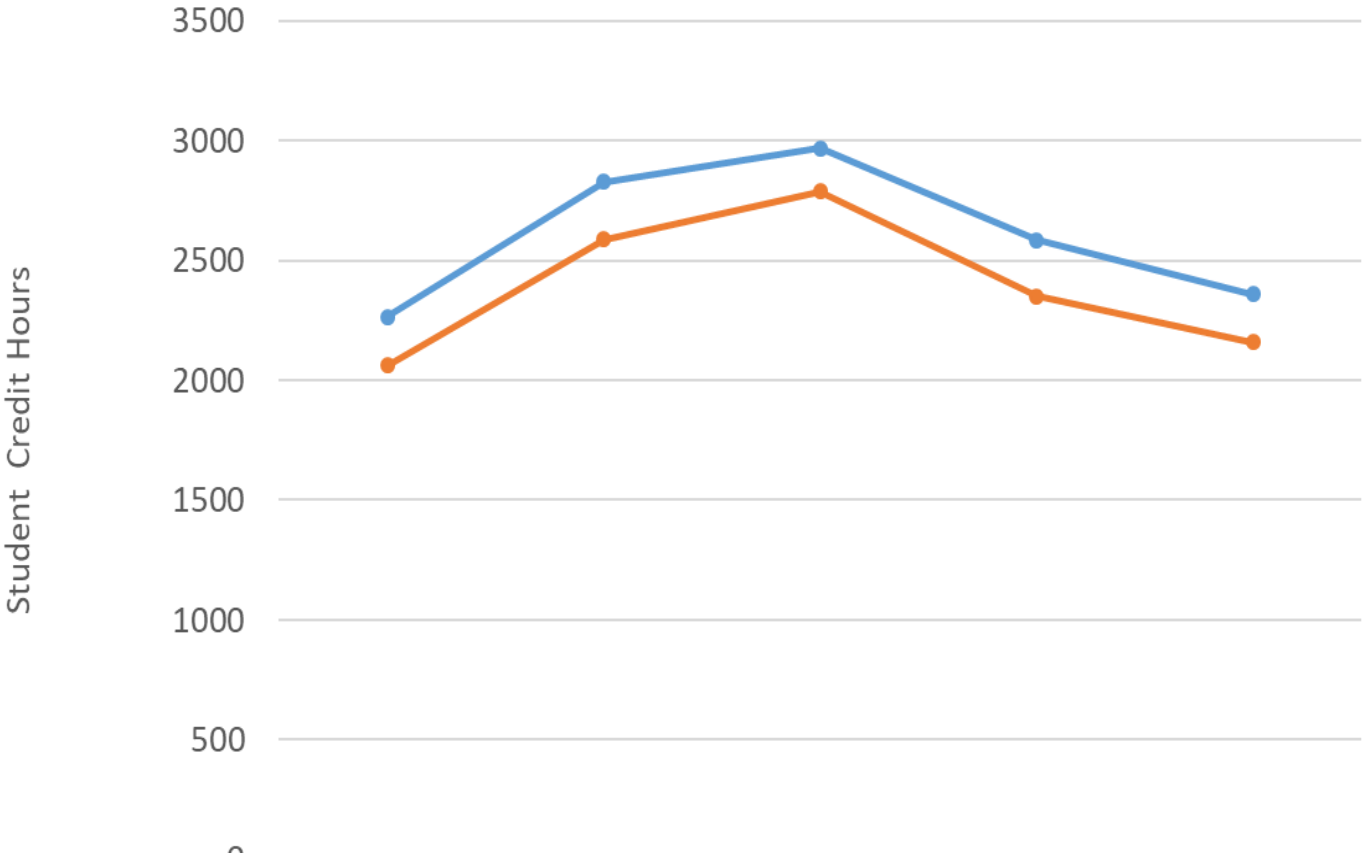
Our Master of Arts degree in Global Sustainability was modified to include only the most relevant concentrations and it shares a similar degree structure and credit requirements as the new MS. The remaining four concentrations that comprise the MA degree are: Climate Mitigation and Adaptation, Sustainable Tourism, Sustainability Policy and Sustainable Business.

The new MS degree complements the existing MA degree with a shared core of courses, and both the new MS and the MA require 36 credit hours to complete. 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 had maintained a consistent graduate student enrollment between 150-200 graduate students the last several years, we are now experiencing the expected results from denials of requests of additional institutional funding with reductions in both student enrollment as well as degrees awarded, unfortunately. We have consistently requested funding for additional faculty and staff to support recruitment and teaching efforts for our degree and certificate programs, with no success. Additionally, we have regularly hosted graduate level courses in summer to reduce the time needed to earn a degree, and have needed to seek funding elsewhere to avoid over-capacity issues with our limited faculty.

Over the next section, we will illustrate the continuing need for staff and faculty growth during the 2023-24 academic year. Investments needed to sustain recruitment, admissions applications, enrollments and degrees awarded will be illustrated. International applications have increased, but a 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. We continue to produce needed SCH and an impressive time to graduation, as well as opportunities for instructors to develop and facilitate new courses and research, and the replenishment of student numbers. The figures below indicate five years of student enrollment numbers at PCGS.

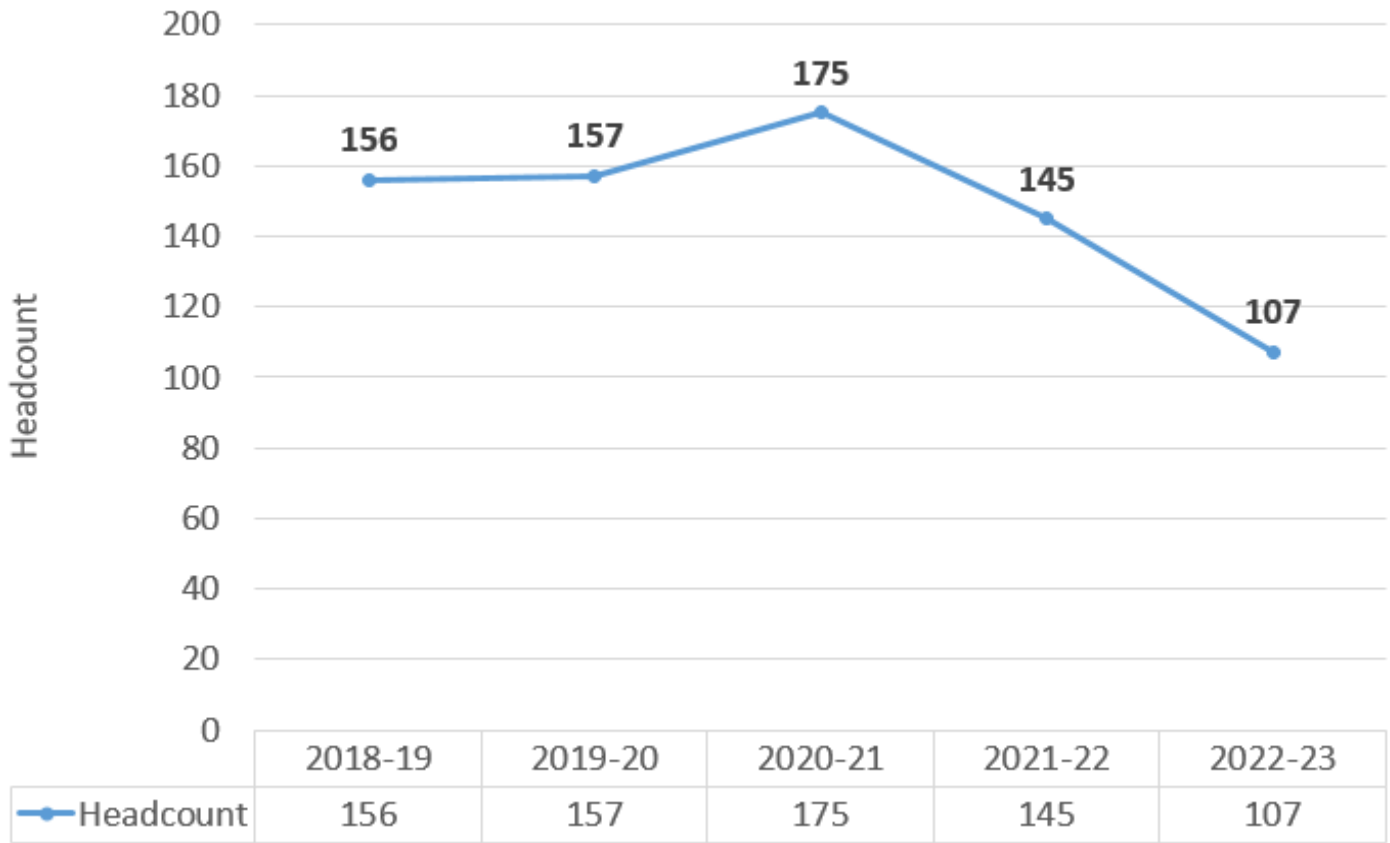
The below figure illustrates the SCH trends the last five years for both gross/fundable hours.

GLOBAL SUSTAINABILITY, 5-YR SCH TREND



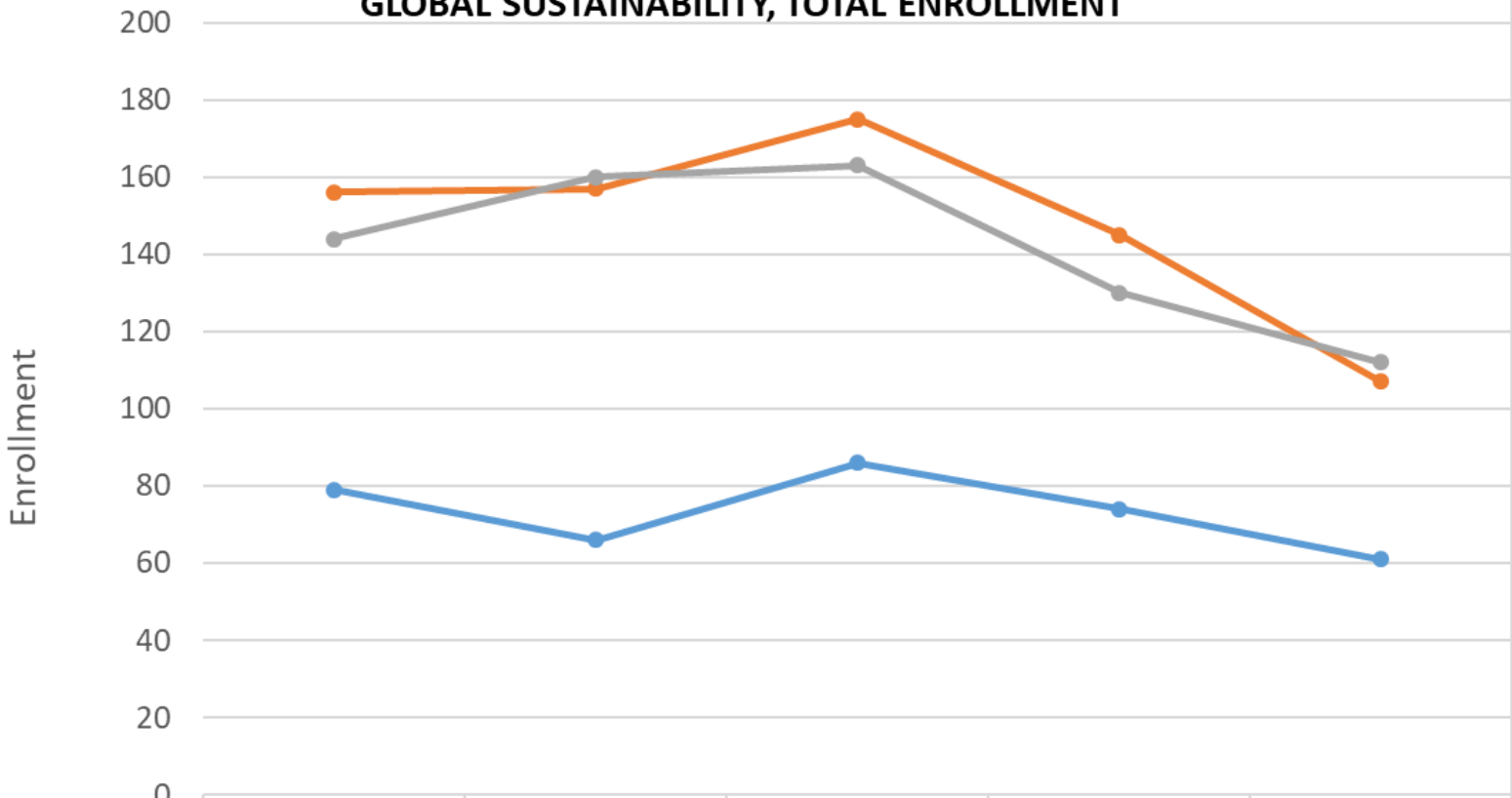
	2018-19	2019-20	2020-21	2021-22	2022-23
SCH Gross	2265	2826	2967	2583	2360
SCH Fundable	2061	2586	2787	2349	2159

GLOBAL SUSTAINABILITY, FALL GRADUATE STUDENT HEADCOUNT



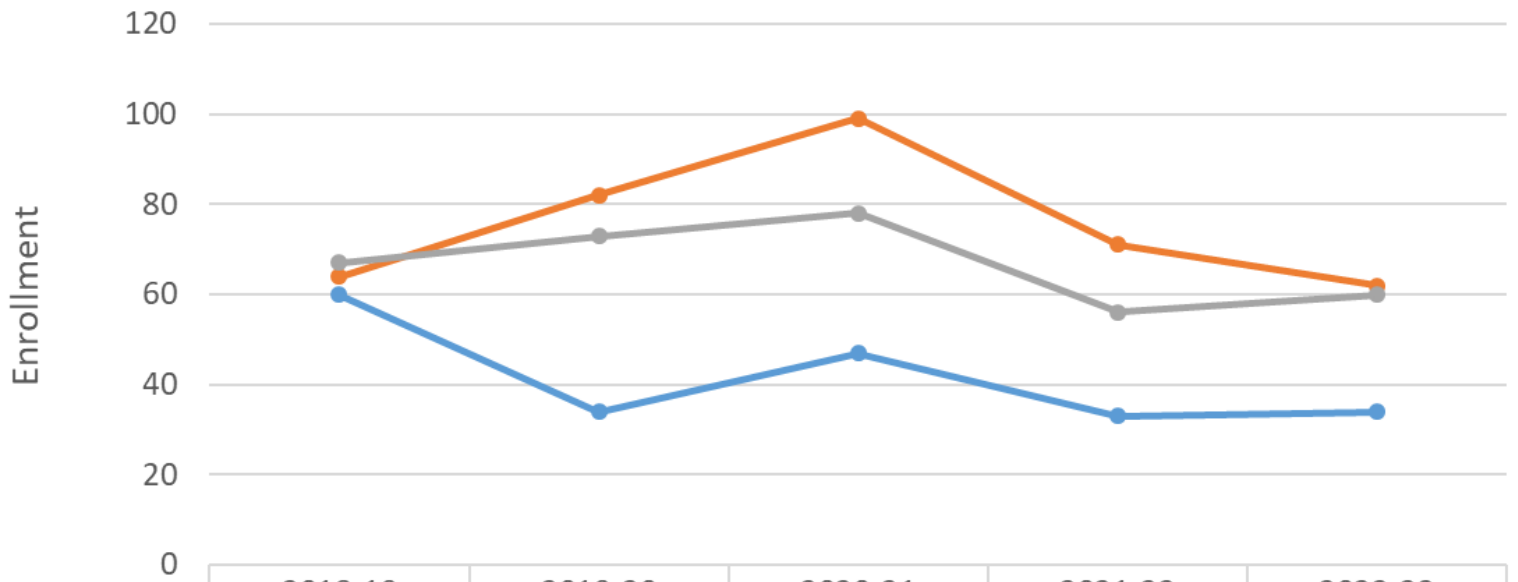
(Unduplicated student headcount for an academic year based on the most recent record of the student regardless of the number of terms attended during that academic year)

GLOBAL SUSTAINABILITY, TOTAL ENROLLMENT



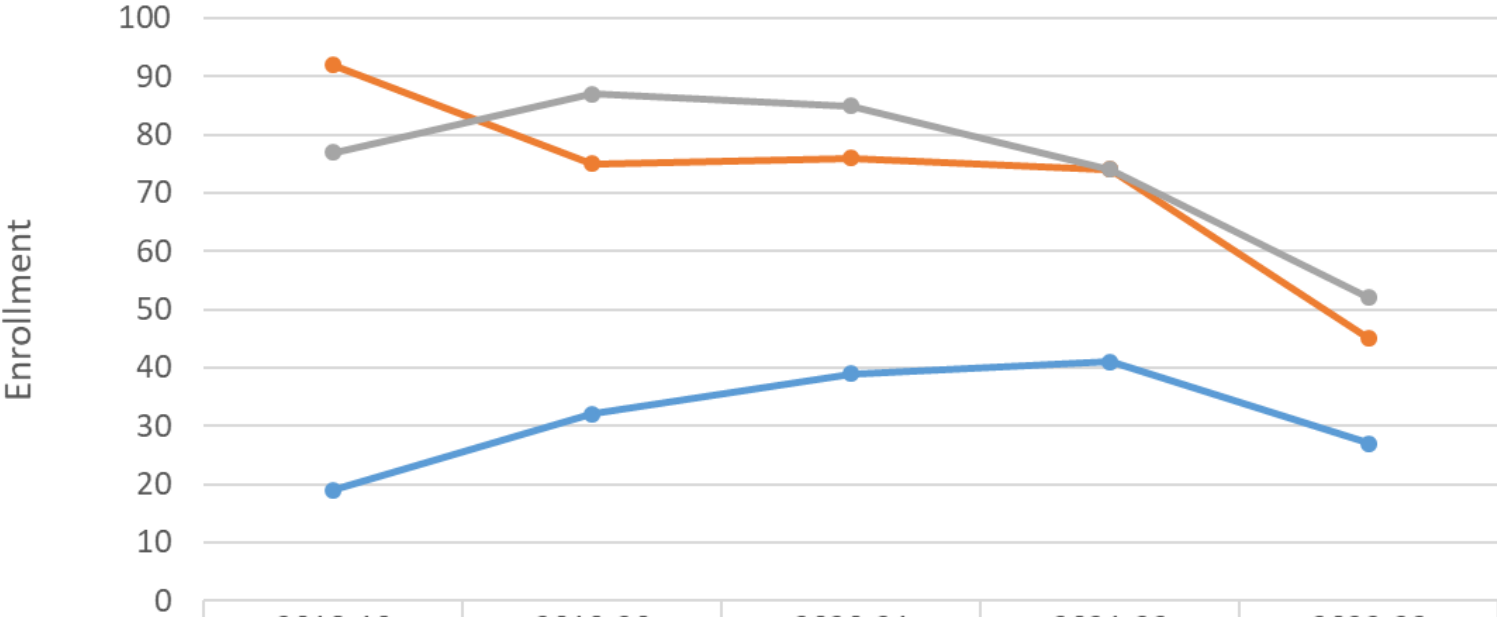
	2018-19	2019-20	2020-21	2021-22	2022-23
Summer	79	66	86	74	61
Fall	156	157	175	145	107
Spring	144	160	163	130	112

GLOBAL SUSTAINABILITY, FULL-TIME ENROLLMENT



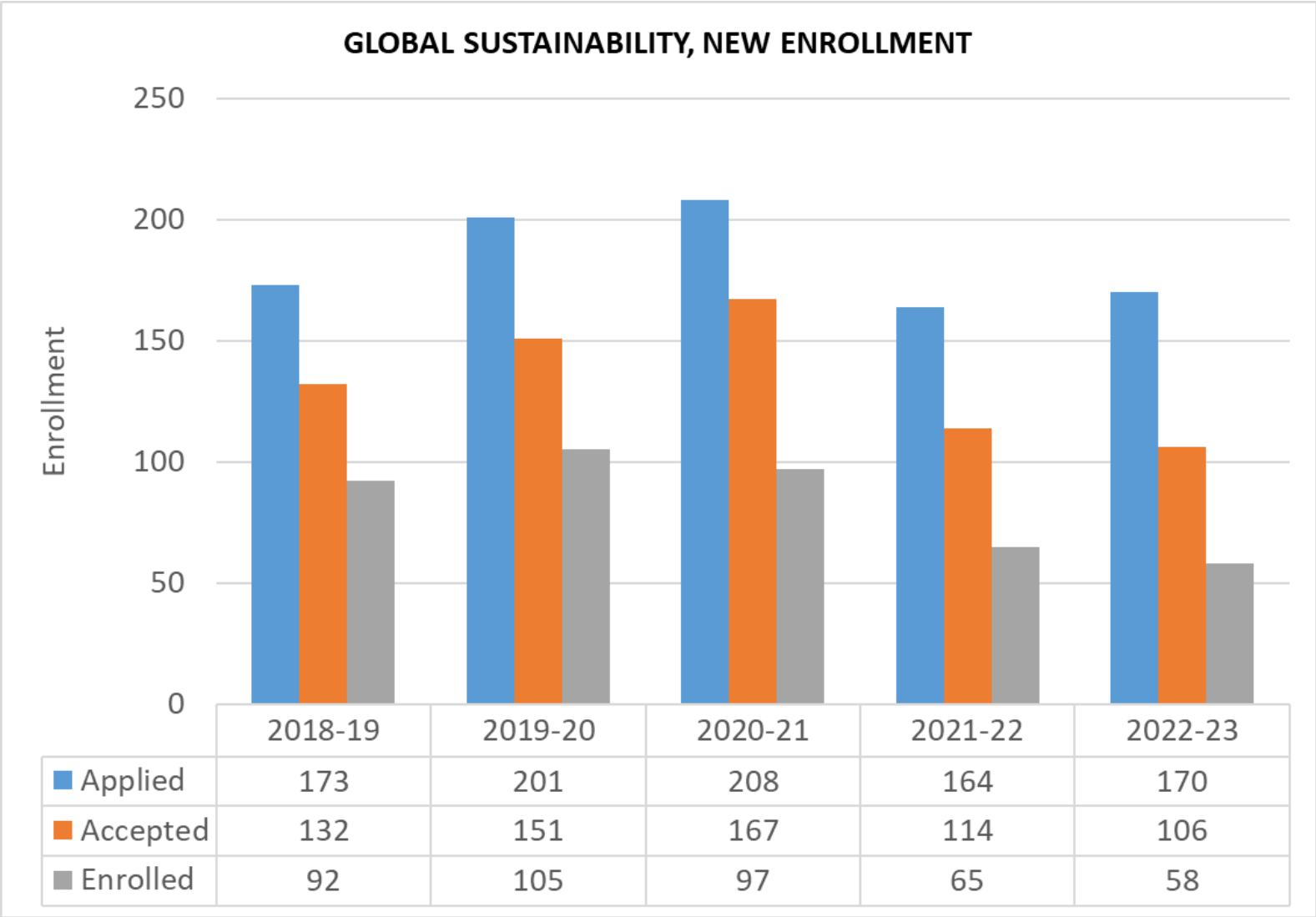
	2018-19	2019-20	2020-21	2021-22	2022-23
● Summer	60	34	47	33	34
● Fall	64	82	99	71	62
● Spring	67	73	78	56	60

GLOBAL SUSTAINABILITY, PART-TIME ENROLLMENT

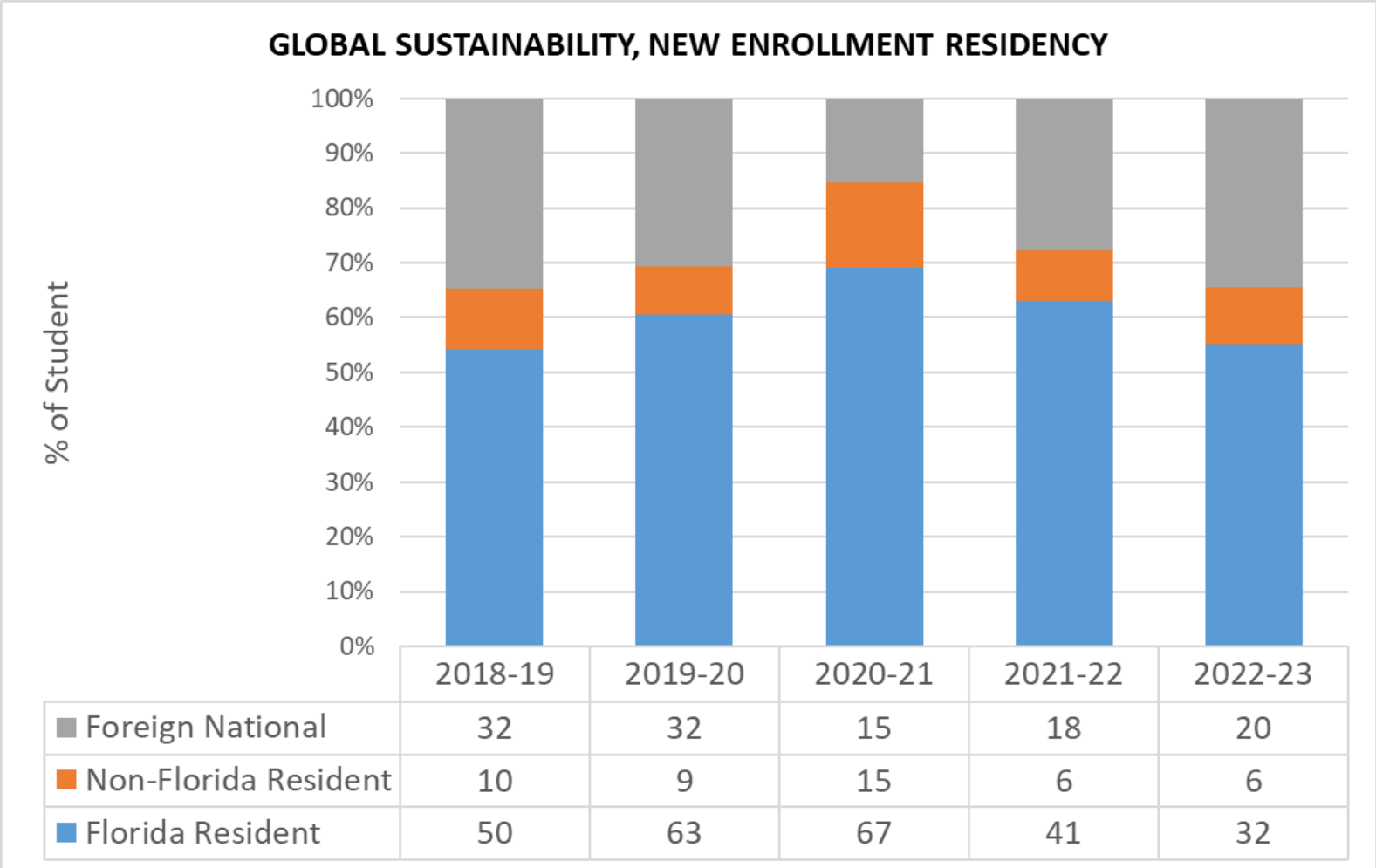


	2018-19	2019-20	2020-21	2021-22	2022-23
● Summer	19	32	39	41	27
● Fall	92	75	76	74	45
● Spring	77	87	85	74	52

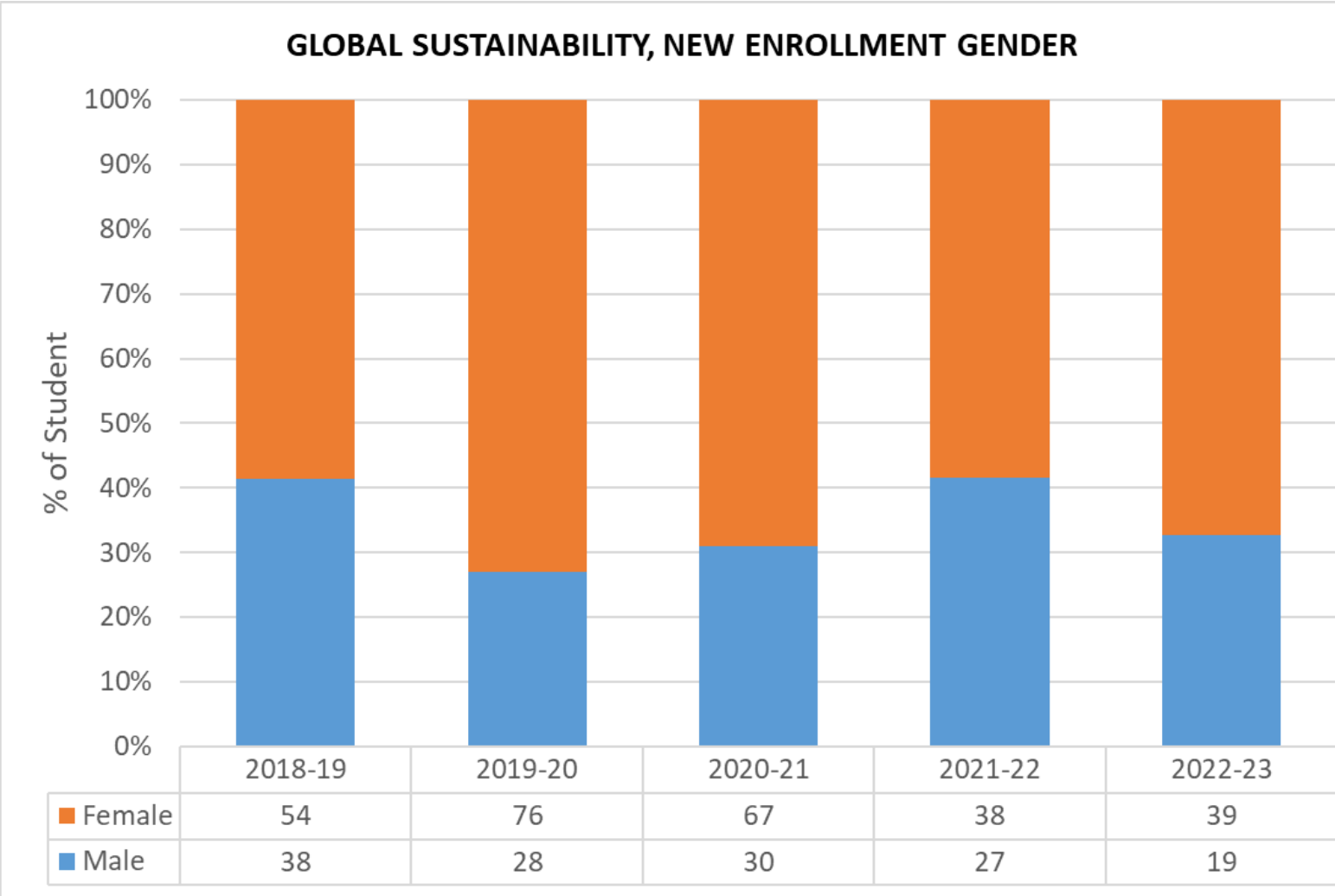
The below figure illustrates the admissions and enrollment trends over the last five years for new students.



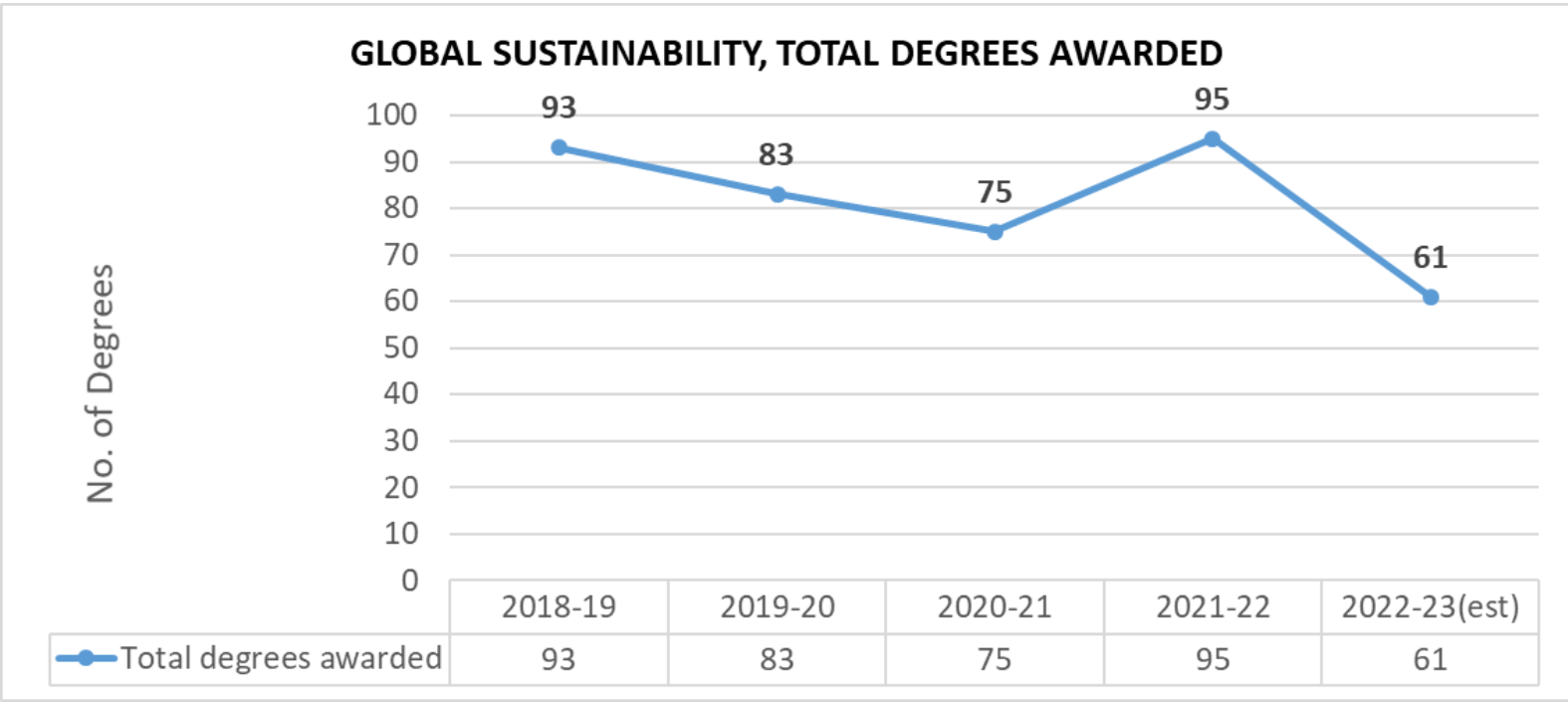
The below figure illustrates residency and enrollment trends over the last five years for new students at PCGS. A significant percentage of non-resident and especially international students enroll. International student enrollment declined during the pandemic (2020) to around 15% but rebounded to over 30% in subsequent years.



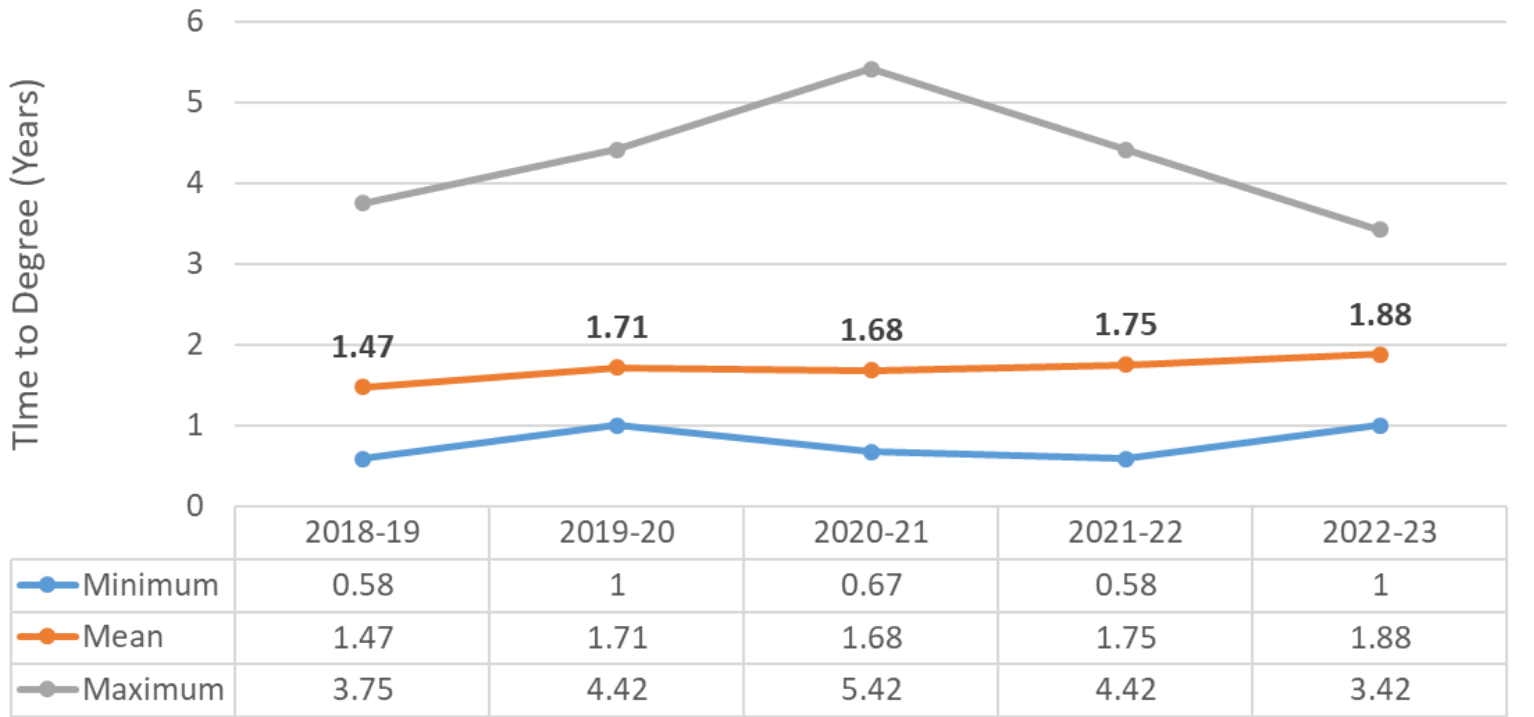
The below figure illustrates the gender distribution in enrollment trends over the last five years for new students. PCGS has a significant percentage of female students (over 50%) every year, with 2019-2020 being the highest at over 70% enrollment.



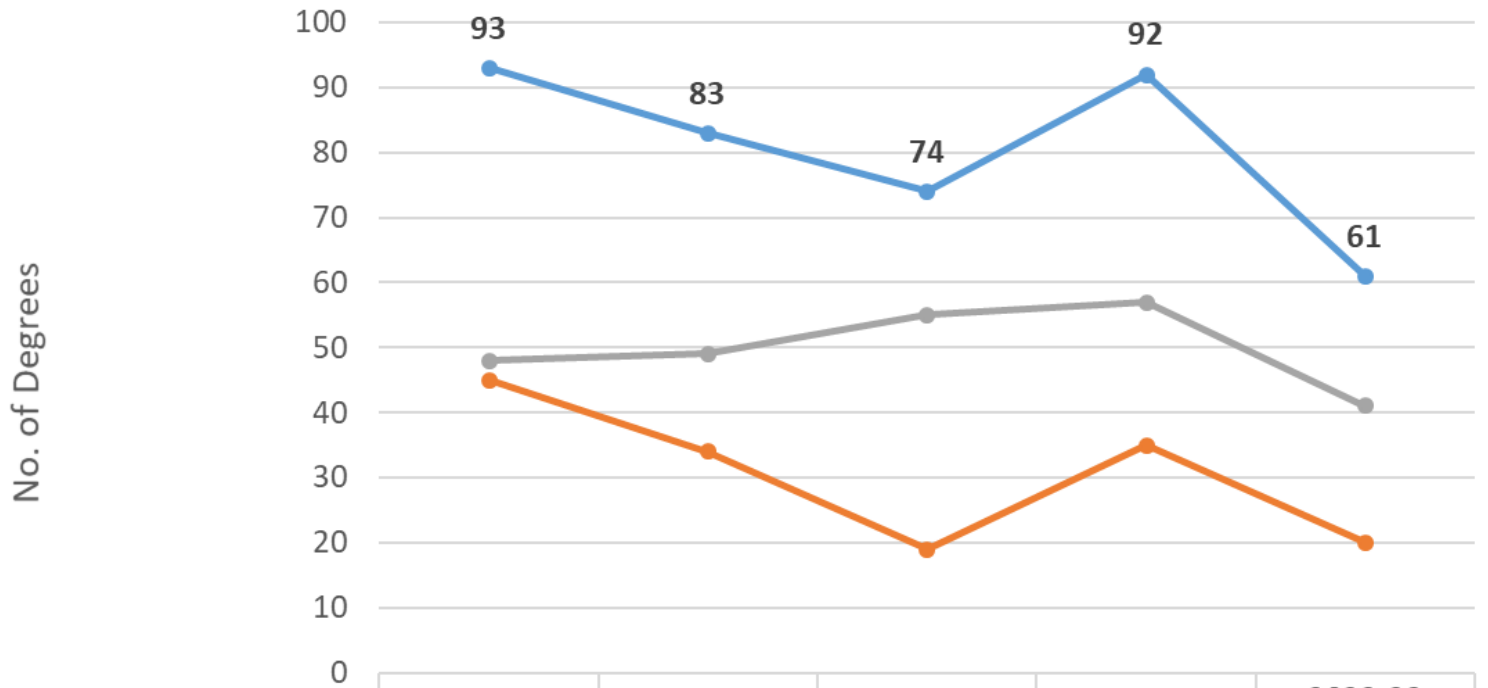
The below figures illustrate the degrees awarded trends across the last five years. The largest enrollment in 2017-2018 resulted in increased degrees subsequently awarded in 2018-2019. As anticipated, degree completions rose in 2021-2022, and declined this year due to decreased enrollment.



GLOBAL SUSTAINABILITY, TIME TO DEGREE TRENDS



GLOBAL SUSTAINABILITY, DEGREES AWARDED - GENDER



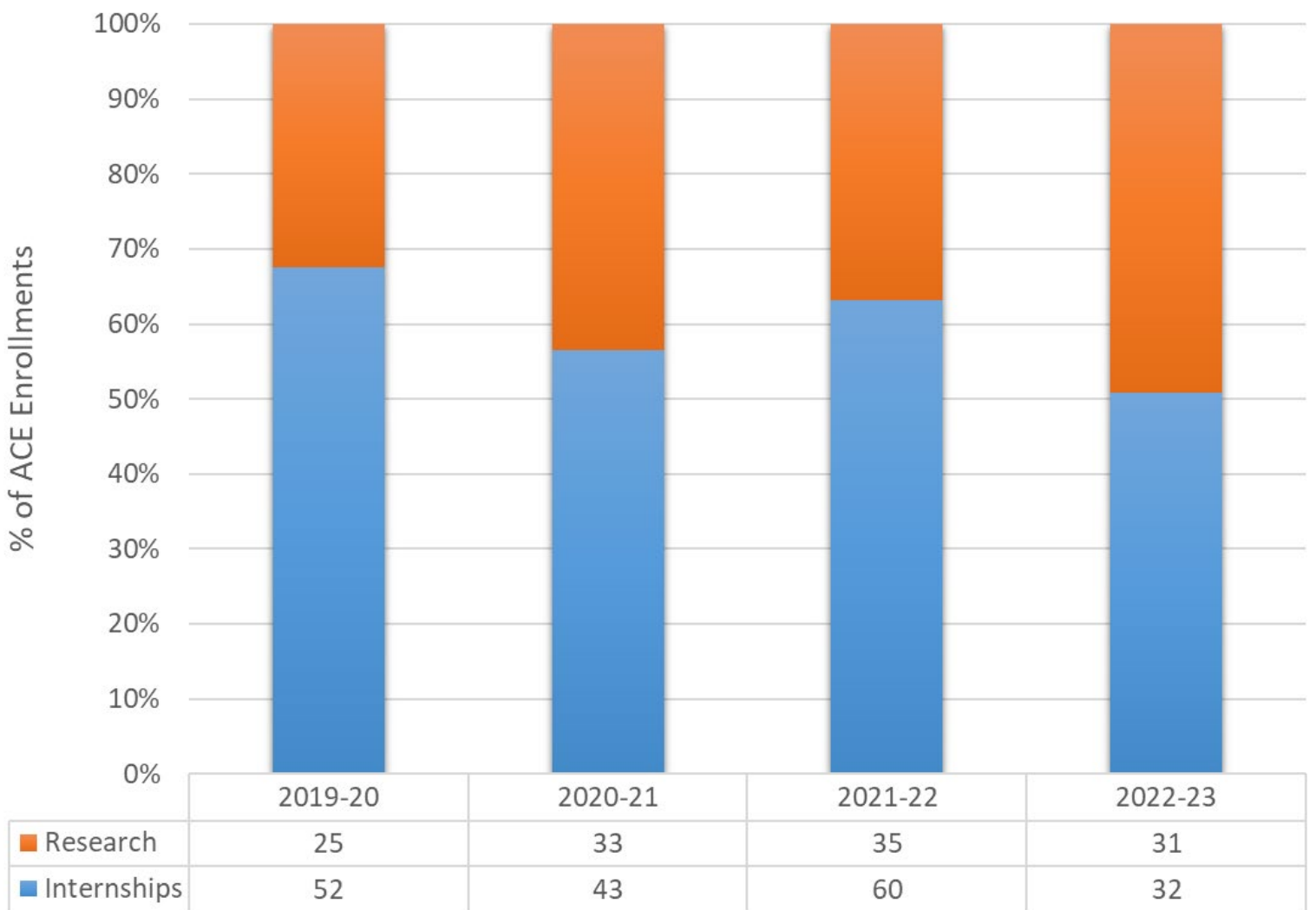
	2018-19	2019-20	2020-21	2021-22	2022-23 (est)
Total degrees awarded	93	83	74	92	61
Male	45	34	19	35	20
Female	48	49	55	57	41

INTERNSHIP / RESEARCH PROJECTS

All graduate students are required to complete a 3 to 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 perspectives 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 a higher percentage of students elect to complete the final project as an internship with hands-on experience.

GLOBAL SUSTAINABILITY, ACE ENROLLMENTS



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, and to 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 and key certifications for sustainable tourism and ecotourism, and provides many experiential learning opportunities, including, but not limited to, visits 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 classroom teaching, a team research project, student engagement through discussions, and experiential learning 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 reduce their carbon emissions 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 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 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 elsewhere that are designed narrowly for just engineering and natural 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 a systems approach to manage social-ecological systems; and develop critical thinking skills for affecting 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 and its real-world application, and increase their opportunities 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 toward 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 represents 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, supported by the private sector and the State of Florida, 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 in 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* (supported by the USDA)

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.

RED TIDE MITIGATION

Increasingly the Gulf Coast of Florida suffers from harmful algal blooms (HABs) caused by *Karenia brevis*, a harmful alga that produces potent neurotoxins (brevetoxins), which disrupt normal cellular functions. The toxins lead to massive fish deaths, mortalities in marine mammals and benthic communities, accumulation in shellfish causing neurotoxic shellfish poisoning, and respiratory disorders in humans. In partnership with the Mote Marine Laboratory (Sarasota, FL), the goal of our research is to identify natural algicidal bacteria and the conditions that favor their activity against *K. brevis* during HAB progression. This way we intend to develop strategies to mitigate red tides. The research is supported by the Florida Fish & Wildlife Conservation Commission.

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, Native American villages, impoverished urban areas and abroad.

FUNDERS: Rosebud Continuum Sustainability Education Center/Bishop Construction Company (Bishop family), the Elizabeth Moore Foundation, PlanetWalk.org, Ekvn-yefolecv.org, 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 U.S. State Department, National Geographic, Solar CITIES, and other NGO partners.

ONGOING AND PLANNED ACTIVITIES

Dr. Culhane's latest project involves working as a lead creator/developer in a team assembled by National Geographic's Explorer in Residence, famed African American Environmental Justice leader John Francis, a.k.a "The PlanetWalker." The team, which involves Culhane's classes and schoolteachers and children from South Florida as STEAM-curriculum-producers of educational content "of the students and teachers by the students and teachers for the students and teachers," is tasked with creating a new Florida Wildlife Corridor Curriculum for digital storytelling. PCGS students met with the Planet Walker team during a week of brainstorming at Rosebud and created a giant mural of threatened Florida wildlife on the Rosebud Classroom wall to complement "world building" they are doing in virtual reality. On Earth Day they joined the Girl Scouts and the Nature Conservancy Education Teams at the Disney Wilderness Preserve and implemented the first Extensible Reality modules for the curriculum, using techniques Culhane and his classes developed with the USF Innovative Education Production Team. The project will launch statewide in September and Culhane is developing a new course for PCGS with Innovative Ed themed around the new career path of "Digital Twinning for Conservation and Sustainability" that will be our first "Sustainable Design Production Workshop."



Florida's first "Mobile Disaster Resiliency Solar Power Station," developed last year at Rosebud with Elizabeth Moore foundation funding, inspired an even higher capacity and larger Mobile Climate Adaptation trailer that Culhane created this year with Dr. Seneshaw Tsegaye at Florida Gulf Coast University. The new trailer is road-worthy, carries 4 kW of PV power, onboard inverters charging a 5kW battery, and, as a first of its kind, a mobile HomeBiogas system and HomeBiogas toilet, complete with cookstove and backup generator. This trailer should enable citizens to bring power and waste management solutions wherever they are most needed in the aftermath of a hurricane or other disruption.

This spring Dr. Culhane and Solar CITIES, the NGO he founded in Egypt as a graduate student in 2006, made an unexpected clean sweep at the March 29th AD and Biogas Industry Awards Ceremony 2023 hosted by the Anaerobic Digestion and Bioresources Association (ADBA) and the World Biogas Association (WBA). Finalists from around the world gathered in Birmingham, UK for a night at the beautiful Vox Conference Center, excitedly waiting for the names of the winners to be announced.

Dr. Culhane was presented with the AD Hero of the Year 2023 award, supported by Future Biogas, for his global work tackling issues involved with establishing AD within communities.

Members and associates of Solar CITIES were called out again and again, winning in multiple categories, garnering prizes for “Women in Biogas” (something that Dr. Culhane has involved several PCGS students in, including Isabel Galleano and Rarosue Amairabi) and “Education Hub of the Year.”

Back at home, Dr. Culhane’s community-scale biodigester project that has been so successful at the Rosebud and Fat Beet Farm sites in Tampa that it 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 and part of his “summer break” in environmental justice service somewhere in the world, and for the past two years he has done that service work in the Ekvyn-Yefolcv Ecovillage deep in the forests of Alabama in the ancestral hunting grounds of the Creek Indians. Learn more at: <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. He acts as chief advisor and as a foreman and hands-on green builder, imparting his expertise in the construction of three large Chinese Puxin concrete biodigesters inside the Muscogee food security greenhouse, building composting toilets 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. This 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 worked with Chief Arvol Looking Horse to host International Indigenous World Peace and Prayer Day at the Rosebud Continuum in summer 2022.

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

Dr. T.H. Culhane continues working with PCGS students in classes (Waste Not, Want Not: Reconsidering Refuse as Resource, Climate Mitigation and Adaptation and Implementing the SDGs) 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. Recently Rosebud Continuum purchased an \$8,000 glass-to-sand crusher, a machine that two of Culhane’s Capstone students have been invited to use for their ACE research. Their most exciting innovation is the creation of “trash art” statues made from a special blend of cement, plastic shreds and crushed glass. The first of these sculptures is a child-friendly playground sized gopher tortoise that acts as a climbable solar water fountain. It is impossible to tell at first glance that these elegant works of art are completely made out of otherwise “unrecyclable garbage.” This is “trash art evolved to the next level” thanks to the machinery provided by Elizabeth Moore and Maryann Bishop for our students to blend engineering, science and art together in the service of our UN SDGs.





Solar C³ITIES Solutions, Co-founded by Dr. T.H. Culhane, center, won multiple awards at the 2023 AD and Biogas Industry Awards.

Water Sanitation and Hygiene

FUNDER: National Science Foundation

GOAL: This project engages USF faculty and U.S.-based students to conduct WASH research in partnership with faculty, students, and communities in Ghana. The project includes research activities in water treatment, sanitation and community engagement. In the summer of 2022 they worked with faculty at the University of Cape Coast and high school students at the Ghana National College in authentic science research using biodigesters as a wastewater treatment technology. The project developed teaching and research materials that are being used as part of the school curriculum for science teaching.

ONGOING AND PLANNED ACTIVITIES

Based on the project outcome of summer 2022, they have been working on two publications that involved the students and the partners in Ghana. The main partner in Ghana visited USF in 2022, and he was able to work closely with USF faculty and students in the preparation of the manuscripts; he presented the project outcomes and experiences at a conference in Daytona, Florida. In preparation for the summer 2023 activities, they advertised the applications for participation and updated the website with the latest information about the project (<https://www.usf.edu/nsf-ires/>).

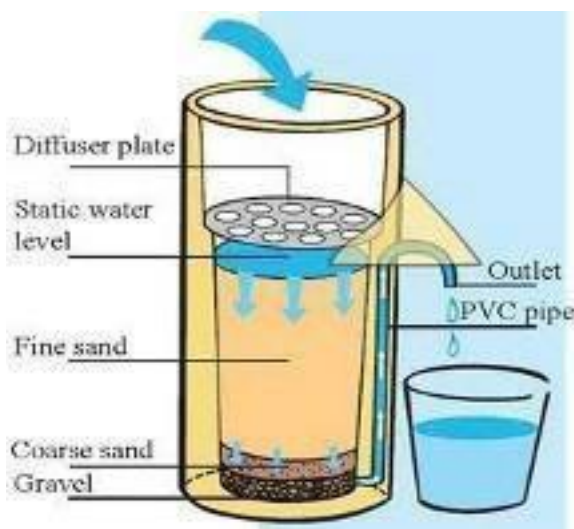
Focus Area: Appropriate technologies for water treatment

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: 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, and 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. Based on this project work, the faculty from PCGS, Engineering and Education conducted a workshop at the Association of Environmental Engineering Science Professors (AEESP) annual conference in St Louis, Missouri in June 2022. The workshop was well attended and provided useful feedback that will be used in



future project activities. A platform presentation was also made that was based on the outcome of the project.

MS and PhD Research

PCGS faculty collaborated with faculty at the College of Engineering as a co-supervisor of masters and Ph.D. students. One of the Ph.D. researchers focuses on a systems thinking approach to conducting life cycle analysis of multifunctional plants. The study involves life cycle assessment and systems modeling. The second PhD student is studying the resilience of water utilities in the Tampa Bay Area under the threats of climate change with a particular focus on saltwater intrusion associated with sea level rise. The PCGS faculty secured \$80,000 for this Ph.D. study from Tampa Bay Water.

Dr. George Philippidis served as major co-advisor of three Ph.D. students from Chemical Engineering and Chemistry and as a member of the dissertation and thesis committees for several other students. Two of his doctoral students graduated in May 2022. Moreover, he mentored undergraduate students interested in hands-on experience with algae research.

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. 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 Ph.D. 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 Ph.D. program.

Dr. Kebreab Ghebremichael

WATER AND SANITATION

Dr. Ghebremichael has 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 Life Cycle Assessment

Dr. Ghebremichael, in partnership with faculty from the Florida Climate Institute member universities, completed Greenhouse Gas (GHG) emissions inventory and projections for the state of Florida. The project was funded by the Environmental Defense Fund and will develop recommendations for state actions that will lead to net-zero GHG by 2050. Dr. Ghebremichael is the lead author of the report “Laying the groundwork for ‘getting to Neutral’ in the State of Florida.” The group is planning to organize a conference around the report for dissemination purposes among the key stakeholders in the state.

Dr. Ghebremichael collaborated with **Dr. Haldar** in a project that was funded by Publix. The project aim was to conduct a life cycle assessment of shopping bags. The project involved two graduate students, one from PCGS and one from Civil and Environmental Engineering.

Dr. Brooke Hansen

VIRTUALIZATION TECHNOLOGIES FOR SUSTAINABLE TOURISM DEVELOPMENT IN TAMPA

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 more than 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.

Dr. Pradeep Haldar

SUSTAINABLE BUSINESS: CLEAN ENERGY, INNOVATION, ENTREPRENEURSHIP AND POLICY

Projects:

Dr. Pradeep Haldar worked on a Publix funded project with **Dr. Kebreab Ghebremichael** and graduate students to review and analyze research related to Life Cycle Analysis of shopping bags.

Coalition of Excellence for Business Sustainability (CEBS): Dr. Haldar has initiated a collaboration with The Sustany Foundation (TSF) to establish and raise funding for CEBS and offer best practices to private and public businesses that create a compelling return on investment by driving innovation, managing risk, and improving stakeholder relations while positively impacting the life of our communities for future generations. The objective is to create and expand the sustainability practices of business organizations that address major challenges designed to improve profitability, competitiveness, and market share while preserving natural resources and health of all life on this planet under rapidly changing economic, policy and environmental conditions. The Coalition of Excellence's goal is to produce positive measurable business and societal impacts, as well as to produce tangible outcomes that span economic, technological, resiliency, educational, and workforce activities through partnerships and engagement of diverse stakeholders across regional, national, and international levels.

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, an airport parking lot, administrative buildings, a justice center, a communications center, and a water reclamation site. By gaining experience in conducting economic assessments for solar installation, the students gain critical new skills.

System Capacity: 1000.0 kWdc (6667 m²)



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 between industry and academia in the U.S. 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 Fort Dade are a popular tourist attraction today. One of the little-known histories of the island includes 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, threaten to erase these valuable histories and many others.



A visitor experiences the Egmont Key Pop-Up VR Exhibit, funded by a USF Creative Scholarship Grant. Photo by 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 continued with the offering of the Cultural

COMMUNITY ENGAGEMENT & OTHER ACTIVITIES

Dr. George Philippidis co-mentored a team of 7th-graders from a Sarasota middle school, whose algae project was selected by NASA in a national competition for execution at the International Space Station in 2023. He also continued to serve in the steering committee of the Tampa Bay Clean Cities Coalition and USF's Student Green Energy Fund.

Dr. Kebreab Ghebremichael worked with schools in Ghana on a water, sanitation and hygiene project that was funded by NSF. The project resulted in authentic science research applications for high schools. Booklets and multiple supplementary documents were prepared to help teachers and students use them in their research and curriculum.

Dr. T.H. Culhane has been engaged in online 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, Altspace for Educators creator training, Minecraft Education Python Programming Language and Modeling, Snapmaker, Protocycler, Ultimaker, Lens Studio, Cuebase, Audacity and Fortnite Creativity).

Dr. Culhane worked with **Dr. Brooke Hansen**, **Dr. 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 allowed students during the COVID-19 Quarantine and Travel Restrictions to visit both the classroom and the field research sites in virtual reality.

Dr. 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 and Grind2Energy. He has worked on this with Mercy College, The Cleo Institute, and the USF community. He continues his research with Dr. Seneshaw Tsegaye at Florida Gulf Coast University.

Dr. Pradeep Haldar worked with the Hillsborough County Aviation Authority to provide hands-on projects to students in his Business Sustainability class during fall 2022 and spring 2023 to review their sustainability plans. The students were "consultants-in-training" and recommended action plans for Tampa International Airport, Tampa Executive Airport, Plant City Airport and Peter O. Knight Airport to reduce greenhouse gas emissions with energy efficiency measures, electrifying their fleet and converting to solar PV renewable energy technologies. Dr. Haldar was awarded the Excellence in Community Engagement Award from USF for the work done by the students.

Dr. Haldar and his students made field trips to get real world experiences of businesses implementing environmental, social, and governance; corporate social responsibility; and sustainability plans. The students visited Jabil, Publix, Raymond James, TD Synnex, and Tampa International Airport to get a tour of their facilities and interact with executives.

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 that can be acquired during the student's time at the College. Students are 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 Office of 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, and the local Environmental Protection Commissions, among others. The Student Development program also organizes training 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

Energy Commission (Ghana), Environmental and Gender Officer

Liberty University, Recycling Coordinator

City of Orlando, Sustainability Recycling Associate

Savan Group, Senior Consultant

U.S. Forest Service, Public Affairs Specialist

Florida Department of Environmental Protection, Environmental Consultant

City of Clearwater, Solid Waste Specialist

Tampa Electric, Manager of Business Planning

Green Business Bureau, Sustainability Program Manager

Hillsborough County, Recycling & Waste Reduction Specialist

Westcliff University, International Credentials Evaluator

CITY Furniture, Sr. Operations Manager

IFCO SYSTEMS, Lean-Six Sigma Specialist

Justice Green, Founder

Florida Power and Light Company, Environmental Specialist

City of Lakeland, Community Engagement Coordinator

Archon, Solar and Wind Generation

Global ETS, Inside Sales Manager

ASICS Oceania, Retail Sales Associate

GoDigitalChina, Sales Development Representative

GreenBiz Group, Conference Coordinator

Study Leave National Power Training Institute, Nigeria, Manager Finance Account

City of St. Cloud, Natural Resources Supervisor

Florida Department of Environmental Protection, Environmental Specialist

Ciccio Restaurant Group, Director of Sustainability and Social Impact

Dunedin Vegan Deli, Food Service Worker

Fair Share Farm LLC, Marketing and Sales Manager

Office of HRH Crown Prince Alexander, Serbia, General Manager

City of Satellite Beach, Sustainability & Resiliency Officer

MetaWatt Solar, Chief Executive Assistant

Road Scholar, Program Operations Coordinator

Feeding Tampa Bay, Grants Coordinator

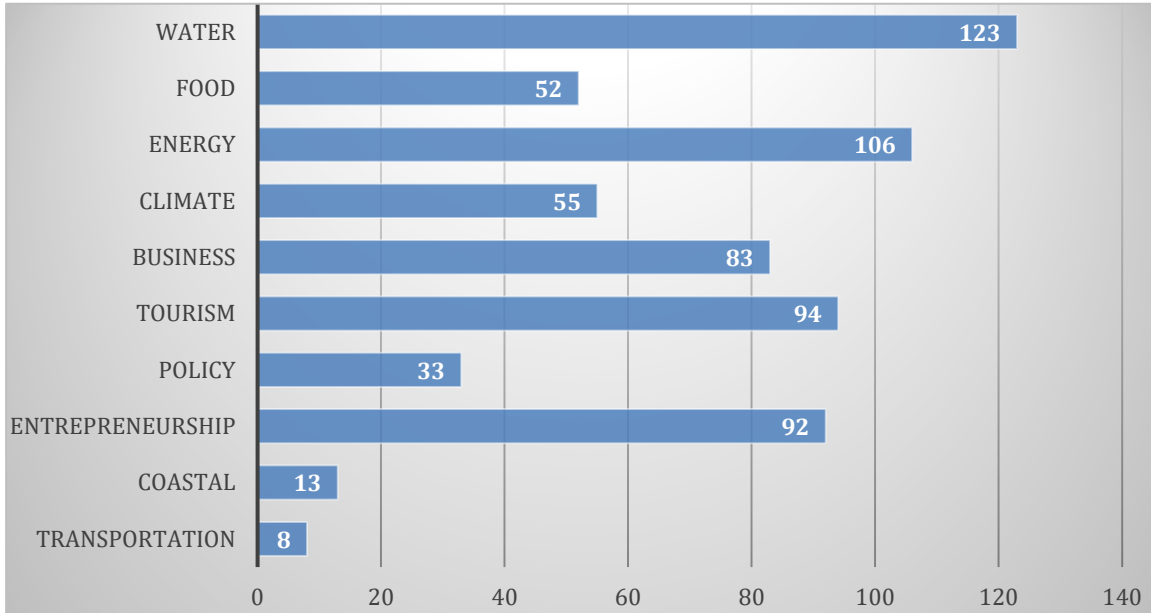
Moss & Mollusk Consulting, Associate Consultant

Whitwam Organics, LLC, Nursery Associate

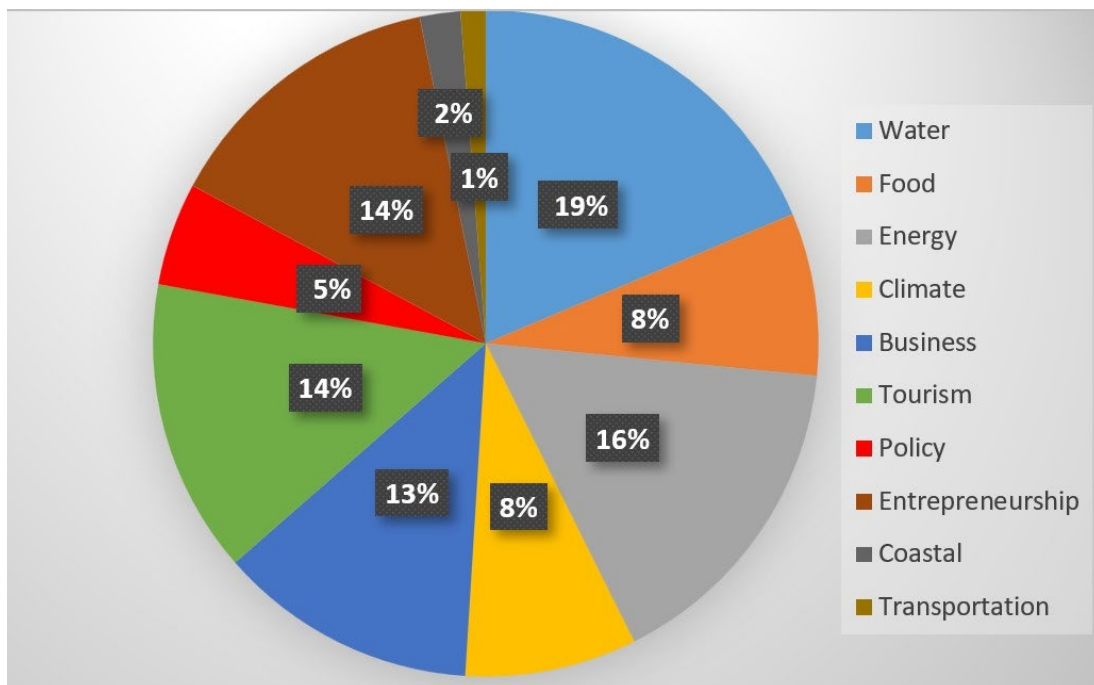
Mohawk Industries, Sustainability Manager

KnowBe4, Environmental Manager

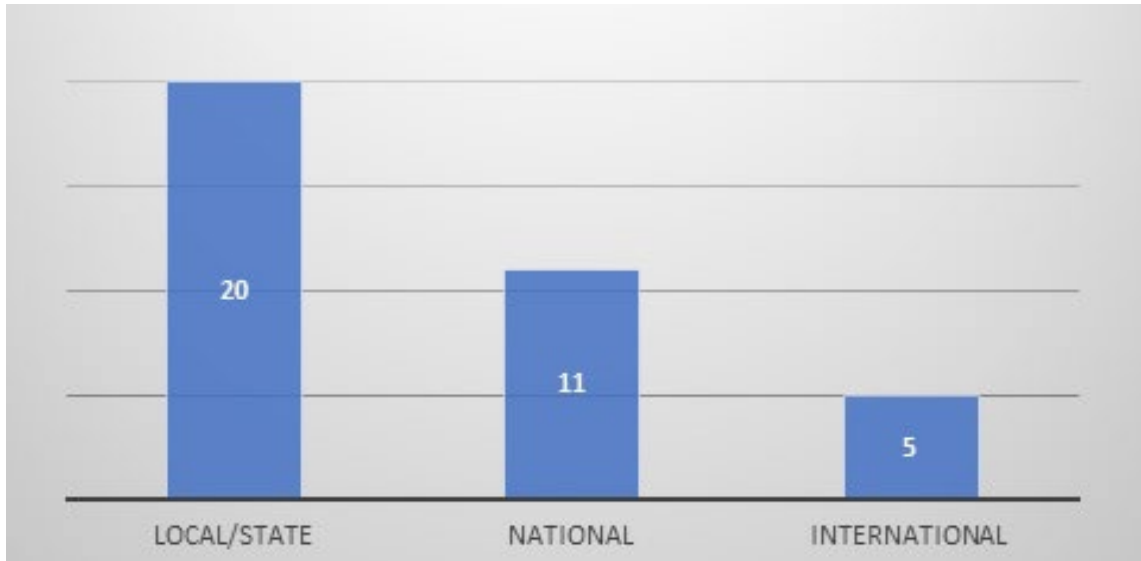
PCGS Graduate Numbers by Concentration (2012-2023)



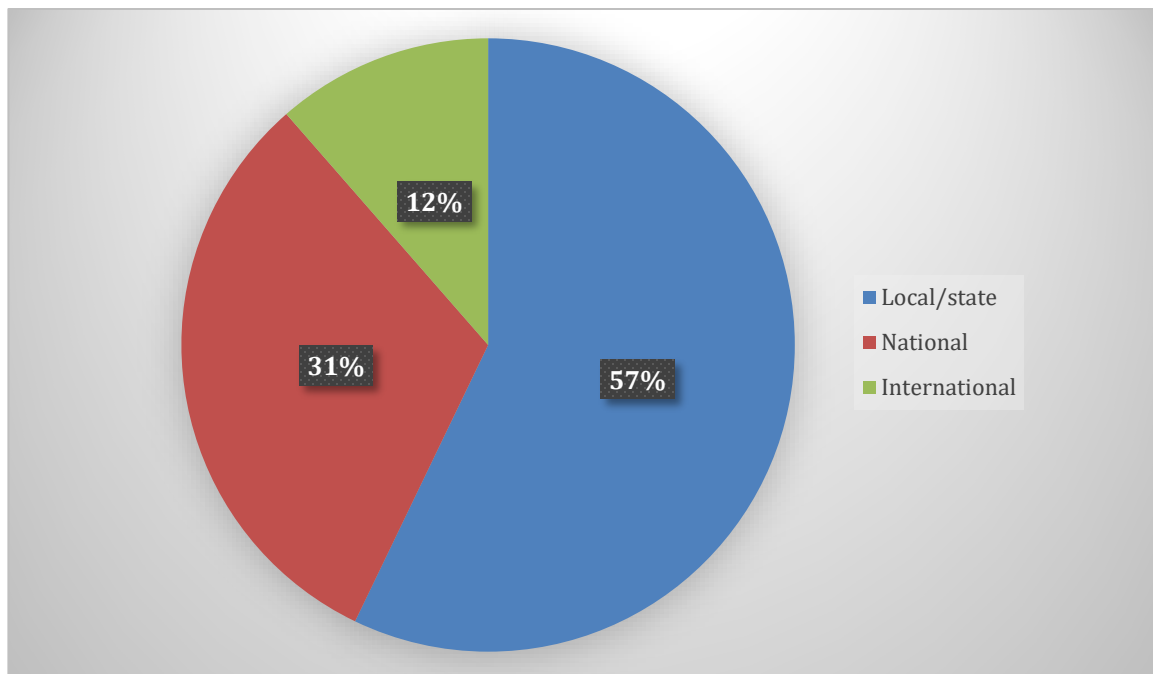
PCGS Graduate Percentages by Concentration (2012-2023)



**PCGS alumni hire numbers (2022):
Local, national and international positions**



**PCGS alumni hire percentages (2022):
Local, national and international positions**



OFFICE OF STUDENT DEVELOPMENT — SUSTAINABILITY SPEAKER SERIES

SUSTAINABILITY SPEAKERS SCHEDULE (Spring 2022)

February 9: US EPA, **Laura Stargel**

February 16: Environmental Defense Fund, **Ilissa Ocko**

February 23: Institute for Sustainable Communities, **Sonia Joshi**

March 2: Climate Adaptation Center, **Robert Buntin**

March 9: Plant-Based Lifestyle Movement, **Dr. Angela Reddy**

SUSTAINABILITY SPEAKERS SCHEDULE (SPRING 2023)

February 3: Tampa International Airport (HCAA), **Eric Caplan, Melissa Solberg and Sara Behnke**

February 10: EXP, **Amy Pastor**

March 1: USF, **John Kuhn**

March 8: NASA, **Nick Murdoch**

April 5: Citi, **Ave Medina**

April 11: Raymond James, **Bill Breckinridge, Joy Facos, Kristi Sutherland**

April 19: JLL, **Mital Hall**

April 26: City of Tampa, **Whit Remer**

FACULTY PUBLICATIONS

1. Pathak, Y.V., Parayil, G., and Patel, J.K. (2022), *Sustainable Nanotechnology: Strategies, Products, and Applications*, Hoboken, NJ: John Wiley & Sons (First Edition March 2022).
2. Puri, T., Pathak, Y., and 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. Arora, N., Lo, E., and Philippidis, G.P. (2022), “A two-prong mutagenesis and adaptive evolution strategy to enhance the temperature tolerance and productivity of *Nannochloropsis oculata*.” *Bioresource Technology* 364, 128101, <https://doi.org/10.1016/j.biortech.2022.128101>.
4. Arora, N., Lo, E., and Philippidis, G.P. (2022), “Dissecting Enhanced Carbohydrate and Pigment Productivity in Mutants of *Nannochloropsis oculata* Using Metabolomics and Lipidomics.” *Journal of Agricultural and Food Chemistry* 70, 8338-8350, <https://doi.org/10.1021/acs.jafc.2c02755>.
5. Lo, E., Arora, N., and Philippidis, G.P. (2022), “Physiological insights into enhanced lipid accumulation and temperature tolerance by *Tetraselmis suecica* ultraviolet mutants.” *Science of the Total Environment* 839, 156361, <https://doi.org/10.1016/j.scitotenv.2022.156361>.
6. Tsarpali, M., Martin, J., Kuhn, J., and Philippidis, G.P. (2022), “Valorization of *Brassica carinata* biomass through conversion to hydrolysate and hydrochar.” *Biomass Conversion and Biorefinery* 4, <https://doi.org/10.1007/s13399-022-02578-y>.
7. Tsarpali, M., Kuhn, J., and Philippidis, G.P. (2022), “Hydrothermal Carbonization of Residual Algal Biomass for Production of Hydrochar as a Biobased Metal Adsorbent.” *Sustainability* 14, 455, <https://doi.org/10.3390/su14010455>.
8. 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.
9. Ghebremichael, K., et al. (2022), “Laying the Groundwork for ‘Getting to Neutral’ in the State of Florida.” Florida Climate Institute.
10. Mompremier, R., Arturo Fuentes Mariles, O., Ghebremichael, K., Gómez Nuñez, J., and Ramírez Pérez, T. (2022), “Impact of Pipe Material on The Wall Reaction Coefficients and Its Application in the Rehabilitation of Water Supply System of San Pedro Nexapa.” *State of Mexico, Water Supply*, 22(4):4296-4306 <https://doi.org/10.2166/ws.2022.049>
11. Cannon, R.A., Mihelcic, J.R., Zhang, Q. and Ghebremichael, K. (2022), “Strategies to improve performance of community-managed water systems with system dynamics modeling.” *Journal of Environmental Engineering*, 148(2):1-14
12. Dorsey, J., and Davidove, M. (2023), “Breastfeeding: A Foundational Strategy to Strengthen Sustainability in Infant Nutrition and Development.” Chapter 17 in *Routledge Handbook of Sustainable Diets*. Kathleen Kevany and Paolo Prospero (Eds.), Routledge Press.

FACULTY PRESENTATIONS

13. Papapanagiotou, G., Samara, C., Arora, N., Lo, E., Philippidis, G.P., and Chatzidoukas, C (2022), “Generation of improved *Chrorella sorokiniana* UV mutants with enhanced lipid accumulation capacity,” AlgaEurope, Rome, Italy (Dec. 13).
14. 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).
15. Henderson, M., Ghebremichael, K., Ergas, S. and Elsayed, N.D. (2022), “Onsite Wastewater Reuse: Performance and Life Cycle Assessment of Hybrid Adsorption Biological Treatment Systems (HABiTS),” AAESP Conference, St Louis, Missouri (June 28-30).
16. Joshelyn, G., Ergas, S., Feldman, A. and Ghebremichael, K. (2022), “Modified biosand filters for fluoride removal: Research and engagement of secondary students and teachers,” AAESP Conference, St Louis, Missouri (June 28-30) (Presenter).



FACULTY GRANT AWARDS

1. Philippidis, G. P.I. January 2022. Bioprospecting of natural algicidal bacteria associated with harmful algal blooms to develop a sustainable mitigation strategy for red tides, funded by the Florida Fish & Wildlife Conservation Commission (FWC), \$110,000.
2. Hansen, B. Co-P.I. April 2022. USF Creative Scholarship Grant with Dr. Hariom Yadav and Dr. Christian Brechot. The USF Metropolitan Food Project: Forging Connections Between Microbiomes and Promoting Human & Planetary Health. \$9,930.
3. 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.
4. Dorsey, J. P.I. April 2022. I-Corps Site at USF, internal award received from USF Research & Innovation. \$3,000.
5. Haldar, P. (Co-PI) and Ghebremichael, K. (Co-PI) November 2022 Review of Life Cycle Analysis Comparing a Variety of Customer Shopping Bags, \$40,000 research funding from Publix Corporation.

**PATEL COLLEGE OF GLOBAL SUSTAINABILITY
FY2022-2023 FUNDING OVERVIEW**

<u>FUNDING SOURCES</u>	<u>TOTAL FY2022-2023 ALLOCATION/REVENUE</u>	<u>TOTAL FY2022-2023 PROJECTED EXPENSES</u>
E&G	\$ 1,175,094	\$ 1,175,094
Carryforward	59,743	27,945
Auxiliary	73,261	51,337
Research F&A	81,871	30,283
Contracts & Grants	207,634	144,401
Federal Work Study	31,500	25,892
Endowment Earnings and Gifts	899,432	442,057
	\$ 2,528,535	\$ 1,897,009

2022-2023 Allocation/Revenue

