PATEL COLLEGE OF GLOBAL SUSTAINABILITY

ANNUAL REPORT

2019 - 2020

UNIVERSITY of
SOUTH FLORIDA
Patel College of
Global Sustainability

2019 - 2020 ACADEMIC YEAR HIGHLIGHTS

- PCGS received a $4M donation for the College Endowment from Dr. Kiran Patel, which doubled the endowment of the College; the College will receive multi-million-dollar gifts from the estate plans of four generous friends of the College.

- Organized the First Global Sustainability Conference on the theme of “Circular Economy.”

- Increased student enrollment and enhanced student success indicated by strong graduate placements.

- Won a two-year competitive research grant from the Florida Department of Agriculture and Consumer Services on large scale algae development.

- Won a two-year education grant from the Coca-Cola Foundation to educate K-12 teachers in sustainability in partnership with the Stavros Center of USF’s College of Education.

- Won a Phase I Small Business Innovation Research (SBIR) grant from the US Department of Agriculture in partnership with industry,

- Received NSF-IRES grant for research activities in Ghana.

- Received a grant from Joy McCann Foundation for research activities at USF and Hillsborough County public schools.

- College sponsored two sustainability certification workshops, which will enhance career readiness of PCGS graduates.

- Published several peer reviewed articles.

- Co-hosted two conferences.

- Executed two projects on sustainability with the City of Dunedin (carbon footprint, solar).
- Graduated second Coverdell Fellow; Appointed new Coverdell Fellows. Faculty member received Fulbright Specialist Scholarship.
- Two faculty members received USF's Outstanding Faculty Award 2019.
- Faculty member elected senior member of the National Academy of Inventors (NAI)
- Hired two Postdoctoral Scholars and two Adjunct/Affiliated Faculty.
- Established new graduate concentration in Sustainability Policy.
- Hosted faculty from Tunghai University (Taiwan) on a 6-month sabbatical.
- Signed collaboration agreements with foreign universities in Taiwan, Japan and Turkey.
- Created a new United Nations Sustainable Development Goals partnership in January 2020 with the establishment of the USF SDG Action Alliance.

DEAN'S MESSAGE

With mixed feelings I present the 2019–2020 Annual Report for the Patel College of Global Sustainability (PCGS). Despite the challenges posed by the Covid–19 pandemic on our academic activities since the middle of the Spring term, the 2019–2020 Academic Year was an important period for PCGS's growth trajectory in terms of student enrollment, student success and faculty achievements. The College has made great progress in becoming a truly interdisciplinary degree–granting College of the University of South Florida since its establishment in 2014. PCGS made great strides in meeting and exceeding the strategic goals set for the College. We saw remarkable increase in competitive external funding for research and in student enrollment numbers, and doubling of its endowment fund. One of the most important achievements for the College was organizing and hosting our first Global Sustainability Conference in October 2019. We received enthusiastic support from several industries and local governments. The conference theme, "Circular Economy" for building a sustainable future was very much in line with the core mission of the College. 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 in the State of Florida, the United States, and elsewhere in the world.

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

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

The College co-hosted two conferences and the College faculty and students worked on several projects involving community partners. The College is in the process of implementing the recommendations of the External Evaluation Report submitted in the Spring of 2018, especially in the area of curriculum enhancement, but we were unable to implement the recommendations due to the moratorium on curriculum changes imposed due to the ongoing USF campus consolidation process. We expect to resume curriculum changes starting in the Fall of 2020 when USF becomes one university geographically located in Tampa, St. Petersburg and Sarasota.

Shortly after receiving a $4 million gift from Dr. Kiran Patel to the PCGS Endowment Fund, which doubled his previous donation and the PCGS Endowment Fund, we signed agreements for a multi-million-dollar promised gift from the estate of Don & Penny Butz, as well as a $50,000 gift for student scholarships from the estate of Amy & Michael Drake. Agreements for these gifts were signed by the concerned parties in 2019.

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

Govindan Parayil, Ph.D.
Dean and Professor

ESTABLISHMENT & BRIEF HISTORY

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

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

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

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

MISSION, VISION, VALUES & GOALS

MISSION

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

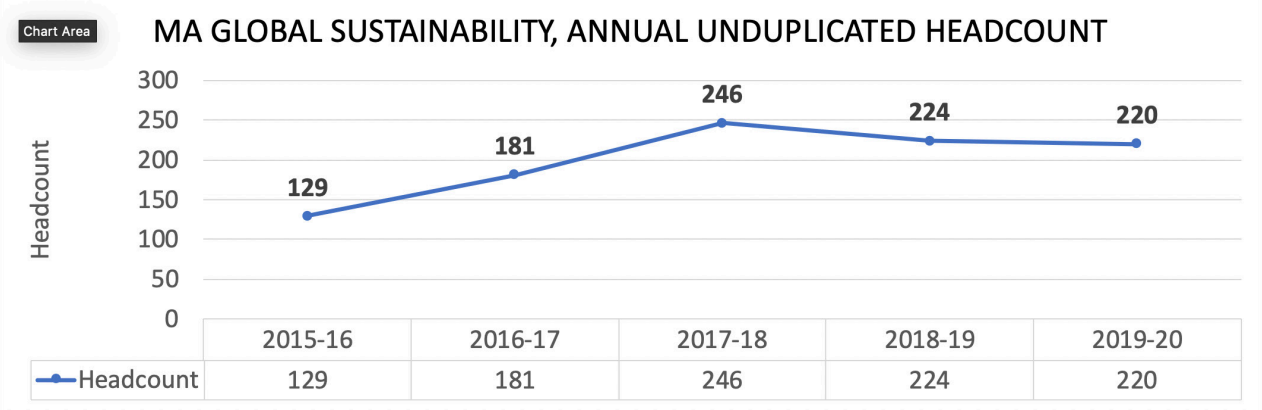
VISION

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

ADMISSION & GRADUATION

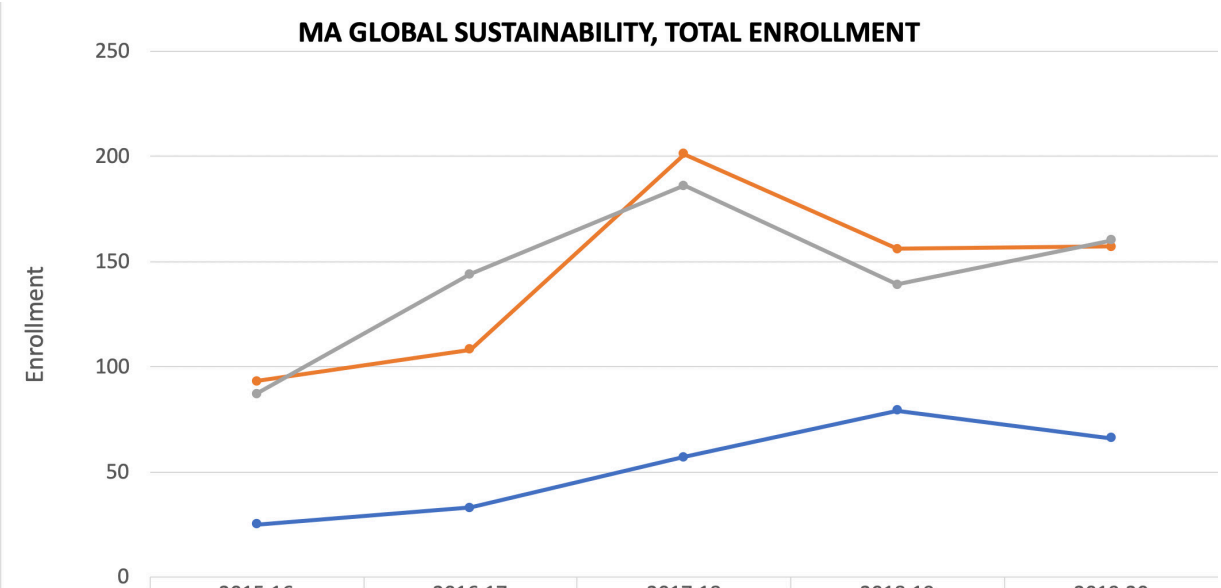
PCGS plans to maintain the MA student enrollment in the range of 150-200 graduate students until we can successfully support larger enrollment by simultaneously increasing the number of our faculty and support staff. Enrollments have matched and exceeded capacity over the last three recruitment and admission cycles in Fall and Spring intake semesters.

Despite the uncertainty of global enrollment projections due to the covid-19 pandemic, especially with international enrollments, our projected total enrollment for 2020-2021 is consistent with current enrollment trends over the last three years. PCGS continues to produce desired SCH, an impressive time to graduation, and continues to provide opportunities for new instructors, GAs and support staff during the summer instructional period. The figures below indicate five years of student enrollment numbers at PCGS.

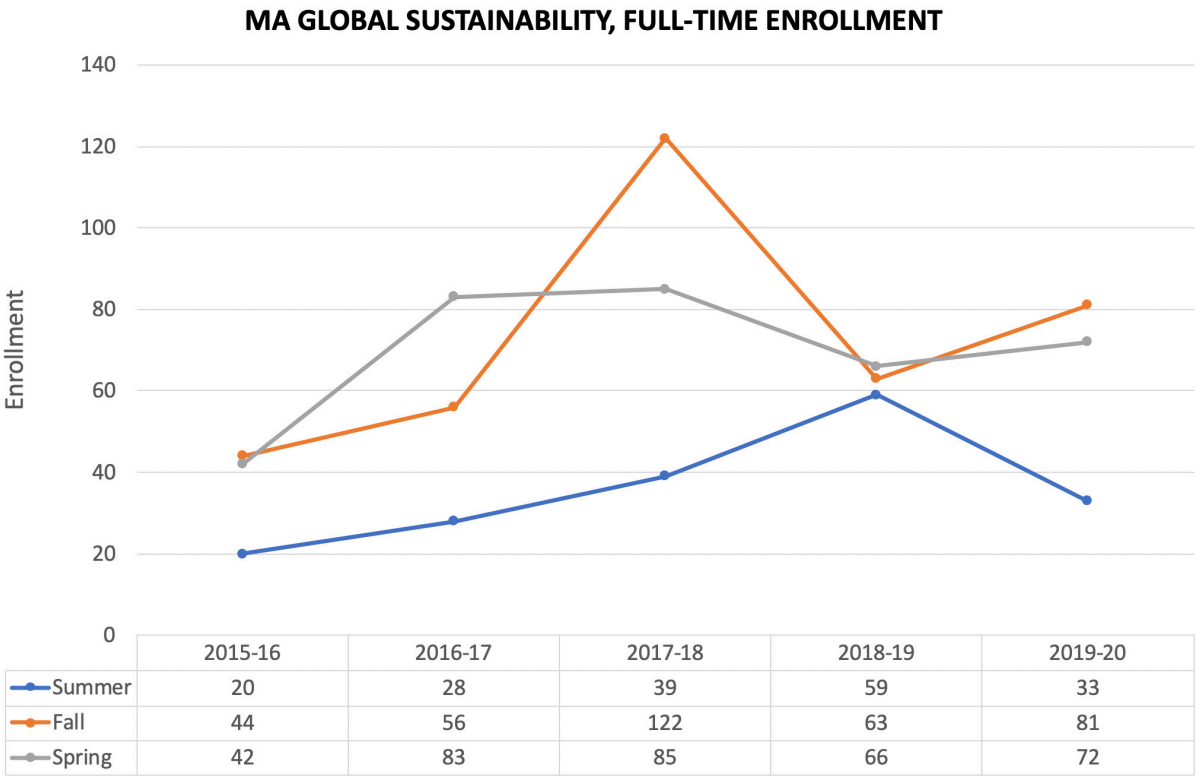


	2015-16	2016-17	2017-18	2018-19	2019-20
Headcount	129	181	246	224	220

(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)

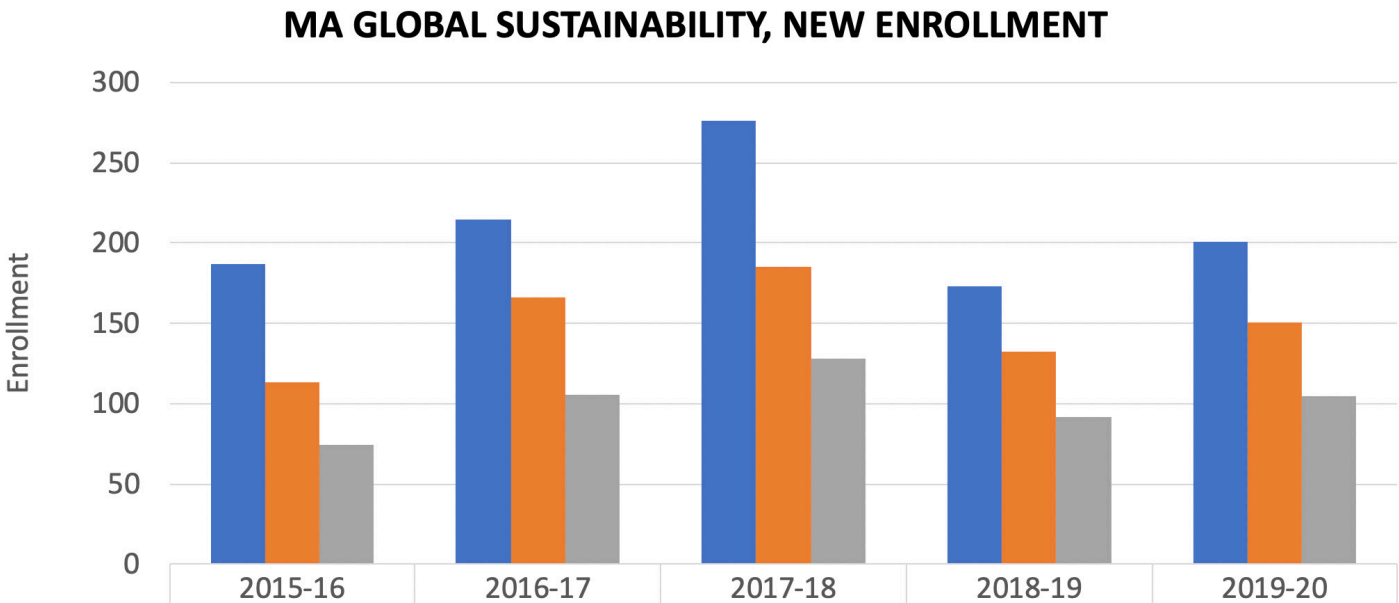


	2015-16	2016-17	2017-18	2018-19	2019-20
Summer	25	33	57	79	66
Fall	93	108	201	156	157
Spring	87	144	186	139	160



	2015-16	2016-17	2017-18	2018-19	2019-20
Summer	20	28	39	59	33
Fall	44	56	122	63	81
Spring	42	83	85	66	72

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

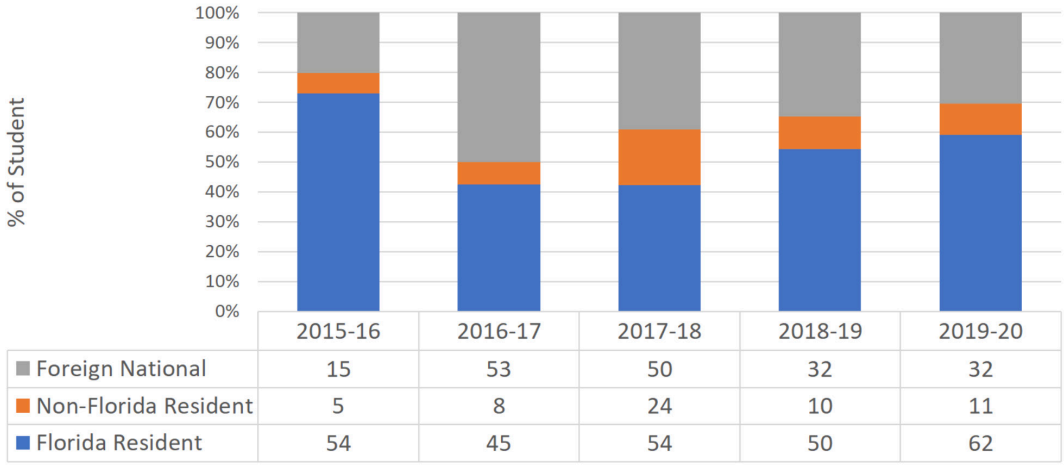


	2015-16	2016-17	2017-18	2018-19	2019-20
Applied	187	215	276	173	201
Accepted	113	166	185	132	151
Enrolled	74	106	128	92	105

	2015-16	2016-17	2017-18	2018-19	2019-20
ENROLLED	**74**	**106**	**128**	**92**	**105**
GENERAL (UNDECLARED)	4	19	28	20	35
WATER SUSTAINABILITY	15	9	7	3	9
ENTREPRENEURSHIP	15	19	18	12	4
SUSTAINABLE TOURISM	19	13	15	12	13
SUSTAINABLE ENERGY	20	18	12	8	8
COASTAL SUSTAINABILITY (CANCELLED 2018)	1	5	9	1	0
SUSTAINABLE BUSINESS		15	9	17	16
SUSTAINABLE TRANSPORTATION		1	4	1	0
CLIMATE CHANGE & SUSTAINABILITY		1	10	8	14
FOOD SUSTAINABILITY & SECURITY		6	16	7	6
SUSTAINABILITY POLICY				3	5

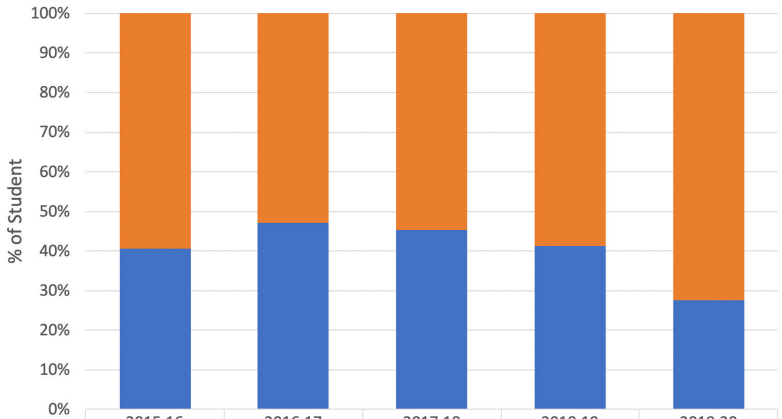
The below figure illustrates residency and enrollment trends over the last five years for new students at PCGS. A significant percentage of non-resident and especially international students enroll, currently over 40% of our new student enrollment. International student enrollment the last five years has been as high as 50% of our new student body (16-17), and is currently averaging around 30%.

MA GLOBAL SUSTAINABILITY, NEW ENROLLMENT RESIDENCY



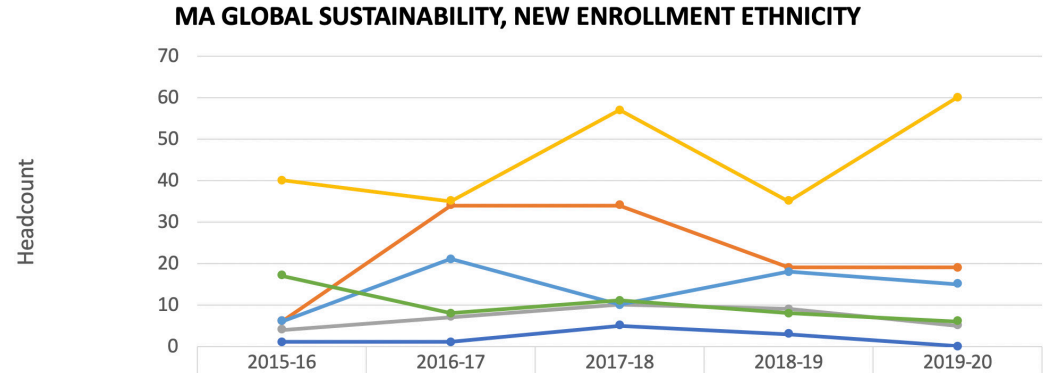
	2015-16	2016-17	2017-18	2018-19	2019-20
Foreign National	15	53	50	32	32
Non-Florida Resident	5	8	24	10	11
Florida Resident	54	45	54	50	62

MA GLOBAL SUSTAINABILITY, NEW ENROLLMENT GENDER



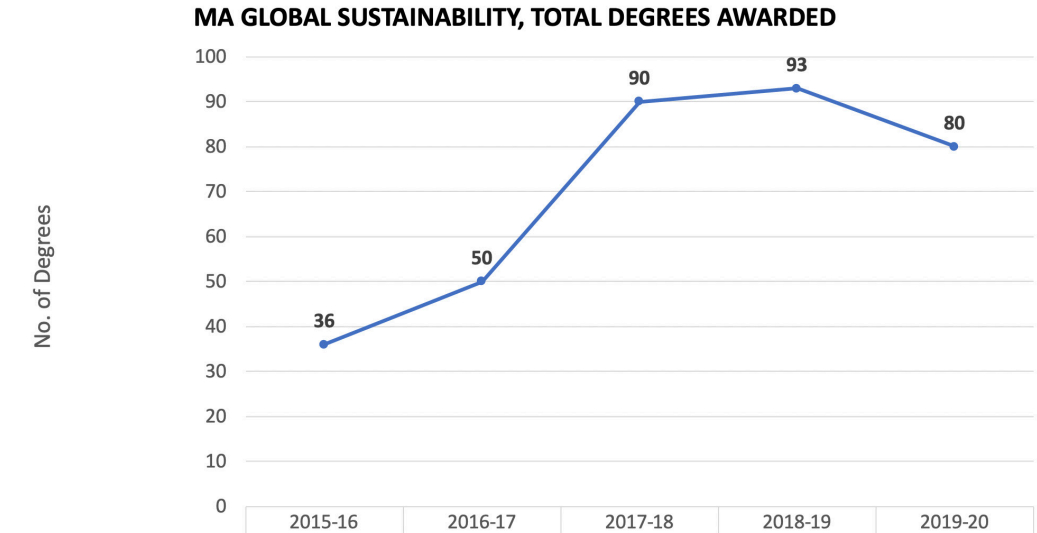
	2015-16	2016-17	2017-18	2018-19	2019-20
Female	44	56	70	54	76
Male	30	50	58	38	29

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



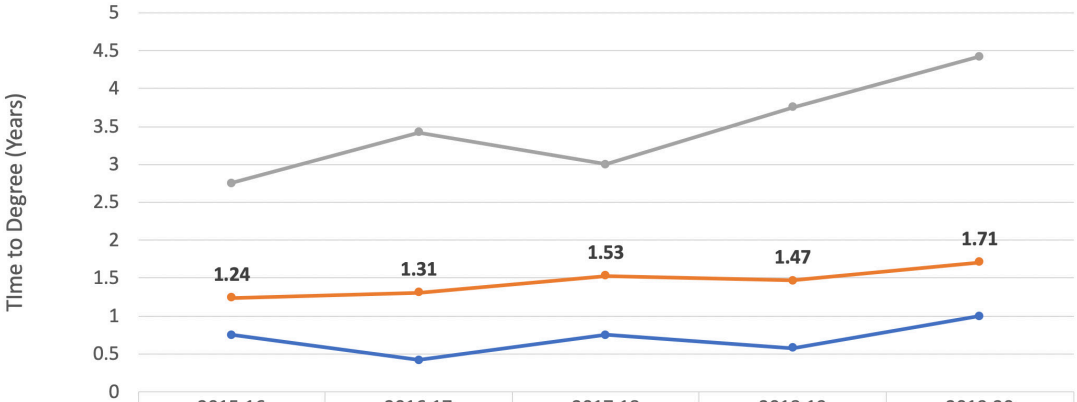
	2015-16	2016-17	2017-18	2018-19	2019-20
American Indian	1	1	5	3	0
Asian	6	34	34	19	19
Black	4	7	10	9	5
White	40	35	57	35	60
Unknown	6	21	10	18	15
Hispanic	17	8	11	8	6

The below figures illustrate the degrees awarded trends the last five years as the program has also grown in admissions and enrollment. The largest enrollment for an academic year was in 2017-2018, degrees subsequently awarded in 2018-2019 were the most ever due to the mean time to degree completion.



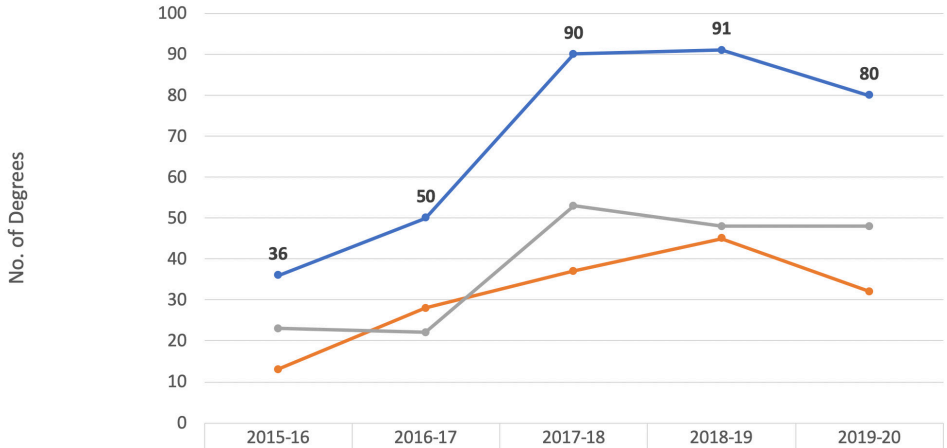
	2015-16	2016-17	2017-18	2018-19	2019-20
Total degrees awarded	36	50	90	93	80

MA GLOBAL SUSTAINABILITY, TIME TO DEGREE TRENDS



	2015-16	2016-17	2017-18	2018-19	2019-20
Minimum	0.75	0.42	0.75	0.58	1
Mean	1.24	1.31	1.53	1.47	1.71
Maximum	2.75	3.42	3	3.75	4.42

MA GLOBAL SUSTAINABILITY, DEGREES AWARDED - GENDER



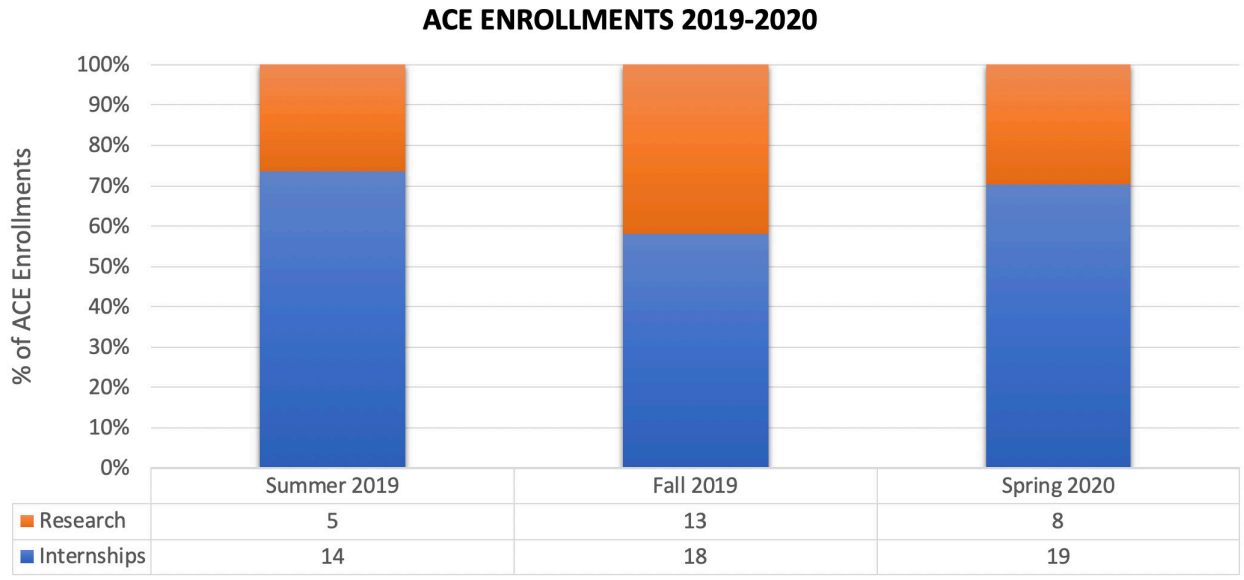
	2015-16	2016-17	2017-18	2018-19	2019-20
Total degrees awarded	36	50	90	91	80
Male	13	28	37	45	32
Female	23	22	53	48	48

INTERNSHIP / RESEARCH PROJECTS

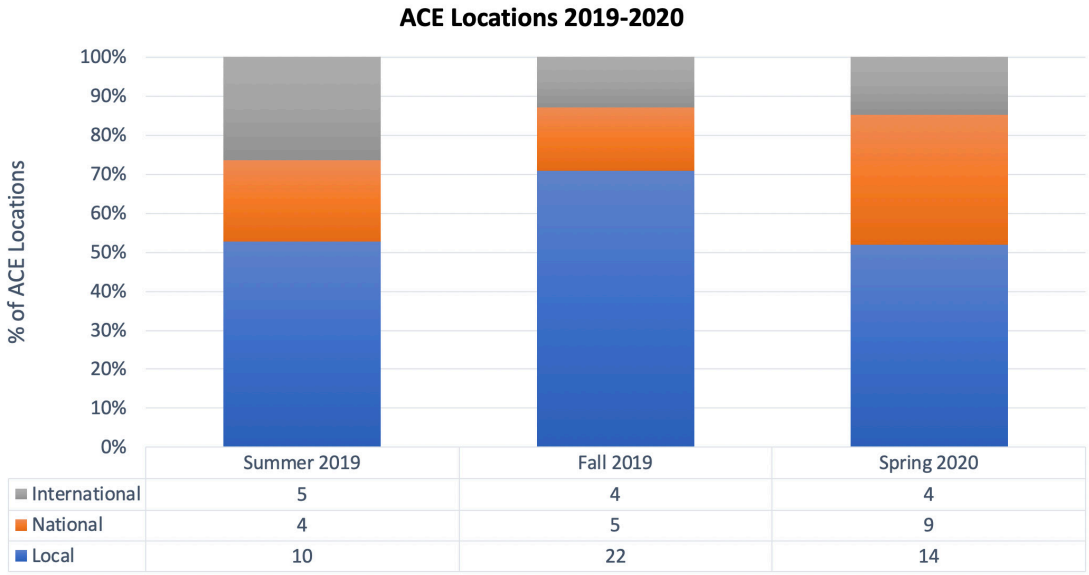
All graduate students are required to complete 3 to 6 credit hours of internship or research project as part of their graduation requirement. Our students conduct their internships at many exciting places across the globe. The Patel College of Global Sustainability internship program allows students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

This academic capstone experience or ACE program is typically completed the semester before the student graduates. This can be completed during spring, summer or fall.

Below is a summary of students who completed their final projects within the academic year of 2019-2020. 60-75% of students elected to complete the project as an internship project, leading to the conclusion that hands-on experience is usually preferred.



The following graph summarizes projects undertaken locally within Florida, nationally, and internationally during the 2019-2020 academic year. 50-70% elected to work with local partners, while the remaining 30-50% completed national/ international projects.



TEACHING & RESEARCH

EDUCATIONAL PROGRAMS

MASTER OF ARTS PROGRAM

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

GRADUATE DEGREE CONCENTRATIONS

CLIMATE CHANGE AND SUSTAINABILITY

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

FOOD SUSTAINABILITY & SECURITY

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

SUSTAINABILITY POLICY

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

SUSTAINABLE BUSINESS

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

SUSTAINABLE ENERGY

The Sustainable Energy Concentration uses expert knowledge and real-world expertise to prepare students for the growing field of renewable energy, which is expected to increase dramatically over the next decades, as the U.S. and other countries seek to become energy independent by increasingly switching to renewable fuels and power. Students will be prepared for private and public sector positions of leadership and responsibility in the biofuels, solar, wind, biomass, and other renewable energy sectors. The concentration is designed for students from a wide range of backgrounds.

SUSTAINABLE TOURISM

The Global Sustainability concentration in tourism enables students to learn knowledge and skills, as well as obtain personal experience in the field of sustainable tourism. Tourism is one of the largest industries in the world, accounting for 9% of the world GDP and 10.5% of the world's workforce. Tourism is also the fastest growing industry in the world and the ecotourism/ sustainable tourism sector is the fastest growing sector in the tourism industry. Taking advantage of the Florida environment, the concentration focuses, specifically, on coastal habitat and marine environmental issues related to tourism. The program also educates students in the concepts of the Global Sustainable Tourism Council Criteria, key certifications for sustainable tourism and ecotourism, and provides many experiential learning opportunities, including, but not limited to, tourism-centered municipalities, non-profit sustainable tourism organizations, aquariums, and major destination marketing organizations such as Visit Florida and Visit Tampa Bay. The first cohort of students completed Ocean Friendly Certification Training in the fall of 2019 so they can be auditors for the Ocean Allies certification program.

SUSTAINABLE TRANSPORTATION

The Global Sustainability concentration in Sustainable Transportation teaches methods for achieving a more sustainable transportation system and how that system fits into efforts to improve community design and the livability of urban areas. The predominant focus on automobile transportation has led to a variety of consequences that are less than sustainable such as urban sprawl, rising rates of obesity, growth in greenhouse gas emissions, habitat degradation, dependence on fossil fuels, and equity concerns. Student take concentration core courses offered by the College of Engineering.

WATER SUSTAINABILITY

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

ENTREPRENEURSHIP

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

I. GRADUATE CERTIFICATES

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

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

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

CLIMATE CHANGE

The concentration/certificate program is intended to prepare students to address complex regional, national and global challenges associated with climate change adaptation and resilience. This concentration/certificate program is unique as the curriculum is fully integrated to provide a systems perspective for learning and the development of an analytical perspective that will focus specifically on climate change, climate vulnerability, adaptive capacity and pathways of climate adaptation/resilience.
The target student audience can come from a diverse array of backgrounds and career interests as the concentration/certificate program provides a sustainability framework to be used as a foundation for any career. The primary goal of the concentration/certificate program is to foster sustainability principles and critical thinking, equipping any student with the tools needed to enact sustainable change.

ENERGY SUSTAINABILITY

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

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

FOOD SUSTAINABILITY

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

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

GLOBAL SUSTAINABILITY

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

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

SUSTAINABLE BUSINESS

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

SUSTAINABLE TOURISM

Tourism is one of the largest industries in the world, accounting for 9% of the world GDP and 10.5% of the world's workforce. Tourism is also the fastest growing industry in the world and the ecotourism/ sustainable tourism sector is the fastest growing sector in the tourism industry. The goal of this certificate program is to provide students with the knowledge, skills and tools to develop sustainable tourism programs that meet Global Sustainable Tourism Criteria.

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

SUSTAINABLE TRANSPORTATION

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

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

WATER SUSTAINABILITY

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

II. INTERDISCIPLINARY RESEARCH AT PCGS

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

KEY RESEARCH AREAS

- Renewable energy, fuels and products
- Global climate change and the associated uncertainties
- Urban water – integrated urban water management, appropriate and low cost technologies
- Sustainable Tourism – practical training in conducting sustainable tourism certifications, climate change risk assessments to the tourism industry, and business sector analyses of the impact of tourism locally and around the globe.
- Elimination of "wastes" through nexus thinking and circular economy best practices.
- Nano-technology and sustainable manufacturing.

FOCUS AREAS

ALGAE TECHNOLOGY

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

OUR EFFORTS ARE FOCUSED ON:

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

BIOFUELS AND BIOPRODUCTS FROM BIOMASS

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

We test and optimize the conversion of various biomass species, such as sweet sorghum and sugarcane bagasse, to sugars in scalable and cost- effective ways through biochemical conversion. First, biomass is pretreated using mild conditions and green chemistry principles. Then, cellulase enzymes are employed to convert cellulose to simple sugars. Those sugars can form the basis of a sustainable green economy, as they are readily convertible via fermentation to a variety of chemical precursors, such as organic acids for the manufacture of biofuels, plastics, resins, and other renewable products. In essence, biomass can replace oil as the source of chemicals essential for consumer products.

BIODIESEL AND JET BIOFUEL

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

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

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

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

FOCUS AREAS

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

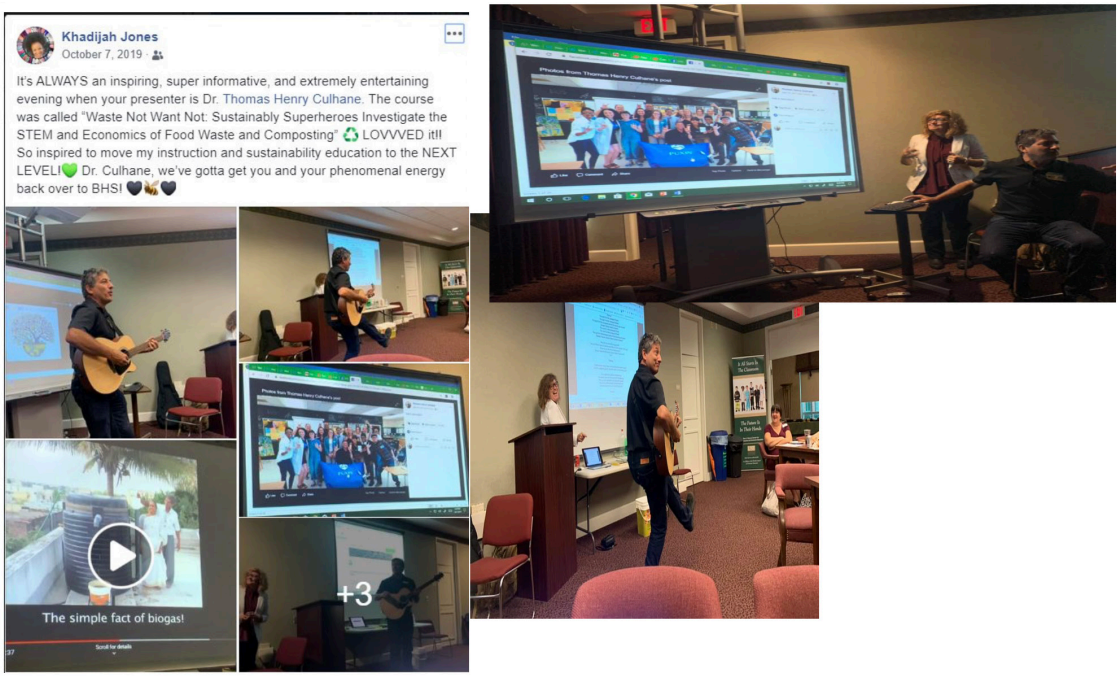
FUNDERS: Fat Beet Farm/Nobel Crust Restaurants (Curci Family), Rosebud Continuum Sustainbility Education Center/Bishop Construction Company (Bishop family), and Florida Gulf Coast University.

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

ONGOING AND PLANNED ACTIVITIES

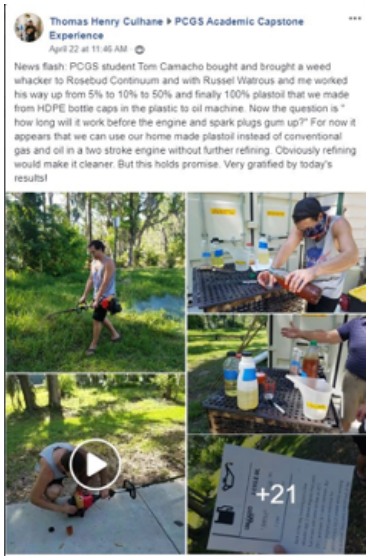
Dr. T.H. Culhane and Patel College students and graduates, working with Cengage Learning/National Geographic Learning and the Stavros Center for Economic Education and the Coca Cola Foundation visit schools and communities around the world to train teachers and students on how to "Be the Nexus" and become "Sustainability Superheroes", through systems thinking, biomimicry and construction of low cost food-energy-water and zero waste systems and the creation of STEM/STEAM sustainability curricula and hands-on activities.

Dr. T.H. Culhane and Patel College students and graduates, working with Cengage Learning/National Geographic Learning and the Stavros Center for Economic Education and the Coca Cola Foundation visit schools and communities around the world to train teachers and students on how to "Be the Nexus" and become "Sustainability Superheroes", through systems thinking, biomimicry and construction of low cost food-energy-water and zero waste systems and the creation of STEM/STEAM sustainability curricula and hands-on activities that blend creativity, music and the arts to enhance science content delivery at the top levels of Bloom's Taxonomy.

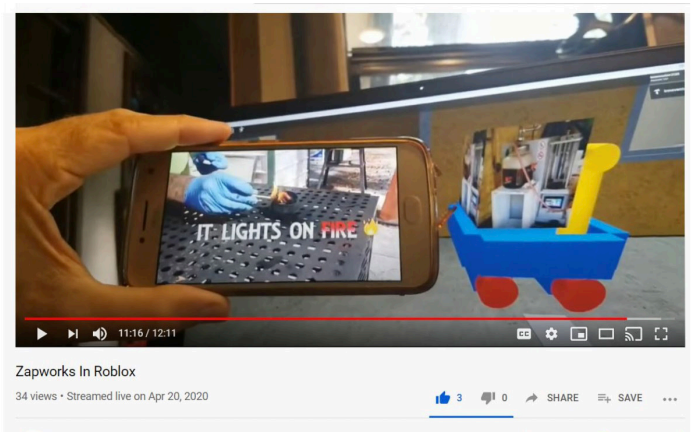


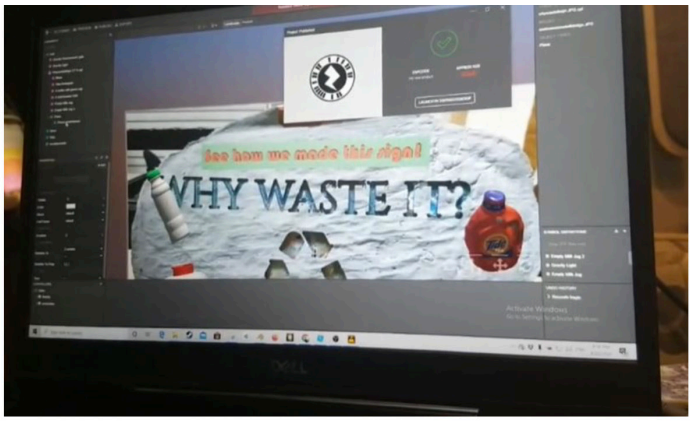
"Upcycling " of household plastic wastes into valuable products

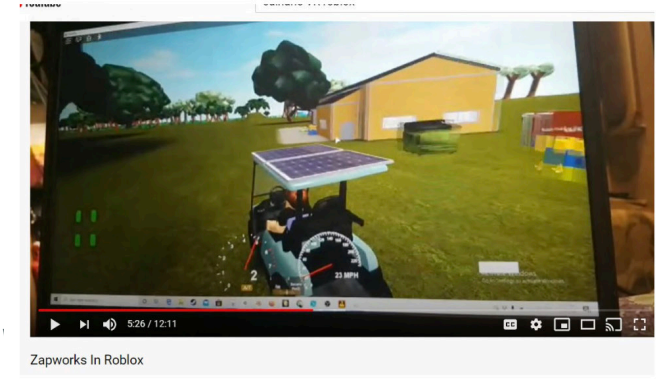
Dr. T.H. Culhane and Dr. Brooke Hansen have been working with Patel students Tom Camacho and Folorunso Tosin Esther on a "Zero-Waste Community Based Plastics Recycling" Initiative, turning HDPE, LDPE, Polystyrene and Polypropylene plastic wastes into a reliable fuel for running garden and lawn equipment and transforming bottle caps and platic bags into durable weatherproof educational signage for the Rosebud Continuum Sustainability Education Center. They are also working on 3D printing using recycled plastics. The US Embassy donated the $13,000 Japanese BLEST plastic-to-oil machine to Culhane's research and the Bishop family has supplied the field laboratory, the convection oven and the $2,500 X-Carve Robotic CNC sign making machine, while PCGS supplied the $5000 Ultimaker S5 3D printer.



T.H. Culhane has been working with Brooke Hansen, Joseph Dorsey and Dr. Laura Harrison and with USF Innovative Education to create interactive 3D models of the Patel College and Rosebud Continuum and to produce VR/AR content that allows students during the Covid-19 Quarantine and Travel Restrictions to visit both the classroom and the field research sites in virtual reality and then trigger video content, 3d models and text annotations using a cell phone or tablet. Some of the technologies ($60 per month Zapworks Studio/Zappar licenses) are supplied by USF Innovative Education so that PCGS students and faculty can create embedded digital engagement content.







FUNDER: National Science Foundation

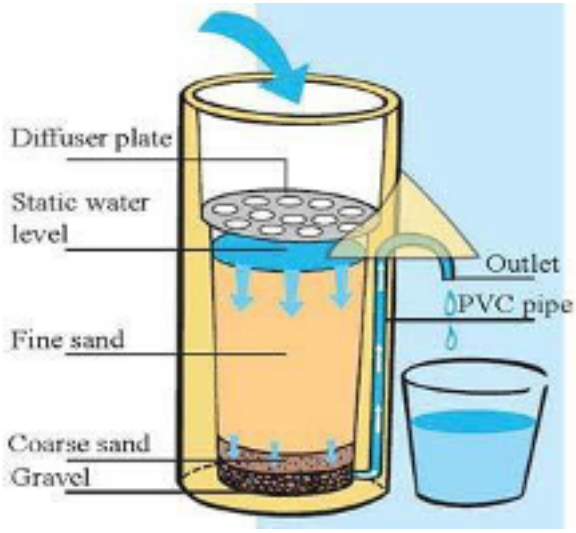
GOAL: This project engages USF faculty and US- based students to conduct WASH research in partnership with faculty, student and communities in Ghana. The project includes research activities in water treatment, sanitation, community engagement and micro financing. USF faculty and students work with faculty 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.

ONGOING AND PLANNED ACTIVITIES

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

Appropriate technologies for water and wastewater treatment

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



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

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

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

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

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

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

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

COMMUNITY ENGAGEMENT & OTHER ACTIVITIES

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

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

Heather Rothrock helped to implement the "Single Use Plastics Campaign" in St. Petersburg, FL. Majority of her work entailed organizing volunteers to educate citizens and local businesses whom the ban would affect. City council successfully passed the ban in December 2018, and ongoing work continues to reach out to local businesses to help them become compliant by 2020.

T.H. Culhane and Heather Rothrock worked on the establishment of a Conservation Trust for the Lake Earle property located in Dunedin, FL, which is owned by Dr. Sylvia Earle.

T.H. Culhane and Brooke Hansen are on the USF Digital Task Force for improving on-line curricula and engagement and equity during the Covid-19 crisis.

T.H. Culhane continues working with the USF Student Green Energy fund and Food Waste Coalition to monitor and do continuing reasearch on the six cubic meters of anaerobic digestion and storage they created at USF facilities using Culhane's Solar CITIES low-cost IBC tank designs. He also continues making presentations and holding Workshops for the "Sustainability Superheroes" Science Teacher's Education Community Engagement through Stavros Center for Economic Education.

Internationally, prior to the recent Covid-19 travel restrictions, **T.H. Culhane** continued to do his annual follow up with Faculty from University of Essen, Germany regarding Permaculture Education Exhibits at Bonnekamphohe Community Sustainability Field Location (October 2019), and over the Winter Break, 2019/2020 continued bi-annual Middle East project site assessments and follow up at Wadi Al-Shabab Permaculture Peace Center, in Jordan, fixing biodigesters he built there in 2017, engaged in renewable energy consultation and solar hot water system repair in Bruqin village, Palestine where his wife is from, held meetings with Renewable Energy and Community Development faculty/colleagues at the American University in Cairo and made Sustainable Tourism site visits, doing video and photographic documentation, and coral reef health assessment, in El Gouna, Red Sea, Egypt.

For the second year, **Dr. Hansen** organized a booth display at the Florida State Fair, Feb. 6-17 with the USF student club GLOBE (Oluwatosin Folorunso, PCGS student and President of GLOBE, pictured here setting up a kids' activity area for the booth). A variety of sustainability exhibits were included from upcycling fabrics and plastic bottles to promoting Ocean Friendly certifications and eliminating single use plastics. The exhibit featured a sustainability pledge tree and two biodigester models, a Home Biogas unit and one constructed by PCGS student Sarah Long. The biodigesters drew a lot of interest and gave our students practice in interacting with the public and discussing the work they are doing at PCGS. The USF SDG Action Alliance supplied informational materials on how to use the Sustainable Development Goals to impact climate change.

Sustainable Tourism Program Becomes a CREST Academic Affiliate: In December 2019, the PCGS Sustainable Tourism concentration became an official member of the Center for Responsible Travel's Academic Affiliate Program. The relationship was developed by Cassie McCabe ('19) who did her internship at the organization in Washington, DC, during the fall of 2019. Dr. Brooke Hansen then registered the Sustainable Tourism program with CREST and participated in the first national meeting in early January. The focus for the affiliates for 2020 will be on climate change, culminating in a summit for World Tourism Day Sept. 27, 2020. Dr. Hansen will be leading a multiregional research and grant writing team to look at coastal vulnerabilities, adaptation, and resilience. https://www.responsibletravel.org/whoWeAre/academicAffiliations.php

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

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

STUDENT DEVELOPMENT

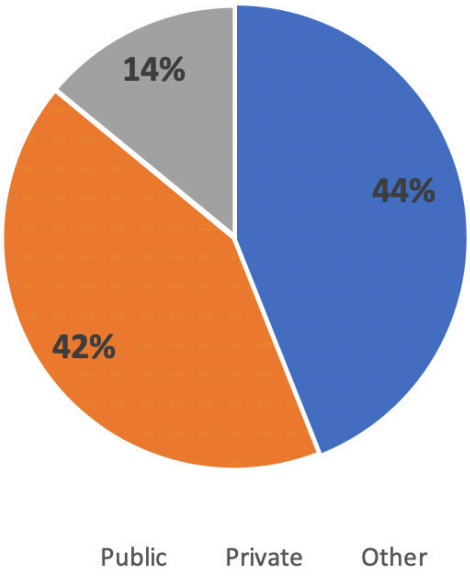
The Patel College of Global Sustainability maintains an Office of Student Development which offers student development advising to all students and alumni to assist them in preparing for careers in the sustainability field. These personalized advising sessions include crafting Student Action Plans, which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

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

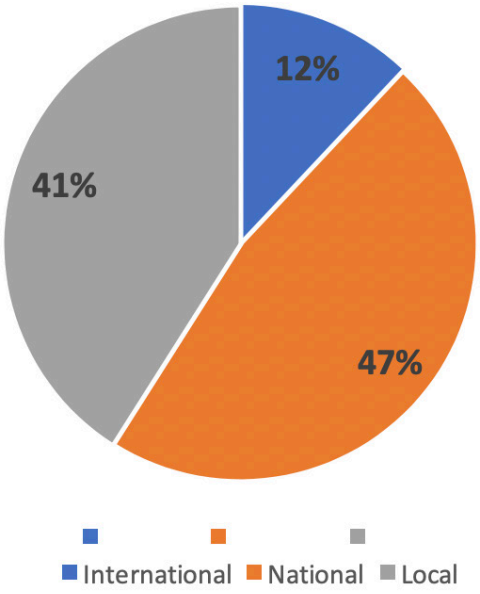
RECENT ALUMNI HIRES

Global Sustainability Director, Pall Corporation
LEED Facility Evaluator, Epsten Group
Course Operations Coordinator, McKinsey & Company
Associate Project Manager, Italian Trade Agency
Project Strategic Engagement Coordinator, Orange County Environmental Protection Division
Sustainability Manager, Coca-Cola Beverages of Florida
Hydrologist, Southwest Florida Water Management District
Energy Specialist, Cynergistic
Founder/CEO Biogas Consulting
Global Environmental Health and Safety Expert, Jabil Senior Project Scientist,Stantec
Energy Field Specialist, Tesla Sustainability Officer, City of Oldsmar, FL Environmental Project Manager, HDR, Florida
Recycling and Sustainability Manager, Leon County, FL
Energy Analyst, Sonoma State University, Sonoma, CA
Sustainability Manager, City of Fort Lauderdale, FL
Environmental Consultant, Handex Consulting & Remediation, LLC
Senior Energy Analyst, Booz-AllenHamilton
Sustainability Project Coordinator, SoMax Environmental Services
Regional Coordinator, National Oceanic and Atmospheric Administration (NOAA)

Employment Sectors



Employment Locations



OFFICE OF STUDENT DEVELOPMENT- SUSTAINABILITY SPEAKER SERIES

SUSTAINABILITY SPEAKERS SCHEDULE (FALL 2019)

TJ King - First Vice- President, Raymond James Financial
Jared Meyers - Co-Founder, Florida For Good
CJ Davila - Executive Director, Florida Green Building Coalition
US Congressional Rep. Kathy Castor - Chair, House select Committee on the Climate Crisis
David Townsend - Senior Consultant, Renewable Energy, Booz Allen (PCGS Class of 2016)David Mesa - Founder, Environmental Origins Colombia (PCGS Class of 2014)

SUSTAINABILITY SPEAKERS SCHEDULE (SPRING 2020)

Debbie Caneen - Founder, Circle Pond Tiny Home Community
Michael Kuras Designs- Michael Kuras President, (PCGS Class of 2015)
Tessa Schreiner, PCGS Alum - Sustainability Manager, Leon County Florida
Dr. John Swanson - The Greening of the Grid

Susan Glickman - Florida Director, Southern Alliance for Clean Energy

GLOBAL CIRCULAR ECONOMY CONFERENCE

The College organized the First Global Sustainability Conference on the "Circular Economy" in October 2019 at the Patel Center. The two-day conference brought renowned global sustainability thought leaders from corporations, academia and non-profit sectors to discuss and share innovative ideas being taken to counter the unsustainable, linear "take, make, dispose" model of consumption that drives our current economy. The Circular Economy, in contrast sets the standard for new business practices, which are restorative, relies on renewable energy, minimizes use of virgin resources, and minimizes waste by maximizing reuse of materials. The key theme of the conference was concepts and applications of the Circular Economy, including initiatives to redesign products and business models, building new relationships with customers, harnessing technology to increase the utilization of assets, and switching to renewable energy. The specific areas of discussion were sustainability in food and beverage industries, chemicals and pharmaceutical industries, hi-tech industries, energy and utility sectors, and smart cities and governments.

KEYNOTE SPEAKERS:

Tesla, Inc. (formerly, Tesla Motors) - Rohan Patel- Director, North America, Policy and Business Development.
Bristol Myers Squibb (BMS)- Dr. Victoria Emerick, Director of Global Environment, Health, Safety, and Sustainability
Mosaic Company - Natali Archibee, Director, Global Sustainability
Coca-Cola North America - Bruce Karas, VP, Environmental Sustainability, Safety & Technology
Coca-Cola Florida- Erin Black- VP, Sustainability & Risk Management
Jabil, Inc.- Eric Austermann- VP, Social & Environmental Responsibility

PARTICIPATING CORPORATIONS, ORGANIZATIONS & SPONSORS:

Tesla, Inc.,; Cocoa Cola Beverages; Patel Foundation; Mosaic Company, Jacobs Engineering; Jabil Inc.; Bristol Myers Squibb (BMS); Interpolymer Group (IPG); ERM; TechData; USF ResearchOne; Florida Power and Light (FPL); Duke Energy; Covanta Waste Management; Southwest Florida Water Management District; Publix; Fat Beet Farm; Rosebud Continuum Sustainability Education Center; Ygrene; Tampa International Airport; City of Orlando; City of Tampa; Pasco County; Arizona State University; USF Federal Credit Union; and Halovation.

FACULTY PUBLICATIONS

1. Manisali, A.Y., Sunol, A.K., Philippidis, G.P. “Effect of Macronutrients on Phospholipid Production by the Microalga *Nannochloropsis oculata* in a Photobioreactor”, Algal Research 41, 101514 (2019).
2. Dogaris, I., Loya, B., Cox, J., Philippidis, G. “Study of landfill leachate as a sustainable source of water and nutrients for algal biofuels and bioproducts using a novel scalable bioreactor”, Bioresource Technology 282, 18-27 (2019).
3. Rojacques Mompremier; Óscar Arturo Fuentes Mariles; José Elías Becerril Bravo; Kebreab Ghebremichael (2019). Study of the variation of haloacetics acids in a simulated water distribution network, *Journal of Water Science and Technology: Water Supply,*19(1):88-96
4. Hansen, B., Stiling, P., Uy, W.F. (2020) Innovation in SDG Integration and Reporting at the University of South Florida. Accepted for the forthcoming special issue of the *International Journal of Sustainability in Higher Education.*
5. Tsegaye, S, Culhane T. et al. The Future of Creative Engineering Education: Application of 2 Virtual Reality for Water-Energy-Food Nexus American Society for Engineering Education Conference, 2020
6. Haldar, P, Culhane, T, Oliphant Z. PUBLIC IMPACTS OF FLORIDA’S PROPERTY ASSESSED CLEAN ENERGY (PACE) PROGRAM, Published Study partially sponsored by Ygrene Energy Fund. https://www.usf.edu/pcgs/documents/pace-report-final.pdf

FACULTY PRESENTATIONS

1. Quasem, I., Philippidis, G., Sunol, A.K. “Optimization and Scale-up of Biodiesel Production using Lipase Immobilized on Magnetic Nanoparticles”, American Institute of Chemical Engineers Annual Meeting, Orlando, FL.
2. Tsarpali, M, Philippidis, G., Kuhn, J. “Hydrothermal Carbonization of Microalgae for Hydrochar Production”, American Institute of Chemical Engineers Annual Meeting, Orlando, FL.
3. Manisali, A., Philippidis, G., Sunol, A.K. “Isolation of Natural Phospholipids from Nannochloropsis oculata Biomass using Semi-Preparative Scale HPLC”, American Institute of Chemical Engineers Annual Meeting, Orlando, FL.
4. Lo, E., Philippidis, G., Chen, K.-C. “Toward a Digestible Biochemical Computer”, 6th ACM International Conference on Nanoscale Computing and Communication, Dublin, Ireland.
5. Zhao, A., Colson, G., Karali, B., Philippidis, G. “A Real Options Analysis of the Relationship between Jet Fuel Price Volatility and Price Thresholds for Investing in a Carinata Biofuel Production Plant”, Agricultural & Applied Economics Association Annual Meeting, Atlanta, GA.
6. Gordon, R., Merz, C.R., Philippidis, G., Gurke, S., Schoefs, B. “Bubble farming: Scalable microcosms for diatom biofuel and the next generation Green Revolution”, North American Diatom Symposium, Eatonton, GA.
7. Goyal, G., Kuhn, J., Philippidis, G. “Production of Alkenes by Catalytic Cracking of Algal Biomass”, 27th European Biomass Conference and Exhibition, Lisbon, Portugal.
8. Geller, D.P., Philippidis, G., Coppola, E., Wright, D., Hubbard, W. “Commercialization Factors for Oil Based Biofuels and Coproducts from Brassica carinata”, 27th European Biomass Conference and Exhibition, Lisbon, Portugal.
9. Wright, D., Small, I., Seepaul, R., George, S., Philippidis, G., Christ, B., Geller, D. “Southeast Partnership for Advanced Renewables from Carinata - a new AFRI CAP”, National Sustainability Summit & National Extension Energy Summit, Tampa, FL.
10. Brabo-Catala, L., Lo, E., Dogaris, I., Ammar, E., Philippidis, G. “Biochemical Processing to Enhance the Value of Agricultural Biomass”, National Sustainability Summit & National Extension Energy Summit, Tampa, FL.
11. Allan Feldman, Sarina Ergas, Kebreab Ghebremichael, Madison Rice (2019) Authentic STEM Research in Schools with Biosand Filters. 2019 Tampa Bay STEM Network Leading and Learning Academy, Tampa, Florida, July 23-24, 2019.
12. Madison Rice, Xia Yang, Sarina Ergas and Kebreab Ghebremichael (2019). Enhancing performance of Biosand Filters: Use of modified filter media and design. SWE 19 (Society of Women Engineers) conference, November 7 m 2019, Anaheim, California

13. Hansen, B. (2020) Regenerating and Diversifying Food Systems Through Collaboration. Keynote talk for Growing a Stronger Economy Through Local Food & Entrepreneurship, University of South Florida, March 6.
14. Hansen, B., Stiling, P., Fung, W. (2020) Innovation in SDG Integration and Reporting at the University of South Florida. Sustainability Literacy Symposium, co-sponsored by the Sustainability Curriculum Consortium and AASHE. Charleston, SC., Feb. 12-13.
15. Hansen, B. Harrison, L., Backhouse, P., Scheidecker, D., Cofer, L., Min, A. (2019) The Shifting Sands of Egmont Key: Heritage at Risk in Tampa Bay. Tampa Bay History Center, Dec. 4.
16. Hansen, B. (2019) Thinking Like an Island: How Do We Achieve Food Sovereignty? Featured presentation for the Tampa Bay Urban Food Sovereignty Summit, University of South Florida, Oct. 22.
17. Hansen, B., Harrison, L., Backhouse, P., Scheidecker, D., Cofer, L., Min, A. (2019) Scanning the Disappearing Island: Digital Approaches to Egmont Key's Endangered Heritage. Tidally United Summit, August 16, Pensacola FL.
18. Hansen, B., Dorsey, J. (2019) Urban Farming in Florida: Pushing the Boundaries of the Food and Farming Systems at the Crossroads of Race, Class and Gender. Association for the Study of Food and Society: Agriculture, Food and Human Values conference, June 26-29, Anchorage, Alaska.
19. Culhane, T. (2019) Invited presentation and workshops at Punahou High School and Punahou Middle School (April 8, April 10 and April 12), Keynote speaker "Food Waste to Energy" through Cengage Learning.
20. Culhane T. (2019). Invited presentation and workshops at Halau Inana Indigenous Education Incubator, Honolulu, April 7 and April 11, "Energy Equity and Justice".
21. Culhane T. (2019), Keynote speaker at "Heal the Planet" Earth Day Festival for "Young Planet Leaders," Fort Lauderdale, April 14.
22. Culhane, T. (2019), Invited Museum Talk Keynote Speaker at Bohemian Club Presidential Grove, San Francisco, to Republican leaders. Topic: Waste Not Want Not, Reconsidering Refuse as Resource
23. Culhane, T. (2019), Presenter and Workshop Leader, National Geographic Student Expeditions/MIT. Topic: Using Arduino Microcontrollers for Environmental Sensing and Data Collection with Community Built Biodigesters
24. Culhane, T. (2019) Invited Keynote Presenter for Polk Country Science Teacher's Association/Cengage Learning, National Geographic Learning.
25. Culhane, T. (2019) Presenter, 14th Annual Sustainable Communities Workshop , Sarasota, FL.
26. Culhane T. (2019), Produced Introduction Video "Being the Nexus" for Patel College presented at GLOBAL CIRCULAR ECONOMY - THE FUTURE OF SUSTAINABILITY and worked with Tim Curci (Fat Beet Farm) and Byron DeLear (Ygrene Energy) regarding their presentations.
27. Culhane T. (2020) Featured speaker, Elders Climate Action "Remembering Earth Day" Webinar, including student representatives from University of Florida and United Religions Initiative.
28. Culhane T. (2019, 2020) Presentations and Workshops for Pasco Country schools at Rosebud Continuum Sustainbility Education Center and Academy at the Lakes High School
29. Culhane T. (2019/2020) Developed "Envisioning Sustainability" Course with USF Innovative Education Department, Approved and Launched Spring 2020.
30. Haldar, P., (2019) "Circular Economy in Energy and Utilities: New York State Best Practices" Global Sustainability Conference on the Circular Economy, Tampa, Florida (Oct 18, 2019)
31. Haldar, P., (2019) "Innovation in Nanotechnology", to ECE and EEE faculty and students at PSG-ITech, Coimbatore, India (Dec 10, 2019)
32. Haldar, P., (2019) "Additive Manufacturing at Nanoscale for electronics and energy", Indo-US Metal Additive Manufacturing Workshop: Technology Gaps and Research Directions, Coimbatore, India (Dec 16, 2019)
33. Haldar, P., (2019) "Nanotechnology Innovations", Guest Lecture at Institution of Engineers India monthly meeting, Coimbatore, India (Dec 23, 2019)

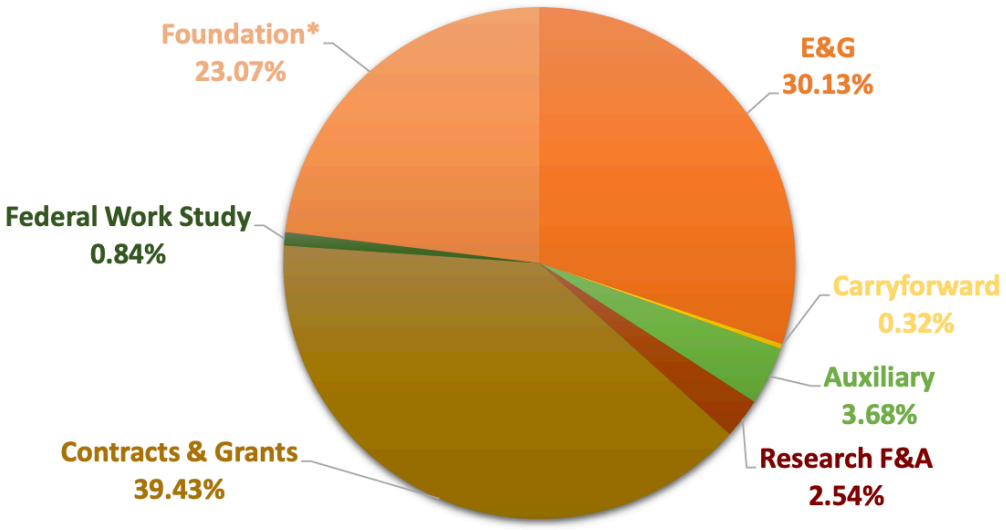
FACULTY GRANT AWARDS

1. Philippidis, G. (PI), "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. Budget: $476,000 (2019-2021).
2. Philippidis, G. (co-PI): "Sustainability Superheroes: Developing Global Citizens for a Sustainable Economic Future", funded by the Coca-Cola Foundation. Budget: $200,000 (2019-2021).
3. Philippidis, G. (co-PI): "Automated Modular Algae Cultivation System for Aquaculture", funded by the USDA SBIR. Budget: $99,000 (2019-2020).
4. Kebreab Ghebremichael (CoPI) US-Ghana Collaboration: Providing Opportunities for Global Research on Water Sanitation and Hygiene (WASH) Budget: $284,752 (2019-2021), NSF Grant
5. Kebreab Ghebremichael (PI) Safe Water Supplies in Vulnerable Communities: Encouraging Use and Enhancing Technical Design of Biosand Filters. Budget $40,000 (2019), Joy McCann Foundation Grant
6. Hansen, Brooke (Co-PI) with Laura Harrison. Sustainable Heritage Tourism at Egmont KeyL Bridging Science, Social Science and the Humanities with Virtual Reality. USF Creative Scholarship Grant, $9,859.15 (2020-2021).
7. Seneshaw Tsegaye and T.H. Culhane (Co-PI): "Student Engagement and Virtual Reality", grant from Florida Gulf Coast University for constructing both physical and virtual anaerobic digester/food production systems for augmented reality curriculum development, bringing Patel Students and FCGU students together to engage in ongoing local and remote nexus problem solving in situ and on line. Budget $20,000 (2019)

PATEL COLLEGE OF GLOBAL SUSTAINABILITY FY2019 - 2020 FUNDING OVERVIEW

Funding Source	TOTAL 2019-2020 Allocation/Revenue	TOTAL PROJECTED FY2019-2020 EXPENSES
E&G	$ 1,131,654	$ 1,118,590
Carryforward	11,993	3,063
Auxiliary	138,233	122,163
Research F&A	95,377	15,107
Contracts & Grants	1,481,041	883,082
Federal Work Study	31,500	28,948
Foundation*	866,392	578,988
	$ 3,756,190	**$ 2,749,941**

2019 - 2020 ALLOCATION / REVENUE



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

Endowments - $7,577,988

Foundation Construction Fund - $241,058