



Annual Report
Patel College of Global Sustainability
2018-2019

2018-2019 Academic Year Highlights

- PCGS received \$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.
- 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 Department of Education.
- Received NSF-IRES grant for research activities in Ghana.
- Received 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.
- Co-hosted two conferences.
- Executed two projects on sustainability with the City of Dunedin (carbon footprint, solar).
- Graduated first Coverdell Fellow; appointed new Coverdell Fellow.
- Funded a Latin American and Caribbean scholarship.

- Faculty member received Fulbright Specialist Scholarship.
- Hired two postdoctoral scholars.
- Established new graduate concentration in Sustainability Policy
- Hosted faculty from Tunghai University (Taiwan) on a 6-month sabbatical

Dean's Message

I am delighted to present the 2018-2019 Annual Report for the Patel College of Global Sustainability (PCGS). The 2018-2019 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. 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 through teaching, research, student mentoring and community outreach, as well as by generating practical knowledge and developing innovative technologies, skills and policies. This mission is well aligned with the strategic priorities of the University of South Florida as a preeminent global research university. The College is engaged in education, research, and service activities that create solutions to sustainable development in a rapidly-changing world, drawing on USF's broad interdisciplinary expertise in renewable energy, water, climate science, public health, energy, transportation, global security, and social equity, among others. This interdisciplinary approach prepares 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.

Drawing on 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 co-exist in productive harmony, fulfilling the social and economic requirements of present and future generations.

The College of Global Sustainability has been successful in enhancing its role as the hub for sustainability-related research and teaching across the USF campus. The College partnered with a number of universities and companies to form a public-private consortium, which won a competitive \$15M five-year award from the US Department of Agriculture to develop a sustainable bio-

economy in the United States based on renewable jet fuel, animal feed, and consumer products from non-edible plants. PCGS and the Stavros Center in the College of Education jointly won a two-year \$200,000 research grant from the Coca Cola Foundation. The College co-hosted two conferences and the College faculty and students worked on several projects involving community partners. PCGS collaborates with five USF Colleges – College of Arts & Sciences, College of Engineering, College of Business, College of Marine Sciences, and the College of Public Health. In my capacity as Dean, I actively seek out input and advise on academic matters from the College Advisory Board made up of the Deans of these USF Colleges. The College went through its first academic review by an external evaluator designated by the Provost. The external evaluator from the Center for Global Sustainability at the School of Public Policy of the University of Maryland visited the College in February 2018 and submitted his report in June 2018 and the College, subsequently, submitted a detailed response to the recommendation of the report to the Provost. The College is in the process of implementing the recommendations of the evaluator, especially in the area of curriculum enhancement.

The College has received approval from the Graduate Council to launch a new MA concentration in Global Sustainability Policy starting in fall 2018, which is supported by the Schools of Public Affairs and Geosciences in the College of Arts & Sciences. The College hired four teaching faculty and two post-doctoral fellows during the 2018-2019 Academic Year.

The founding donor of the College, Dr. Kiran Patel, gave a \$4 million gift to the PCGS Endowment Fund in November 2018, which doubled his previous donation and the PCGS Endowment Fund. The College will receive a multi-million-dollar 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 early 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 2019-2020 Academic Year.

Govindan Parayil, Ph.D.
Dean

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.

Student Development

The Patel College of Global Sustainability maintains a Student Development program that offers student development advising to all students and alumni, including résumé building assistance, résumé reviews, career search advising, and networking opportunities. 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 general advising, 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. These speakers have come from the 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 sustainability certifications such as LEED GA and Envision. These workshops are offered to all students to assist them in gaining a competitive edge when seeking positions in the field.

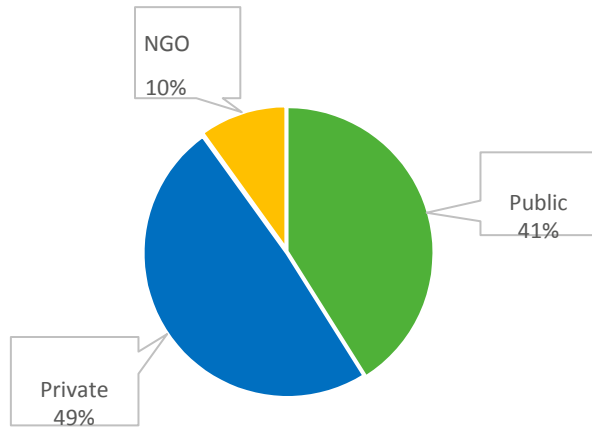
Recent Alumni Hires

- Sustainability Manager, Coca-Cola Beverages of Florida
- Hydrologist, Southwest Florida Water Management District
- Energy Specialist, Cynergistic
- Global Environmental Health and Safety Expert, Jabil
- Senior Project Specialist, Stantec
- Energy Field Specialist, Tesla
- Sustainability Officer, City of Oldsmar, FL
- Environmental Project Manager, HDR
- Recycling and Sustainability Manager, Leon County, FL
- Energy Analyst, Sonoma State University, Sonoma, CA

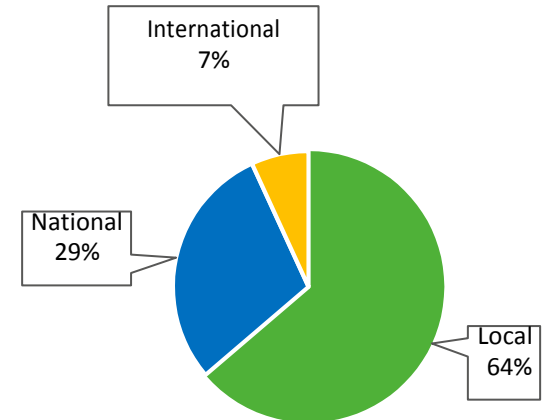
- Sustainability Manager, City of Fort Lauderdale, FL
- Environmental Consultant, Handex Consulting & Remediation, LLC
- Senior Energy Analyst, Booz-Allen Hamilton
- Sustainability Project Coordinator, SoMax Environmental Services, Paoli, PA
- Regional Coordinator, National Oceanic and Atmospheric Administration (NOAA)

Alumni Employment

Sector
2011- August 2018



Location
2011- August 2018



Sustainability Speaker Series

The Patel College organizes a Sustainability Speaker Series each semester, bringing sustainability professionals to the college to speak with students and faculty. The speaker series was established to increase knowledge and awareness among our students about innovative sustainability practices in both private and public sector organizations. Previous speakers included researchers from the Florida Fish and Wildlife Conservation, the National Oceanic and Atmospheric Administration (NOAA), local Environmental Protection Commissions, and more. Our fall 2018/Spring 2019 speakers:

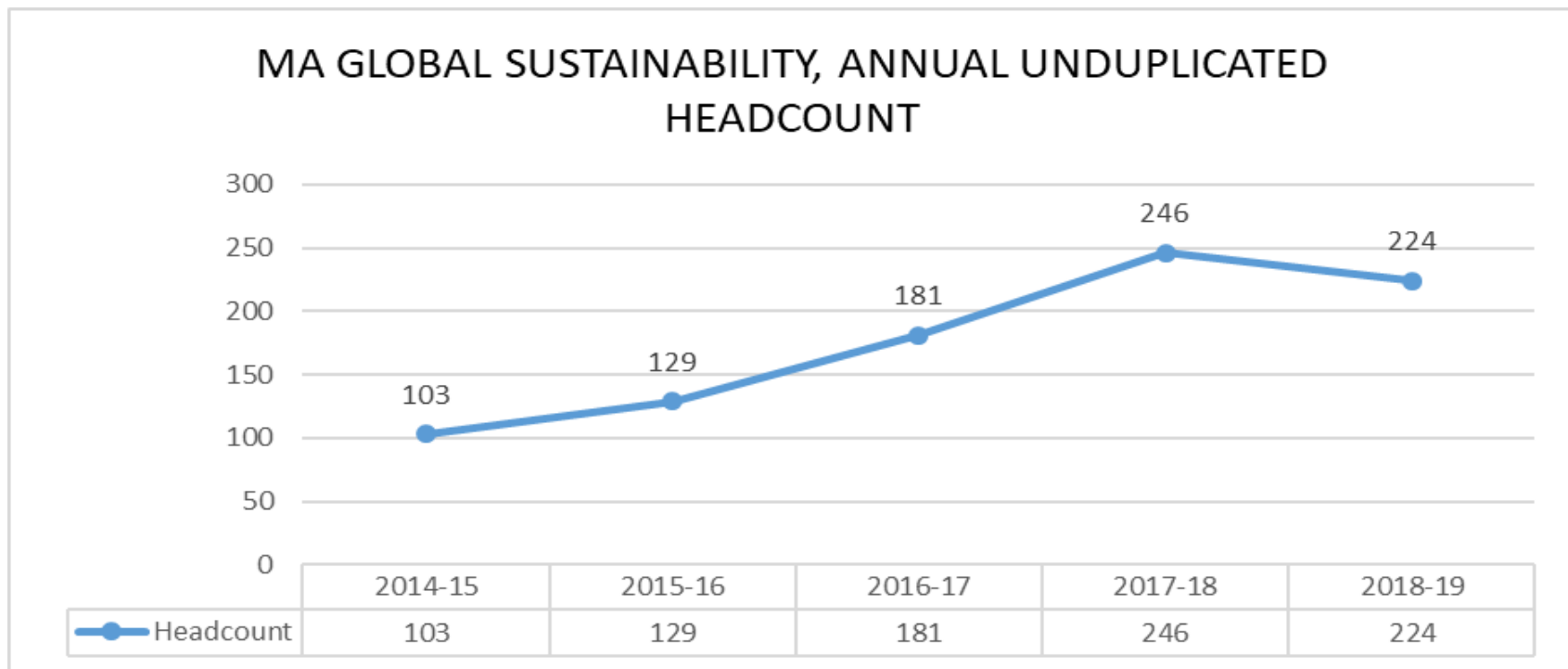
- David M. Taylor Future Solutions, LLC, Tampa, FL
- Karolina Sobeka, USF Contemporary Art Museum
- Whit Remer, Counsel and Director of Public Policy, IBHS, Tampa, FL
- Dan Spracklin, SoMax, Massachusetts
- Dr. Kathryn Guindon, Florida Fish and Wildlife Conservation Commission Conservation Project
- Andrew Reich, Scientific Advisor, Bureau of Environmental Health, Florida Department of Health
- Dr. Tirusew Asefa, Tampa Bay Water
- Dr. Ioannis Dogaris, KTH Royal Institute of Technology, Sweden
- Professor Hong-Wei Yen, Department of Chemical & Materials Engineering, Tunghai University, Taiwan
- Tayrn Hipwell, Founder of Beyond the Label / Author of How to Shop for Shi(f)t
- Dr. Jose A. Puppim de Oliveira - School of Business Administration (FGV – EAESP), Brazil

Admissions

Graduate student recruitment and admission

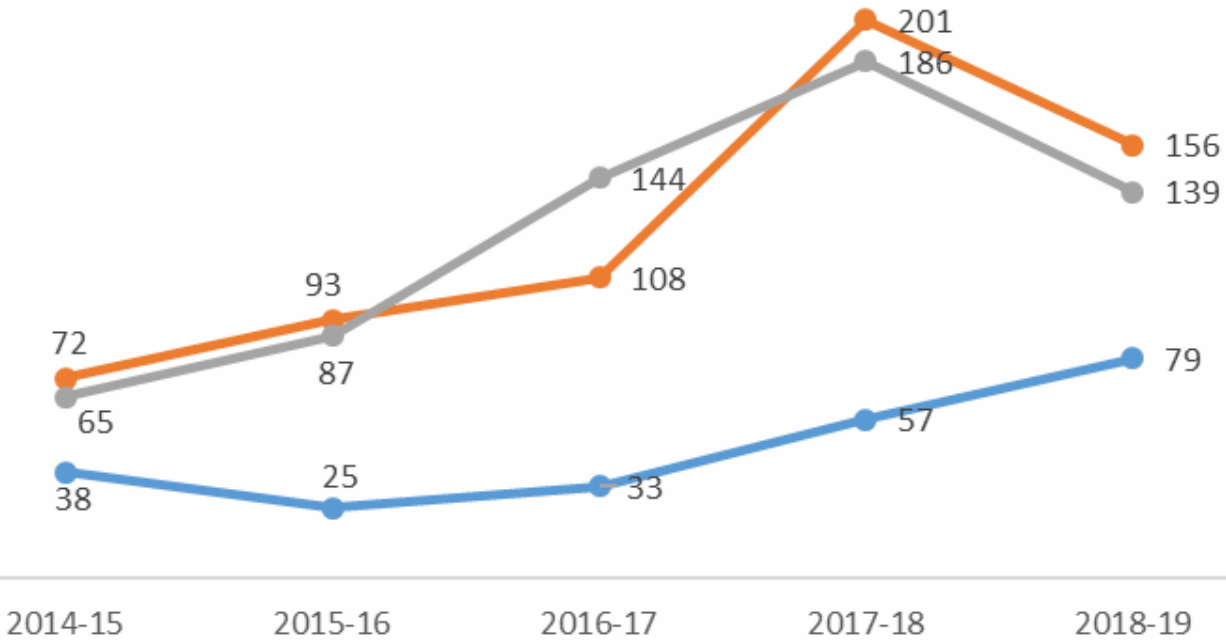
There has been a significant increase in the number of students enrolled in the program, especially over the last two years. The last academic year (2018-2019) recorded the second largest enrollment in the history of the College. The College plans to maintain the MA student enrollment in the range of 150-200 graduate students until we can support larger enrollment by increasing the number of our faculty and support staff.

Projected enrollment for 2019-2020 is consistent with current enrollment trends over the last couple years. PCGS has increased SCH, reduced time to graduate, and provided additional opportunities for instructors, GAs and support staff during the summer instructional period. The figures below indicate the student enrollment numbers in the program during the past five years.



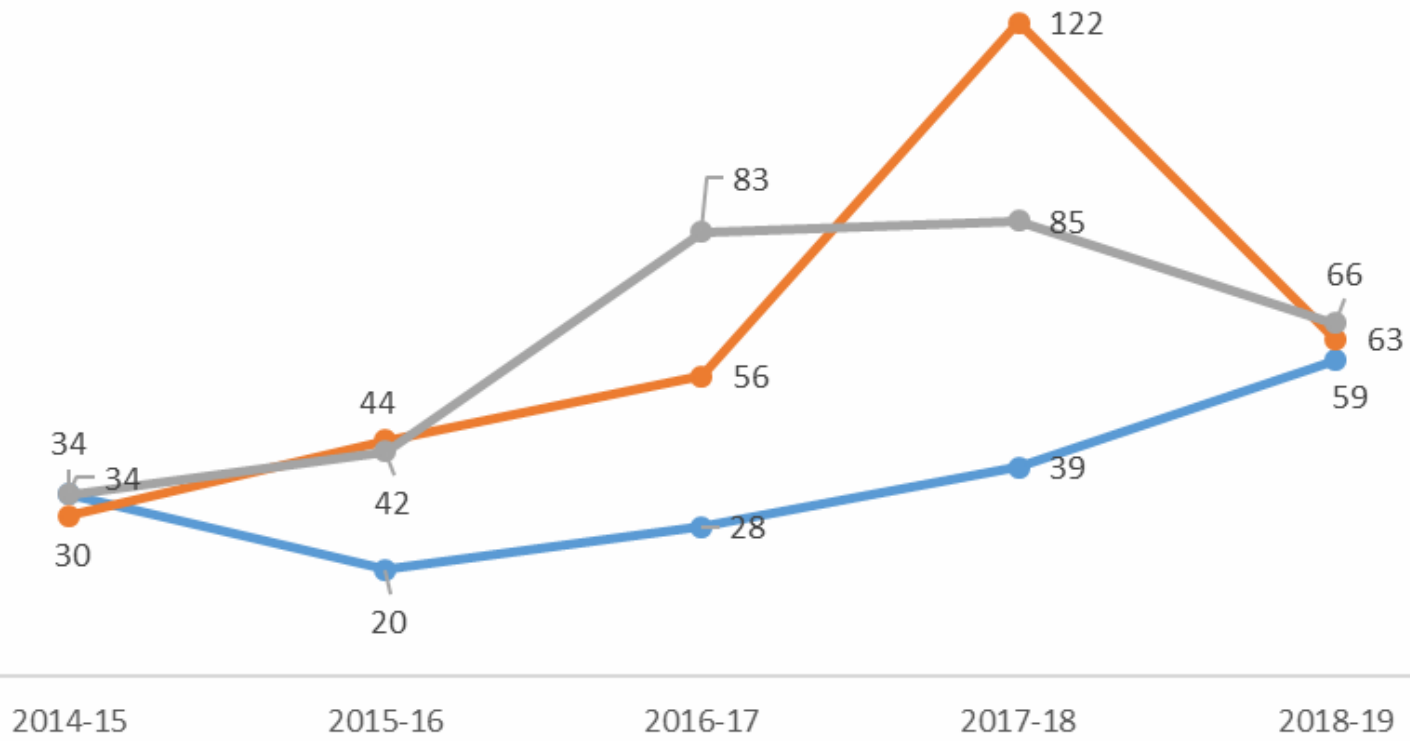
MA GLOBAL SUSTAINABILITY, TOTAL ENROLLMENT

Summer Fall Spring

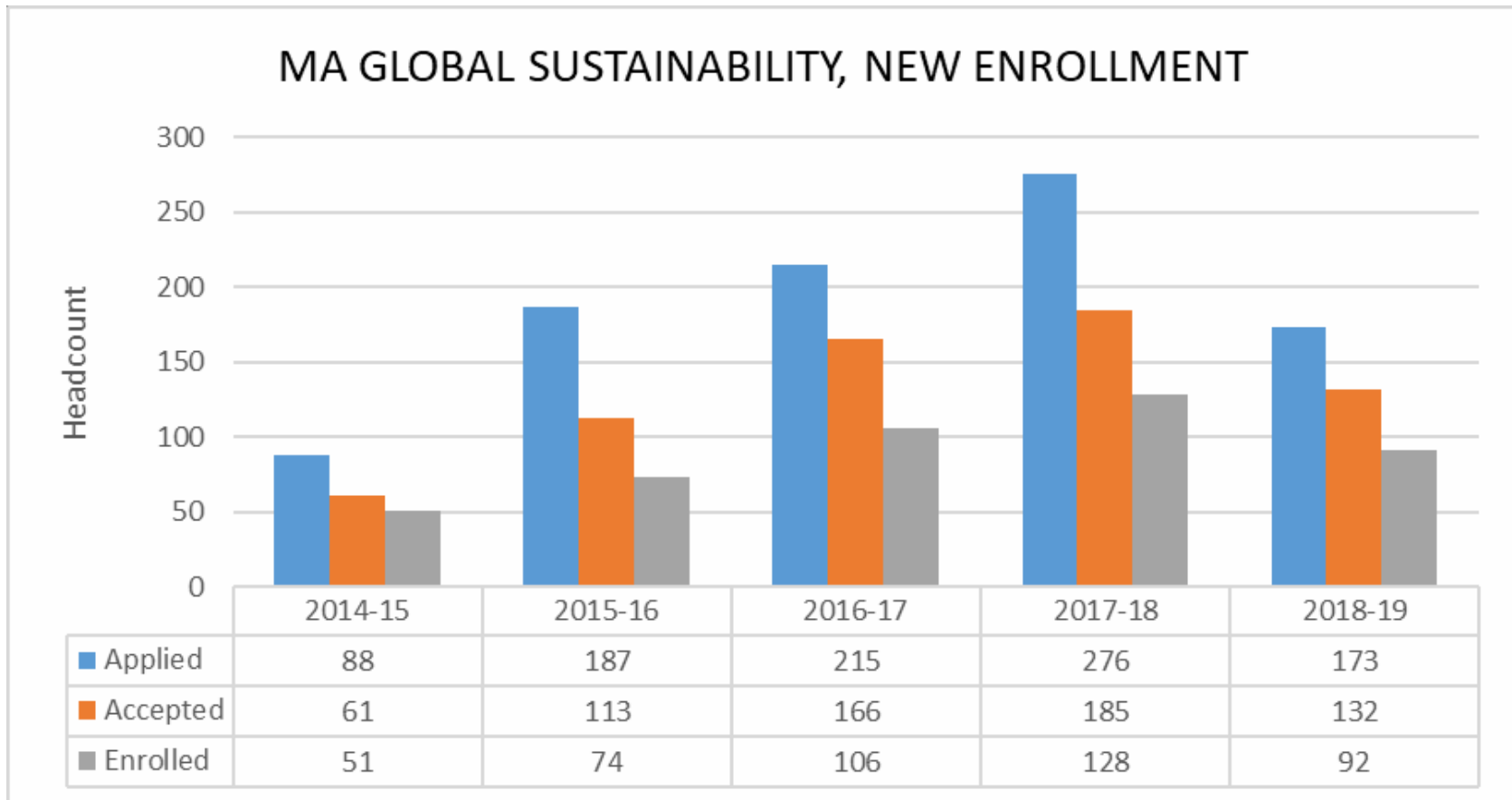


MA GLOBAL SUSTAINABILITY, FULL-TIME ENROLLMENT

Summer Fall Spring

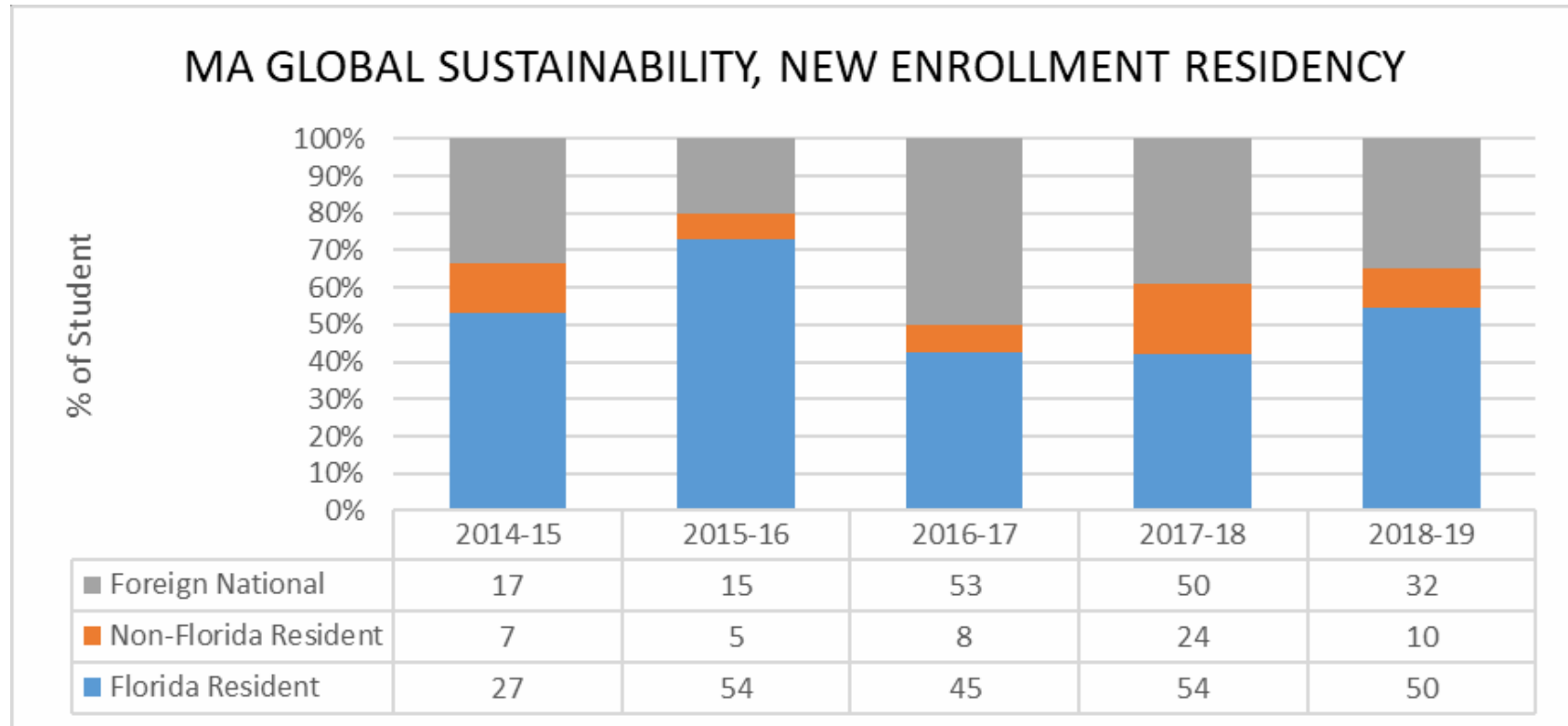


The below figure illustrates the admissions and enrollment trends over the last five years for new students. There has been steady new enrollment growth each year, and significant growth in new student numbers in both applications and new student enrollment during the last three academic years.

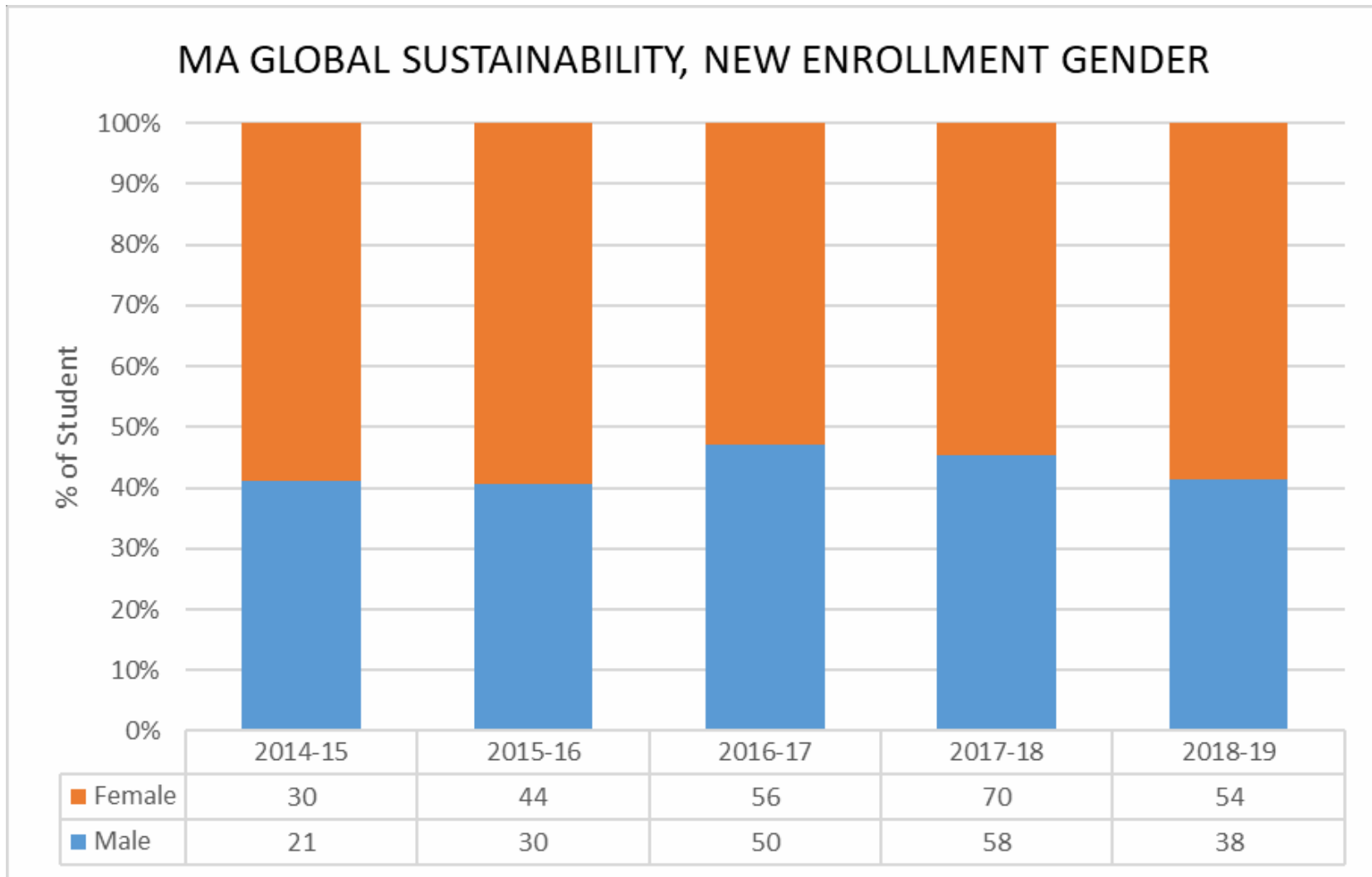


	2014-15	2015-16	2016-17	2017-18	2018-19
ENROLLED	51	74	106	128	92
GENERAL	3	4	19	28	20
WATER SUSTAINABILITY	15	15	9	7	3
ENTREPRENEURSHIP	9	15	19	18	12
SUSTAINABLE TOURISM	13	19	13	15	12
SUSTAINABLE ENERGY	11	20	18	12	8
COASTAL SUSTAINABILITY		1	5	9	1
SUSTAINABLE BUSINESS			15	9	17
SUSTAINABLE TRANSPORTATION			1	4	1
CLIMATE CHANGE			1	10	8
FOOD SUSTAINABILITY & SECURITY			6	16	7
SUSTAINABILITY POLICY					3

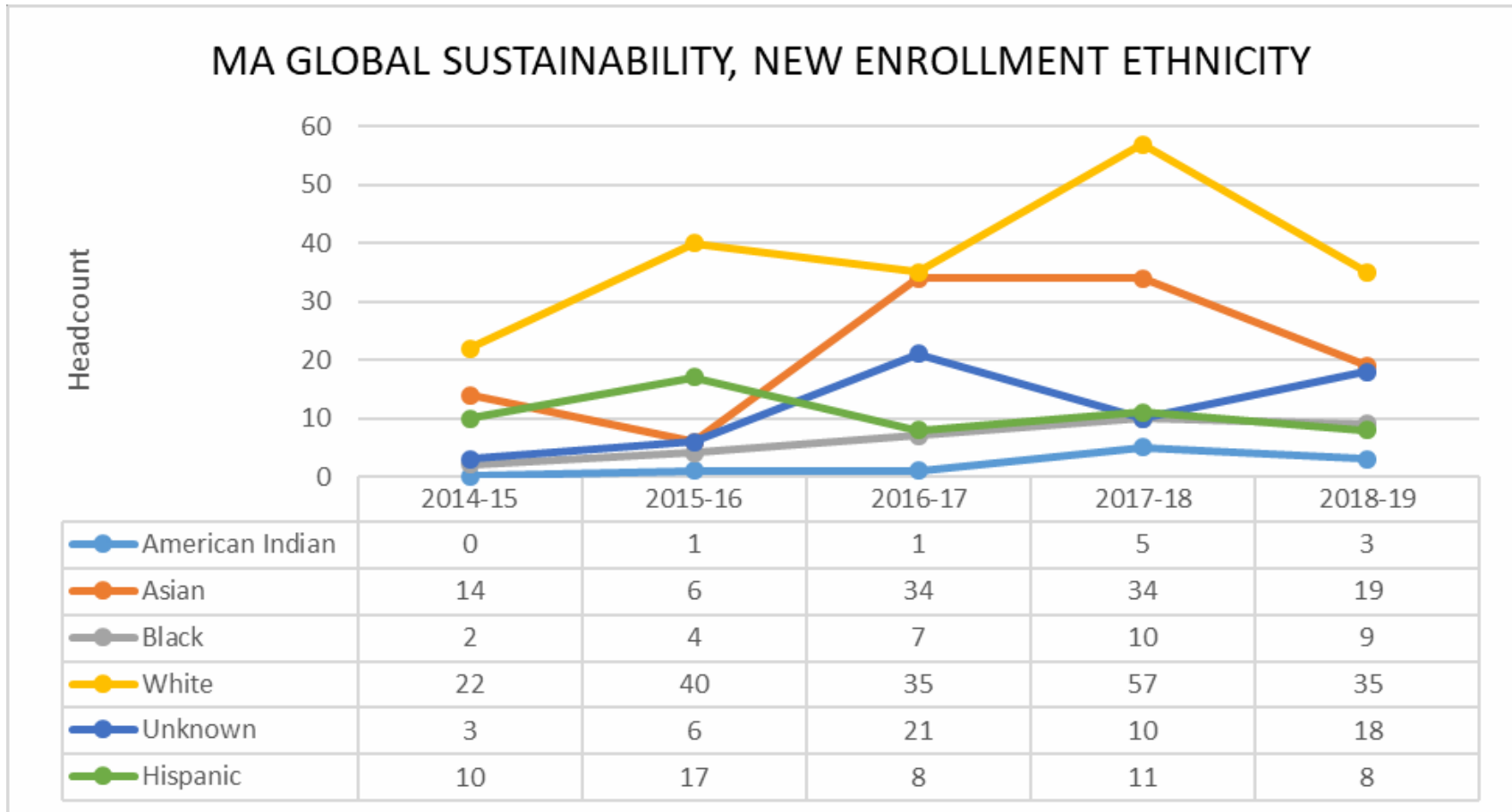
The below figure illustrates the residency and enrollment trends over the last five years for new students. The Patel College of Global Sustainability has a significant percentage of non-resident and international students enrolled. The makeup of international students in the last five reported years has been at least 20% of our student body, and as high as 50% in 2016-2017.



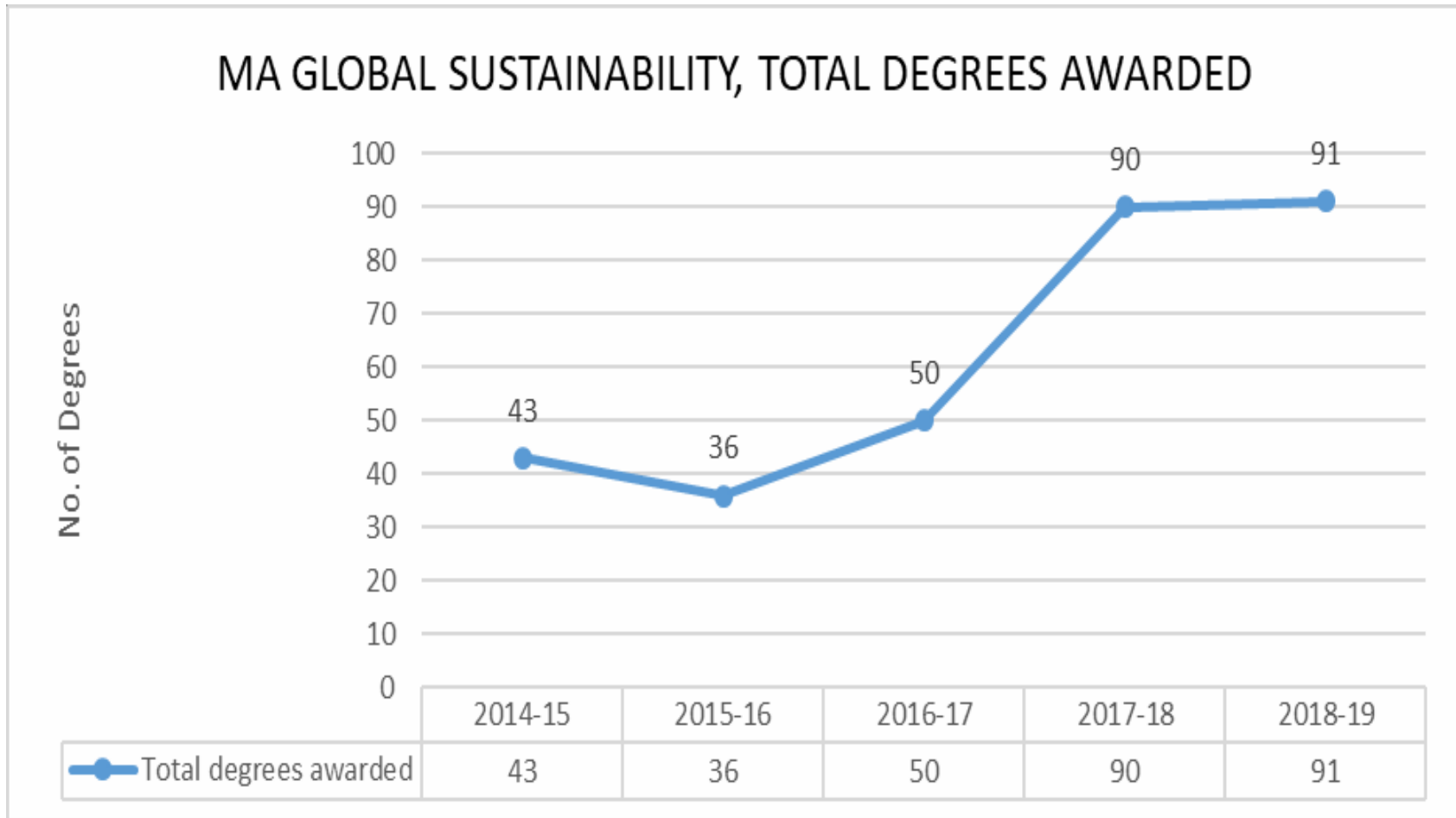
The below figure illustrates the gender distribution in enrollment trends over the last five years for new students. PCGS has a significant percentage of female students (over 50%) every year.



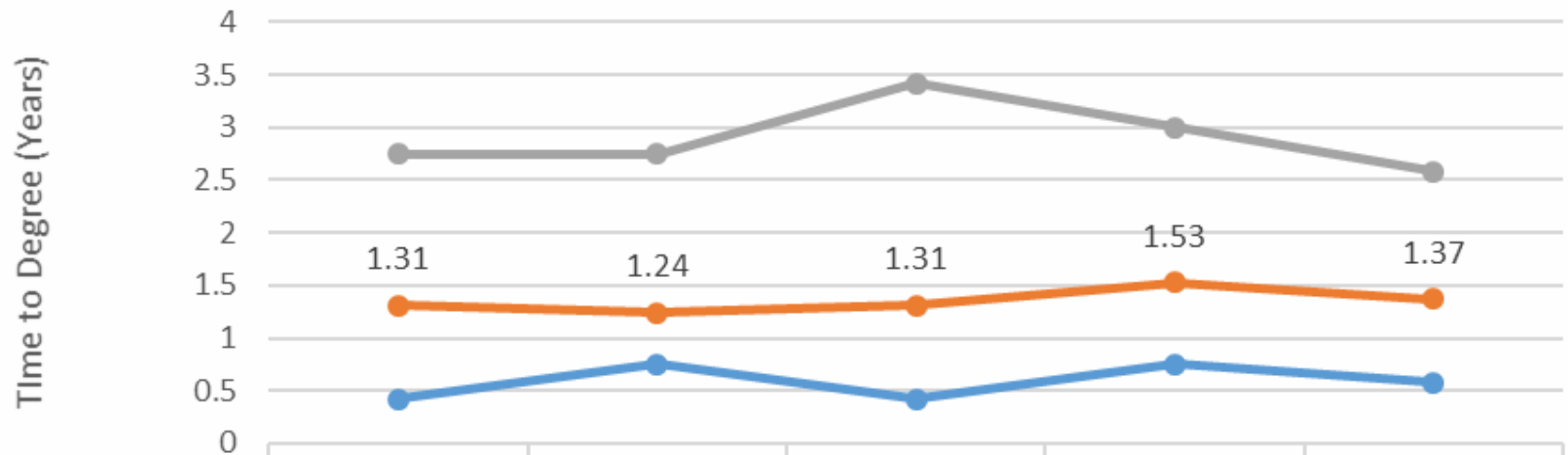
The below figure illustrates the ethnicity distribution for the MA student enrollment. One can observe from this figure that there was a direct correlation between international student enrollment growth and ethnicity growth. There has also been consistent growth of Black student enrollment each year and well as strong Asian student growth. White, Hispanic and American Indian student enrollment has fluctuated yearly.



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, and degrees awarded for 2018-2019 are projected to be the largest ever due to the mean time to degree completion.

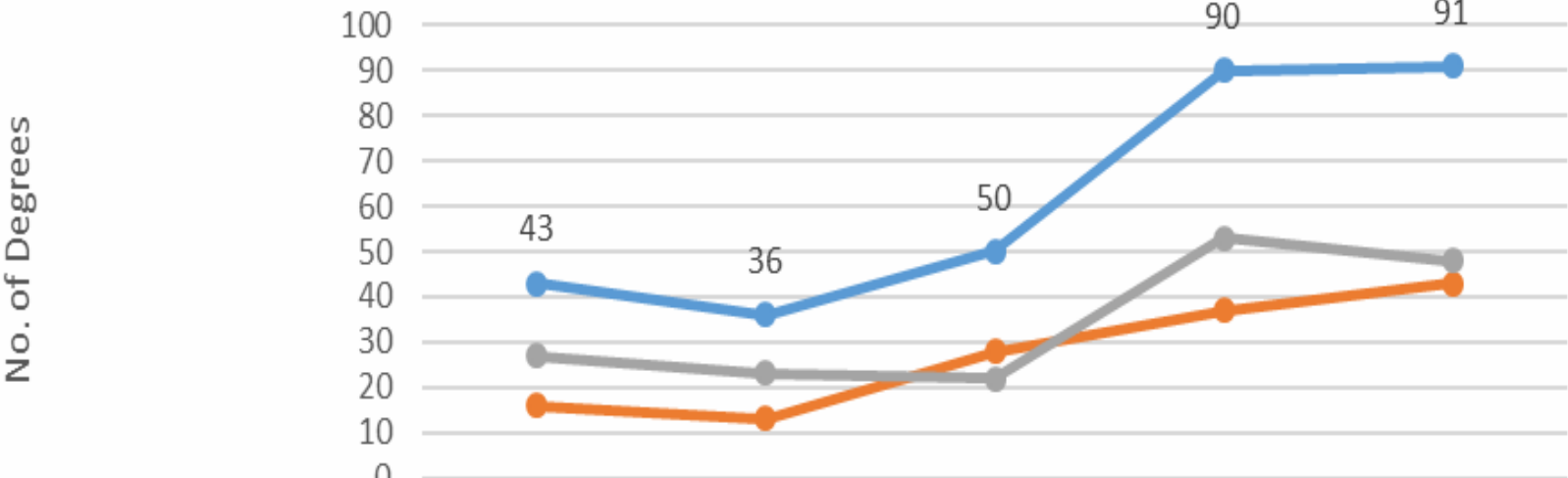


MA GLOBAL SUSTAINABILITY, TIME TO DEGREE TRENDS



	2014-15	2015-16	2016-17	2017-18	2018-19
Minimum	0.42	0.75	0.42	0.75	0.58
Mean	1.31	1.24	1.31	1.53	1.37
Maximum	2.75	2.75	3.42	3	2.58

MA GLOBAL SUSTAINABILITY, DEGREES AWARDED - GENDER



	2014-15	2015-16	2016-17	2017-18	2018-19
Total degrees awarded	43	36	50	90	91
Male	16	13	28	37	43
Female	27	23	22	53	48

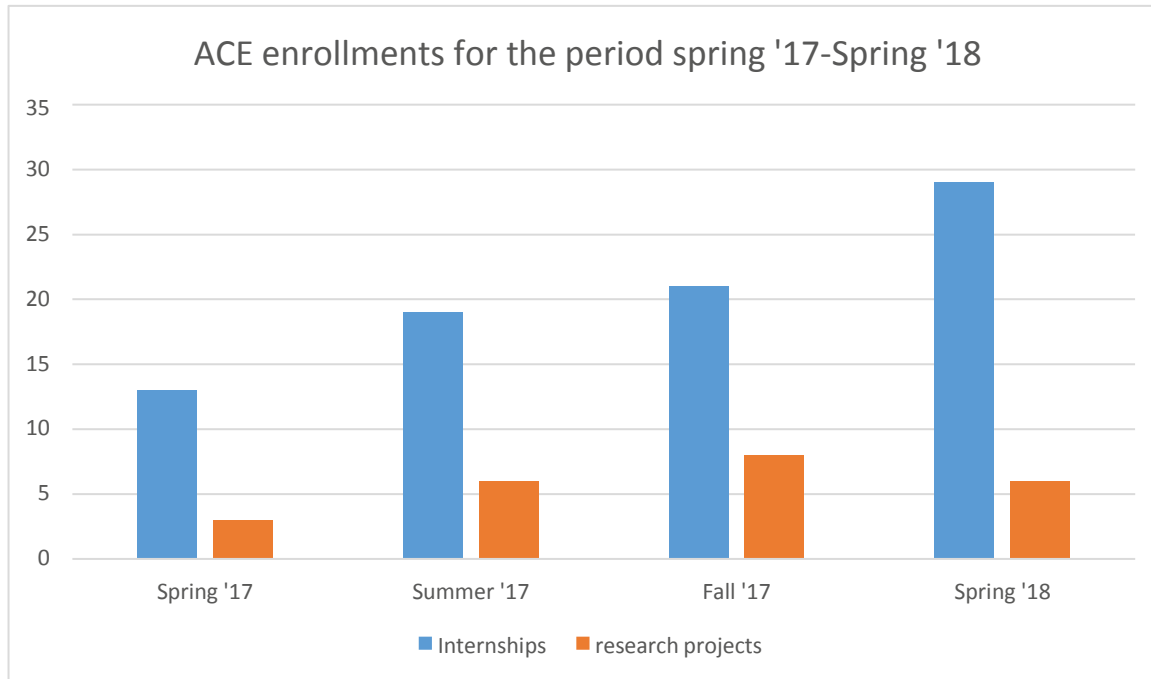
INTERNSHIP / RESEARCH PROJECTS

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 on the number of students who undertook their capstone project within the period of Spring 2017- Spring 2018.

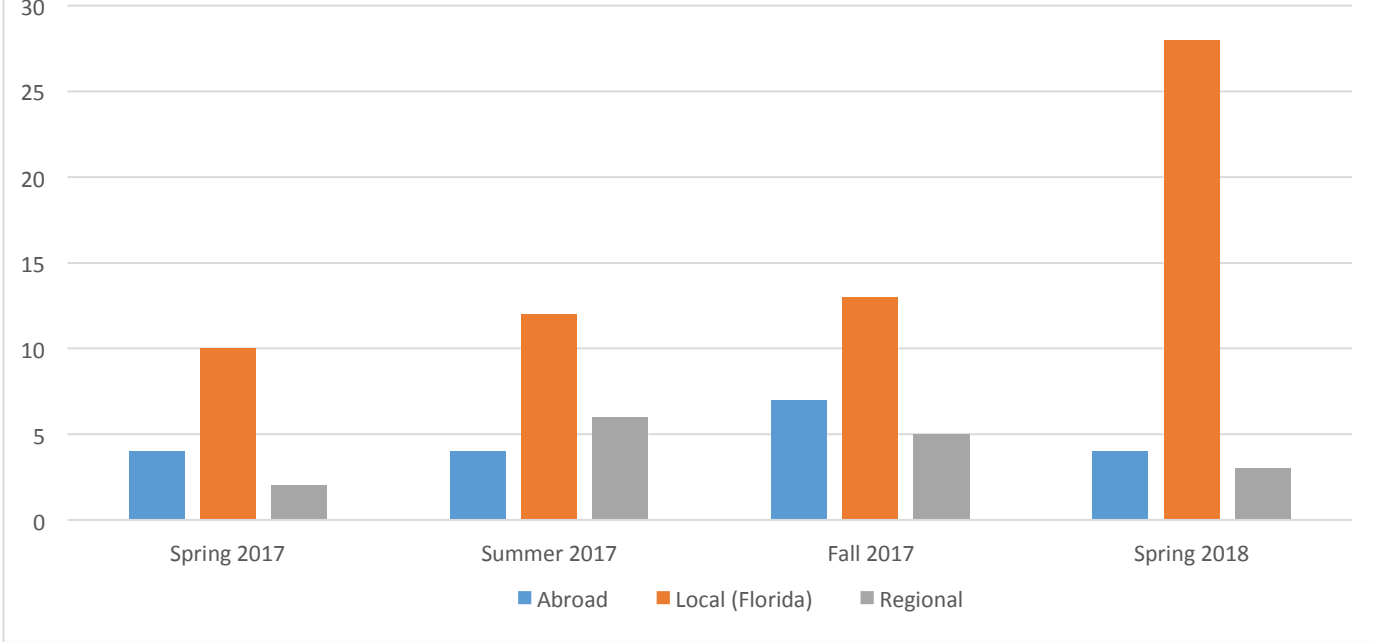
Semester period	Internship	Research	Total
Spring 2018	13	3	16
Summer 2017	19	6	25
Fall 2017	21	8	29
Spring 2018	29	7	36



The following graph summaries internships undertaken within the U.S, Abroad as well as local internships within Florida.

Semester period	International /Abroad	Local (Florida)	Regional (within US)
Spring 2018	4	10	2
Summer 2017	4	12	6
Fall 2017	7	13	5
Spring 2018	4	28	3

ACE projects Locations for the period Spring '17 - Spring '18



Teaching and Research

I. 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 & 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.

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.

Graduate Certificates

The Patel College of Global Sustainability strives to offer a dynamic curriculum, top-notch internship experiences, and overall superior education for our students. Our graduate certificates offer students an abbreviated path to a specialization in sustainability. Graduate certificates can be earned in only 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 demand 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.

The certificate program is based on a multidisciplinary approach to sustainable water management. It will present water management issues from technological, economics, and policy perspectives. The program will provide students with general knowledge on sustainability and deeper understanding of water management in a sustainable manner. It is open to students from

multiple disciplines (engineering, natural sciences, and social sciences) and will build knowledge and skills for holistic and integrated approaches to water management in the face of complex global challenges.

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.

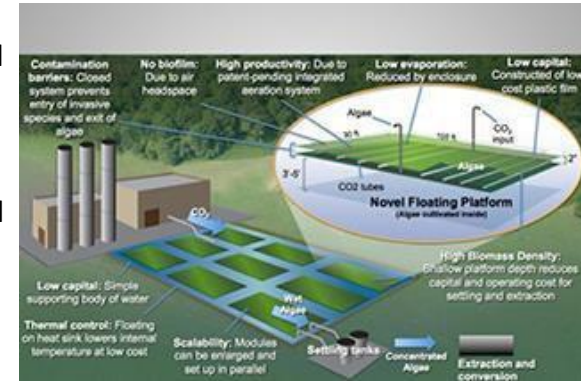
Key Research Areas

- 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.

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. This research is supported by our multi-year research grant from the US Department of Agriculture.



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.

Small-scale fermenters fully equipped with control systems are operated in the lab. A bio-refinery pilot plant has been designed and operated in partnership with a sugar company inside one of its sugarcane mills in Florida. It provides USF and its collaborators with unique process development and scale-up capabilities in a real-world environment.

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 Area

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), 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.



Water Sanitation and Hygiene (WASH) Research in Ghana

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.



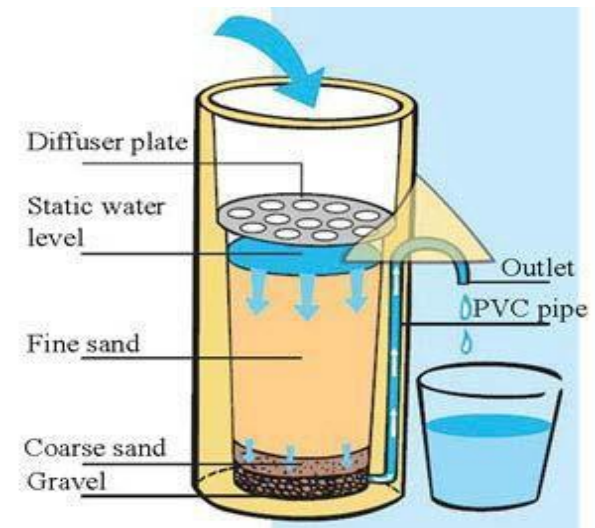
Ongoing and planned activities: The first batch of students (five students) for the first year have been selected. Along with a USF Patel College faculty, they will travel to Ghana in the summer of 2019 for five weeks. The students will conduct research under the supervision of KNUST faculty PCGS faculty members and will work with the selected schools to develop the research activities at the schools. The water research will focus on the development of enhanced biosand filter for fluoride removal. The sanitation research will focus on developing low cost-effective sanitation system for the schools and the educational/community component will work on embedding the water sanitation research in school curriculum and empower the pupil in community engagement for water and sanitation and hygiene practice that will promote public and environmental health.

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 Leto high school and Pierce Middle school in Tampa. 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. This research focuses on the treatment of onsite wastewater for non-potable reuse for irrigation.

Community Engagement and Other Activities

George Philippidis, Kebreab Ghebremichael and Joseph Dorsey, through the USF Office of Community Partnerships, mentored and supervised two teams of PCGS students (15 students in total) assisted the City of Dunedin in (1) Assessing the city's carbon footprint and recommending ways to reduce carbon emissions from city operations; and (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 two teams of students from the courses "Renewable Power Portfolio" under Prof. G. Philippidis and "Systems Thinking: The Key to Sustainability" under Prof. K. Ghebremichael. The solar project was executed by a team of students from the course "Concepts and Principles of Sustainability" under Prof. J. Dorsey. Reports were submitted to the City of Dunedin and the findings were presented to the City Council, which expressed its appreciation for the quality of the work.

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 is worked with the USF Student Green Energy fund and Food Waste Coalition to create six cubic meters of anaerobic digestion and storage at USF facilities using Culhane's Solar CITIES low-cost IBC tank designs.

Brooke Hansen developed and executed the Florida State Fair PCGS Sustainability Showcase for 2019. She trained and coordinated 25 PCGS students to be Sustainability Outreach Educators for the 12- day event (Feb. 7-18, 2019). Over 100 sustainability pledges were collected from the public and the team distributed metal reusable straws.

Brooke Hansen worked on using 3D virtualization to digitally preserve Florida Egmont Key's endangered cultural heritage to collect and archive ethnohistorical data from the perspectives of Seminole Indian Community. This project will document the relationship of past events to local and national history while incorporating the role of climate change in heritage preservation. The dataset generated by this pilot project will be incorporated into future grant applications.

Faculty Publications

1. 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 the microalga *Picochlorum oculatum* in a novel scalable bioreactor”, *Bioresour. Technol.* 282, 18-27 (2019).
2. Laura Rodriguez-Gonzalez, Amulya Miriyal, Madison Rice, Daniel Delgado, Justine Marshall, Michelle Henderson, **Kebreab Ghebremichael**, James R. Mihelcic, Sarina J. Ergas (2019) A Pilot-Scale Hybrid Adsorption Biological Treatment System (HABiTS) for Nitrogen Removal in Onsite Wastewater Treatment, *(Submitted for publication)*.
3. **Geislar, S.** On quantifying food waste: Food waste audits, surveys, and new technologies. In C. Reynolds, T. Soma, C. Spring, J. Lazell (Eds.), *Handbook of Food Waste Studies*. Routledge, New York *(Accepted for publication)*.
4. **Geislar, S.** & Huff, E. Resident requests and expert evaluations: Spatial analysis of the squeaky wheel phenomena in compounding urban tree canopy disparities, *(Submitted for publication)*.

Faculty Presentations

1. Manisali, A., **Philippidis, G.**, Sunol, A.K. “Continuous Cultivation of Microalga *Nannochloropsis oculata* to Extract and Characterize Phospholipids for Cosmetic Applications”, AIChE Spring Meeting, Orlando, FL (2018).
2. Nagpurkar, S., Sunol, A.K., **Philippidis, G.** “Thermodynamic Data Requirements for Biodiesel Process Development”, AIChE Spring Meeting, Orlando, FL (2018).
3. Quasem, I., Sunol, A., **Philippidis, G.** “Enzymatic Reaction Kinetics for Biodiesel Process Development and Scale-up”, AIChE Spring Meeting, Orlando, FL (2018).
4. Lo, E., Brabo-Catala, L., Dogaris, I., **Philippidis, G.** “Organic Acid Production from Sweet Sorghum Bagasse using Green Chemistry Principles”, 26th European Biomass Conference and Exhibition (EUBCE), Copenhagen, Denmark (2018).
5. 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 (2019).
6. Wright, D., Small, I., Seepaul, R., George, S., **Philippidis, G.**, Christ, B., Geller, D. “Southern Partnership for Advanced Renewables from *Carinata* – A new AFRI CAP”, National Sustainability Summit & National Extension Energy Summit, Tampa, FL (2019).
7. 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 (EUBCE), Lisbon, Portugal (2019).

8. Goyal, G., Kuhn, J., **Philippidis G.** “Production of Alkenes by Catalytic Cracking of Algal Biomass”, 27th European Biomass Conference and Exhibition (EUBCE), Lisbon, Portugal (2019).
9. Henderson, M., Ergas, S.J., **Ghebremichael, K.**, (2019) Assessment of Onsite Greywater Treatment Systems for the Removal of Antibiotic Resistant Genes McKnight Doctoral Mid-Year Meeting, Tampa FL, February 23-24,2019.
10. Henderson, M., Miriyala, A. Stocks, J.L., Rice, M., Thomas, D., Rodriguez-Gonzalez, L.C., **Ghebremichael, K.**, Mihelcic, J.R., Ergas, S.J. (2018) Passive Hybrid Adsorption and Biological Onsite Wastewater Treatment Systems for Removal of E. coli and Nitrogen, Proc. 15th IWA Specialised Conference on Small Water and Wastewater Systems, Oct. 14-18, 2018, Haifa, Israel.
11. Henderson, M., Ergas, S.J., **Ghebremichael, K.**, (2018) Can Passive Nitrogen Removal Systems Reduce E. coli Concentrations for Irrigation Reuse? McKnight Doctoral Mid-Year Meeting, Tampa FL, February 23-24,2018.
12. Henderson, M.; Thomas, D.; Rice, M; Ergas, S., **Ghebremichael, K.** (2018) The Fate of E. coli in a Hybrid Adsorption Biological Treatment System: A Wastewater Treatment Approach. UNC Water Microbiology Conference, Chapel Hill, North Carolina, May 2018
13. **Geislar, S.** (2019) Circular (and Just?) Food Systems. Urban Affairs Association Conference, Los Angeles, California, April 24-27, 2019.
14. **Hansen, B.** (2019). Invited panelist, “Achieving Success & Sustainability in Cultural and Heritage Tourism” for the Cultural Heritage Alliance for Tourism Summit: Cultural and Heritage Tourism as an Economic Driver for Fueling Local Communities and Small Businesses, Fort Lauderdale, FL, May 10.
15. **Hansen B.** and Leib, E. (2019). Invited presentation and tour development “Sustainability and School Gardens in Florida: A Case Study at Greco Middle School, Tampa” for the National Farm to School Network Annual Meeting, Tampa, FL, May 2.
16. **Hansen, B.** and Leib, E. (2019). “Promoting Food System Sustainability through Agritourism: From Suburban Farm to School Gardens and Agrihoods.” National Sustainability Summit, Tampa, April 18.
17. **Hansen, B.** (2019). Invited Keynote presentation “Food Sustainability: Equipping for Life.” Florida Association of Family and Consumer Sciences Annual Conference, Safety Harbor, FL, April 13. Hansen, Brooke; Rossen, J. (2019). Conference presentation “From Poi to Poke: Colonization and Revitalization of Hawaiian Heritage Foods in Cultural and Culinary Tourism.” Food, Heritage and Community: An Interdisciplinary Conference, Prague, Czech Republic, March 10.
18. **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 CengageLearning.
19. **Culhane T.** (2019). Invited presentation and workshops at Halau Inana Indigenous Education Incubator, Honolulu, April 7 and April 11, “Energy Equity and Justice”.
20. **Culhane T.** (2019), Keynote speaker at “Heal the Planet” Earth Day Festival for “Young Planet Leaders,” Fort Lauderdale, April 14.

Faculty Grant Awards

1. **Philippidis, G.**, “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. **Kebreab Ghebremichael (CoPI)** US-Ghana Collaboration: Providing Opportunities for Global Research on Water Sanitation and Hygiene (WASH) Budget: \$284,752 (2019-2021), NSF Grant
3. **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
4. **Hansen, Brooke (Co-PI)** Applied Heritage and Sustainability Research at Egmont Key, Florida. Submitted with Co-PIs Dr. Laura Harrison and Dr. Antoinette Jackson. USF Creative Scholarship Grant, \$9,700 (pending).
5. 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 FY2018-2019 FUNDING OVERVIEW

Funding Source	TOTAL 2018-2019 Allocation/Revenue	TOTAL PROJECTED FY2018- 2019 EXPENSES
E&G	\$ 1,102,988	\$ 1,079,280
Carryforward	204,757	195,414
Auxiliary	113,947	82,538
Research F&A	83,335	11,699
Contracts & Grants	1,013,758	422,387
Federal Work Study	21,000	21,000
Foundation	577,476	233,698
	\$ 3,117,261	\$ 2,046,016

2018-2019 Allocation/Revenue

