STRONG COASTS

A Collaborative National Research Traineeship

UNIVERSITY OF SOUTH FLORIDA

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ABOUT THIS PUBLICATION

Our Collaborative National Research Traineeship, Strong Coasts, is committed to building graduate student skills for global competency, and interdisciplinary and community engaged research. This book captures our experience from a field course in Belize, Central America.

In June 2019, our Strong Coasts cohort of three anthropologists and five environmental engineers from the University of South Florida spent two weeks in Placencia, Belize studying relationships between water, food, and energy.

Our graduate student fellows and faculty built relationships with community partners, and working in interdisciplinary teams, learned to develop systems thinking frameworks that capture food, energy and water challenges and potential solutions.

During the first week of the trip, we engaged with several organizations and individuals doing work on the “reef” like Fragments of Hope, the Placencia Seaweed Farmer’s Association, the Placencia Village Council, and the Caribbean Community Climate Change Center (5Cs). By week two, we moved from the reef to the ridge where we workshopped with staff from the Ya’axché Conservation Trust and visited farmers in the village of Trio.

Some of our graduate student fellows will continue to work with partners in Belize for their dissertation research.

Our graduate student fellows compiled this book. We hope you enjoy it, and find it resourceful. As we have learned, "Seeing is Belizeing," and we are thankful for the opportunity to do this through our National Science Foundation grant.

Maya Trotz, Rebecca Zarger, & Christy Prouty

ORGANIZATIONS THAT WE WORKED WITH IN BELIZE

- Caribbean Community Climate Change Center - https://www.caribbeanclimate.bz/
- Fragments of Hope - http://www.fragmentsofhope.org/
- Placencia Seaweed Farmer's Association - https://www.facebook.com/PlacenciaSeaweedFarmers/
- Placencia Village Council - https://www.facebook.com/PlacenciaVillageCouncil/
- The Placencia Breeze - https://issuu.com/theplacenciabreeze
- Ya'axché Conservation Trust - https://yaaxche.org/

AUTHORS WHO WORKSHOPPED WITH US IN BELIZE

- Lyra H. Spang, "Bite Yu Finga!: Innovating Belizean Cuisine"
- Melissa Johnson, "Becoming Creole: Nature and Race in Belize"

OUR BLOG - MEDIUM.COM/@STRONGCOASTS

- Systems Thinking with Coastal Communities at the Food Energy Water Nexus
- Interdisciplinary Training is About People Not Just Ideas
- Utility Through Nature
- Good Toilets = Healthy Waters = More Coral = More Fish
- Laughing Bird Caye National Park, Belize
- Community Cacao Agroforestry
- The Interconnectedness of All Living Things: Ya'axché and FEWs Insights in the Ridge
- Un-Belizeable

FOOD, ENERGY, AND WATER ARE LINKED

Strong Coasts is a team of faculty and graduate students from the University of South Florida and the University of the Virgin Islands. As engineers, anthropologists, and marine scientists we are committed to finding solutions to complex sustainability challenges related to food, energy and water. Partnering with communities and organizations, Strong Coasts teams explore how food, energy, and water are interconnected and strive to understand community visions and opportunities for the future.

Photography by Atte Penttilä, Michelle Platz, Maya Carrasquillo, Maya Trotz

2019 STRONG COASTS
FOOD ENERGY WATER
FIELD COURSE

COMMUNITY ENGAGEMENT

SUSTAINABLE LIVELIHOODS

CONTENTS/ROADMAP

Food Energy Water Systems – Belize

applying systems thinking to Food Energy Water Systems with coastal communities

2019 Field course in Belize. University of South Florida environmental engineering & anthropology PhD students.

Jun 1

Placencia with Miss Cunchie

History lessons from the original water tank to the end of the pier.

Jun 2

Laughing Bird Caye National Park

More Coral = More Fish
Seeing coral restoration first hand with Fragments of Hope!

Jun 3

Sapodilla Cayes

A marine reserve in southern Belize. A wreck and lots of fish.

Jun 4

Little Water Caye

Lowell Godfrey farms seaweed for local and export markets.

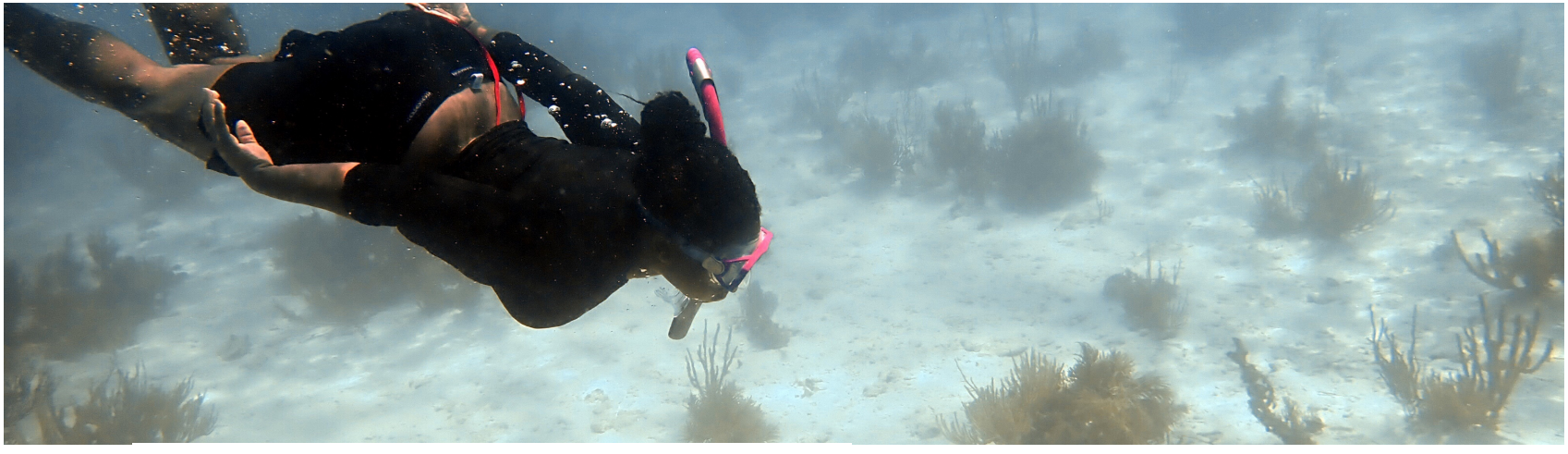
CONTENTS/ROADMAP

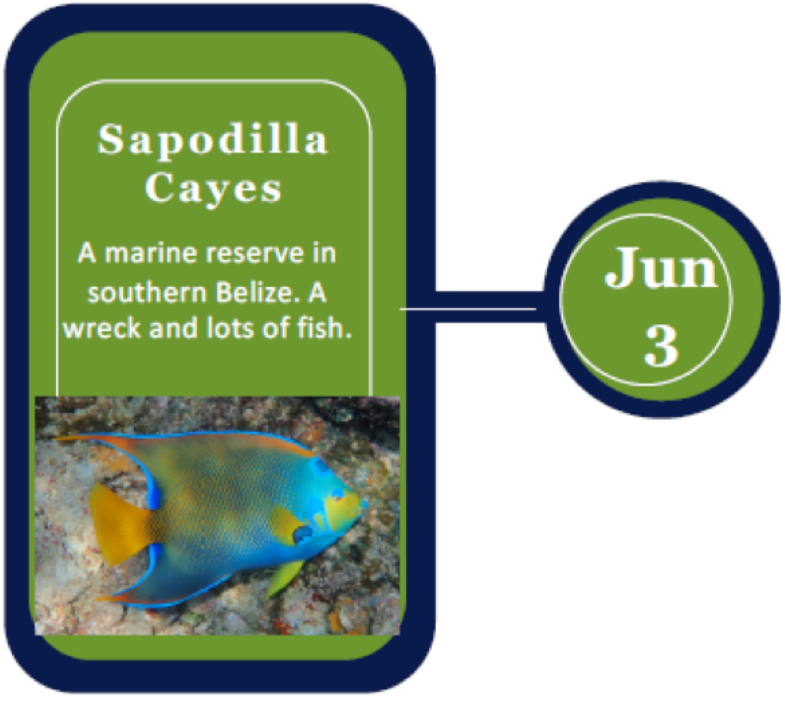
PLACENCIA COMMUNITY MEETING

We started with getting to know each other and learning about Placencia. The 2019 Strong Coasts cohort held an interactive Food, Energy, and Water activity with the residents of Placencia at the Placencia Community Center. Large sticky notes were placed at three corners of the building and were labeled according to the three components of the FEWS nexus. We spent the night asking questions relating to food, energy, and water on the peninsula and how it affects everyday life on the peninsula.

LAUGHING BIRD CAYE NATIONAL PARK WITH FRAGMENTS OF HOPE

LAUGHING BIRD CAYE IS ONE OF THE MOST SUCCESSFUL CORAL REEF RESTORATION SITES IN THE WORLD DUE TO THE PERSISTENT EFFORTS OF FRAGMENTS OF HOPE, A COMMUNITY BASED ORGANIZATION IN PLACENCIA, BELIZE. WE GAINED DEEPER INSIGHTS INTO THE FEWS NEXUS AND HOW IT INTERSECTS WITH HABITAT RESTORATION AREAS.





SAPODILLA CAYES

At the Sapodilla Cayes, we explored the food, energy, and water system. This marine reserve encompasses the southern part of the Belizean Barrier Reef and is home to a vast array of marine life. Because it is located in the southern most part of Belize, many visitors from Honduras and Guatemala visit the cayes.

SEAWEED FARMING AT LITTLE WATER

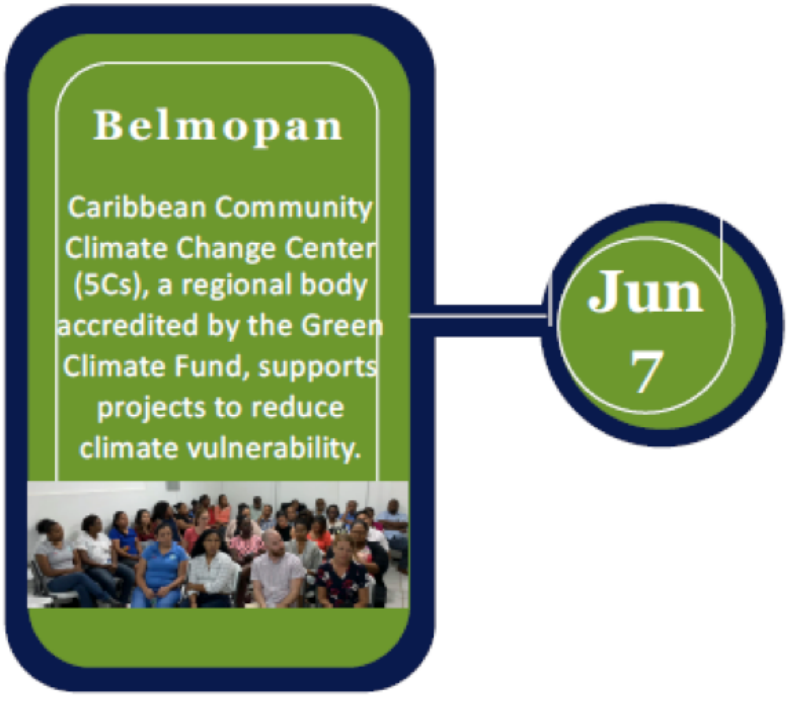
Mr. Lowell Godfrey demonstrated the seaweed farm he manages with the Placencia Producers Cooperative Society Limited at Little Water Caye. The farm cultivates seaweed, and also acts as a nursery for many juvenile marine species like crabs, lobsters, conch, and fish. The farm's sustainable practices allow for the conservation of many aquatic species while also providing a food source on the peninsula. The cultivated seaweed is very nutritious and full of protein. It can be used as a thickener in meals and is commonly found in seaweed shakes that are sold in various restaurants in Placencia. Local entrepreneurs are exploring ways in which seaweed could be used in cosmetics and other products.

Tobacco Cayes

Coconuts , coconut water, coconut milk, coconut tarts.

Jun 6

PhD candidate Maya Carrasquillo drinking coconut water. The inside of the coconut can be used for many food applications, skincare, haircare, and the shells can even be used for water treatment.



CARIBBEAN COMMUNITY CLIMATE CHANGE CENTER(5CS)

One of our partners is the 5Cs, which serves the Caribbean as a leader in climate change adaptation and resilience and is based in Belmopan. We learned how approaches to climate change have transformed over the last several decades and plans for future programs that integrate renewable energy, water, and food.

YA'AXCHE' CONSERVATION TRUST AND MAYA FOOD PRODUCTION

Strong Coasts, researchers from the University of Durham and Ya'axche' Conservation Trust Co-hosted a workshop with us in Golden Stream to share past and future research plans focused on Mayan agroforestry practices and a changing climate.

Placencia

"Becoming Creole: Nature and Race in Belize" with author Melissa Johnson

Jun 11

PLACENCIA VILLAGE


Captain Luis

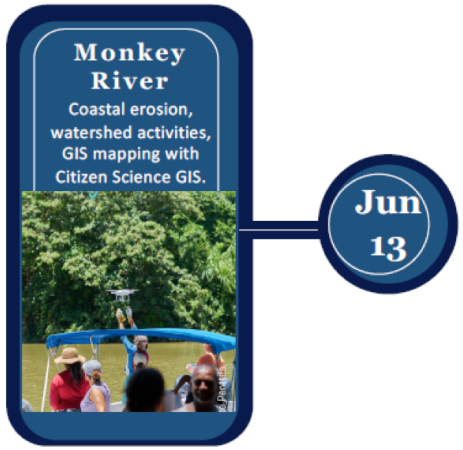
AGROFORESTRY AND FARMING IN THE MAYA MOUNTAINS OF BELIZE

Mr. Santiago Cus participates in agroforestry and farming programs with the community-based organization, Yaaxche Conservation Trust. He brings together traditional Maya farming expertise for growing cacao and other

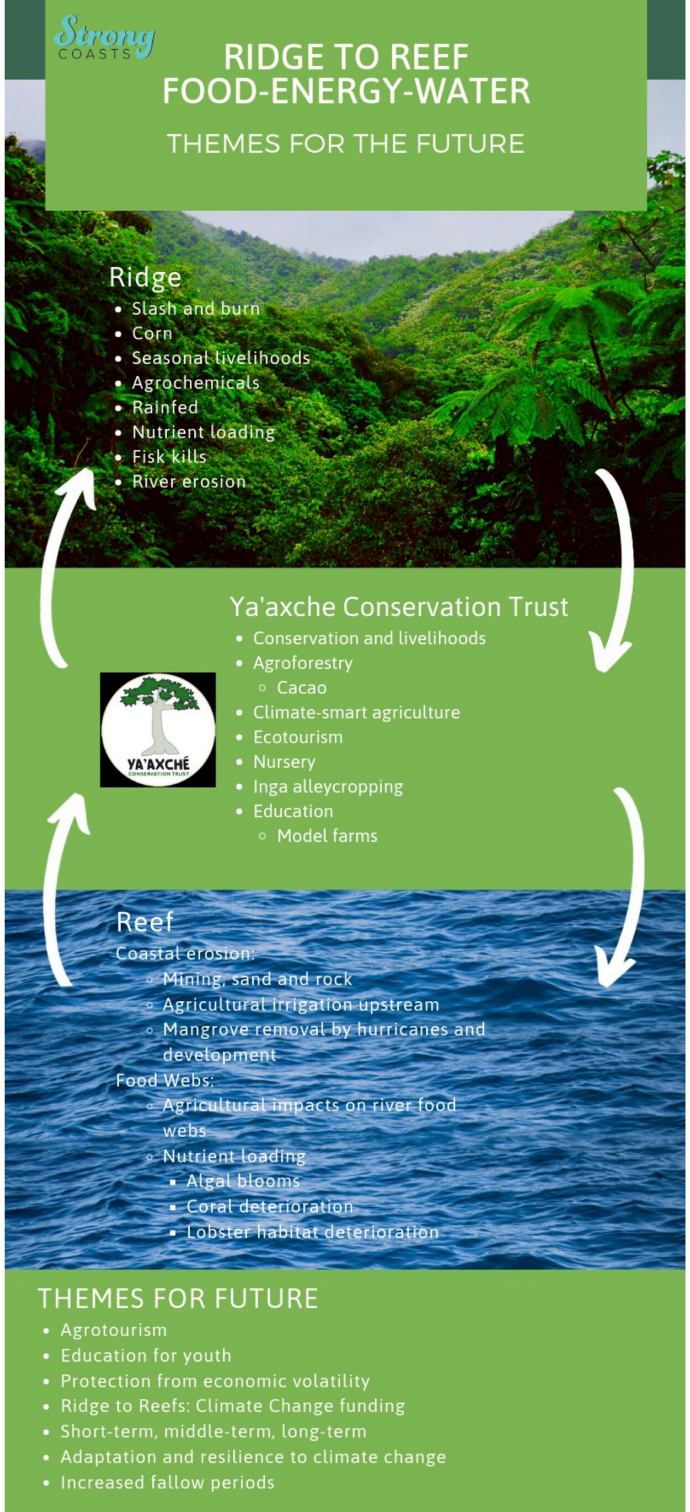
SAN MIGUEL AGROFORESTRY

CITIZEN SCIENCE TO TRACK COASTAL EROSION IN MONKEY RIVER

Strong Coasts joined the University of Central Florida (UCF) and Fragments of Hope at Monkey River, where we taught primary school students about drones and how they can be used for environmental issues. Geographic Information Systems (GIS) and Citizen Science, watershed activities were used to see how coastal erosion has shaped the community of Monkey River over time.



INFOGRAPHICS

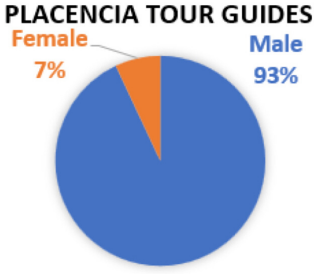


READ MORE ON OUR BLOG:

BREAKING STEREOTYPES

The relationship between changing gender roles, tour guiding, and conservation in Placencia, Belize

Seafaring in Placencia



- Globally, only 2% of seafarers are female
- In Placencia, fishing and tour guiding have traditionally been male-oriented
- In the last 10 years, women have begun to participate as tour guides, fishermen, and boat captains

Why is participation of both genders important?

Including women:		
Brings a new perspective to the tour guiding and conservation industry	Empowers young women to have careers and demonstrates a positive relationship with the environment	Provides a livelihood to those who may not have a degree but want a career outside the home

Conservation in Southern Belize

- Many conservation efforts in southern Belize are female-led
- 30% of trained coral restoration practitioners in Placencia are female

Conservation is an avenue for equal involvement:

Roadblocks and potential solutions:

- Training fees and schedule conflicts are biggest hurdles preventing equal participation
- Accommodating household schedules or providing day-care may improve access to training

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READ MORE ON OUR BLOG:

Seaweed Farming

Eucheuma isoforme* and *Gracilaria spp.

Little Water Key

Establishments that sell Placencia seaweed

- Placencia Producers Cooperative Limited Society
  - Address: Placencia Village, Steam Creek District, Belize, Central America
  - Phone (501) 523-3102
- The Shak
- Brewed Awakenings
- Taste of Belize
- Angel Lisa
- Numada Holistic Massage and Spa in Placencia

Nutritional Facts on Seaweed from "The Shak"	
Amount per serving: 50 calories	
Calories from Fat: 0	
	% Daily Value
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat. 0g	
Cholesterol. 0 mg	0%
Sodium 65 mg	3%
Potassium. 65 mg	2%
Total Carbohydrate. 12g	4%
Dietary Fiber 1g	5%
Sugars. 1g	
Protein 2g	

Magnesium, Manganese, Phosphorous, Folate, Calcium, Riboflavin, Iron, Niacin, Vitamins E, A, K, and B6, Zinc

Sustainability

Environmental

- Alleviating stress from local fisheries
- Providing nurseries for juvenile aquatic species

Social

- Enabling a local workforce
- Cross cultural harvesting training

Economic

- Creating ands selling value added seaweed products
- Ecotourism

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READ MORE ON OUR BLOG:

Meet Our Fellows

"The best part of being an anthropologist on an interdisciplinary team with engineers is having the opportunity to gain a holistic understanding of the Food-Energy-Water nexus that incorporates meaningful community engagement with technological advancements to create sustainable solutions to issues related to climate change."

Kris-An Hinds is pursuing a PhD in Applied Anthropology at the University of South Florida (USF). She received her BA in International Studies and Masters in Applied Anthropology from USF. Her Masters research examined resident perspectives of public policies and regulations on stormwater management, area infrastructure and redevelopment, and environmental justice issues in Hillsborough County, Florida. Currently, Kris-An's research investigates the adaptation and mitigation strategies used by Caribbean coastal communities to increase their level of resilience to climate change and natural disasters with an emphasis on equitable practices. Kris-An is a Florida Education Fund McKnight Doctoral Fellow, a Student Research Associate for the Center for Brownfields Research and Redevelopment and an executive board member for the Applied Anthropology Graduate Student Organization at USF. She is also passionate about issues related to the resettlement of Tampa's refugee population and serves as a volunteer English as a Second Language for the CARIBE Refugee Program.

Estenia Ortiz Carabantes is pursuing a PhD in Environmental Engineering at the University of South Florida (USF). She received her BS in Environmental Engineering Sciences (EES) at the University of Florida (UF) in Gainesville, FL and her AA at Miami Dade College in Miami, FL. Estenia has previously worked with understanding the role of functional groups on chemically and physically modified activated carbon for mercury capture in the water phase. She is a Ronald E. McNair Scholar Alumni and has served on the executive boards of the McNair Ambassadors, Engineers Without Borders-UF Chapter, and the EES Mentoring Program.

For her doctoral studies, Estenia is interested in water quality and reuse in sustainable multitrophic systems for human and economic development, a topic inspired by seaweed farming in Belize.

"The Strong Coasts program taught me how to be a resourceful and adaptable engineer given the context I am in, available equipment, and schedules of community members. Working alongside our partners and bonding over similar passions and hobbies has been an invaluable experience that I hope to further cultivate in my career."

"Strong Coasts provides a space where engineers, anthropologists and scientists can come together with our unique skills to tackle 21st century challenges. We are no longer siloed into our disciplines, but instead take an integrated approach to solving issues."

Michelle Henderson is a scientist and environmental engineering PhD candidate at the University of South Florida whose work focuses on water reuse. Her research focuses on health, environmental and sustainability issues related to onsite wastewater treatment and reuse systems, including effective management of pathogens, nutrients and antibiotic resistant organisms. Michelle obtained her Master's degree in Engineering Science with a concentration in Environmental Engineering. During her PhD, Michelle conducted research abroad in Israel and will continue her work in the U.S. Virgin Islands to study food, energy, and water connections. Michelle is an Alfred P. Sloan scholar and Florida Education Fund Mcknight doctoral fellow. Michelle has presented her research at twelve conferences and mentored numerous undergraduate students including three underrepresented minorities and women who she trained with wet chemical skills during the course of her research career. Outside of her research Ms. Henderson is involved with various community organizations and NGOs.

Maya Elizabeth Carrasquillo is an Environmental Engineering PhD student at the University of South Florida. Her research interests are at the intersection of water, sustainability, and social justice. Her current research looks at stormwater management through an environmental justice lens to develop a community-based framework of sustainability, promoting more equitable development of stormwater best management practices in coastal African American communities. Her work includes community partnerships in East Tampa, Florida and Bayview-Hunters Point in San Francisco, California.Maya holds a B.S. in Environmental Engineering with a minor in History from the Georgia Institute of Technology. Maya is also a recipient of the National GEM Fellowship, the McKnight Doctoral Fellowship and the Alfred P. Sloan Graduate Minority Scholarship Program, and has industry experience with Intel Corporation working on environmental treatment systems and diversity and inclusion projects.

"Programs like STRONG Coasts are reflective of the holistic approaches needed to tackle the world's most complex challenges. We are interdisciplinary, diverse, and community-driven, and as a result we are producing well-rounded anthropological engineers and technical anthropologists who have the ability to tackle 21st century sustainability, equity and justice challenges head on!"

"Not only is it interesting but, I believe, fundamental to harvest global knowledge in the age of the Anthropocene. Strong Coasts has facilitated this and guided us to investigate and articulate significant global environmental issues within local cultural frameworks."

Atte Penttilä is pursuing a Ph.D. in Applied Anthropology at the University of South Florida in Tampa. He is also an instructor for a class focusing on cross-cultural diversity. He has a BSc in Environmental Engineering from Tampere Polytechnic in Finland, University of Applied Sciences and an MSc in agroecology from the University of Helsinki. His multidisciplinary and international background brings together different aspects of the food-energy-water nexus. In his Master's thesis, Atte studied the effect of dung beetles on greenhouse gas emissions from cow dung. The results were published in PLOS One and featured in several news outlets and magazines, including National Geographic. Prior to beginning his doctoral studies, Atte worked in the field of development in Ethiopia, Vietnam, and Finland. His work focused on agroforestry with regards to local farmers' associations. Atte is interested in how food production relates to local livelihoods, sustainability, global economics, and climate change.

"Strong Coasts has challenged me to adapt and become more culturally aware, interdisciplinary, and sustainability minded. Having the opportunity to train alongside a diverse team and develop an interdisciplinary team, including community partners and members, for my research is an amazing experience that will shape the rest of my schooling and career."

Addie Beurck is currently a second year PhD student in USF's civil and environmental engineering department. She is currently looking at lead mitigation in pitcher pumps in coastal Madagascar. This research is taking an interdisciplinary approach through looking at the engineering aspects around the pump but also the social aspects. To achieve this she is also working on a Social Marketing Certificate from USF and working closely with scholars in Social Marketing.

Addie received her master's in civil engineering from Saint Louis University in 2018. Her master's research looked at arsenic (III & V) removal through iron-oxide coated ceramic filters. Her undergraduate degree was also from Saint Louis University (2016) in civil engineering with a minor in business administration.

After high school, **Daniel Delgado** spent six years in the Navy as a nuclear plant operator onboard a submarine. Those experiences created an interest in engineering that lead to environmental engineering. After completing his contract with the Navy, Daniel enrolled in community college and later transferred to San Diego State University (SDSU). At SDSU he was accepted as a research assistant helping with algal biomass research removing nutrients from wastewater. Upon completing his bachelors in environmental engineering, he was accepted to University of South Florida (USF), Tampa, for a Ph. D. program in civil engineering with a concentration in environmental engineering. There he researches biological onsite wastewater treatment for removal of nutrients. His research interests revolve around food, water, energy nexus specifically in wastewater treatment, resource recovery from waste, and bioremediation.

"Improving my ability to engineering solutions that incorporate the human variables has been my greatest takeaway from working with Strong Coasts anthropologist and engineers embedded in a community, and I believe this will help birth more sustainable solutions."

"Participating in community-engaged research with anthropologists continually challenges me to think differently about engineering solutions to ensure they are rooted within the context of the community for which we are designing."

Michelle Platz is pursuing a PhD in Environmental Engineering at the University of South Florida. She has a BS in Environmental Engineering from the University of Cincinnati and a Masters in Environmental Engineering from the University of South Florida. Her dissertation research investigates monitoring in-situ community metabolism, the processes involved in cycling carbon for coral calcification and biomass production, in coral nurseries and on restored reefs as a means to monitor coral restoration. She is working with a suite of monitoring technologies known as the Benthic Ecosystem and Acidification Measurement System (BEAMS) which was previously developed by Dr. Yui Takeshita of the Monterey Bay Aquarium Research Institute. Her research goal is to use these data to improve restoration practitioners' understanding of the metabolic, environmental, and hydrodynamic processes driving coral growth. She hopes to contribute data which can be used to inform upstream environmental and ecological engineering interventions to help protect the ecosystem services reefs provide.

W Alex Webb received his BS in Psychology from Westminster College and Masters of Marine and Environmental Science from the University of the Virgin Islands before pursuing a Ph.D. in Applied Anthropology at the University of South Florida. In between, he taught English in South Korea, spent a year sleeping on the beach working with sea turtle conservation programs in the Caribbean, and acted as a data consultant for a small county in Southern Utah.

As a Ph.D. student, he has collaborated with environmental engineers investigating the sociotechnical aspects of wastewater and water management. His dissertation explores how institutions, scientific practices, and policy shape infrastructure planning.

"The opportunity to share and learn about problems with colleagues from other disciplines has helped me see the world in new ways."

Our Faculty Team

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Rebecca Zarger

ASSOCIATE PROFESSOR AND GRADUATE DIRECTOR, ANTHROPOLOGY | CO- PRINCIPAL INVESTIGATOR | LEAD, INTERDISCIPLINARY

Qiong Zhang

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ASSISTANT PROFESSOR, CIVIL & ENVIRONMENTAL ENGINEERING | FACULTY MENTOR

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