

Education innovation to meet Sustainable Development Goals (SDGs)

12th Natural Resource Management & Research Symposium
“BELIZE, “THROUGH THE BOTTLENECK”
University of Belize, Belmopan, BZ
5/29/19

Maya A. Trotz, Ph.D.

Professor, Civil & Environmental Engineering, University of South Florida

Director, STRONG Coasts

President, Association of Environmental Engineering & Science Professors

Board Member, Fragments of Hope Corp



© Global Context © Regional Initiative © Belizean Examples © Future Connections



Global Context



SUSTAINABLE DEVELOPMENT GOALS



Education for

Sustainable Development Goals

Learning Objectives



“Integrated problem-solving competency”

The sustainable development of small island developing states (SIDS) through genuine and durable partnerships.
SAMOA, 2014

Investment in education and training, including through partnerships with migrants and diaspora communities, with “concrete, focused, forward-looking and action oriented programmes.”





Regional Initiative

Sagor Visionaries Challenge (SVC)



2013



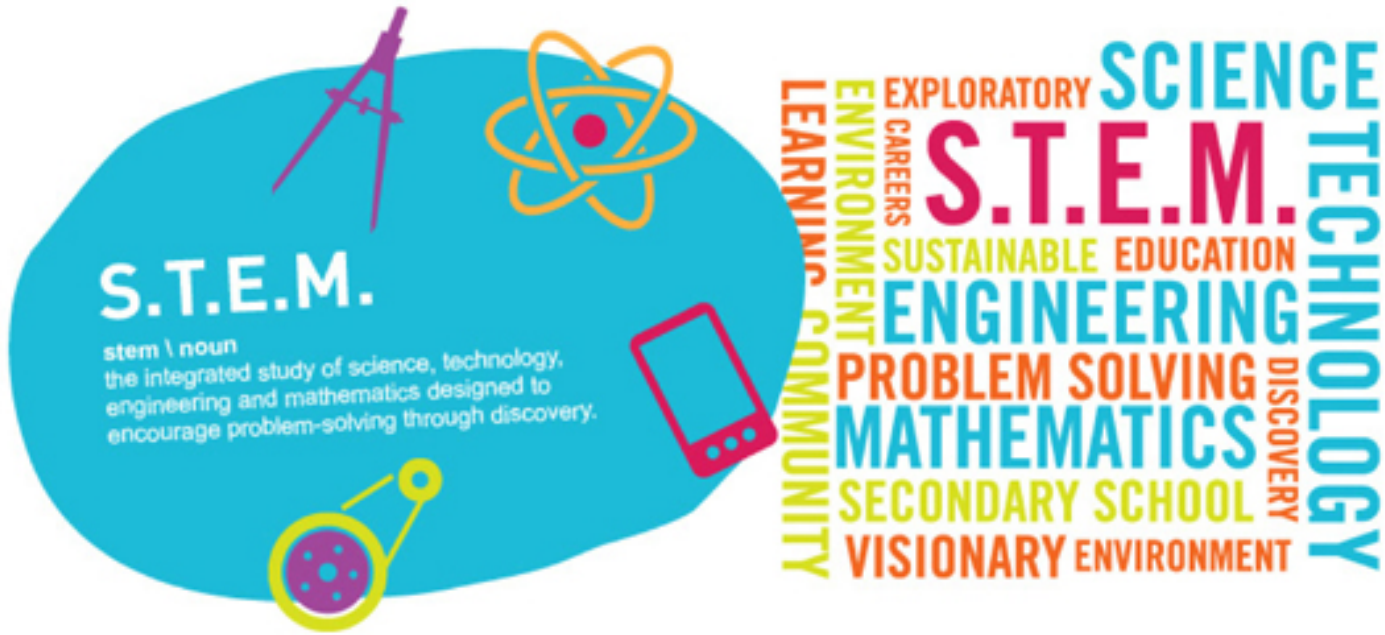
12 Ministries of Education

Target

- secondary school students

Challenge

- identify a challenge facing your respective school or community, and
- using **science, technology, engineering and mathematics (STEM)**,
- develop effective, innovative and **sustainable solutions** to the challenge.



In 2011

~ 35% of Students
in Caribbean received grades 1, 2, or 3
In CXC Mathematics

15-20% of students in Caribbean
did science subject at CXC

**the integrated study of science, technology,
engineering and mathematics designed to encourage
problem-solving through discovery.**



**meeting the needs of current generations
without compromising the needs of future ones,
so that society can co-exist in continuous harmony**

Toolkit

- Teamwork



Image Courtesy of Dr. Jim Mihelcic & Danielle de Vuyst

Toolkit

- Teamwork
- Project Based Inquiry



Image Courtesy of Dr. Jim Mihelcic & Danielle de Vuyst

Toolkit

- Teamwork
- Project Based Inquiry
- Behavior Change



Image Courtesy of Dr. Jim Mihelcic & Danielle de Vuyst

Toolkit

- Teamwork
- Project Based Inquiry
- Behavior Change
- Innovation



Image Courtesy of Dr. Jim Mihelcic & Danielle de Vuyst

Toolkit

- Teamwork
- Project Based Inquiry
- Behavior Change
- Innovation
- Communication



Toolkit

- Teamwork
- Project Based Inquiry
- Behavior Change
- Innovation
- Communication
- Leadership



Judging Criteria

Relevance to Sustainable Caribbean Communities (4)	
Very relevant to sustainable Caribbean communities. Addresses school/community needs in many ways.	4
Relevant to sustainable Caribbean communities. Addresses school/community needs.	3
Somewhat relevant to sustainable Caribbean communities. Addresses school/community needs.	2
Very little relevance to sustainable Caribbean communities. Barely addresses school/community needs.	1
Is not relevant to sustainable Caribbean communities. Has no application at school or in the community.	0
Creativity and Innovation (4)	
Adapts, extends, and transforms a unique idea, question, format, or product to create something new.	4
Experiments with a unique idea, question, format, or product.	3
Begins to experiment with a unique idea, question, format, or product.	2
Successfully reproduces an appropriate idea, question, format, or product with minimal changes.	1
Does not reproduce an appropriate idea, question, format, or product.	0
Content and Knowledge of Project (4)	
Excellent (clear and thorough) explanation of project challenge, background and findings.	4
Good explanation of project challenge, background and findings.	3
Satisfactory explanation of project challenge, background and findings.	2
Limited explanation of only one or two parts of project challenge, background and findings.	1
No explanation of project.	0
Project Plan and Design (3)	
Clear and thorough identification of project plan, design and implementation process.	3
Good identification of project plan, design and implementation process.	2
Limited identification of project plan, design and implementation process.	1
No identification of project plan, design and implementation process.	0

- Relevance to Sustainable Caribbean Communities (4)
- Creativity and Innovation (4)
- Content and Knowledge of Project (4)
- Project Plan and Design (3)
- STEM Linkage (3)
- Methods of Investigation (2)
- Presentation (2)
- Answering Questions (2)
- Public or Community Engagement (2)

Challenge

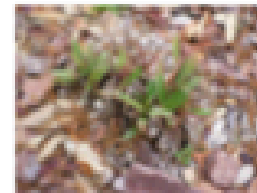
Our schoolyard is mainly concrete. It quickly floods when it rains. We wish to replace the concrete with pervious materials and plants.

Investigative Methods

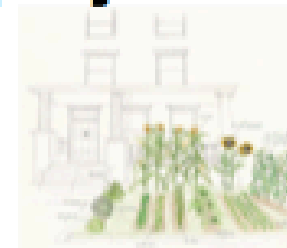
- Literature Review
- Site Assessment
- Survey of Students

Results

- Rain & butterfly gardens gaining popularity in literature.
- 88% of students (500 total) support project.



Photo



Sketch



Plot

Implementation Plan

- Company YX to donate rain barrels/tanks.
- Test rain garden.



Ambassador Programme

The national winner and teacher who endorsed the project from each Challenge Country will participate in a 7-day trip to Florida



Kennedy Space Center

Lunch with an astronaut & tour

Museum of Science & Industry (MOSI)

Hurricane Simulator, Idea Zone, Bank of America Butterfly Garden

Disney EPCOT Center

Living with the Land Tour; Imagination EXPO

University of South Florida

Engineering Education; Patel School of Global Sustainability



Sensitization Workshops 2012, Principals, Belize



Sensitization Workshops 2012 – Teachers, UB, Belize City

Teacher reflections from workshops

- “To empower students to consider not only traditional careers, but to be aware of engineering and the many options available.”
- “To further encourage students to identify solutions to problems they encounter while working in the lab or in the field.”
- “To better teach students of their roles in society and to incorporate STEM into my teaching process.”
- “To persuade and encourage community residents and young children to appreciate science and technology in their everyday life.”
- “Increase the number of critical thinking projects.”



Sensitization Workshops 2012/13 – Students

2013. 12 countries, 175 projects, representing 900 students ranging in age from 11 to 19

Country	Project Title of Winning National Team
Anguilla (17)	Alternative energy revolutionized
Antigua & Barbuda (14)	213 JKD(M)T mulching remote control lawnmower
Barbados (15)	Healthier lungs with the help of the carbon-ioniser
Belize (17)	Coconuts 4 life (Bishop Martin)
Dominica (15)	Flush efficiency
Grenada (18)	Water striders: conserving water and promoting health by going green
Guyana (15)	Use of a shrimp dryer to reduce air pollution at Zeeburg secondary school
Jamaica (18)	Electro-light; making your electricity bill lighter
St. Kitts & Nevis	When rubber hits the road
St. Lucia (16)	Obstacle detector for the visually impaired
St. Vincent & the Grenadines (14)	Paper bricks
Trinidad & Tobago (15)	So who is the farmer in your neighborhood?

The following challenges were common throughout the Caribbean:

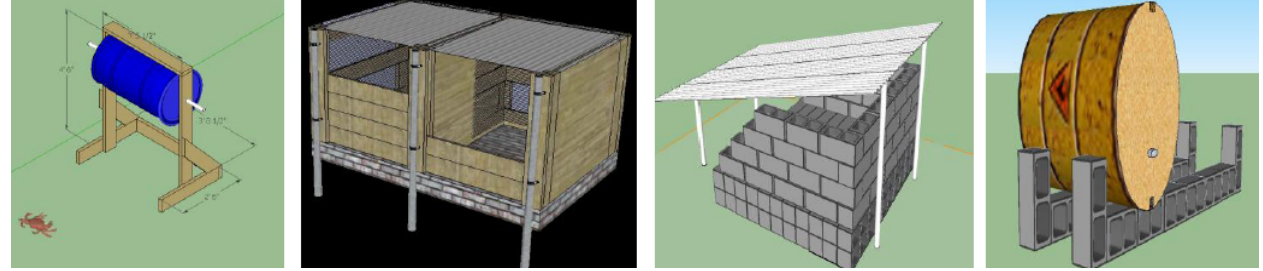
- hot classrooms
- unhealthy food in the cafeteria
- malfunctioning restrooms
- inadequate solid waste management and water supply
- dilapidated athletic facilities
- limited access to computers and computer facilities
- inadequate laboratory facilities and equipment
- flooding on the school campus.



Belize Examples

Sagor Visionaries Challenge (SVC)

Ocean Academy & Auburn University



Interaction: SKYPE & email

Auburn University student team deliverables: a team report and a 5-minute Skype presentation to Belize.

The faculty mentor coalesced the teams' reports and forwarded a final report to the Belizean teacher who was supervising the project.

Sagicor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



Sagicor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



Sagicor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



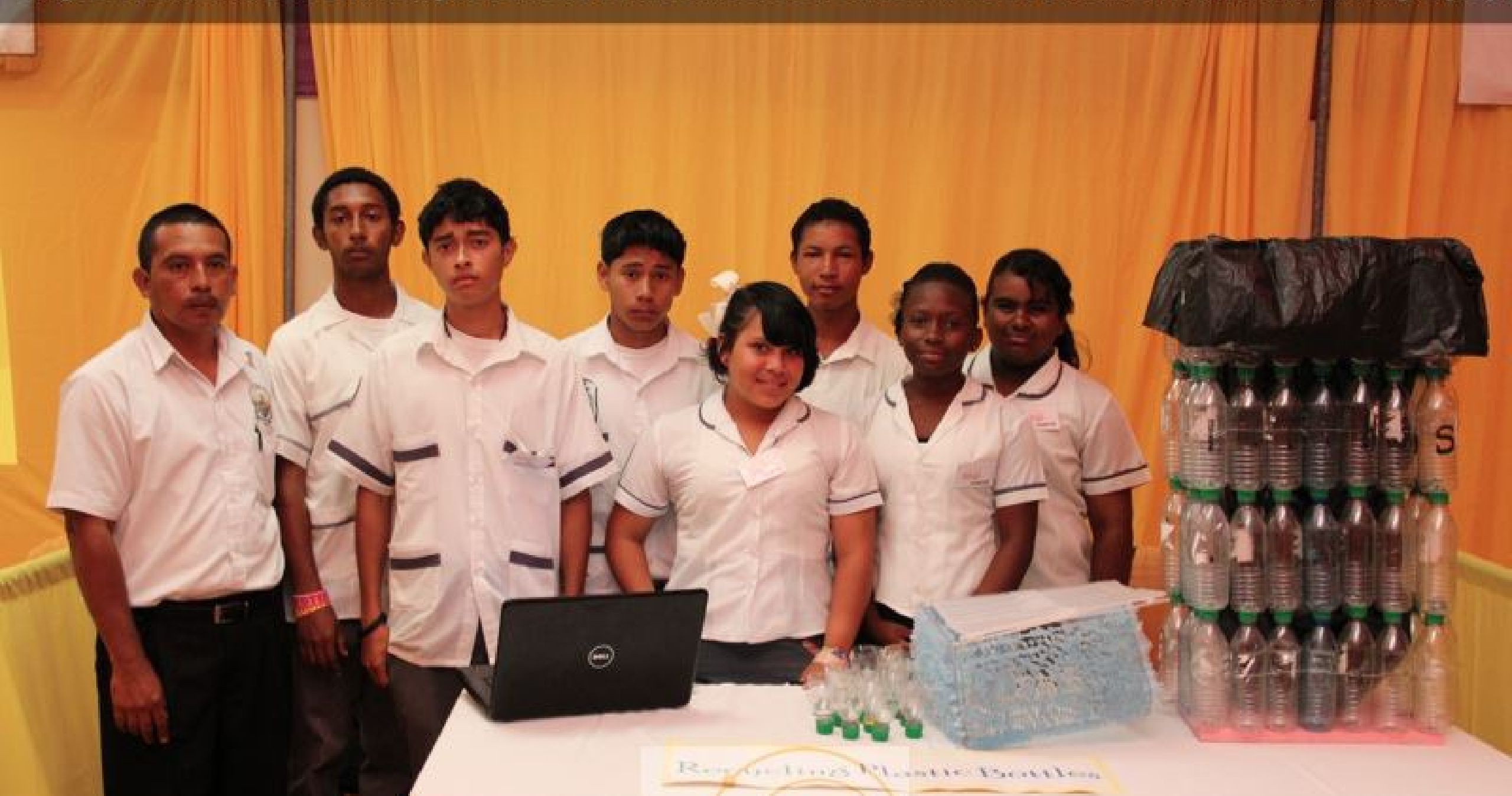


Nationals in Belize. Princess Hotel, March 20th, 2013.

Sagicor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



Sagicor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



Sagicor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



Sagikor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



Bishop Martin Secondary

Sagikor Visionaries Challenge Nationals in Belize. March 20th, 2013. Raul Villanueva photography.



Sagikor Visionaries Challenge Regional Competition. April 12th, 2013 in Barbados



Sagcor Visionaries Challenge 1st runner up in Belize:
Yorker Ecological Educational Park for Belizean Biodiversity.
Visiting the Edward P. Yorke High School in Belize. March 22nd, 2013.

Yorker Ecological Park

YORKER'S ECOLOGICAL EDUCATIONAL PARK FOR BELIZEAN BIODIVERSITY

STEM Approach

- Biodiversity test
- Soil Composition test
- Contaminant test
- Water level test
- AUTO CAD
- Power Point
- Irrigation system
- land topology



Sagcor Visionaries Challenge Belize National Competition
with the University of Mount Union to build
Photograph by Alina Selby



Sagcor Visionaries Challenge 1st runner up in Belize:
Yorker Ecological Educational Park for Belizean Biodiversity.
Edward P. Yorke High School in Belize. March 22nd, 2013.

**Sagcor Visionaries Challenge 1st runner up in Belize:
Yorker Ecological Educational Park for Belizean Biodiversity.
Visiting the Edward P. Yorke High School in Belize. March 22nd, 2013.**









Future Connections



Placencia Seaweed Farmers

Edward P. Yorke
August 2015



Placencia Seaweed Farmers

Belmopan Comprehensive
August 2015



Fragments of Hope
Sandwatch Program
Seine Bight, Summer 2018



FRAGMENTS
HOPE



CAPE®

GREEN ENGINEERING

**THE CARIBBEAN EXAMINATIONS COUNCIL IS PLEASED TO INTRODUCE
THE CARIBBEAN ADVANCED PROFICIENCY EXAMINATION (CAPE®)
GREEN ENGINEERING SYLLABUS.**

The study of CAPE® Green Engineering will enable students to acquire the knowledge, skills, values and attitudes needed to sustain the natural environment. This course of study will enable students to apply Scientific, Technological, Engineering and Mathematical (STEM) principles to improve their environment at the local, regional and global levels.

The study of Green Engineering will enhance quality of life for present and future generations, while providing wealth creation through new and innovative job opportunities and other economic possibilities including entrepreneurship. By pursuing this course, students will develop twenty-first century engineering skills and ethics required for sustainable development. The syllabus is designed to provide the knowledge, skills and competencies that are required for further studies, as well as for the world of work.

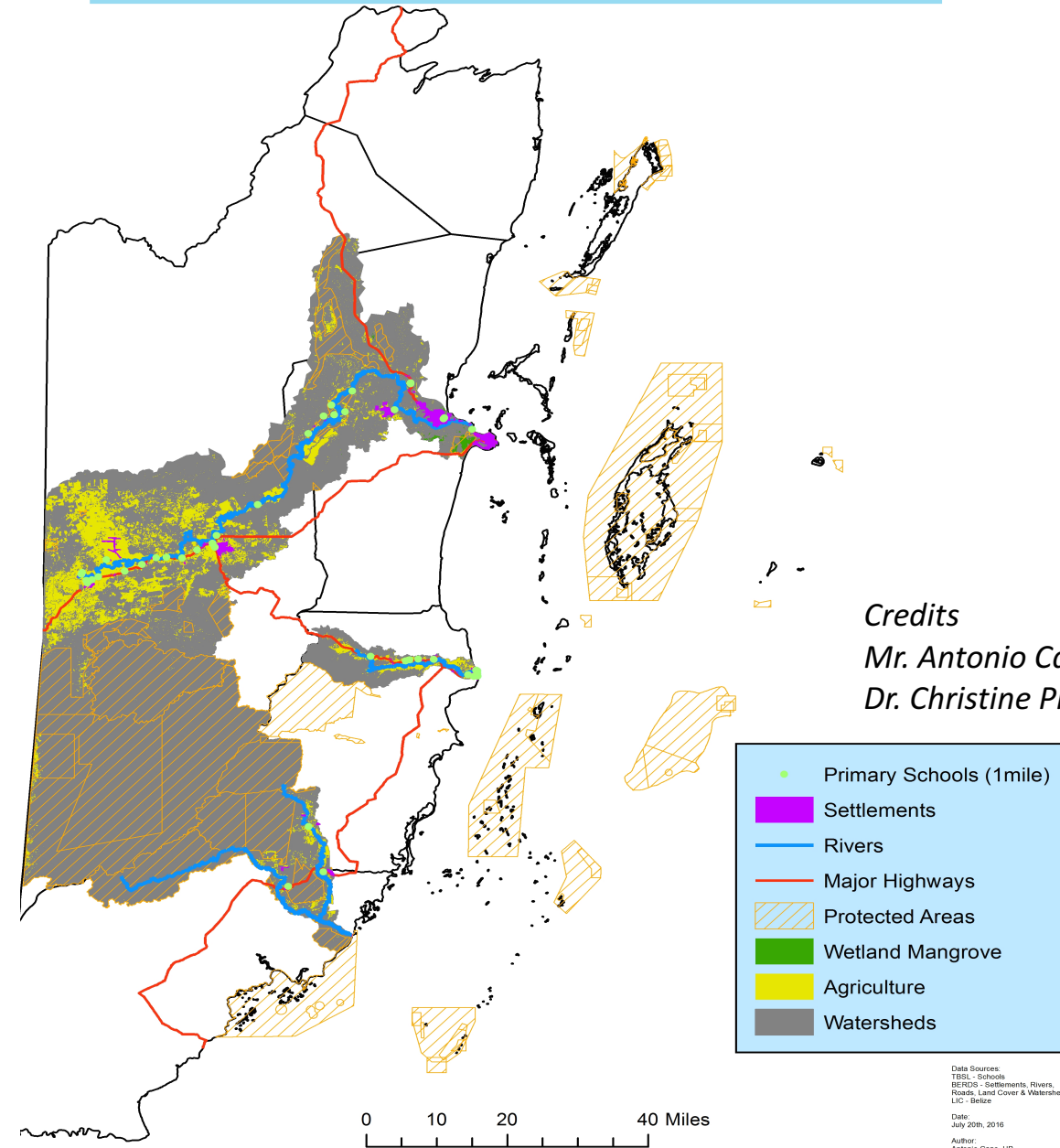
Green Engineering – Caribbean Examinations Council



Building resilience – educational centers as community hubs for climate change adaptation

- Increase understanding of important weather variables and how they relate to climate change
- Project based solutions
 - Food
 - Water
 - Health/Wellness
 - Energy
 - ...

Potential Land Based Impacts To Belize North Stann Creek, & Monkey River Watersheds & Marine Protected Areas





- This research has been supported by grants from the National Science Foundation under Grant Numbers 1243510 and 175320. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



Thank You! Maya Trotz, matrotz@usf.edu
www.strongcoasts.org