Climate Change Education - unique linkages and opportunities between the Caribbean and CACCE

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CACCE Workshop on Impacts of Climate Change over the Caribbean Countries
February 1-3, 2012
Mayagüez, Puerto Rico

The 4 Points

Why connect Caribbean/CACCE

Challenges

Opportunities

How to connect Caribbean/CACCE

Why are we interested in Caribbean-CACCE links?

Why

Caribbean connections

why

why

Innovation from S&T critical as Caribbean like the canary in a coal mine:

isolated
limited natural resources
changing trade agreements on products like sugar
population growth & brain drain
climate change impacts

http://www.tourismgeographic.com/images/grenada1.jpg

$$$ Driver

Why

- Partnerships for Enhanced Engagement in Research (PEER). USAID/NSF, $300 K US.
  - Food security - agricultural development, fisheries, and plant genomics
  - Global health issues - ecology of infectious disease, biomedical engineering, and natural/human system interactions
  - Climate change - water sustainability, hydrology, ocean acidification, climate process and modeling, and environmental engineering
  - Other development topics - disaster mitigation, biodiversity, water, and renewable energy
- Sustainability Research Networks Competition (SRN). NSF, $8 Million US.
  - Support integrated research enterprises for trans-disciplinary knowledge built around pressing societal needs in sustainability.
  - Cross the boundaries of climate, energy, and environmental sciences, as well as physical and computational sciences, social and behavioral sciences, and educational sciences.
  - Inform societal actions for future environmental, economic, social and cultural sustainability.
- University Engagement through Higher Education Institutions. USAID, $5-25 Million US.
  - Foster and support creative, evidence-based international development beyond traditional approaches to development, engaging an innovative, heterogeneous, academically-based community and other partners such as foundations, development organizations and institutions, and social entrepreneurs within both the developed and developing world.
- Caribbean Region: Climate Adaptation Partnership Initiative 2011. HED/USAID, $775,000 US.
  - Build additional permanent, local capacity in the area of climate adaptation at University of the West Indies (UWI)/Centre for Resource Management and Environmental Studies (CERMES).

Synergy & global network

Why

- Caribbean Community Climate Change Center

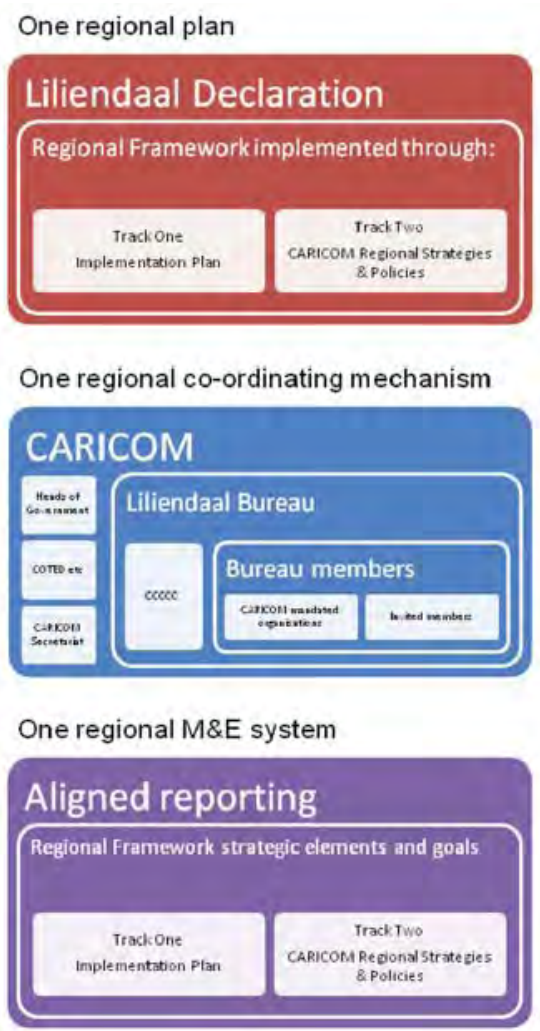
http://www.youtube.com/watch?v=HjR3mdwqVUM

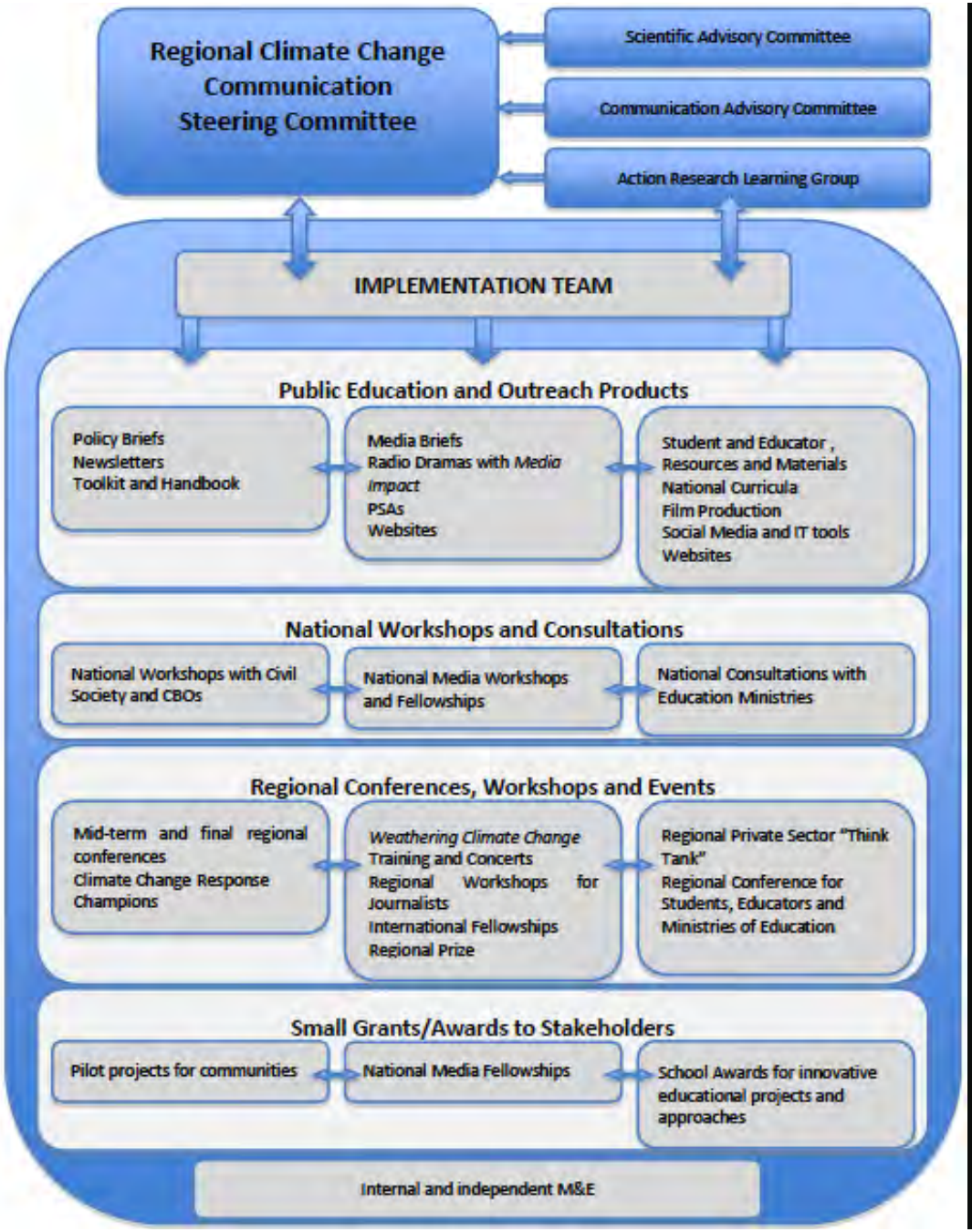
1992 – UNFCCC Meeting
1994 – Barbados Program of Action
2009 – Lilliendal Declaration
Regional Strategy
Implementation Plan for strategy

The Caribbean Modeling Initiatives: (2011 – 2016). $30 Mil US suggested.

Implementation Plan

why





US National Science Foundation Funding

why

- Climate Change Education Partnerships (CCEP) – 2010-2012 & 2012-2017
- Engineering Directorate – first climate change workshop held 2011

Challenges

challenges

Guyana

challenges

Photo by O. Dalrymple

Between a conservancy & a coast

challenges

East Demerara Water Conservancy

Branch feeder canal at "NANCY" takes water to the GWInc. Water Works and feeds Houston Estate. The conservancy dam then continues south past Land Of Caanan where there is a four door relief sluice and ends at Huist Coverden which is at the foothill of the Timehri highland that is the white sand area along the Linden Soesdyke highway.

Land of Caanan Canal and Relief Sluice. 5 doors opened Jan 15th, 2005 (water level at 57 GD)

The sluices at "Stop Off" on the Lama Creek which is another branch of the Mahaica River prevent water from getting into the Mahaica River, thus storing it in the conservancy. Those sluices opened on Jan 21st, 2005 Water level at 58.8 GD

Sluice at the Maduni Creek which retains the Maduni water in the Conservancy and in high water allows the discharge of excess water into the Mahaica River. Sluice opened Jan 18th, 2005

The Maduni Creek which is coloured yellow feeds water into the conservancy all the way south approximately in line with Timehri on the Demerara River and St Cuthbert's Mission on the Mahaica River. The trail to St Cuthbert which is a watershed like most trails in the interior is shown as a red dotted line, running East to West along the watershed.

http://www.jouvay.com/guyana/technical/edwc.html

East Demerara Water Conservancy

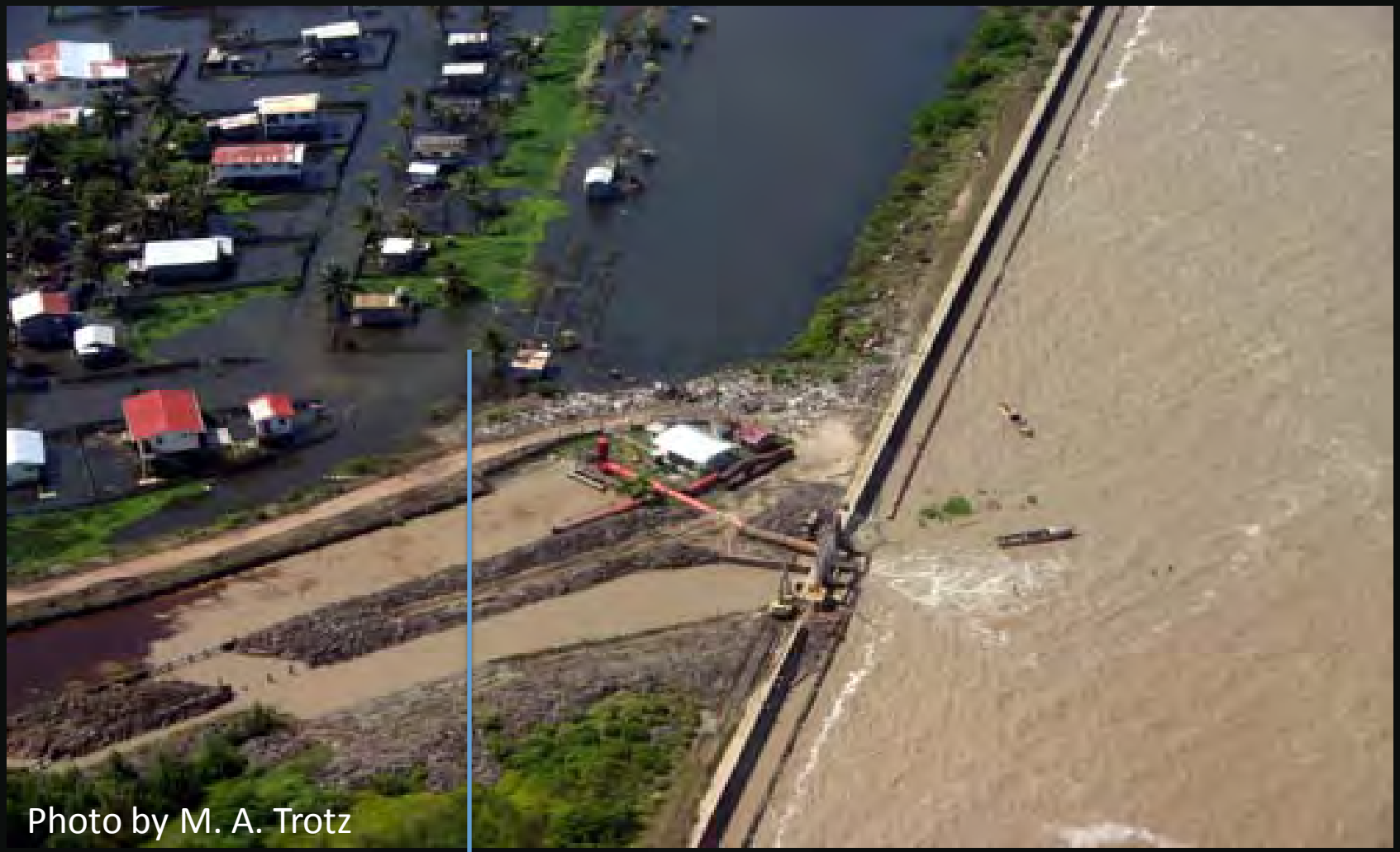
challenges

Photo by Maya Trotz

USF
UNIVERSITY OF SOUTH FLORIDA

Guyana, 2005

challenges

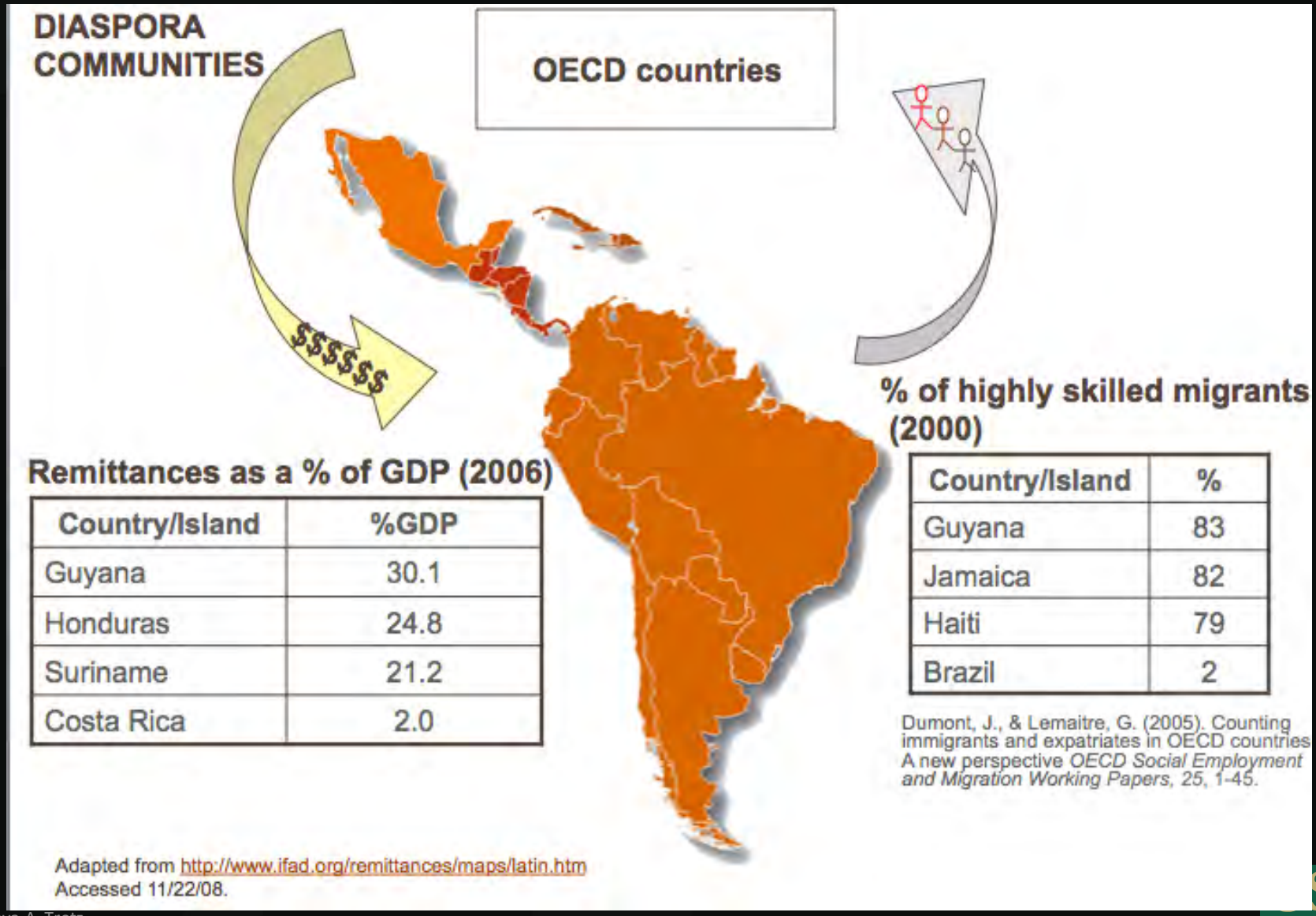


Leptospirosis?

Haiti, 2011

Challenges

challenges



Remittances as a % of GDP (2006)

Country/Island	%GDP
Guyana	30.1
Honduras	24.8
Suriname	21.2
Costa Rica	2.0

% of highly skilled migrants (2000)

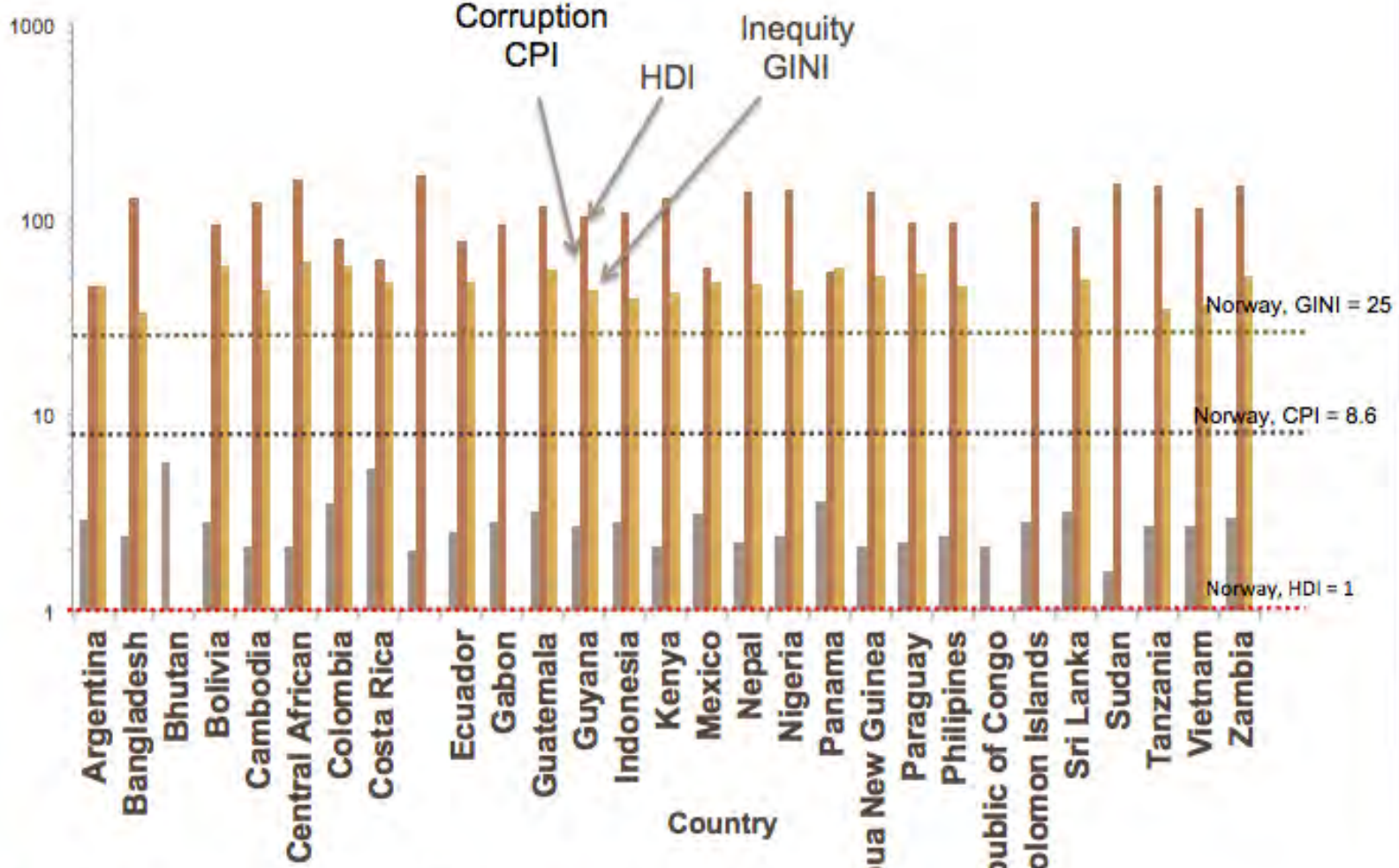
Country/Island	%
Guyana	83
Jamaica	82
Haiti	79
Brazil	2

Dumont, J., & Lemaitre, G. (2005). Counting immigrants and expatriates in OECD countries A new perspective *OECD Social Employment and Migration Working Papers, 25*, 1-45.

Adapted from http://www.ifad.org/remittances/maps/latin.htm
Accessed 11/22/08.

REDD+ Countries – managing funds

opportunities



http://www.transparency.org/policy_research/surveys_indices/cpi/2010/in_detail
https://www.cia.gov/library/publications/the-world-factbook/fields/2172.html
http://hdr.undp.org/en/statistics/

National Academy of Engineering Grand Challenges

Find out more about any of these Grand Challenges:


Make solar energy economical


Provide energy from fusion


Develop carbon sequestration methods


Manage the nitrogen cycle


Provide access to clean water


Restore and improve urban infrastructure


Advance health informatics


Engineer better medicines


Reverse-engineer the brain


Prevent nuclear terror


Secure cyberspace


Enhance virtual reality


Advance personalized learning


Engineer the tools of scientific discovery

STEM EDUCATION!

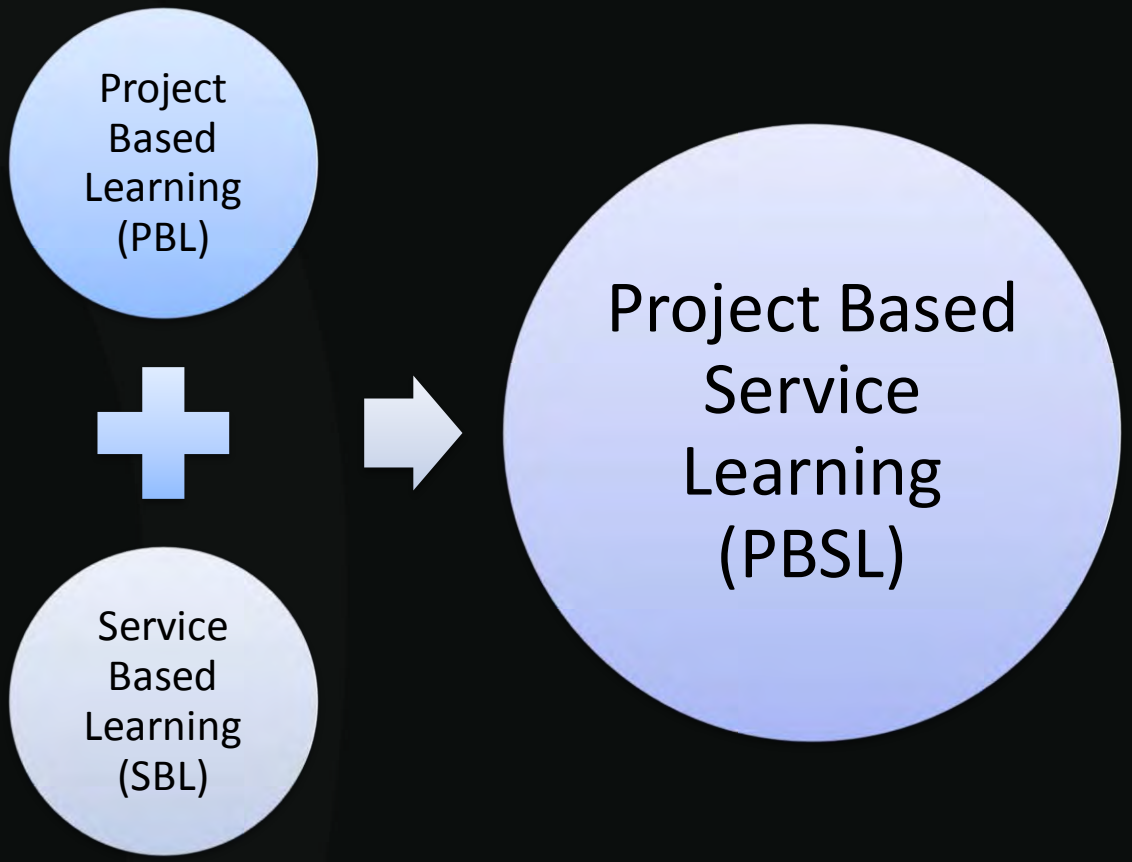
http://www.engineeringchallenges.org/cms/challenges.aspx

Opportunities

Education, mentorship, internships
Innovation from Science & Technology

Project based service learning

- Project central to the curriculum
- ill-defined problem drives inquiry
- Student lead
- Real or authentic setting

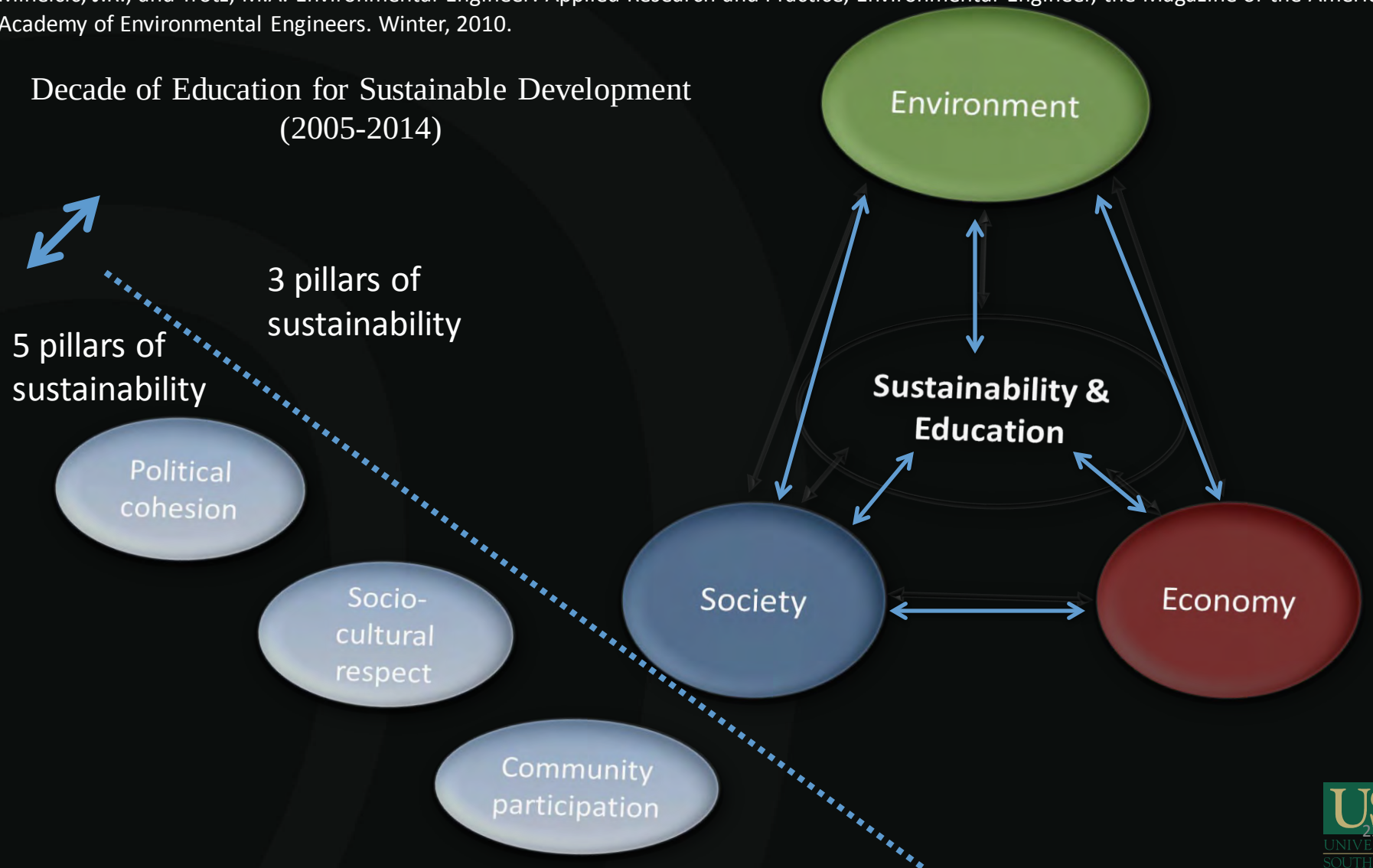


- Course-based, credit-bearing educational experience
- Organized service activity
- Meets identified community needs
- Student reflection on service activity

Sustainability & Engineering Education

McConville, J.R. and J.R. Mihelcic (2007). Adapting Life Cycle Thinking Tools to Evaluate Project Sustainability in International Water and Sanitation Development Work. *Environmental Engineering Science, 24(7): 937-948*.
Mihelcic, J.R.; and Trotz, M.A. Environmental Engineer: Applied Research and Practice, Environmental Engineer, the Magazine of the American Academy of Environmental Engineers. Winter, 2010.

Decade of Education for Sustainable Development
(2005-2014)



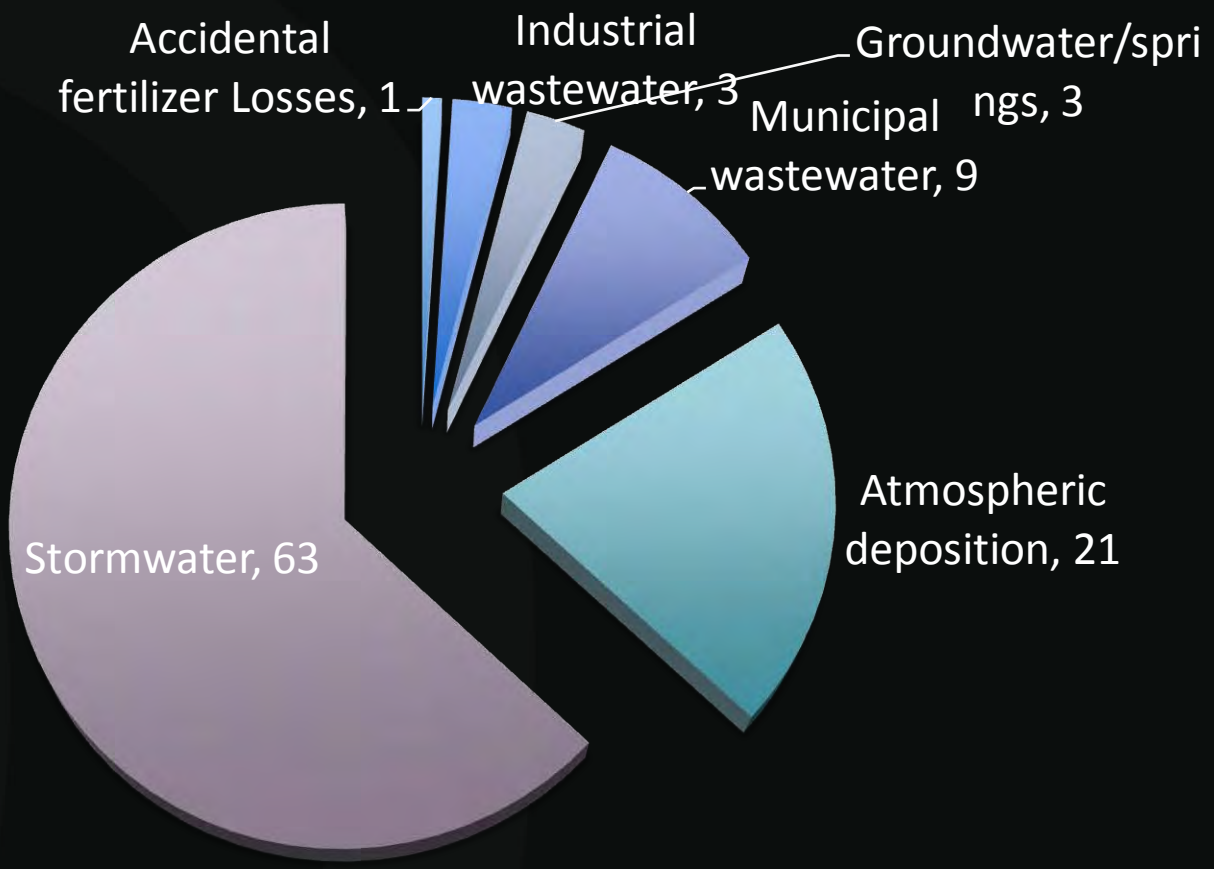
Water Awareness Research & Education (WARE)

Partnership Development
Community Engagement
Curriculum Development
Free Informal Science Education
Formal Science Education

2008 **2009** **2010** **2011**

Taken from: Tampa Bay Estuary Program, "Charting the Course: The Comprehensive Conservation and Management Plan for Tampa Bay," 2006.

Sources of N input to McKay Bay as %



Residential – 20
Pasture lands – 15
Intensive agriculture – 12
Commercial – 9
Mining – 6
Undeveloped land – 1

Taken from: Tampa Bay Estuary Program, "Charting the Course: The Comprehensive Conservation and Management Plan for Tampa Bay," 2006.

East Tampa Community Revitalization Partnership (ETCRP) – beautification project

Designed by Prof. Trent Green, USF Architecture

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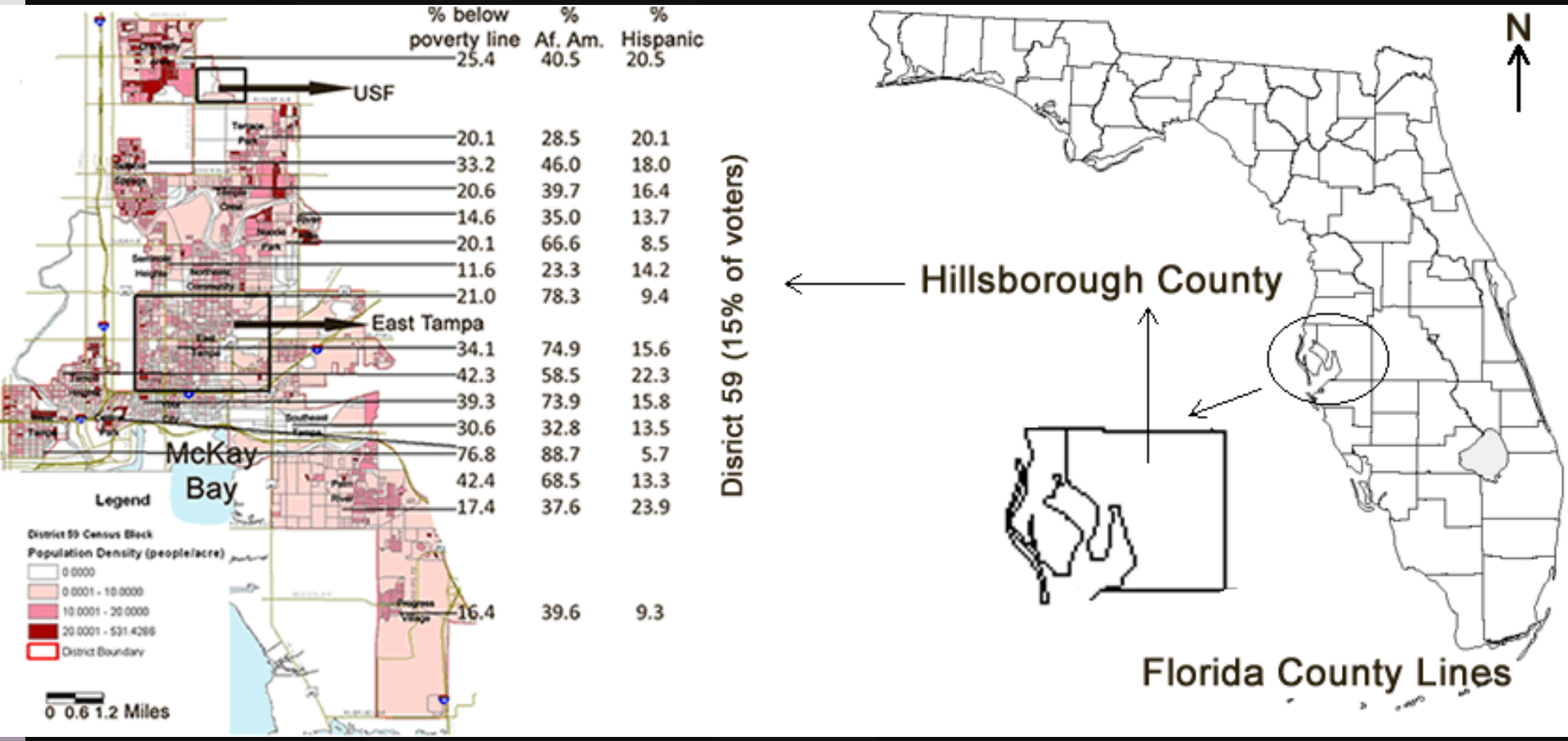
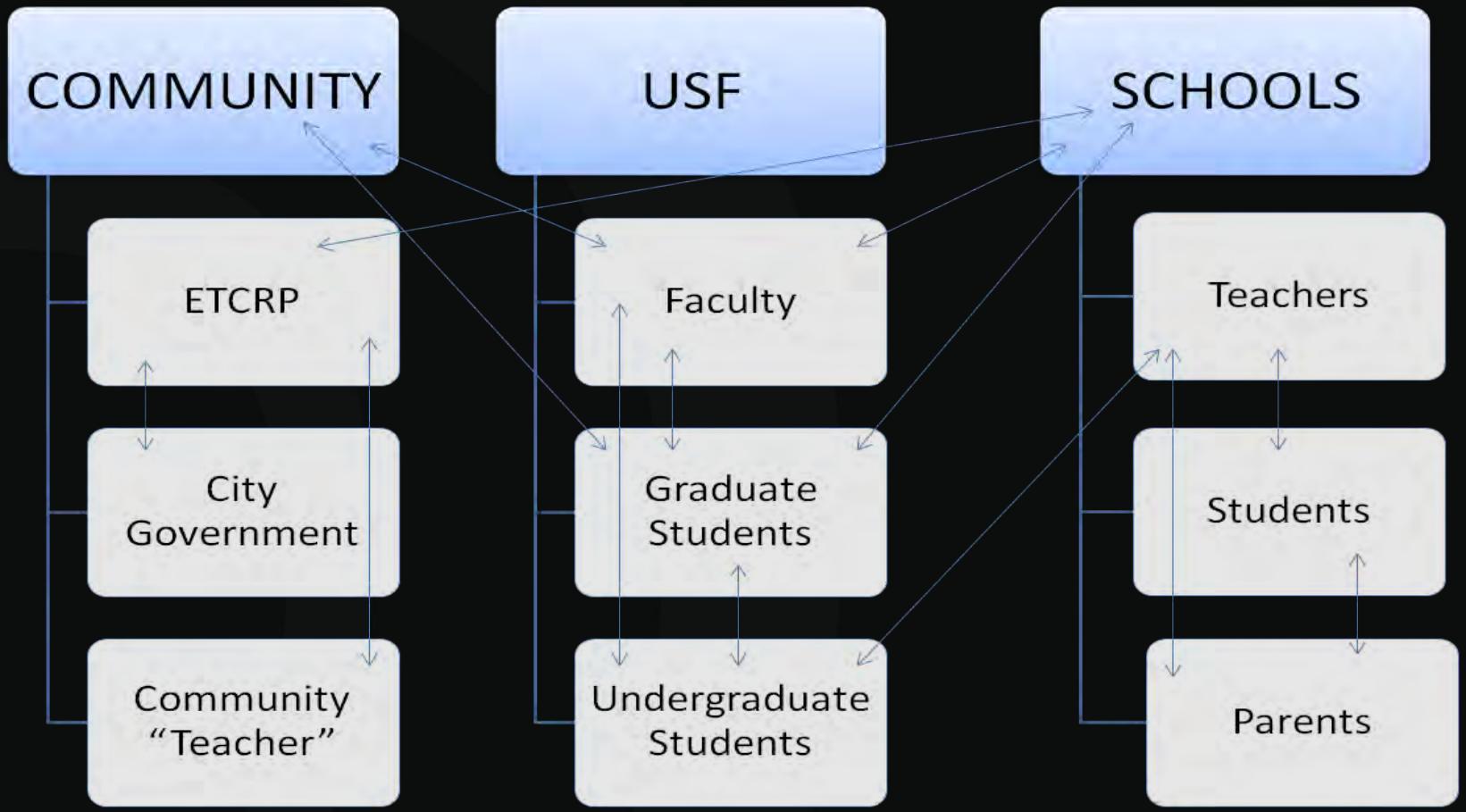
Levels of poverty around McKay Bay



Taken from: IREPA (2011). The Florida Communities & Economic Development Report. http://www.irepa.com/index.php/featured_project, accessed 2/12/11.

WARE Activities – partnership development

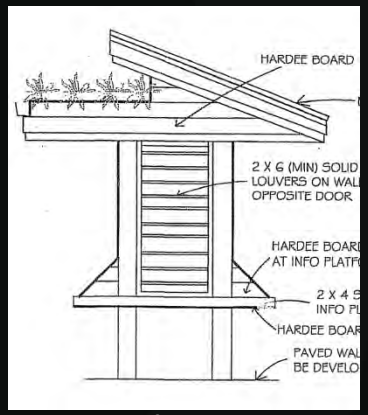


WARE Activities – community engagement

Ware activities – informal science education

October 2009

October 2009 - now

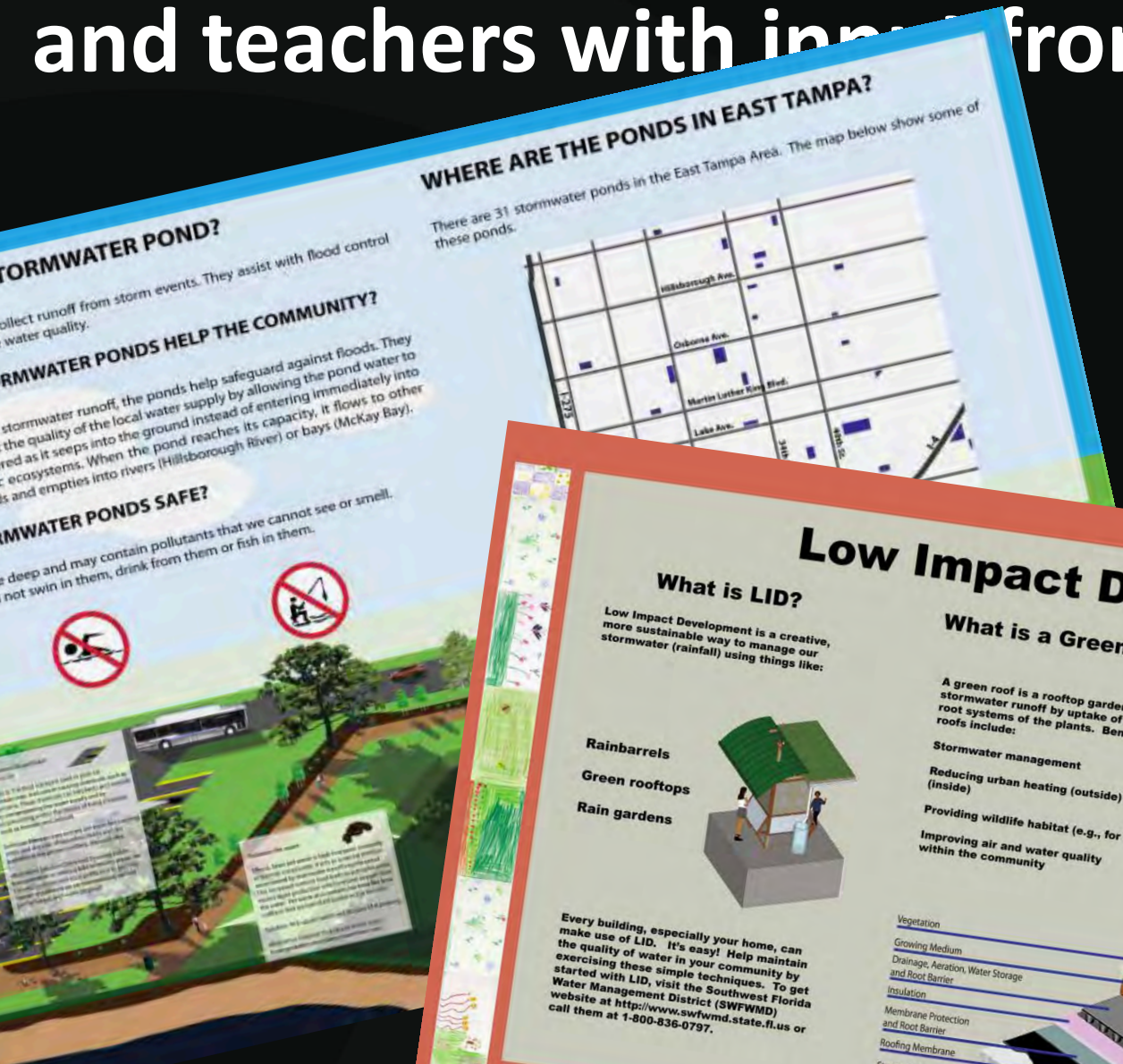


October 2009

March 2010

July 2010

Display material created by students and teachers with inp from ETCRP



WARE activities – curriculum development

As a result of this unit of study, the student will…	Lesson topics
• Understand the hydrologic cycle and the importance of water. • Describe water properties. • Identify the role of stormwater ponds in local communities. • Define retention and detention ponds. • Explain how different parameters are used to measure the health of a pond. • Make scientific observations in the classroom and in the field and communicate that information in a written report and newsletter. • Take measurements (e.g. water quality parameters) and report that information. • Synthesize information to develop and design a physical model describing an aspect of the stormwater pond. • Communicate information learned using different avenues. • Use various technologies to gather information, analyze data and communicate information to different audiences	1. Overview of WARE-East Tampa project 2. Scientific observations a) Characterizing water b) Engineering that changes water characteristics c) Measuring water characteristics 3. Hydrologic cycle and Water in Florida/Tampa 4. Field observations at stormwater pond a) Pond features including structures, animals, vegetation, human use and impact b) Role of stormwater ponds and the different types of ponds in the area 5. Field Sampling a) GIS co-ordinates of sites b) Water quality monitoring using basic test kits provided for free from the Southwest Florida Water Management District for World Water Monitoring Day, nutrient analysis test kits purchased by USF, and a multimeter probe used by USF researchers c) Digital collection for species identification d) Processing of field data 6. Managing runoff a) Drainage area & type of land use b) Soil maps and runoff coefficients c) Design requirements based on different storm event criteria and basin characteristics 7. Pond report development

Be a steward of the stormwater pond/ environment

Middle school teachers
USF graduate students
USF faculty
Community member

Civil & env. Eng
Science Education
Instructional Technology
Architecture

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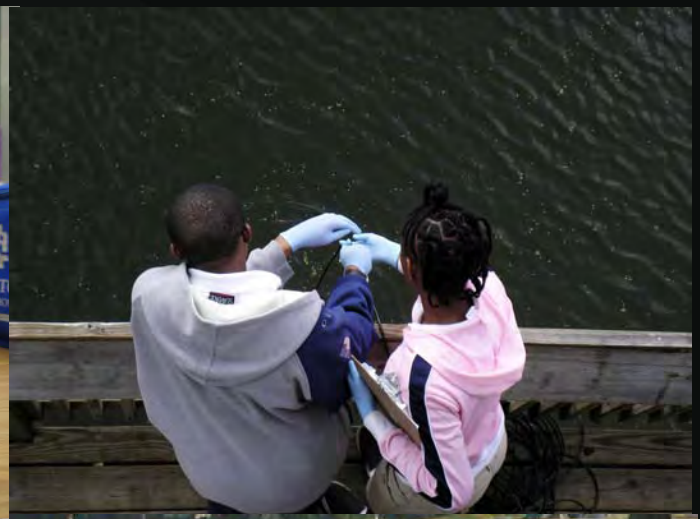
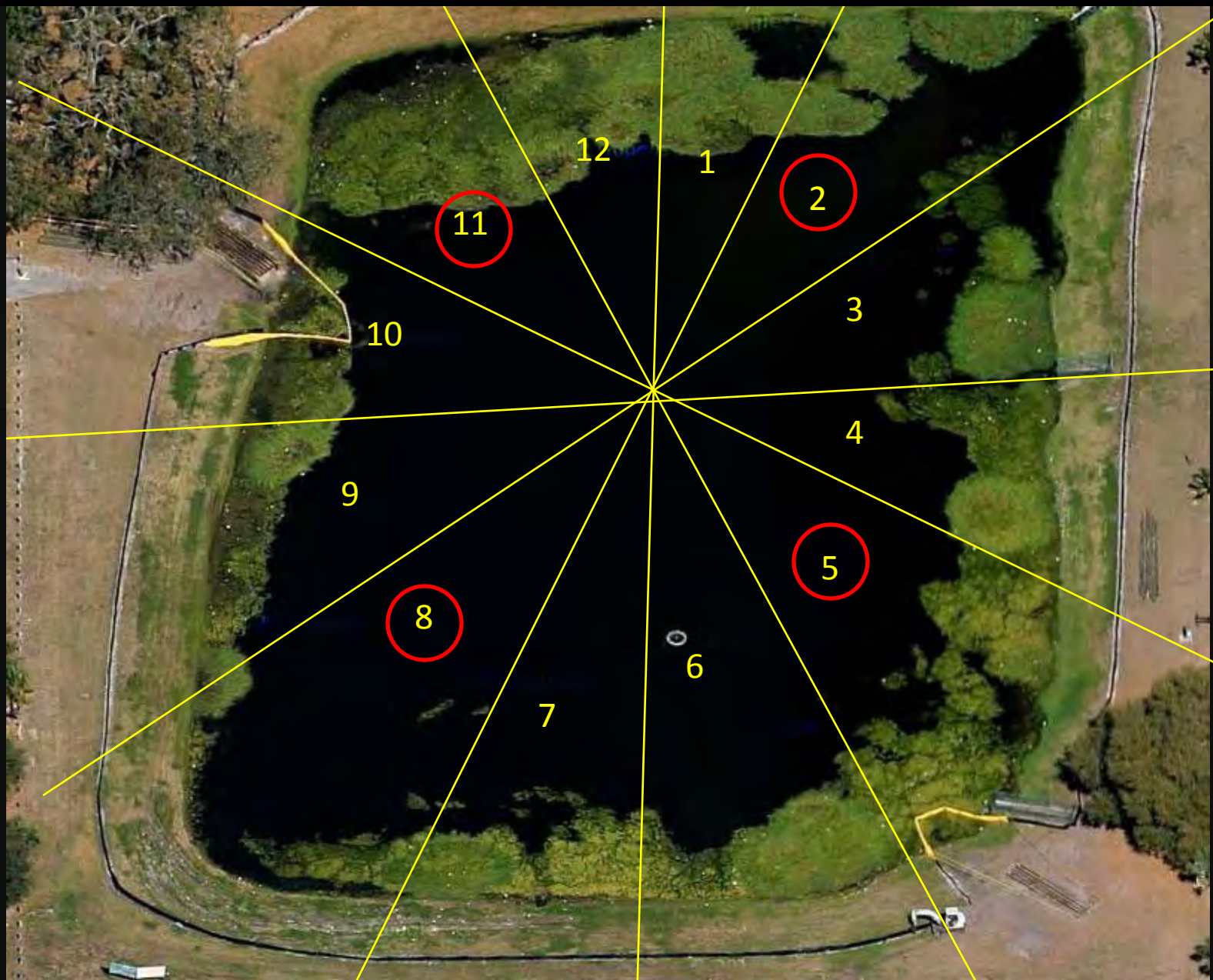
WARE activities – formal science education

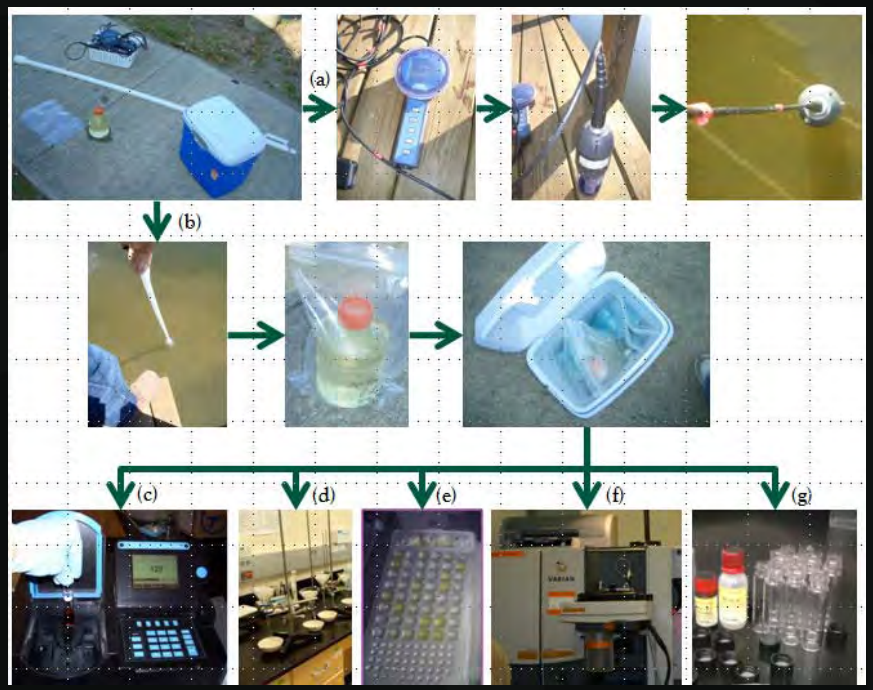


7th grade science project
8th grade project – STEM academy

Lake Vegetation Index = 29/100 = Category III = Impaired

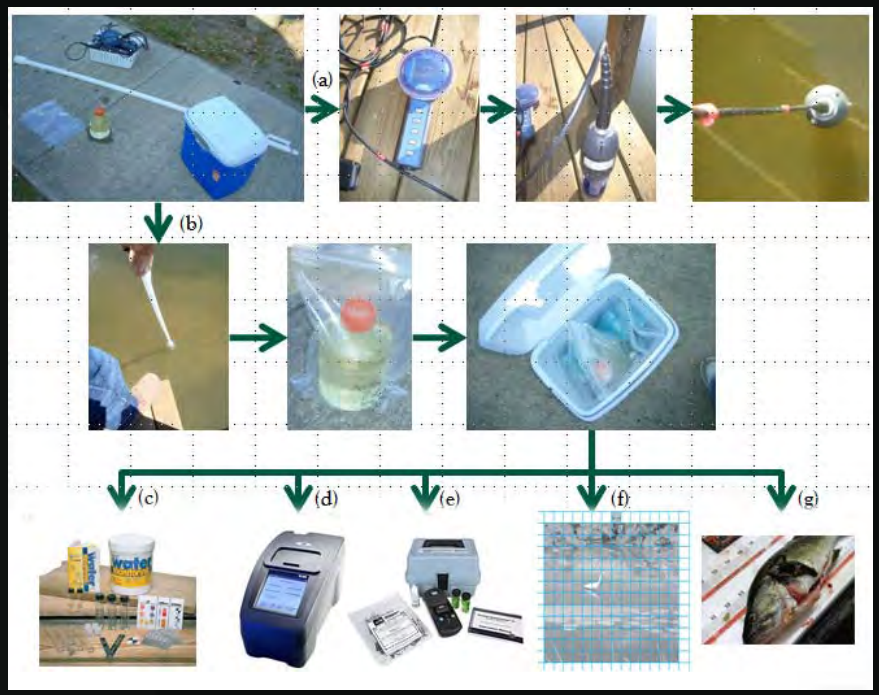


USF Students



1. Students pay a lab fee.
2. P3 grant pays for some analyses

Middle & Elementary Students



1. P3 grant pays for some kits.
2. Teachers apply for external grants. E.g. SPLASH grants.
   http://www.swfwmd.state.fl.us/education/schoolgrants/
3. Teachers include in science budget.

USF
UNIVERSITY OF SOUTH FLORIDA

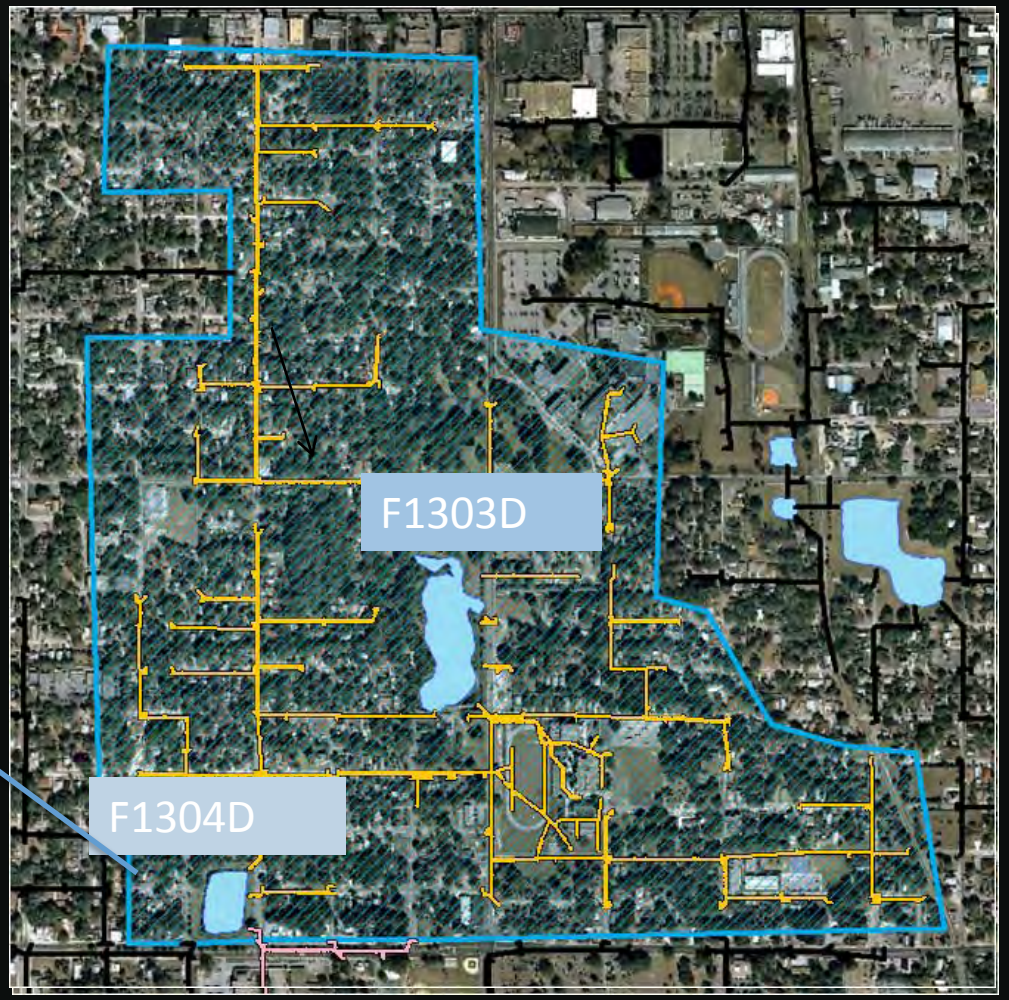
Stormwater Pond Testing (8/11)

EPA's Total Nitrogen (TN) criteria recommendation for ecoregion XII = 0.62 mg/L

Sampled 8/11
TN (mg/L)

Effluent: 1.1 mg/L

Stormwater: 5.8 mg/L

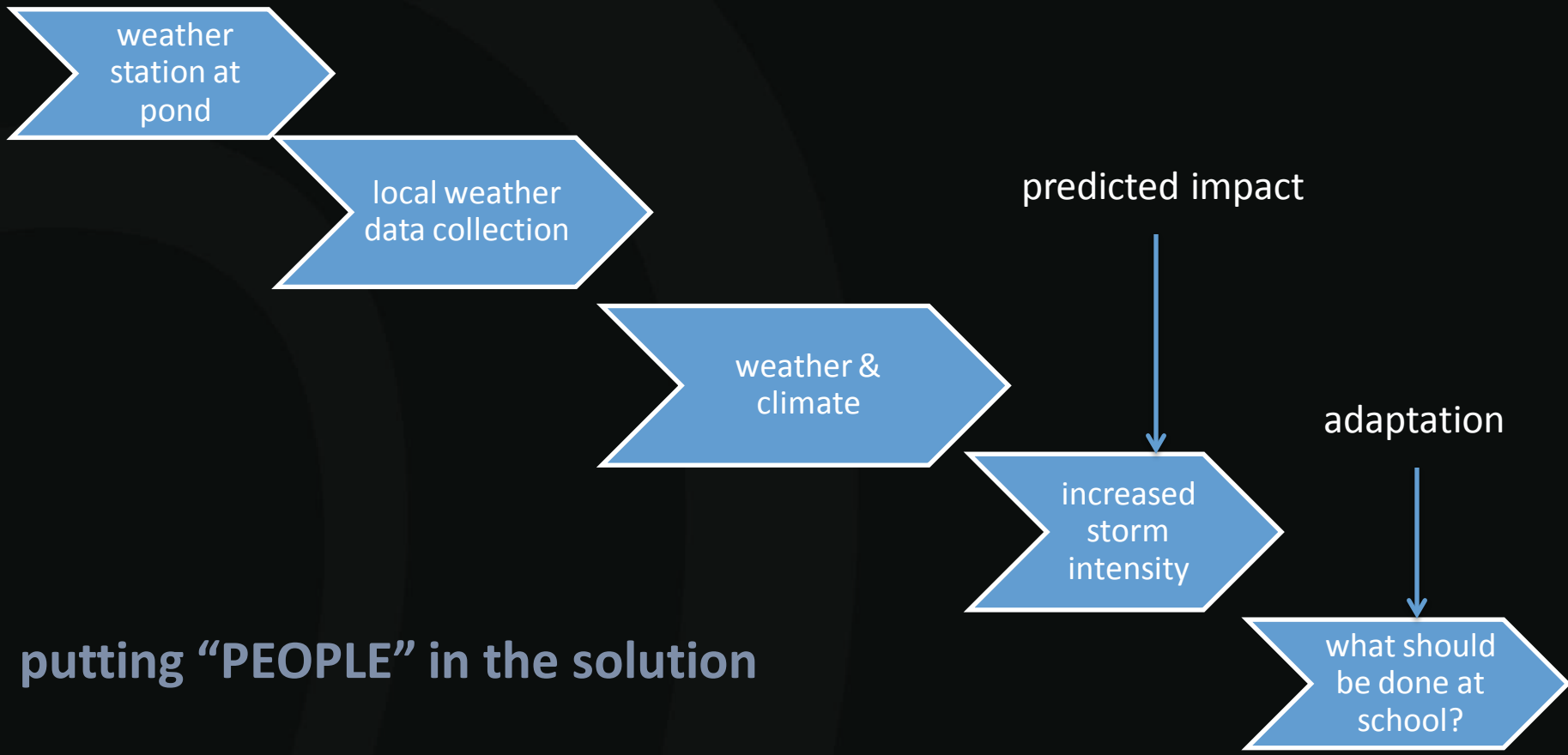


Interdisciplinary/transdisciplinary

Low Impact Development

- Corporation to Develop Communities in Tampa, Inc. (CDC)
- East Tampa Community Revitalization Partnership (ETCRP
- Hillsborough County Public Schools (HCPS)
- Courses
  - USF Capstone Environmental/Water Resources Engineering.
  - USF Environmental Engineering Laboratory.
  - USF Cultural Anthropology (Global Citizenship section).
  - USF Engineering Engagement Beyond the Lab and the Drawing Board.
- NSF Funded research
- EPA Funded projects
  - WARE, ESW-USF
- National Fish & Wildlife Foundation project

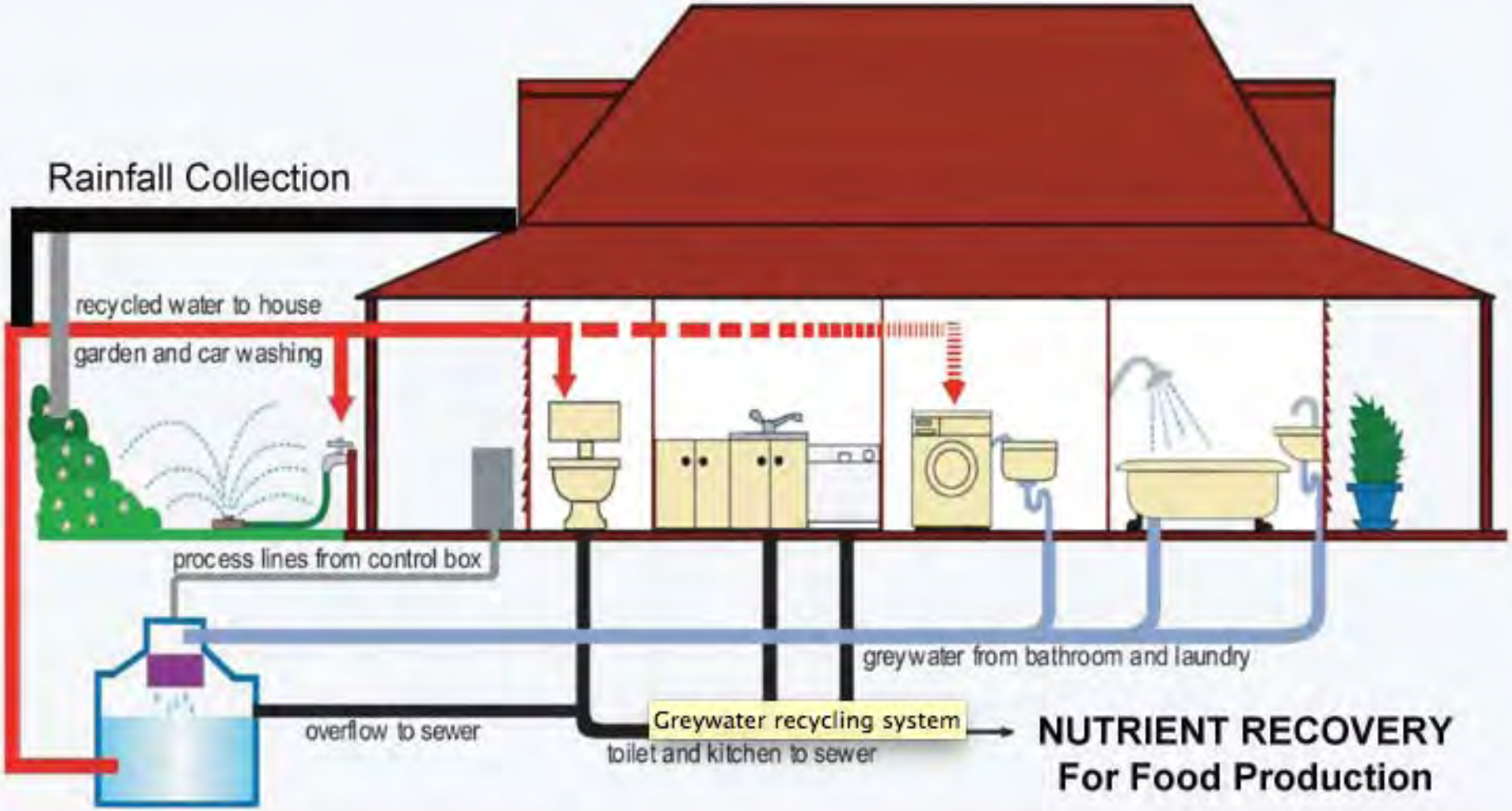
WARE, Weather, Climate Change & Adaptation



putting "PEOPLE" in the solution

Residential

Climate, energy, water, materials, human nexus



Synergy with Caribbean project

opportunities

- Rainwater used for toilet flushing will be treated in sewage treatment system and recycled for landscaping-two-prong conservation of potable supply.
- Expected reduction in **water purchased** ~ 3,000,000 L/yr.
- Sewage treatment, recycling and irrigation -for landscaping.
- This component will reduce the amount of **water purchased** for maintenance of the grounds by ~ 21,000,000 L/yr.

Xeriscaping – Nevada, Arizona
Florida friendly yards - Florida

Water purchased vs **Water used** or **Water required**

See Vishal Bhala's presentation at IADB March 2011 workshop. Public-Private Partnerships in Climate Change: Financing for the Case of Coconut Bay Beach Resort and Spa-Saint Lucia. http://www.iadb.org/publications/search.cfm?docType=Discussion%20Papers.

Integrate approaches & engage people (address gender & inequity)

opportunities

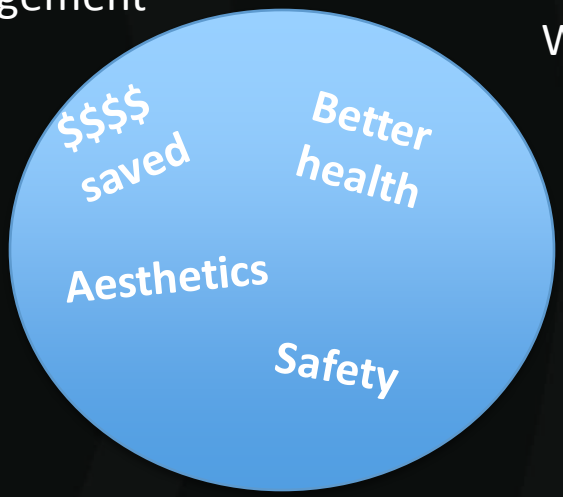
Scale

Personal Household Village Town/City Country Region Global

Water Supply
Water Quantity
Water Quality
Water Efficiency
Water Use

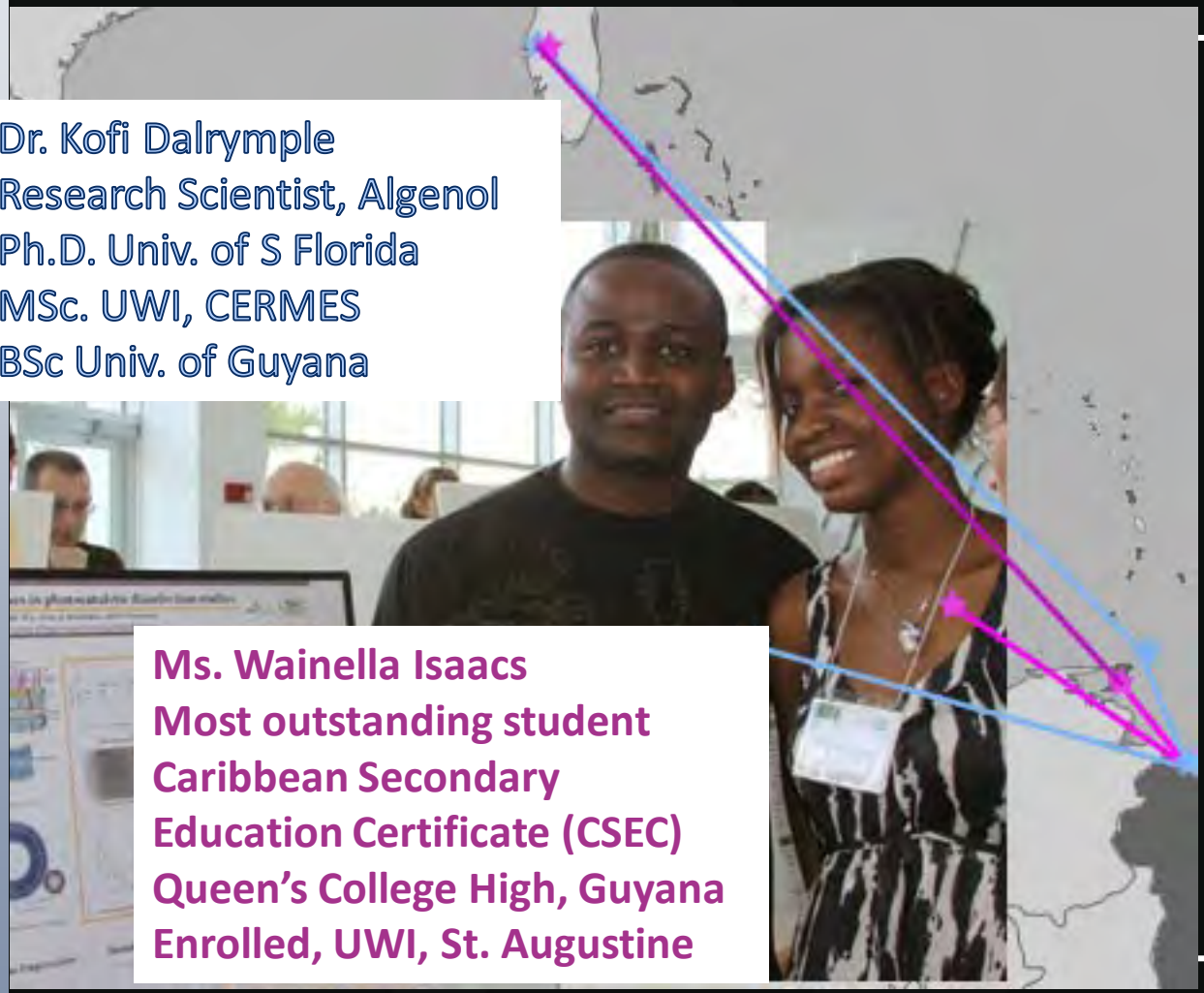
FOOD
ENERGY
INFRSTRUCTURE
INDUSTRY

Selling points for engagement



opportunities

S&T training



Dr. Kofi Dalrymple
Research Scientist, Algenol
Ph.D. Univ. of S Florida
MSc. UWI, CERMES
BSc Univ. of Guyana

Ms. Wainella Isaacs
Most outstanding student
Caribbean Secondary
Education Certificate (CSEC)
Queen's College High, Guyana
Enrolled, UWI, St. Augustine

Research Experience for Undergraduate program funded by NSF

REU:TIER mentee Wainella Isaacs with her graduate mentor Kofi Dalrymple

Faculty advisor: Dr. Maya Trotz
Associate Prof., USF
Ph.D. Stanford Univ.
B.S. MIT
Queen's College High, Guyana
Research in
Jamaica, T&T, Guyana

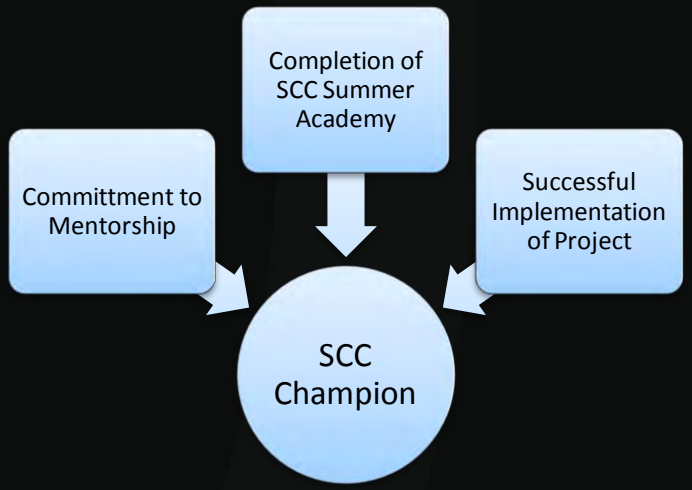
Caribbean Science Foundation

Opportunities

CSF projects

opportunities

- 6 week Summer institute for high school students – MIT MITES
- Wind Energy project
- Sustainable Caribbean Communities



How to connect Caribbean/CACCE

Connecting CACCE & the Caribbean

Inter American Development Bank

connecting

- Sustainable Energy and Climate Change Initiative Adaption to Climate Change
  - Assist towards a climate resilient and carbon neutral economy - incorporation of adaptation strategies into sectoral, national/sub-national and/or regional planning.
  - Strengthen/build local institutional capacity to identify and assess vulnerability to climate change
  - Provide finance and technical assistance in the design and implementation of strategic and replicable pilots of adaptation measures that address the anticipated impacts of climate change
  - Promote preventive risk management and risk reduction strategies
  - Assist countries in the development and assessment of key policy and regulatory instruments
- Climate Change Adaptation Fund
- The Multilateral Investment Fund (MIF)
  - Investing US$1.5 million to launch a pioneering initiative that will help coastal communities and micro and small companies in the Caribbean to fight the impacts of climate change.

connecting

- National Science Foundation
  - Research Experience for Undergraduates
  - Research Experience for Teachers
  - Workshops
  - Partnerships for International Research and Education
- Education Programs
  - Peace Corps placement
  - School of Global Sustainability at USF
  - Study abroad programs
  - Sabbaticals
  - Faculty/student exchanges – Fulbright Fellowships
- Private Sector Funding
- FAVACA :: Florida International Volunteer Corps
- Global Partnerships
  - Monitoring networks
  - Research oriented with access to funding from multiple global entities
  - REDD+ Funding

Questions?

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http://www.eng.usf.edu/~matrotz
http://www.cacce.net

http://okeechobee.ifas.ufl.edu/News%20columns/FYN.RainGarden.htm

http://www.ultimatelandscaping.info/florida-friendly-landscaping-plants/