GEORGIA SMART
COMMUNITIES CHALLENGE

CREATING THE NEXT®

2018 Georgia Smart Communities Challenge

Chatham County

Smart Sea Level Sensors

FINAL REPORT

September 30, 2019

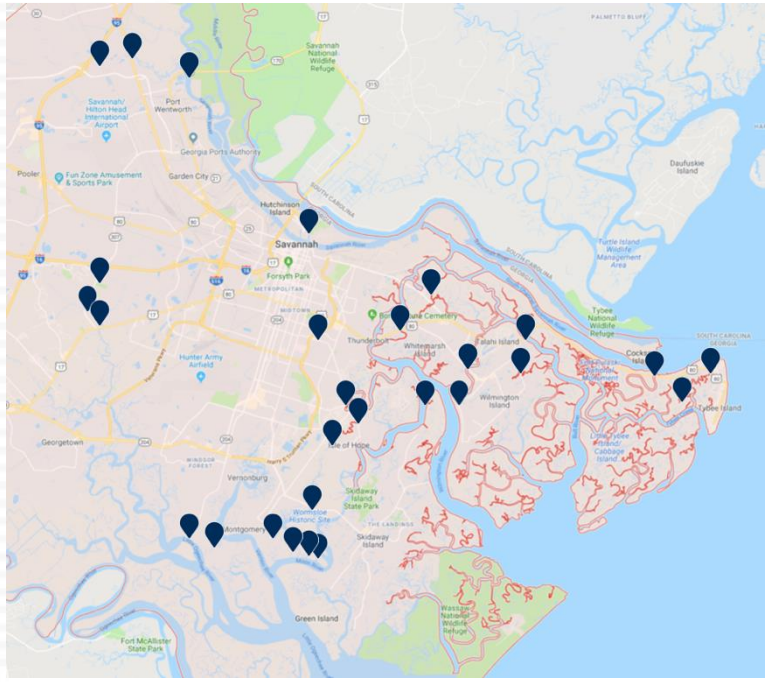
Georgia Tech

Project Overview

A high-density deployment of smart sea level sensors to provide hyper-local, real-time water level data across the community.

Goals:

- *emergency planning & response*
  - real-time data portal & toolkits
- *short- and long-term risk assessment and resilience planning*
- *develop & test educational resources*
  - middle & high school curricula
- *communication and awareness*
  - public events, installations, website



- See more details at http://sealevelsensors.org

GEORGIA SMART COMMUNITIES CHALLENGE

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Project Team

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Harambee House
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GEORGIA SMART COMMUNITIES CHALLENGE

Harambee House

Project Motivations and Goals

- Need to understand flooding at a local, neighborhood level
  - Both during a storm and after for targeting response resources
- Previously the only water level gauge in the region was on the Savannah River at Fort Pulaski. Local flooding was only documented anecdotally and inconsistently.

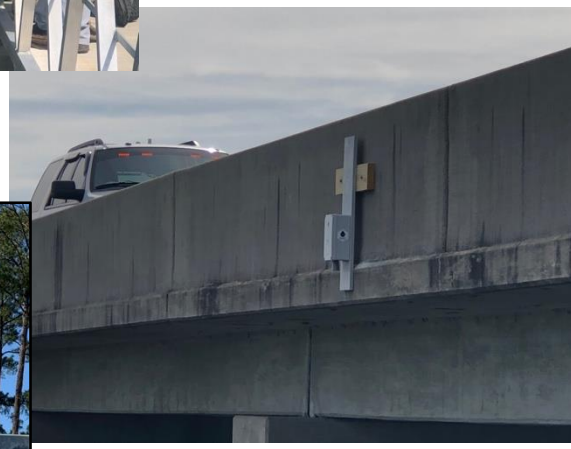
Photo: Anne Smith

Project Timeline

- May 22, 2018 – Planning workshop in Savannah
- August 15-16 – first sensors deployed for King Tide
- August 21 – Public kickoff and team workshop
- October 26 – Workshop at GT Savannah
- January 2019 – Begin collaboration with Jenkins High School
- January 29 – Workshop at Coastal Georgia Center
- March 27 – Workshop at GT Savannah
- May – Sensor deployment push, >30 deployed
- May 16 – GA Smart event in Savannah, public event with demos and posters
- August 1 – Workshop at GT Savannah

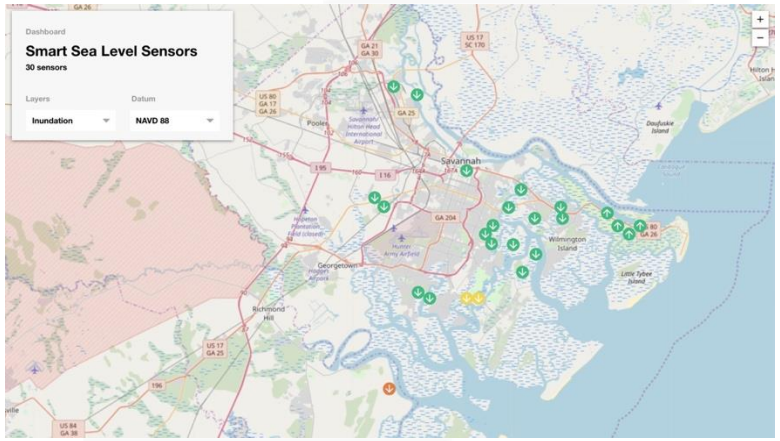
Project Actions & Results

- Deploy sensors across county critical infrastructure
  - > 30 deployed
  - Combination of City, County, State, and private locations
  - State DOT approval and support
- Deploy LoRaWAN gateways to support sensor network
  - 14 deployed across Chatham county
  - Combination of City, County, USG, and private locations



Project Actions & Results

- Educational Partnerships
  - Jenkins High School – sensor assembly
  - Oglethorpe Charter Middle School – sea level curriculum
- CEMA Portal Development
  - Developed initial portal for CEMA use
  - Trials this Fall during hurricane season



Project Actions & Results

- Community Engagement
  - Established working relationships with Harambee House
    - Local NGO with leadership in environmental justice
  - Developed local, neighborhood-level focus starting with West Savannah nieghborhoods


NEIGHBORHOOD DISASTER PLAN

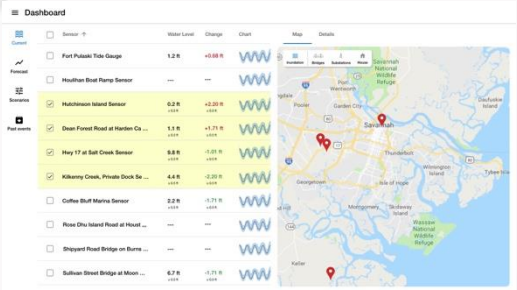
TEMPLATE

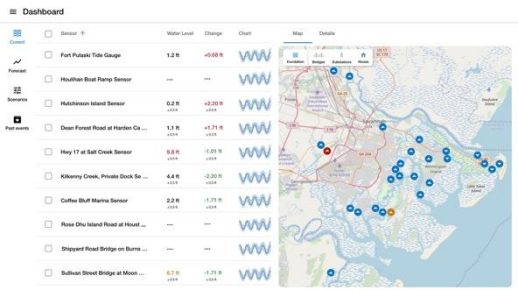
Hudson Hill Community
[Insert plan version number]
07/22/19

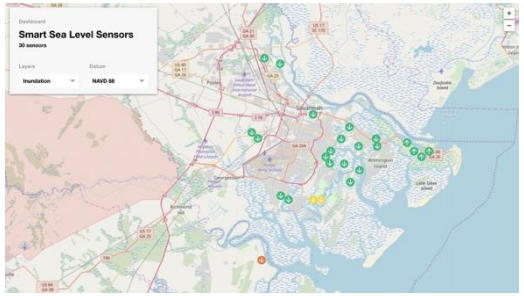
DRAFT

Research Actions & Results

- Developed the design and final packaging for the sensors
- Researched gateway coverage and best practices for LoRa gateway deployment in the coastal environment
- Developed precise (10 meter resolution) ocean grid models for better forecasting
- Met with stakeholders to identify workflow and design appropriate tools





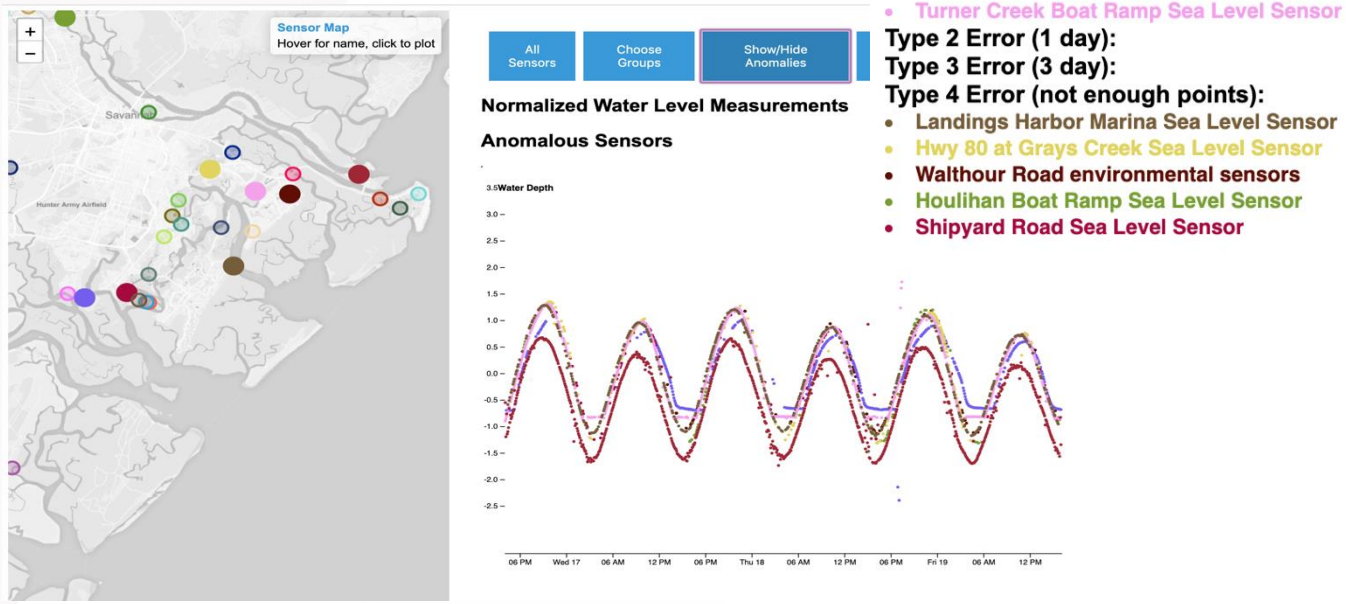


Georgia Tech Student Engagement – Smart CC Intern

- Establishment of Community Engagement Team Partnership and Roles
- Emergency Preparedness Plan for Hudson Hill
- Community Profile for Hudson Hill
- Educational Programs with Hudson Hill schools

Georgia Tech Student Engagement – Civic Data Science Team

- Focused on identification and tracking of anomalies in the sensor data



Type 1 Error (1 hour):
- Fort Pulaski (B) Sea Level Sensor
- Rose Dhu Island Sea Level Sensor
- Turner Creek Boat Ramp Sea Level Sensor

Type 2 Error (1 day):

Type 3 Error (3 day):

Type 4 Error (not enough points):
- Landings Harbor Marina Sea Level Sensor
- Hwy 80 at Grays Creek Sea Level Sensor
- Walthour Road environmental sensors
- Houlihan Boat Ramp Sea Level Sensor
- Shipyard Road Sea Level Sensor

Challenges

- Technical challenges included understanding the limitations of the ultrasonic sensors and the LoRa radios and how to overcome them
- The coordination of deployment across diverse infrastructure with many stakeholders takes a lot of time (e.g. phone calls, face to face meetings, etc)
- The sensor data is just the beginning! The real work and opportunities come from how it is used in the community.
- Community engagement takes time and local partnerships, one neighborhood at a time.

Process Improvement, Data, & Automation

Worked with end-users to identify workflow and design appropriate tools

Before sensor data

1. Receive an alert of a flooding event
2. Visit Fort Pulaski tide gauge chart
3. Check if water level has exceeded a threshold
4. If yes, dispatch 1-2 people to drive to known low lying areas
5. After the event, review which areas were affected and differences from the previous flooding event

With sensor data

1. Receive an alert of a flooding event
2. Open one tab with Fort Pulaski tide gauge chart
   Open another tab with Sea Level Sensors dashboard
3. Compare differences between Fort Pulaski measurements and sensor measurements
4. Dispatch people to areas around specific sensors to see what's going on

Recommendations

- Identify the key drivers that will justify the work. Focus on making those successful and demonstrating value before branching out.
- Community engagement is difficult to do in broad strokes. Focus on local, neighborhood level and build trust.
- An enthusiastic community response is inspiring! If you find the value that resonates with people, getting them engaged is much easier.

Research Recommendations

- Find ways to get students involved both in the research and in education, as part of classes. This makes it easier to justify the time spent for the faculty.
- Identifying significant funding is an ongoing effort.

Impact

- The May event was attended by the Mayor and other city officials. City council members regularly attended other workshops.
- Significant local press coverage starting with the kickoff event in August up through the public event in May. Multiple stories on local TV and Savannah Morning News
  - https://www.sealevelsensors.org/news/
- Featured in AAAS series launched this Fall – "How We Respond"
  - https://howwerespond.aaas.org/community-spotlight/residents-of-savannah-rise-to-the-occasion-as-higher-seas-encroach/

Future Plans

- Continue sensor deployment to fill in areas not yet covered, especially inland
- Augment with weather and air quality
- Complete the CEMA portal
- Create and publish a community facing portal
- Continue education engagement
- Move forward with community engagement plans developed for West Savannah neighborhoods

Future Funding

- Multiple proposals and funding opportunities pursued
  - Georgia DNR Coastal Incentive Grant – awarded $80K
  - NSF Award – Network Infrastructure Resilience as part of the NSF FABRIC project – awarded $200K
- NSF S&CC Proposal submitted - $3.9 million

Grant Monies Financial Reporting

Hardware Purchases	Amount	Period
Gateway Parts - County	$6,315.00	11/13/18
Gateway Parts – County	$525.75	1/8/19
Gateway Parts – County	$6,420.00	1/16/19
Sensor Parts - GT	$20,615.00	Jan - April 2019
Event Supplies - GT	$676.00	May 2019
Gateway Parts – GT	$9,500.00	June 2019
Sensor Parts – City	$5,000.00	encumbered

Community Match Financial Reporting

Salary Commitments	Amount	Period
County Personnel	$33,500	Sept 2018-Aug 2019
City Personnel	$18,500	Sept 2018-Aug 2019

Supplemental Information

- Sensor data is available from the Sea Level Sensors API, documented at dev.sealevelsensors.org

Project Team Contact Information

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