Empowering Local Community Organizations to Engage with Community Decision-makers for the Application of Science-based Hazard Mitigation through Scientist-community Partnerships: A Thriving Earth Exchange Case Study

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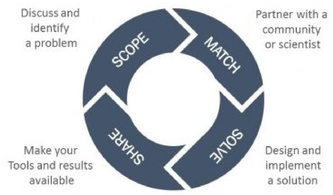
Abstract

Many communities are experiencing an increase in the frequency and magnitude of local natural disaster events associated with a changing climate. As an example, tidal flooding is among the most evident present-day impacts of global sea level rise. As sea levels continue to rise concerns exists within coastal communities as to when more substantive impacts form tidal flooding of greater frequency and duration will regularly occur. Through informal education and local experiences, many community groups have formed to advocate for the appropriate local governmental response to the present and future risk presented by natural hazards. Often, the community groups experience significant challenges in communicating their concerns in a coherent way when confronted with scientific studies, local master plans, and consulting engineering reports, among many other reports and studies conducted for the local government. Herein, the challenges and successes experienced through a Thriving Earth Exchange (TEX) partnership between a coastal researcher and a community flooding committee in Ocean City, NJ are discussed. The TEX partnership was formed to facilitate the adoption of science-based planning and decision-making by local municipal officials to address present and future tidal flooding in the community. Navigating the challenges associated with community conflict and the occasional desire by community groups to have the science partner act as an expert consultant is important to the success of science–community partnerships. In the present partnership, sustained engagement and conversation among the TEX participants provided an understanding of the role of each participant and allowed for the identification of local priorities within which the appropriate science knowledge could be developed and conveyed to the community group. An understanding of the relevant science has empowered the community group leaders to more effectively, and independently, communicate their desire for alternative hazard mitigation solutions for the community. The initial collaboration has been strengthened by partnerships with boundary expanding organizations and is leading to participatory science within the local community that will improve their understanding and communication of the local flood issues.

Introduction

The TEX program promotes partnerships between scientists and community leaders to tackle community issues and advance local priorities related to natural hazards and climate change. A key differentiator in the TEX approach is community-inspired research questions and the co-creation of projects. Community-science partnerships ensures that the science is responsive to the needs of all that have a stake in the research outcome (*Kitcher, 2011*) and does not place science above other ways to create knowledge *(Pandya, 2014*). TEX characteristics of community driven science include four elements: Scope, Match, Solve, and Share. Following, we describe how the Ocean City, NJ TEX project integrated the elements of community driven science and the resulting outcomes.



Four stages of TEX Community Driven Science (*Thriving Earth Exchange, 2018*)

I. Scope

Project goals and priorities are defined by community stakeholders to ensure that the project is focused on socially relevant issues and that the outcomes will be responsive to the needs of the community.

Community Issues in Ocean City, NJ

- Increased frequency and magnitude of flooding
- Outdated infrastructure enhances problem
- Properties increasingly incur flood damages
- Residents' quality of life is reduced due to flood impacts

Community Response

Flood Forum USA
Anthropocene Alliance

- Municipal leaders and community group clash over spending priorities and mitigation solutions
- Community group seeks help and partners with grassroots flood groups across the country through Flood Forum USA

Partnership between AGU TEX and Flood Forum USA

- Enhances capacity to use science to address local geophysical issues
- Helps define scope of scientific project
- Matches volunteer scientist with community

II. Matching

Attributes of a Good Scientific Partner

- Expertise in the Field
- Knowledge of Local Issues
- Strong External Professional Partnerships
- Experience in Outreach & Education
- Willingness to Listen and Co-define research

Science Partner Network

The Jersey Shore Partnership, Inc. "The Sand in the Beach People"
Sea Grant NJ Sea Grant Consortium
US Army Corps of Engineers.
asbpa American Shore & Beach Preservation Association Advocating for healthy coastlines
The Nature Conservancy New Jersey
DEP
FEMA

Roles and Responsibilities

Community Group	Science Partner
• Willingness to engage in research • Willingness to refine goals and objectives if needed • Understanding that project results may not serve desired outcomes • Commitment to not misuse co-created knowledge. • Ability to revise goals and objectives based on results	• Listen to needs of community • Mutually define goals • Do not become an advocate or consultant • Engage in collaborative knowledge creation • Communicate openly/effectively • Share research outcomes with community

III. Solve

Co-designing a Solution

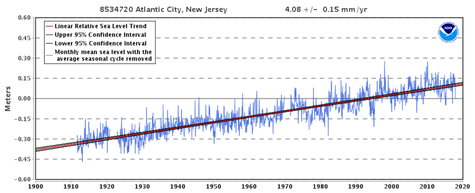
ISSUE: The community group experiences significant challenges in communicating their concerns in a coherent way when confronted with scientific studies, local master plans, consulting, and engineering reports.

SOLUTION: Enhance community capacity to use science and connect science to local issues by empowering the community to formulate science-based decisions that support long-term flood mitigation and the creation of a resilient coastal community.

Implementation

- Discussion of underlying scientific knowledge of natural hazards facing the community in a public forum
- Discuss possible mitigation solutions
- Emphasize knowledge gaps and how the community can help fill them

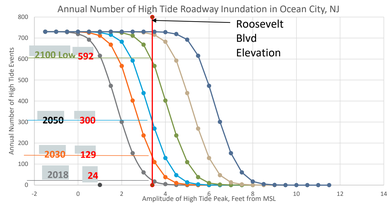
Geophysical Stressors



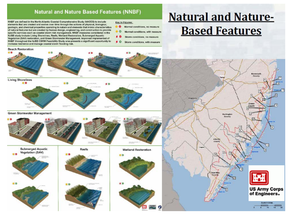
Relative Sea Level Rise

	Central Estimate	'Likely' Range	1-in-20 Chance	1-in-200 Chance	1-in-1000 Chance
Year	50% probability SLR meets or exceeds...	67% probability SLR is between...	5% probability SLR meets or exceeds...	0.5% probability SLR meets or exceeds...	0.1% probability SLR meets or exceeds...
2030	0.8 ft	0.6 – 1.0 ft	1.1 ft	1.3 ft	1.5 ft
2050	1.4 ft	1.0 – 1.8 ft	2.0 ft	2.4 ft	2.8 ft
2100 Low emissions	2.3 ft	1.7 – 3.1 ft	3.8 ft	5.9 ft	8.3 ft
2100 High emissions	3.4 ft	2.4 – 4.5 ft	5.3 ft	7.2 ft	10 ft

Local Sea Level Rise Projections (*Kopp et al., 2016)*



Future Roadway Inundation with Sea Level Rise



Potential Mitigation Solutions

IV. Outcomes

- Enhanced knowledge of natural hazard issues led to new discussions of long-term flood risk reduction
- Engagement of coastal management experts by Science partner increased community knowledge/capacity

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- State Coastal Management Program partners with OC Flooding group and the City of Ocean City to co-conduct citizen monitoring of flood events.
- City provided flood elevation markers
- NJ Sea Grant provided certified rain gauges

AGU TEX partnership connects OC Flooding to ISeeChange.org

- Global Community that documents climate change impacts through posted data and images by users
- Connects local issues to broader global issues through citizen science

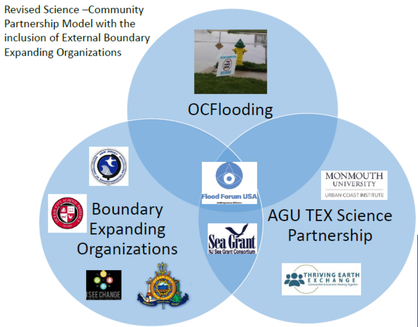
citizen SCIENCE

- State-City-Community Engagement provided opportunity to expand engagement into K12 school district
- Additional Citizen Science Partners
- Co-curriculum development by teachers and boundary organizations

Conclusion

- Listening to community needs allowed for the co-creation of a project focused on increasing the community's understanding of the relevant science.
- Improved knowledge has empowered the community to effectively engage and communicate their concerns publically.
- Increased knowledge of hazards and climate impacts allowed the community to revise their goals and objectives and ask new questions.
- Boundary Expanding organizations allow for new partnerships that provide additional resources and an exponential increase in community engagement and knowledge.

Revised Science –Community Partnership Model with the inclusion of External Boundary Expanding Organizations



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