

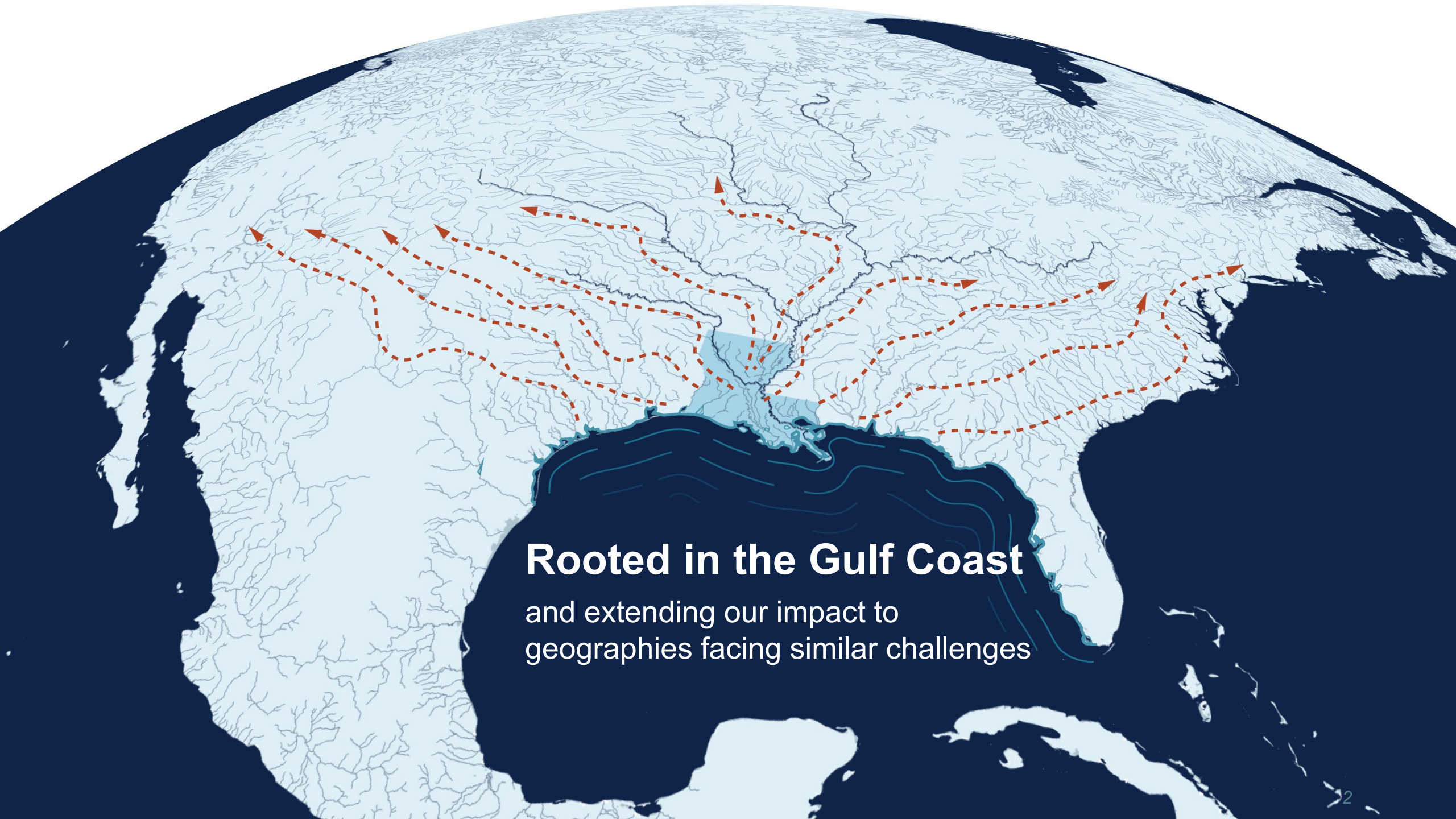


THE WATER INSTITUTE
OF THE GULF®

STRENGTHENING RESILIENT COMMUNITIES IN SOUTH TEXAS

Katya Wowk, PhD
Senior Social Scientist
The Water Institute

August 4, 2026



Rooted in the Gulf Coast
and extending our impact to
geographies facing similar challenges

AREAS OF IMPACT

The Water Institute and its partners have had tremendous impact across hundreds of funded efforts, each of which has benefited our sponsors and the communities and ecosystems in which we work. Across this diverse portfolio, significant Areas of Impact have emerged where the Institute has brought unique skills and advanced science and practice to create meaningful impact.

RESTORING
THE VANISHING
COAST



STRENGTHENING
RESILIENCE IN AN
UNCERTAIN FUTURE



SUPPORTING
PLANTS AND
ANIMALS AT RISK



UNDERSTANDING
EVOLVING
FLOOD RISKS



MANAGING
SEDIMENT
RESOURCES



ADVANCING
COMMUNITY-LED
ACTION



DECISION SCIENCE: STRUCTURED DECISION-MAKING

It provides a framework

For best possible decision using
available information,
timing and cost considerations



Data, Models, Research
Process Understanding

Manager

I need to know
what I can do for
my community

Regulatory Agency

I'm sorry, you
cannot do that

Data Analyst

Here's what
is/has happened

**Scientist/
Engineer**

Here's why that
happened and what
future might be



PROACT FRAMEWORK

1. Define the Problem
(Decision Context)
2. Determine the Objectives
3. Identify Alternatives
(Solutions)
4. Evaluate alternatives and
forecast the Consequences
5. Evaluate the Trade-offs
6. Make the **decision and take
action**
7. Apply **Adaptive
Management** as needed

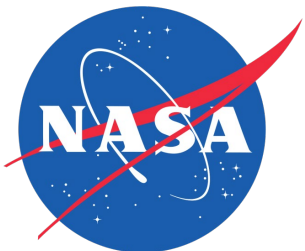


from Runge MC, Grand JB, Mitchell MS. 2013.
Structured decision making. Chapter 5 *in* Krausman
PR, Cain JW III, eds. Wildlife Management:
Contemporary Principles and Practices. Johns
Hopkins University Press, Baltimore, Maryland.

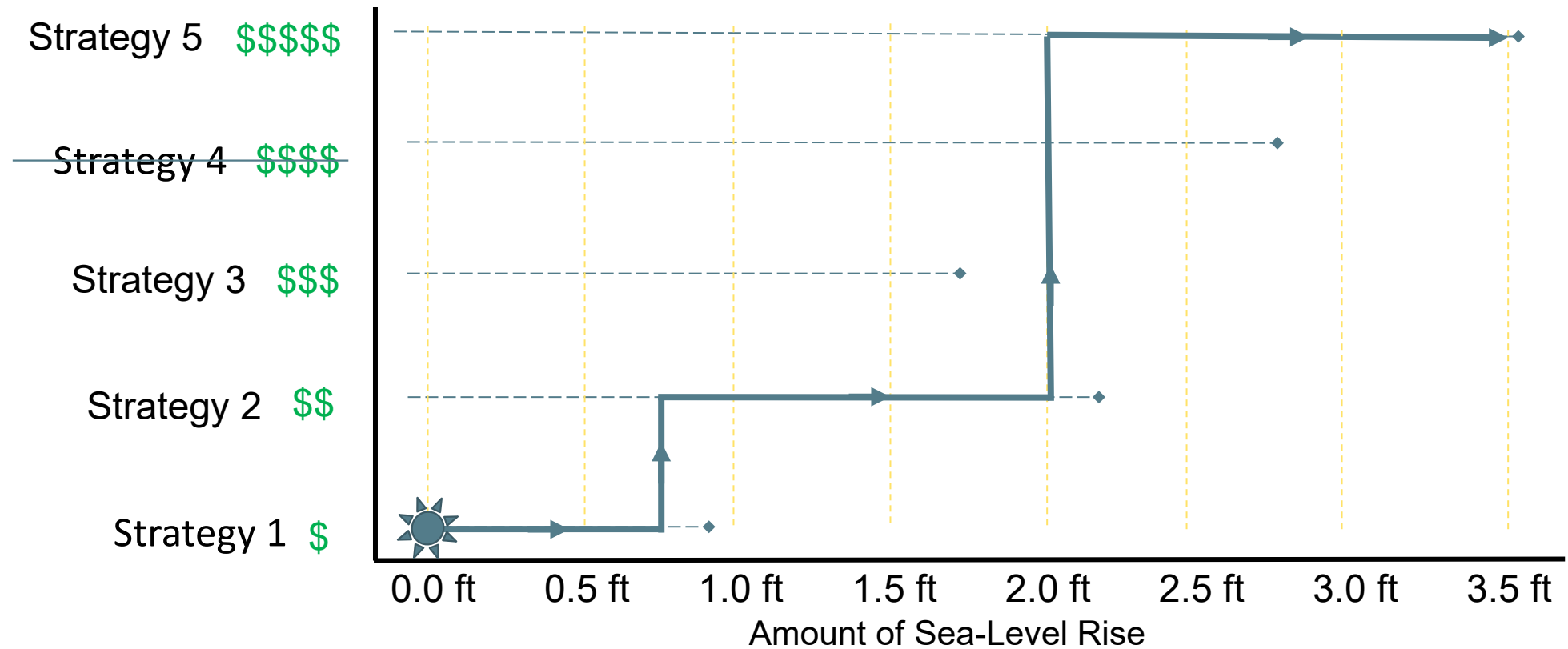




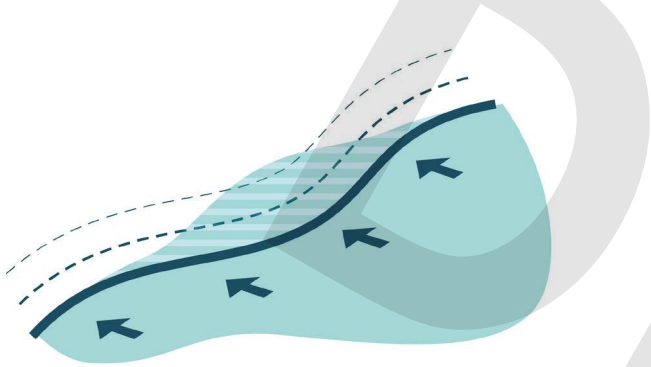
FACILITATING DYNAMIC ADAPTIVE PATHWAYS FOR COASTAL DECISION-MAKERS THROUGH LAND ICE AND WATER PROJECTIONS



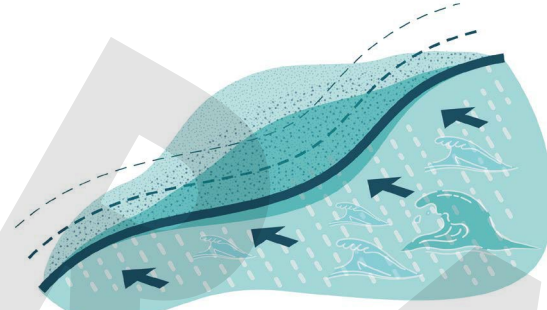
What Are Adaptation Pathways?



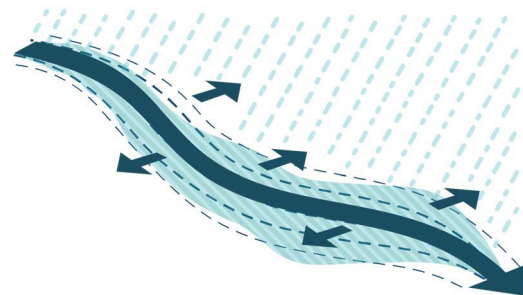
TYPES OF FLOODING



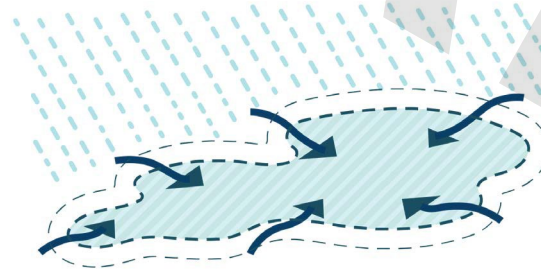
High Tide Flooding



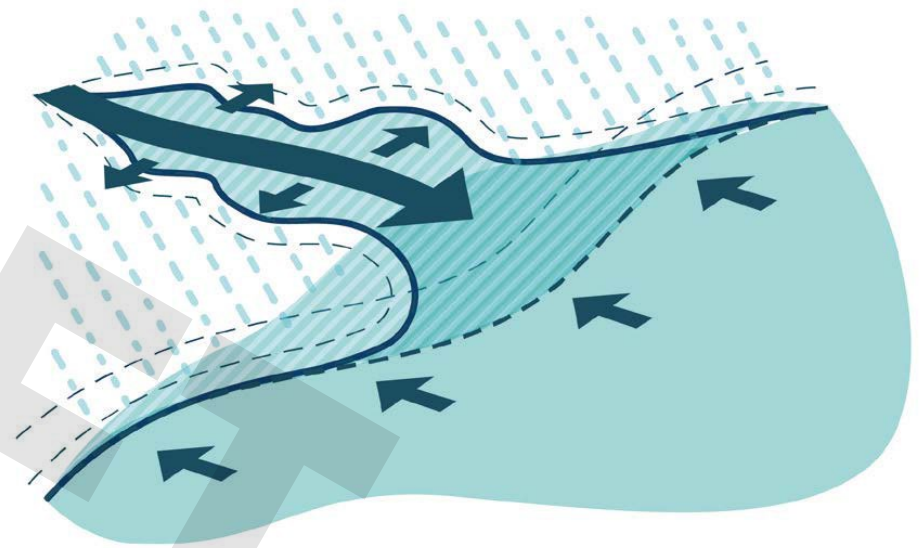
Coastal Storm Flooding



Riverine (Fluvial) Flooding



Stormwater (Pluvial) Flooding



Compound Flooding

Single Flood Probability

Rainfall – 24 hours

Return Period	Return Level
Monthly	~0.5 in
5-year	~5.7 in
10-year	~6.7 in

Coastal (Storm Surge)

Return Period	Return Level
monthly	~0.6 ft
1-year	~1.4 ft
5-year	~1.9 ft



WHAT IS THE JOINT PROBABILITY

Around 20 year

Take Aways

- Combined sources of flooding *magnifies* the extent of flooding overall
- The frequency of them co-occurring is increasing overtime so while it currently is a 20-year return period it is likely co-occurring more frequently than that
- With sea-level rise, the frequency of the individual coastal events is increasing causing the joint frequency to increase

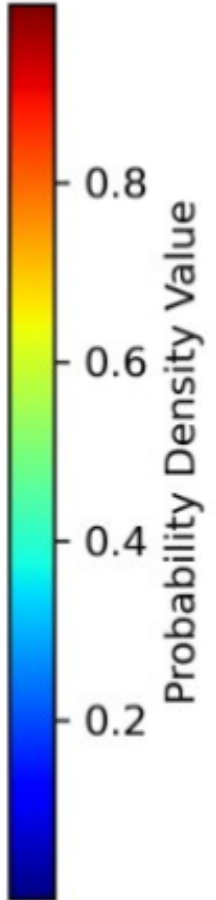
COASTAL

Return Period
monthly
1-year
5-year

RAINFALL

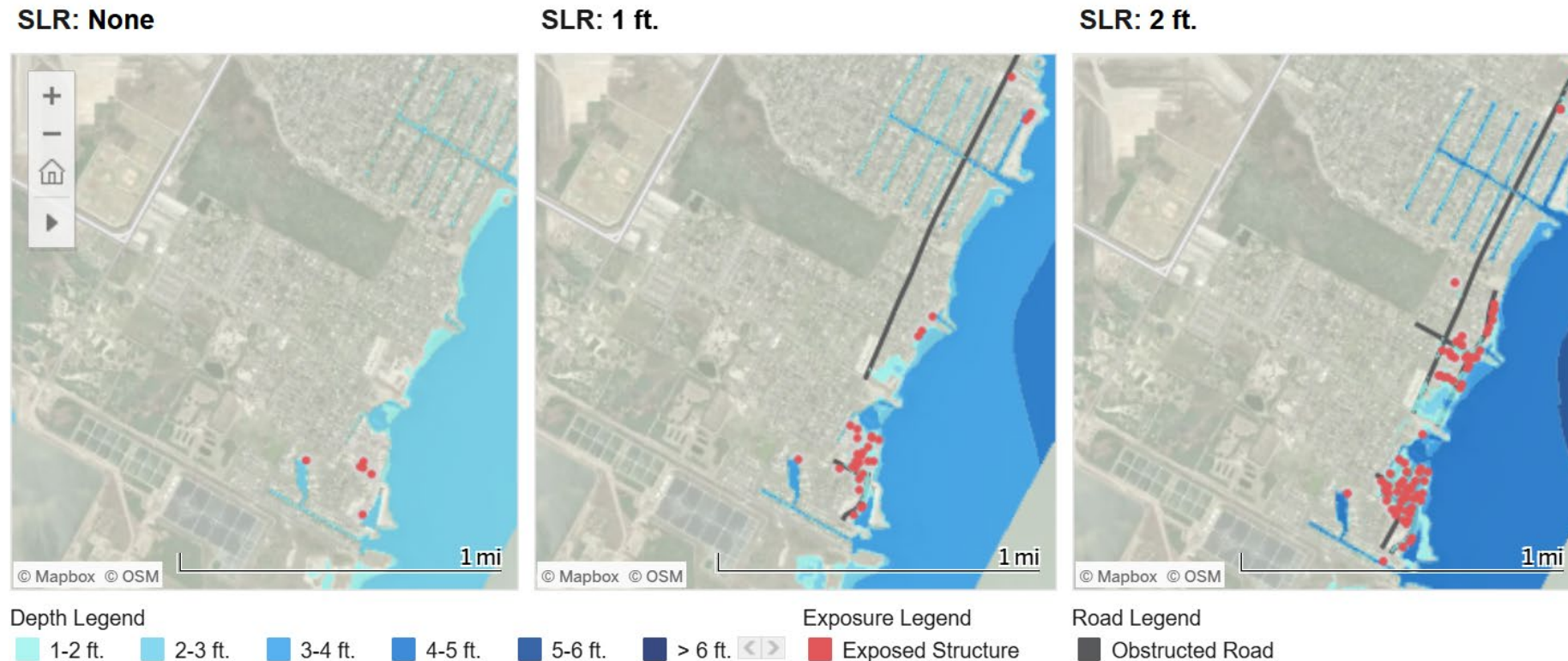
Return Period
Monthly
5-year
10-year

0 2.0 3.9 5.9 7.9 9.8
24-hr accumulated rainfall (inches)



Measures of Impact – Miles of Road Exposed

Monthly rainfall (0.4 in) x Monthly coastal flooding (0.6 ft)



Impacts to exposed structures and roads here is driven by increasing sea level





SAFE ROADS

For the Coastal Bend



SAFE ROADS

Situational Awareness of Flooding Events on Roads



THE OPPORTUNITY

Empower local emergency managers with the best available, reliable, and consistent flood intelligence without the burden of managing disparate data streams.

EMERGENCY RESPONSE MANAGERS AND DECISION MAKERS NEED

Hyper-local information

Near real-time flood intelligence

Reliable, consistent, and best available information

WHAT IS SAFE ROADS

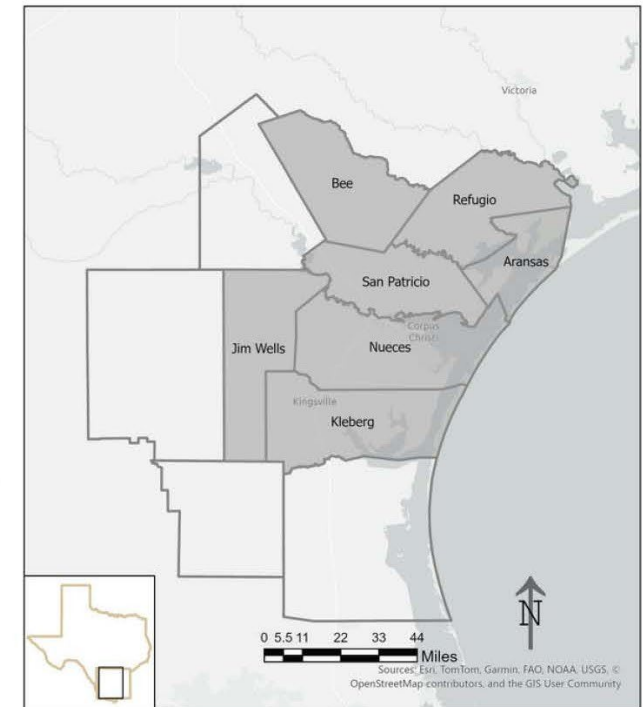
SAFE Roads enhances flood situational awareness by using artificial intelligence systems and data fusion to combine multiple flood sensing data sources, including traffic cameras, social reports, and sensors, with physics-based flood models to rapidly sense road flooding and community access to essential and emergency services.

TARGET REGION

Counties this project will serve include those eligible for GLO Mitigation Funding from disasters in 2015, 2016, and 2017.

BENEFITS OF SAFE ROADS

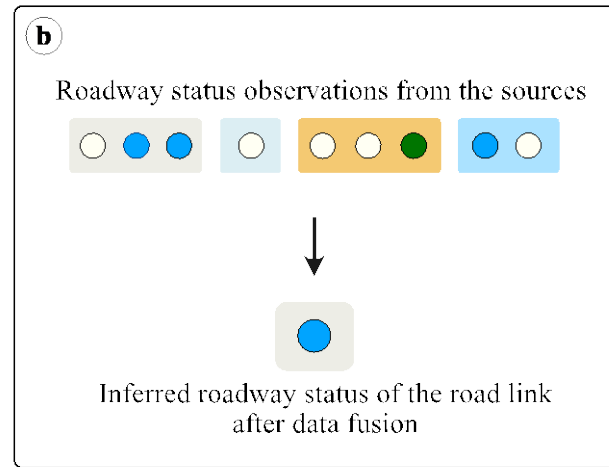
-  **FINE SCALE**
Offers high-resolution spatial flood hazard data to inform situational awareness and response
-  **NEAR REAL TIME**
Produces the best available data on near-real-time flood hazards
-  **MULTIPLE DATA SOURCES**
Uses multiple data sources to reduce uncertainty
-  **COMPOUND FLOODING**
Accounts for rainfall and storm surge flooding



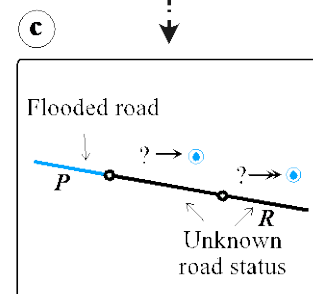
Target counties in the Coastal Bend region

SAFE ROADS DATA AND PROCESS

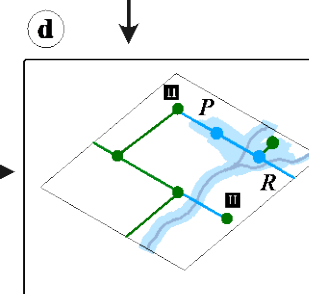
Repeat for every link in the network at each time step



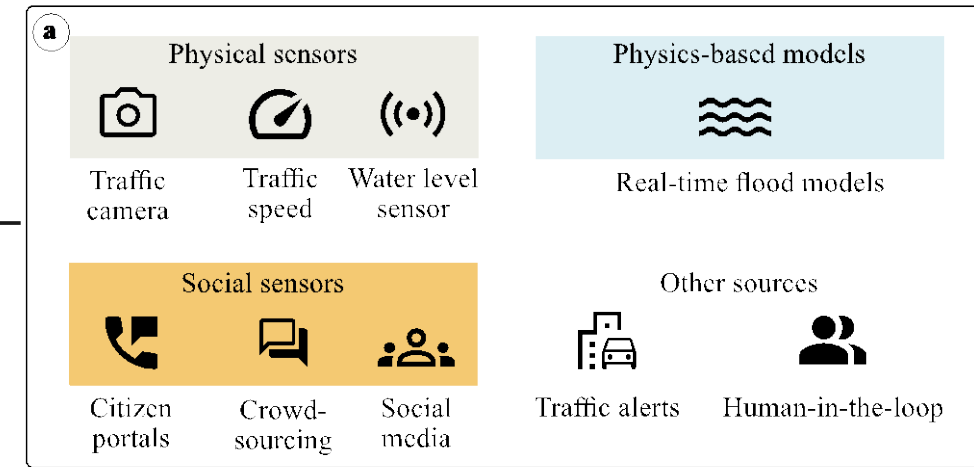
Fuse real-time flood observations for each road link



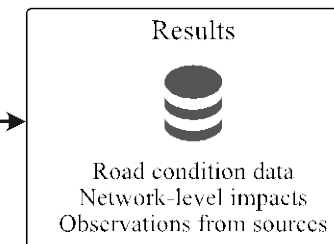
Data augmentation



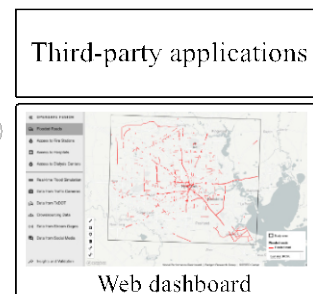
Real-time network analysis



Collect, process, and geolocate real-time observations at each time step



REST API



Communication

- Flooding observed
- Normal road observed
- No observations
- Flooded roads and nodes
- Open roads and nodes
- Flood (fluvial and pluvial)

Needs Assessment
Conceptual Design
Prototype
Usability Study
Implementation
Debugging

Stakeholders



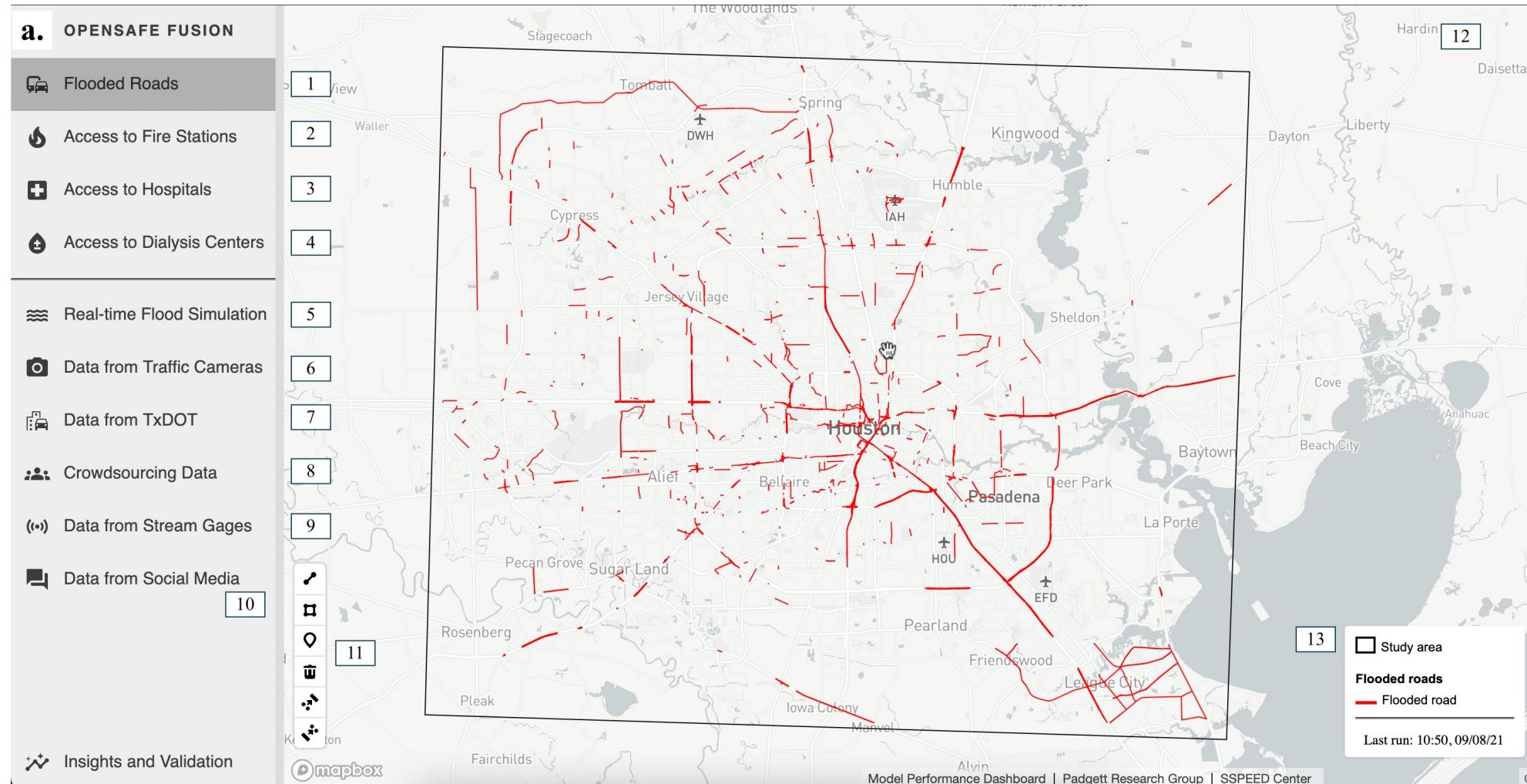
Community



Co-develop tools with stakeholders and community



OPENSOURCE FUSION WEBSITE





SOCIAL AND COMMUNITY DATA



PROJECT FACTORS: HEALTH, SOCIAL DETERMINANS & ENVIRONMENT

Table. Nueces SDOH Project Health Outcome Factors

Chronic Disease	Molina § ¥	Nueces County ¥	Texas ¤	U.S. ¤
Hypertension	41.5	34	32.2	32.4
Diabetes	21.5	14.7	11.5	10.9
Obesity	45.3	39.8	36.1	33.9
Asthma	9.8	9.1	8.4	9.8
Depression	22.8	22.7	18.6	20.5

§ Mean of data for tracts 1703, 1704, 1801 & 1602

¥ 2019 Data collected from the CDC PLACES

¤ 2021 Data collected from CDC Behavioral Risk Factor Surveillance System

Table. Project SDOH and Climate and Environment Factors

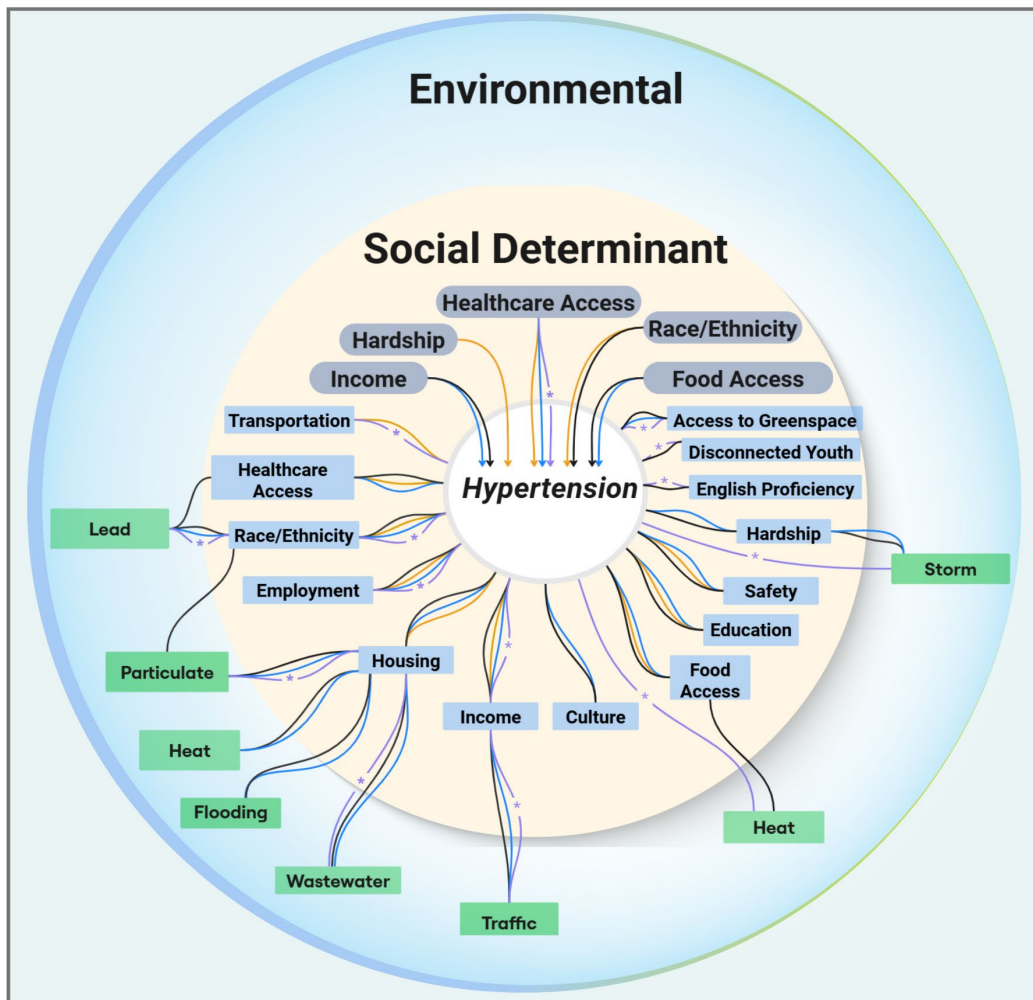
SDOH Factors M N	Climate (C) or Environmental (E) Factor
Disconnected Youth ^N Employment ^{M N} Education ^M English Proficiency ^M Food Access ^N Hardship* ^M Healthcare Access ^N Income ^{M N} Race & Ethnicity ^M Safety ^N Transportation ^A Access to Greenspace ^A Accessible Housing ^A Culture ^A Literacy ^A	Heat (C) (E) Flooding (C) (E) Storm (C) (E) Particulate Matter (C) (E) Ozone (C) (E) Lead Exposure (E) Wastewater Discharge (E) Traffic
^A SDOH added by Action Committee ^M SDOH in Molina neighborhood ^N SDOH in Nueces County * Hardship combines unemployment, age dependency, education, per capita income, crowded housing, and poverty into a single score (Christus Spohn, 2023)	



SDOH LOGIC MODEL WORKING GROUP

Purpose of Logic Models:

- Integrate diverse ways of knowing.
- With diverse ways of knowing, identify which SDOH, climate and environmental factors are linked to health outcomes.
- Increase understanding on specific datasets that can be used to assess SDOH impacts to health in Nueces County.



KEY

- | | |
|--|--|
| — Peer-reviewed Literature Link | → Peer-reviewed Literature Driver |
| — State and Local Information Link | → State and Local Information Driver |
| — Action Committee Input Link | → Action Committee Identified Driver |
| — Molina Input Link | → Significant Driver Identified From SEM |
| — Significant Link Identified From SEM | |

SDOH Link

SDOH Driver

Environmental Link

Environmental Driver

Grey text: Not a primary SDOH or environmental factor

GeoRED - Geospatial Resilient Economic Development

Welcome to GeoRED, a geospatial data platform designed to assist the communities of the Coastal Bend, Texas in practicing smart growth practices by providing regional hazard, modeling, and economic development data. Begin by using the interactive map tools to explore data layers available in each category below.

[Learn More](#)



Learn about the Hazard Impact and Planning Tool

GeoRED can be used by decision-makers and the public to build resilience to weather events, flooding and other disruptions.



Learn about the Social Vulnerability Tool

Community resilience and social vulnerability are intensely local. GeoRED builds specialized local data into resilience assessments.



Learn about the Economic Development Tool

Coastal Bend partners depend on a strong economy - learn how GeoRED can help strengthen economic resilience.



Learn about the Environmental Resilience Tool

GeoRED can be used to identify areas of priority concern to build environmental resilience, such as those listed in the Texas Coastal Resiliency Master Plan



Learn about the Nueces Community Health and Environment Tool

GeoRED can be used to support decision-making for improved health, social, and environmental factors in Nueces County



GeoRED Interactive Tools

Access the GeoRED Interactive Tools here



GeoRED has data covering different areas of interest for users across the Coastal Bend. The data has been separated by type into four main data viewing tools

- [Hazard Impact and Planning Tool](#)
- [Social Vulnerability Tool](#)
- [Economic Development Tool](#)

- [Nueces Community Health and Environment Tool](#)

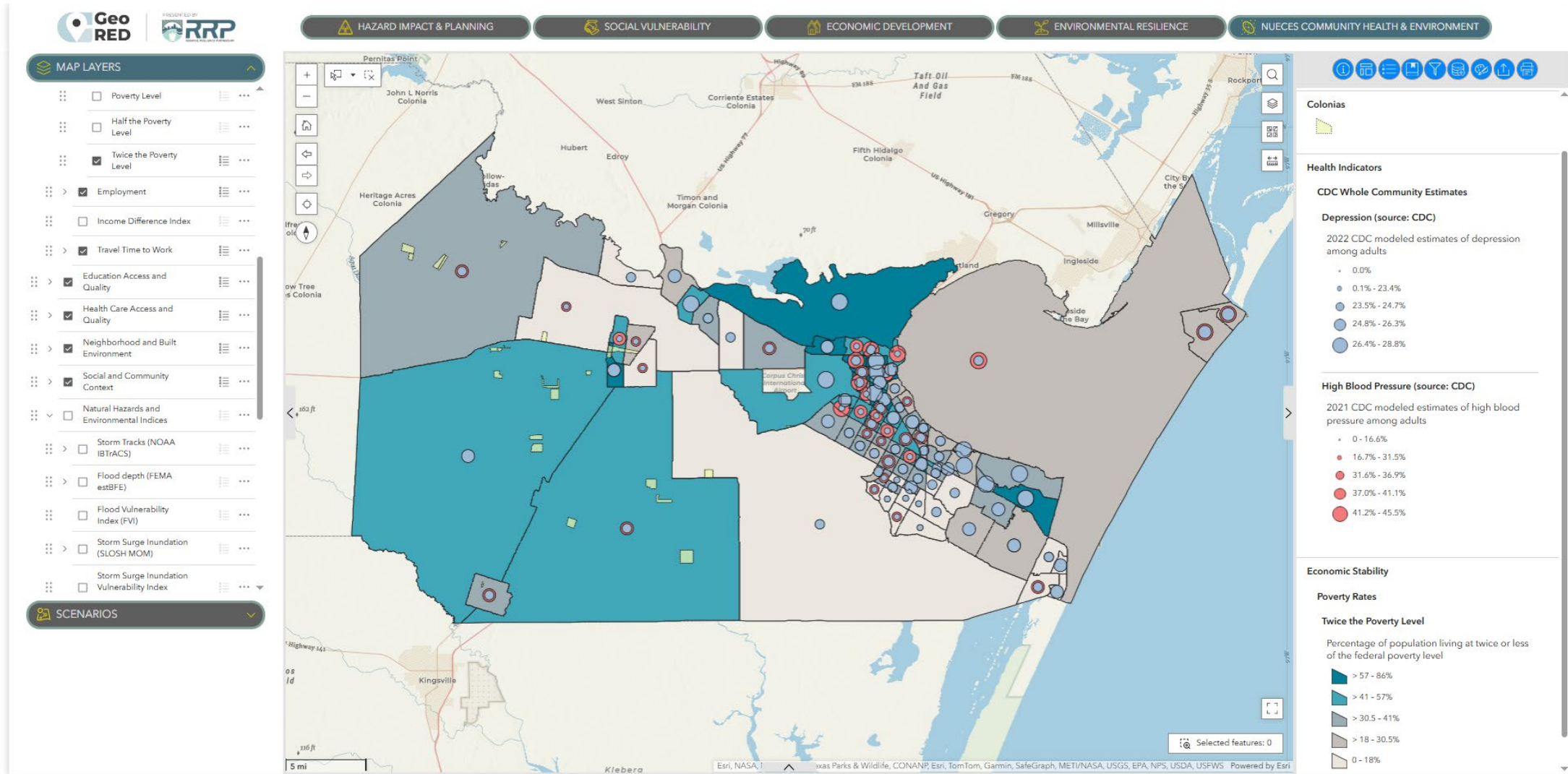
use the [GeoRED Flood Event Reporting Tool](#)



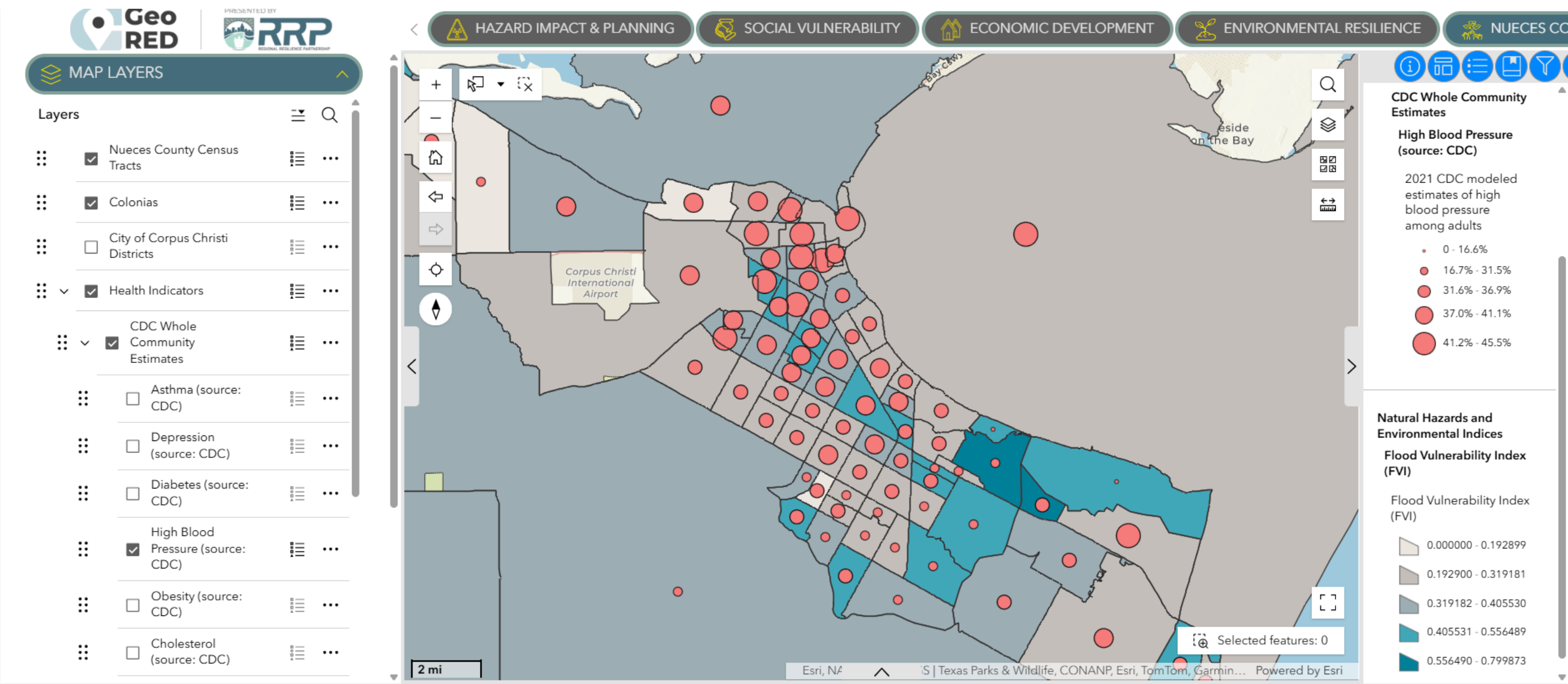
<https://geored.org/>



COMMUNITY HEALTH & ENVIRONMENT TOOL



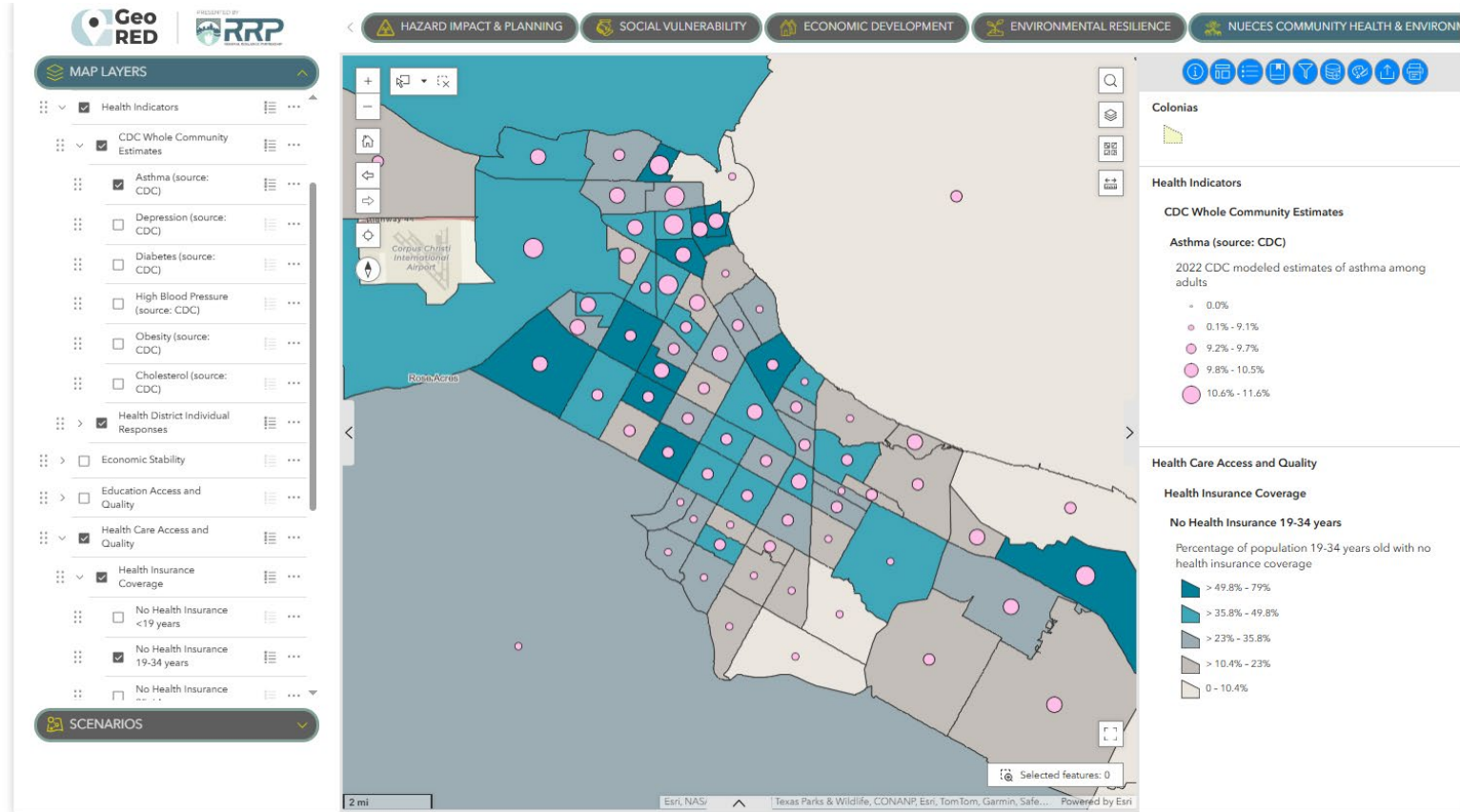
Community Health & Environment Tool for Nueces County, Texas. Data are grouped into SDOH categories. Image shows CDC data on depression rates and rates of high blood pressure, overlaid on poverty data (twice the federal poverty level). All data are available for download.



Environment & Health: Community Health & Environment Tool for Nueces County, Texas. Data are grouped into SDOH categories. Image shows CDC data on high blood pressure, overlaid on flood index data derived for this project. All data are available for download.

IMMEDIATE APPLICATIONS

- Prioritizing Resources and Capacity
- Conducting Community Needs Assessments
- Scoping Additional Projects
- Assessing Data to Support Funding Requests



SDOH & Health: Community Health & Environment Tool for Nueces County, Texas. Image shows CDC data on asthma rates for adults overlaid on data showing a lack of health insurance for adults 19-34 years. All data are available for download.



KEY TAKEAWAY: RESILIENCE IS *LOCAL*
***STRENGTHENED CAPACITY IS NEEDED FROM THE
LOCAL TO REGIONAL LEVEL!***

REGIONAL RESILIENCE MODELS

Collaborative	Membership [†]				Administrative or Fiscal Host	Funding Source(s) [‡]				
	Local government	Public agencies & utilities*	Nonprofit, Academia	Business/Private		Member dues/Cost-share	Philanthropic grants	State or federal grants	Other	In-kind services
<i>King County-Cities Climate Collaboration (K4C)</i>	✓	✗	✗	✗	County	✓				✓
<i>Capital Region Climate Readiness Collaborative (CRC)</i>	✓	✓	✓	✓	Nonprofit – Local Government Commission	✓			✓	✓
<i>Sierra Climate Adaptation & Mitigation Partnership (Sierra CAMP)</i>	✓	✓	✓	✓	Nonprofit – Sierra Business Council	~	✓		✓	✓
<i>Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC)</i>	✓	✓	✓	✓	University – UCLA	✓		✓		✓
<i>San Diego Regional Climate Collaborative (SDRCC)</i>	✓	✓	✓		University – USD	~	✓	✓	✓	✓
<i>Southeast Florida Regional Climate Change Compact (Compact)</i>	✓	✗	✗	✗	Nonprofit – Institute for Sustainable Communities; County – Broward (fiscal)	✓	✓	✓		✓
[†] Note on Membership: “✗” indicates entities/organization types that are not eligible at all for membership in the collaborative, while blank spaces indicate member types that are eligible but so far the collaborative does not have any from that category. [‡] Note on Funding Sources: blank spaces indicate funding sources not used to date, while tildes (~) indicate mixed or optional dues structures (i.e., SDRCC, which does not charge dues to public agency members, and Sierra CAMP, which has a voluntary/suggested contribution structure). *Other public agencies include regional authorities like water and air districts, councils of government, port authorities, etc. Utilities (e.g., electric) are included in this category regardless of ownership.										

REGIONAL RESILIENCE PARTNERSHIP *COASTAL BEND OF TEXAS*

MEMORANDUM OF UNDERSTANDING
ESTABLISHING A JOINT PROJECT BETWEEN
TEXAS A&M UNIVERSITY-CORPUS CHRISTI
AND
COASTAL BEND COUNCIL OF GOVERNMENTS
Agreement No. 1

I. PARTIES

This Memorandum of Understanding ("Agreement") is entered into by Texas A&M University-Corpus Christi ("TAMUCC"), represented herein by Dr. Kelly Quintanilla in her capacity of President, and the Coastal Bend Council of Governments (CBCOG), represented herein by Mr. John Buckner, in his capacity of Executive Director, with the purpose of setting forth the general framework for specific projects in the future in matters related with: Disaster Resilience and Mitigation of the Texas Coastal Bend and Investigation and the Disclosure thereof, subject to the following considerations, recitals and clauses:

RECITALS

II. TAMUCC HEREBY DECLARES THROUGH ITS AGENT:

- (1) That it is a university managed by a Board of Regents of The Texas A&M University System (the "A&M System"), and that it has legal capacity to engage in, and be engaged under the terms of the policies of the A&M System and the laws of the State of Texas.
- (2) That its purpose is supporting investigation and education activities as well as the disclosure thereof, which includes long term development in the sustainable use and preservation of the Gulf of Mexico and resilience building of Gulf coastal communities, specifically through the Harte Research Institute for Gulf of Mexico Studies.
- (3) That the TAMUCC President has the legal capacity to execute this Agreement and additional agreements with other institutions according to the laws of the State of Texas and the policies of the A&M System.
- (4) That its legal domicile is located at Texas A&M University Corpus Christi, 6300 Ocean Drive, Corpus Christi, Texas 78412, United States of America, telephone +1(361) 825-2000.



RRP launched in 2019 to build community capacity to mitigate disaster risk

- RRP Listserv for training and funding announcements
- Training sessions (local officials, small business, NGOs, students)
- Direct technical support and guidance to counties and cities on building and implementing recovery, resilience and risk mitigation plans
 - Co-develop feedback to state/federal surveys
 - Targeted assistance
- Technical assistance in data and GIS
- Develop funding strategies, assist with grants applications and administration
- Strategic resilience assessment locally and across counties

The Water Institute is officially joining RRP this Fall!



THE WATER INSTITUTE
OF THE GULF®

THANK YOU!

K WOWK

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