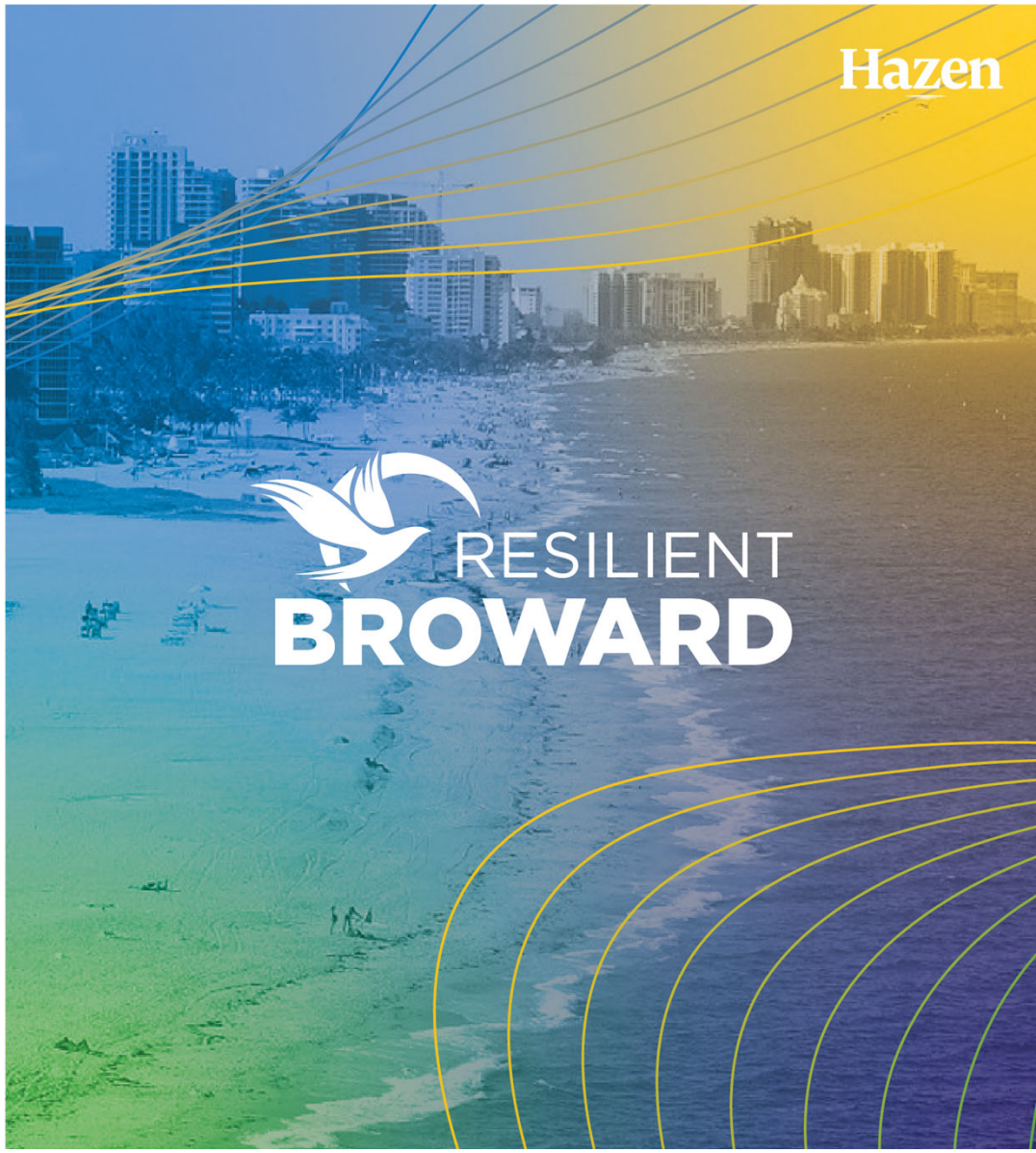
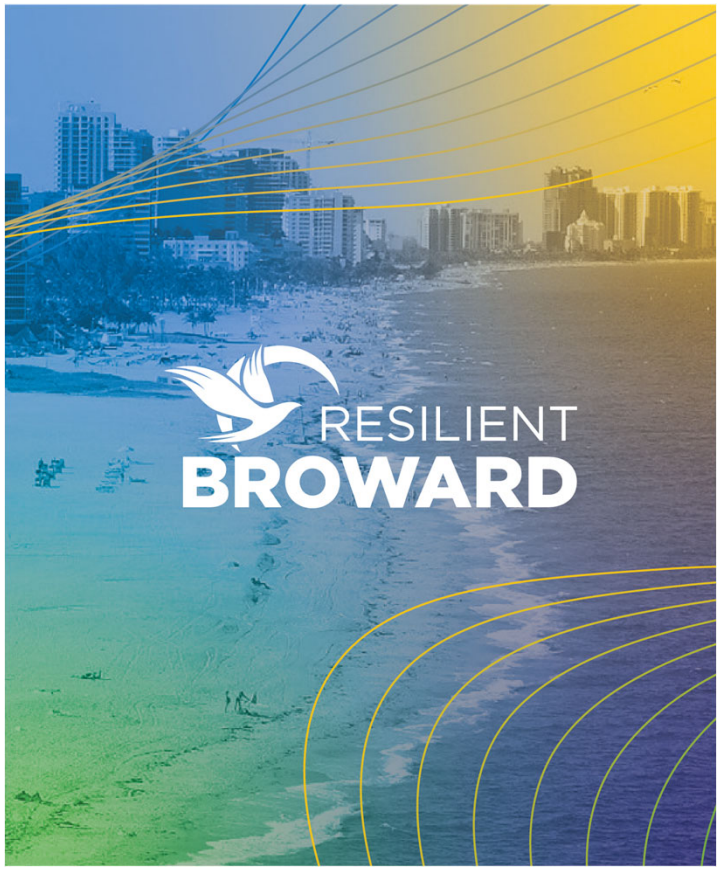
Roundtable Discussion
Countywide Risk Assessment and Resilience Plan

September 15, 2022





1

Understanding Resilience and Vulnerability

Hazen

How can we assist decision makers in making meaningful contributions to collective resilience?

Confident action stems from a more complete understanding of factors affecting resiliency and our Countywide approach

Review of Basic Concepts Relative to Climate Resiliency

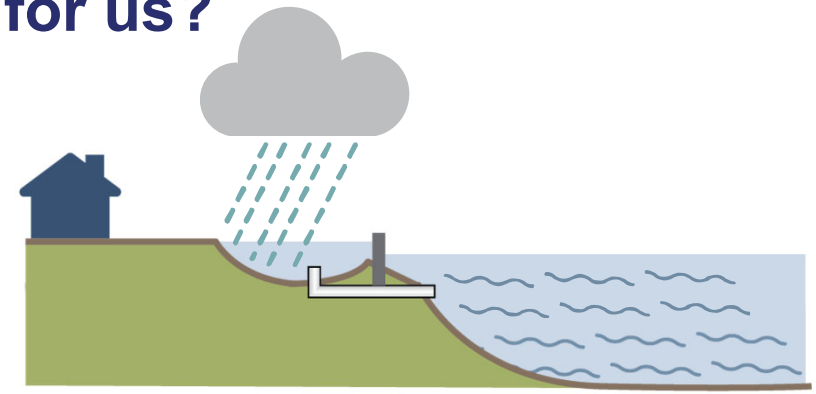
- **Vulnerability** – the state of being exposed to the possibility of being attacked or harmed.
- **Resiliency** – the capacity to recover quickly from difficulties; toughness.
- **Climate Change** – a change in global or regional climate patterns.
- **Compound Probability** – the likelihood (probability) of multiple events occurring; equal to the product of the individual event probabilities.

What might these concepts look like for us?

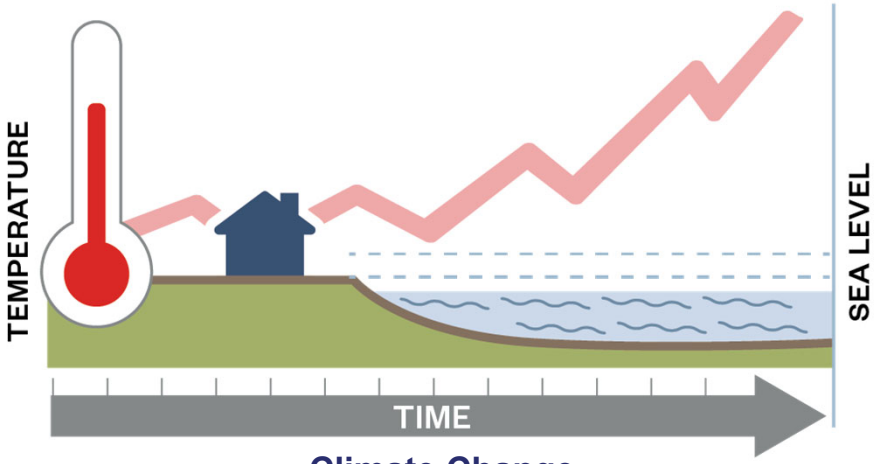
Vulnerability

What might these concepts look like for us?

Vulnerability



Resiliency

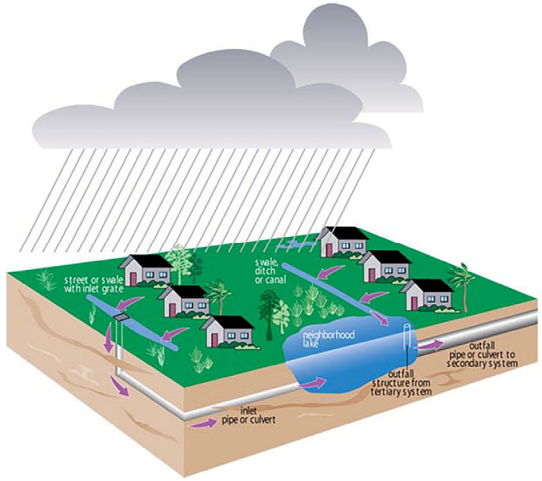


Climate Change

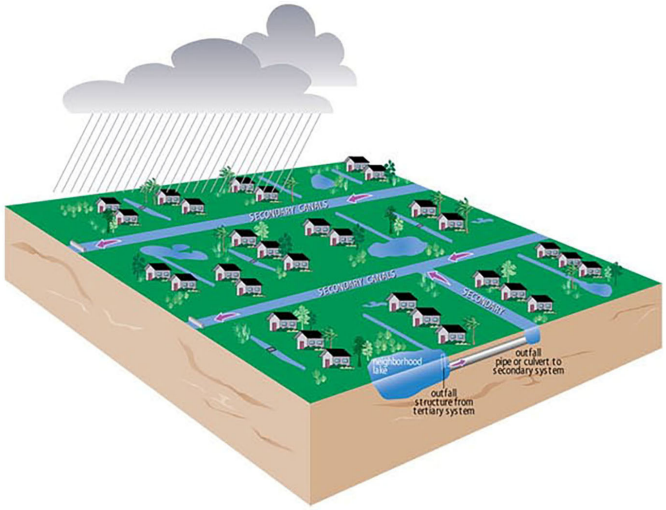
Compound Probability

Understanding how we can promote and support resilience requires knowledge of the overall water management system and how the component parts work together

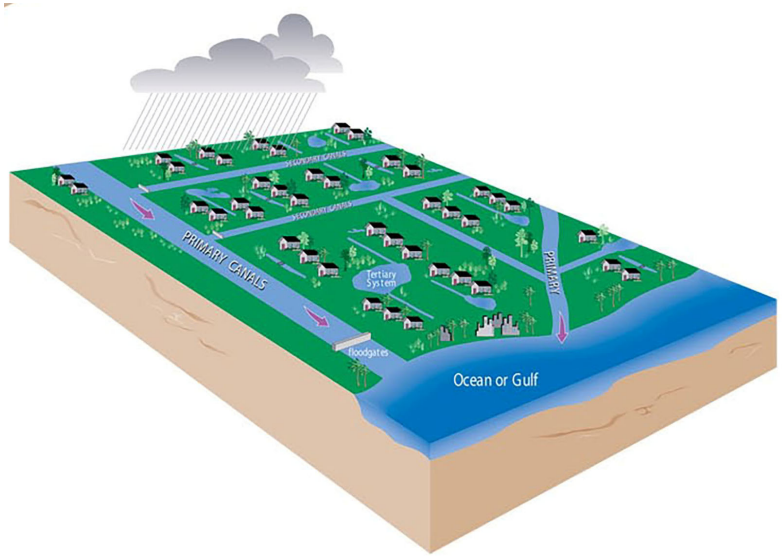
Know the Flow



Neighborhood
Tertiary Drainage System

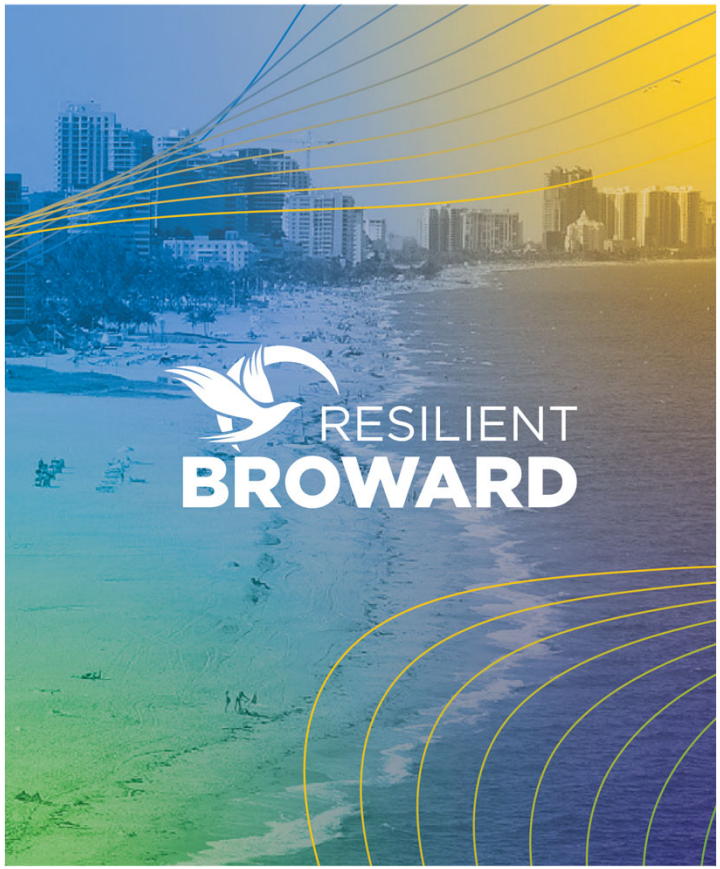


Local Drainage
District/County or City
Secondary Drainage System



SFWMD Canals/
Natural Rivers/Other Waterways
Primary Drainage System

sfwmd.gov



2

How South Florida Water Management Works

Hazen

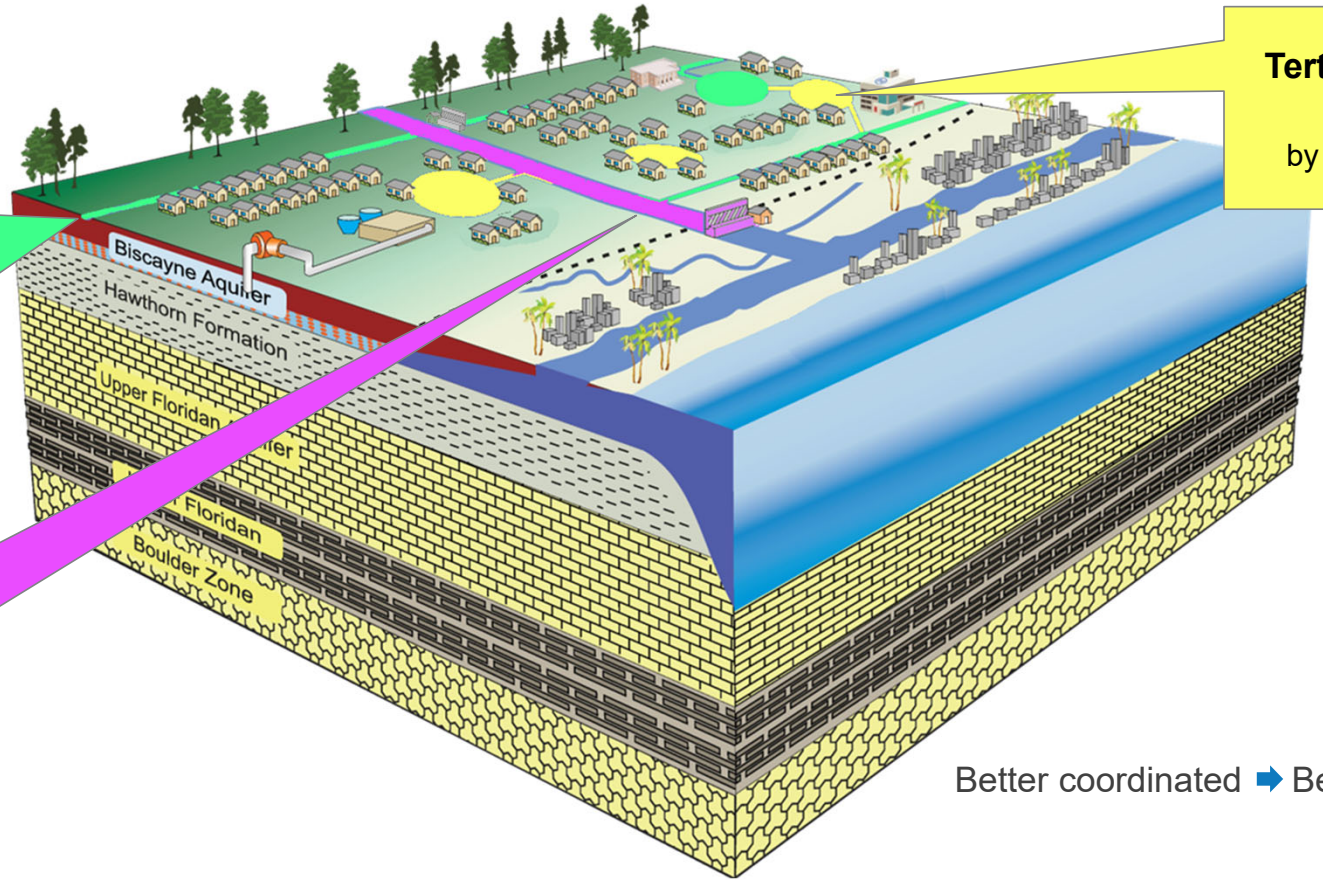
Primary, Secondary and Tertiary Systems

Secondary System

Managed by Water Control Districts, Counties, Cities

Primary System

Operated by SFWMD under USACE authorization

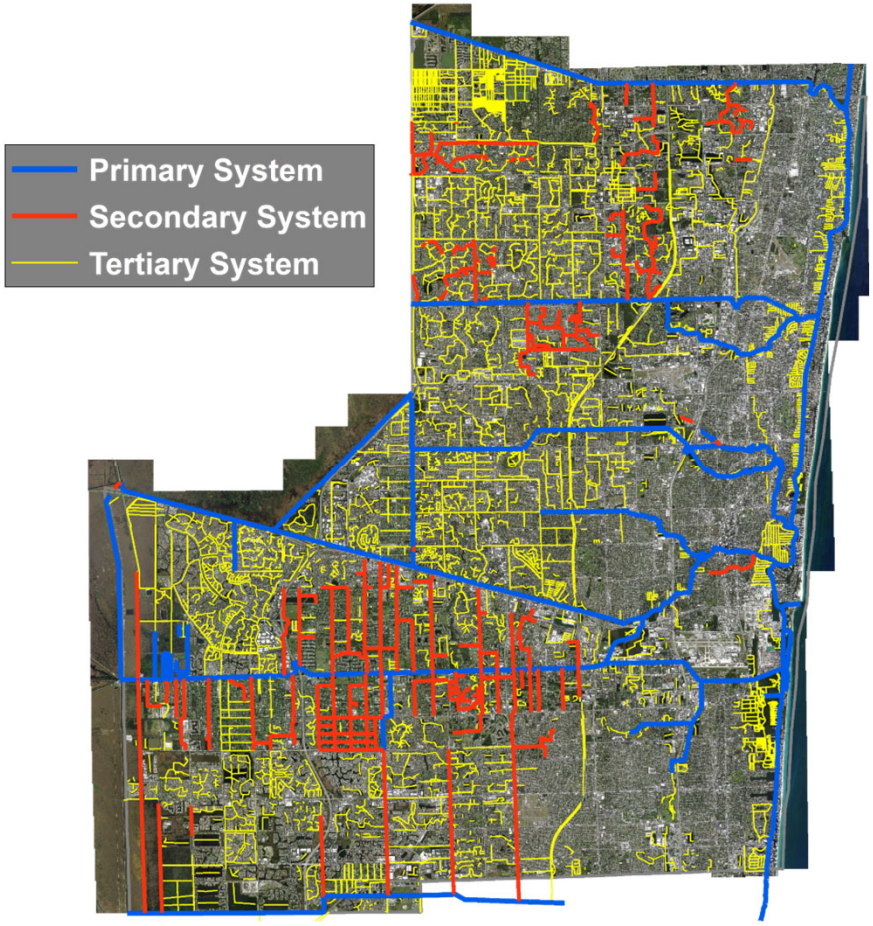


Tertiary System

Managed by HOAs, Cities

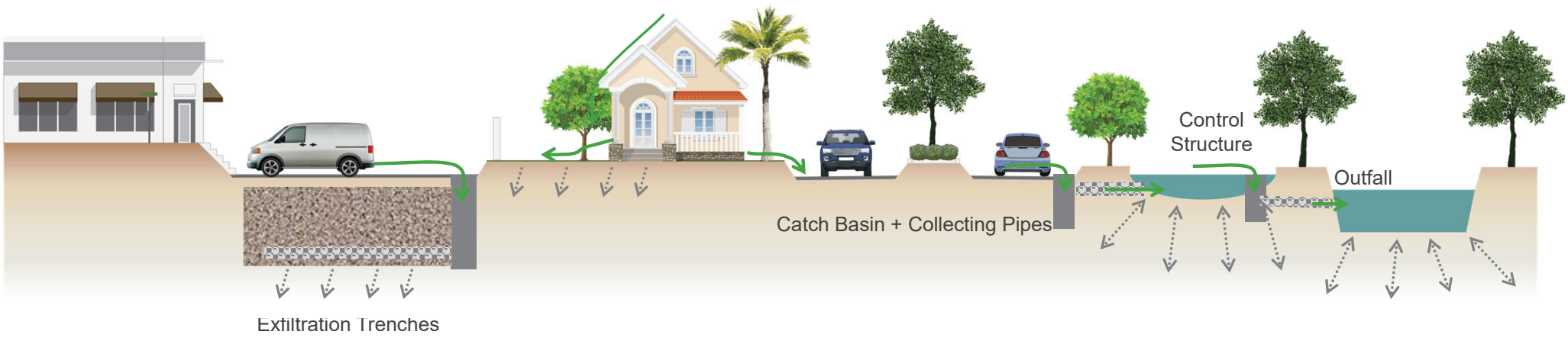
Better coordinated ➡ Better performance

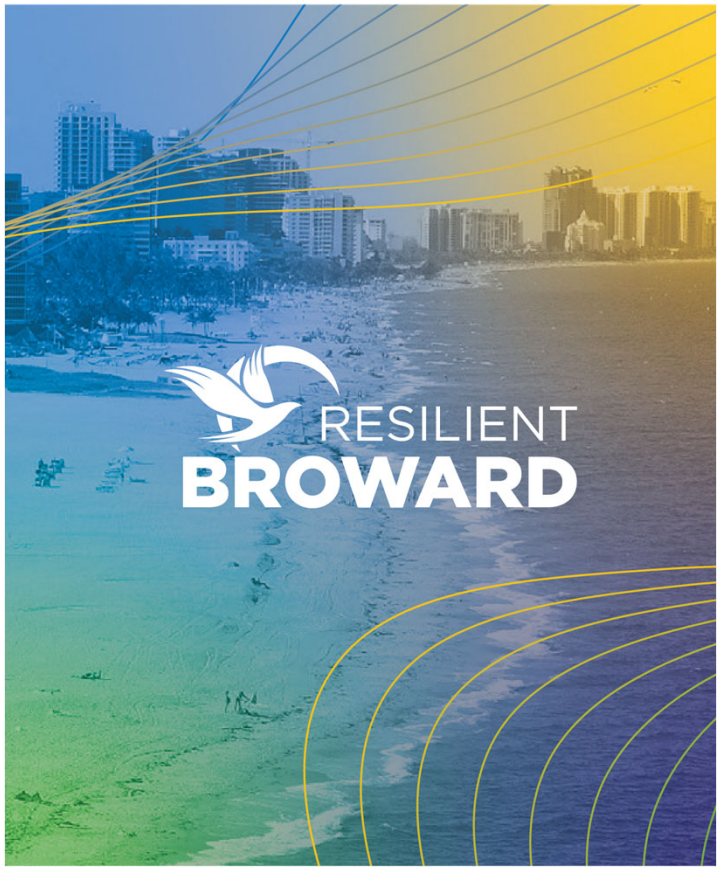
Typical South Florida Drainage System



- Path that stormwater typically follows from neighborhoods to the secondary/primary drainage system
- **Maintenance and upkeep of community drainage facilities is typically the responsibility of homeowner associations/municipalities.**

Typical Tertiary / Neighborhood Stormwater Management System





3

Risk Assessment and Resilience Plan

Hazen

Broward County enlisted the Hazen team to perform the scope of work. This team includes 16 subconsultants and individuals.

Hazen

CUMMINS | CEDERBERG
Coastal & Marine Engineering

Collective
WATER RESOURCES

Munich RE

BRIZAGA
ASSESS. COMMUNICATE. ADAPT.

McKinsey
& Company

THE WATER INSTITUTE
OF THE GULF

R.J.Behar

HR&A

Willis Towers Watson

Gridics

CRANEN·THOMPSON & ASSOCIATES INC.

Louis C. Aurigemma, PE

Joyce Coffey, LEED AP

Dr. Cheryl Holder

Daniel Stander

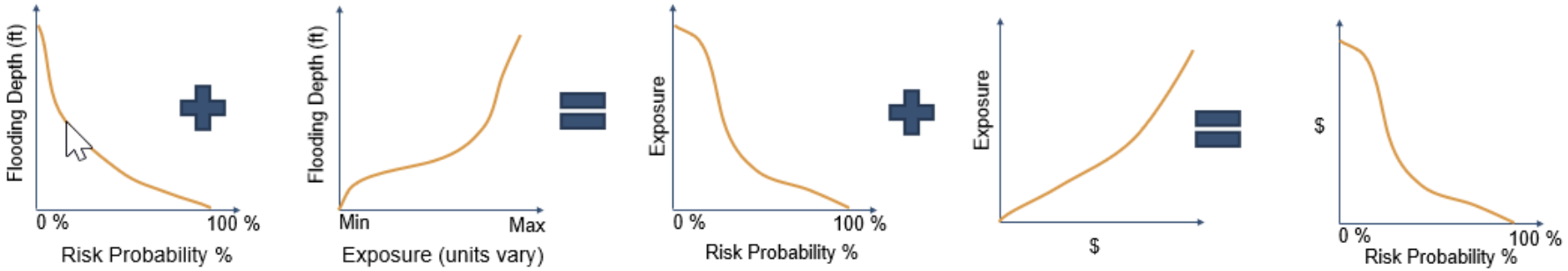
Dr. Michael Sukop

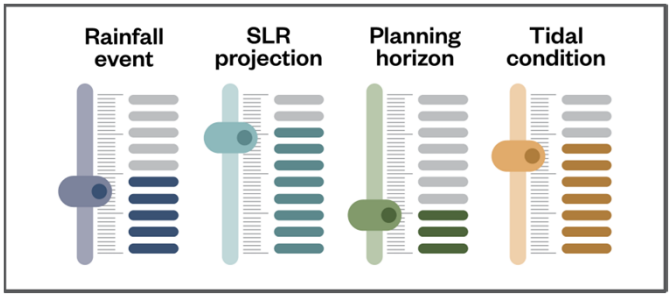
The Scope of this Resilience Project includes Eight Major Components

1. Stakeholder Engagement
2. Hydrologic Modeling
3. County Asset Analysis
4. Economic Modeling
5. Resilience Adaptation Plan
6. Resilience Planning Platform
7. Presentation of Results
8. Summary Report and Platform Turnover

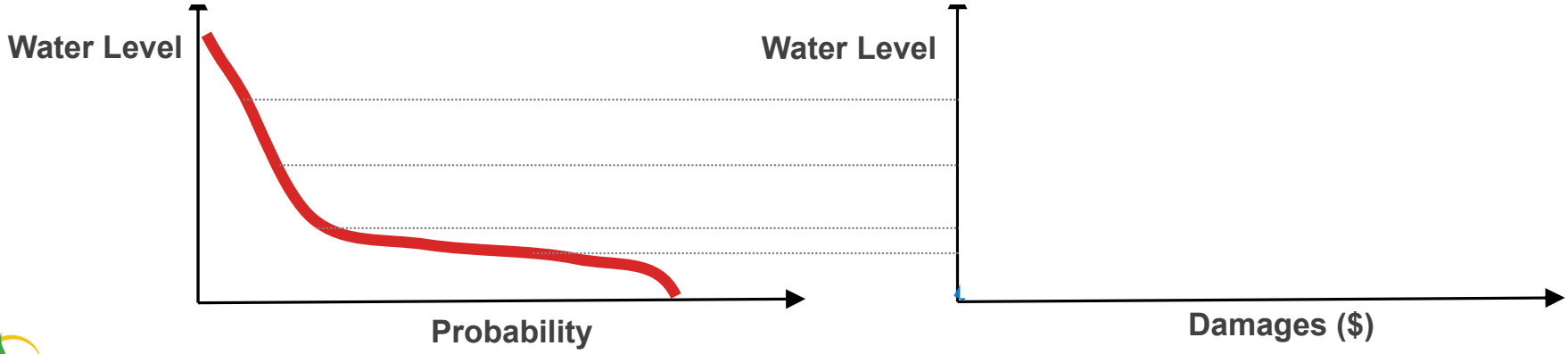
2. Hydrologic Modeling

The team will perform more detailed hydrologic modeling based on the provided data





The updated hydrologic model will feed the economic model



Economic modeling will provide estimates of adaptation strategy benefits

Economic benefits will be measured:

- In dollars
- By geographic area
- In five-year increments
- By type of beneficiary

… to help determine economic feasibility, cost-sharing arrangements, and funding options and strategies

4. Economic Modeling

First economic forecast – Baseline Conditions ("What if we do nothing?")

Hazard Exposure

- Frequency, duration, extent of flooding – properties, roads, essential infrastructure
- Flood damage repair costs
- Heating degree days
- Socio-economic projections

First Party Loss

- Building and asset damage
- Lost income from business interruption
- Cost of lost access to services
- Humanitarian (health) impacts

Indirect Impacts

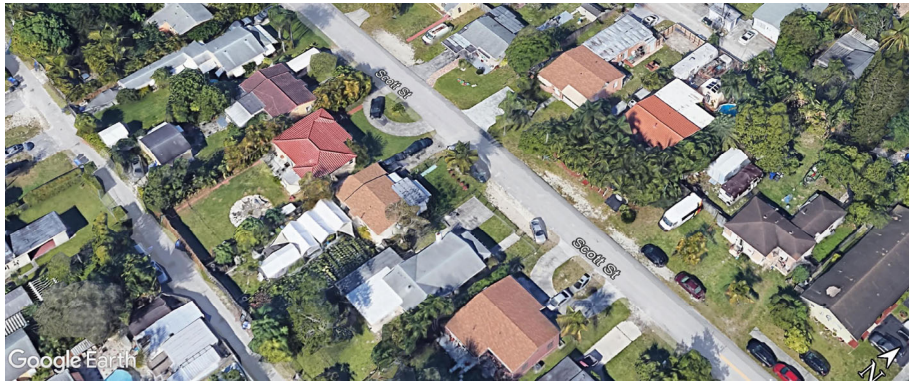
- Resident and business income
- Population, Jobs, Investment
- Economic Growth
- Beaches, recreation areas Natural environment
- Insurance availability, affordability
- Real estate values
- Tax revenue and government spending/Credit quality

Key Impact Metrics

- Economic activity (by sector)
- Household impacts
- Asset values
- County finances
- Distribution of impacts

Additional Economic Forecasts – Will Measure Benefits in Dollars by location

Avoided Loss in:	Avoided Cost of:	Avoided Reduction in:
Resident and Business income	Emergency services	Property values
Neighborhood amenities (a.k.a. - Increases in quality and availability of goods and services)	Property insurance premiums	Value of Recreation days (willingness-to-pay)
	Mortgage interest rates	Value of Environmental amenities (willingness-to-pay)
	Electricity cost to cool properties	
Tax revenue to County and local governments	County borrowing and credit	Government services

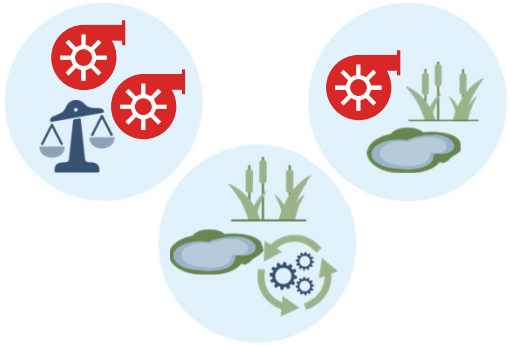


The Resilience Adaptation Plan will include actionable Countywide adaptation and mitigation strategies…

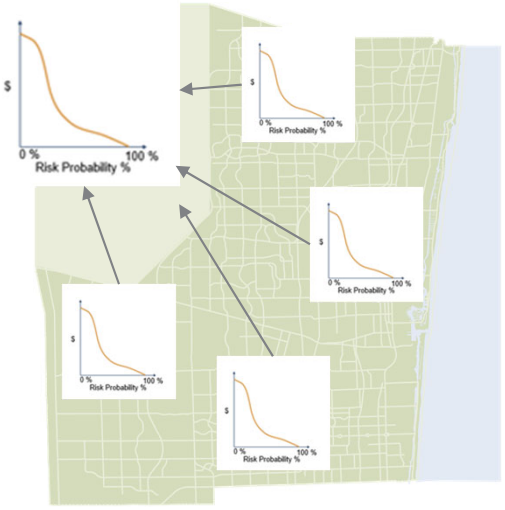
Sample Types of Adaptation / Mitigation Strategies:

- Pump Stations
- Natural Barriers
- Storage/Impoundments
- Regulation Changes
- Operation Changes
- Et cetera.

Sets of Strategies
are combinations of different types of mitigation strategies in different parts of the County.



The evaluations need to consider the effects of the sets of strategies on the entire County.



5. Resilience Adaptation Plan

6. Resilience Planning Platform

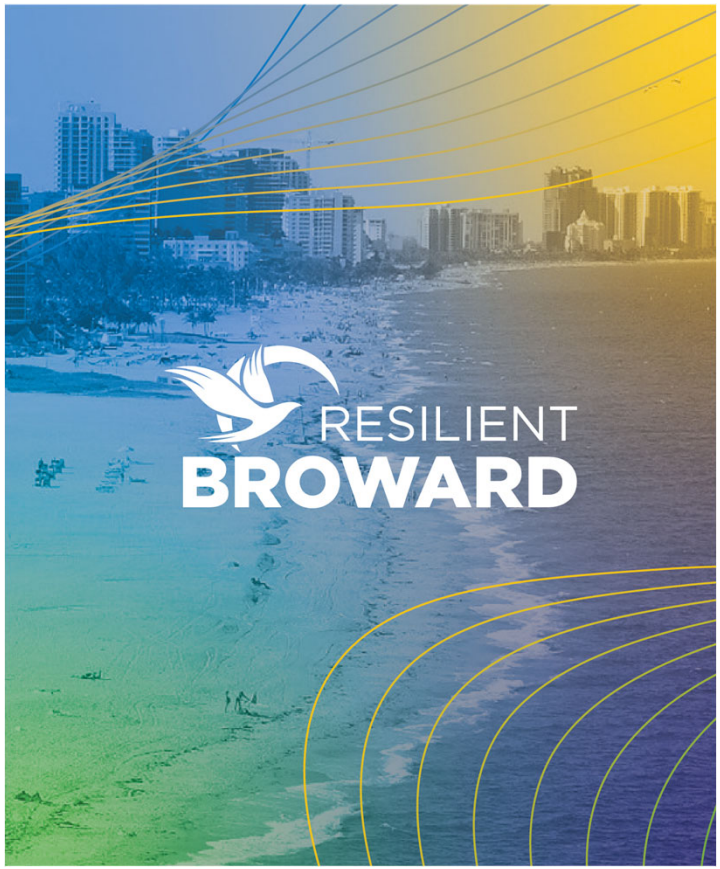
….to be implemented by water control districts and municipalities as appropriate.

Selected Plan: Combination of adaptation/mitigation strategies.

- Location type
- Benefits (Focused on Countywide Risk Reduction)
- Planning Level Cost Estimates

Web Application Tools

- Stakeholder engagement to solicit input on planned strategies
- Stakeholder engagement to share preliminary results
- Tracking of Plan components implementation
- Monitoring of key variables and indicators

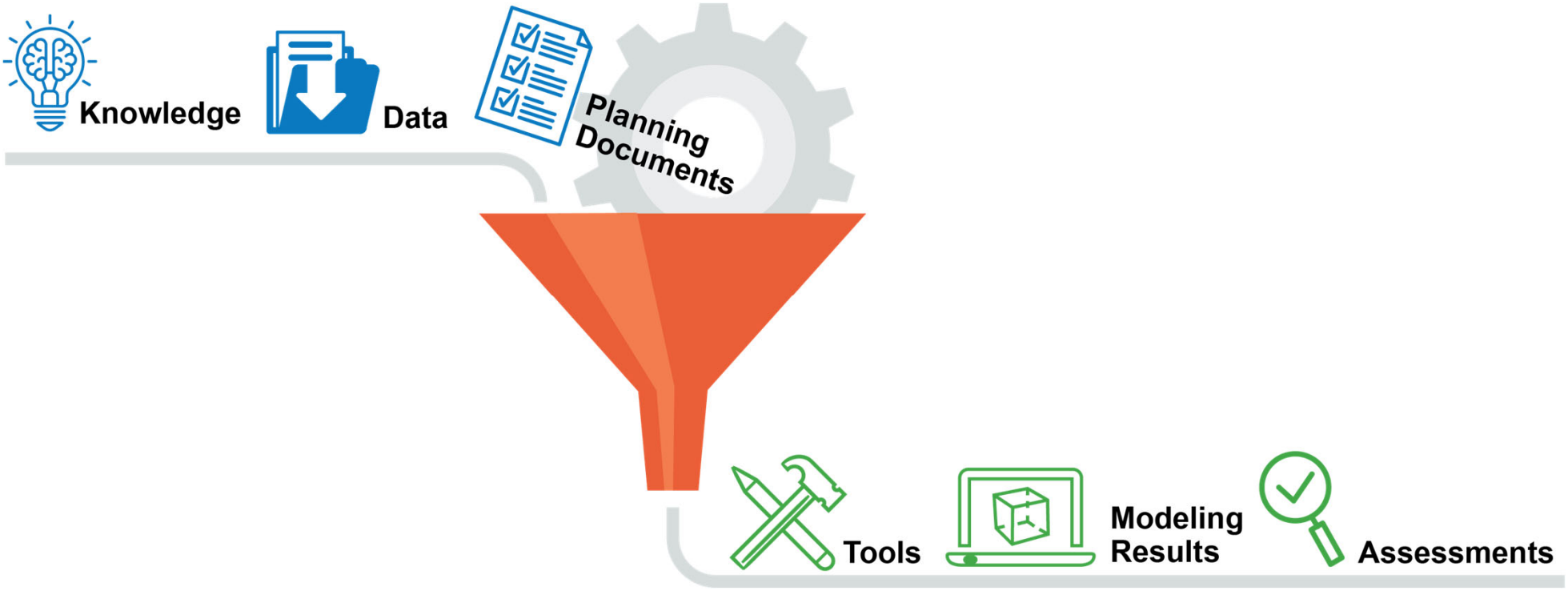


4

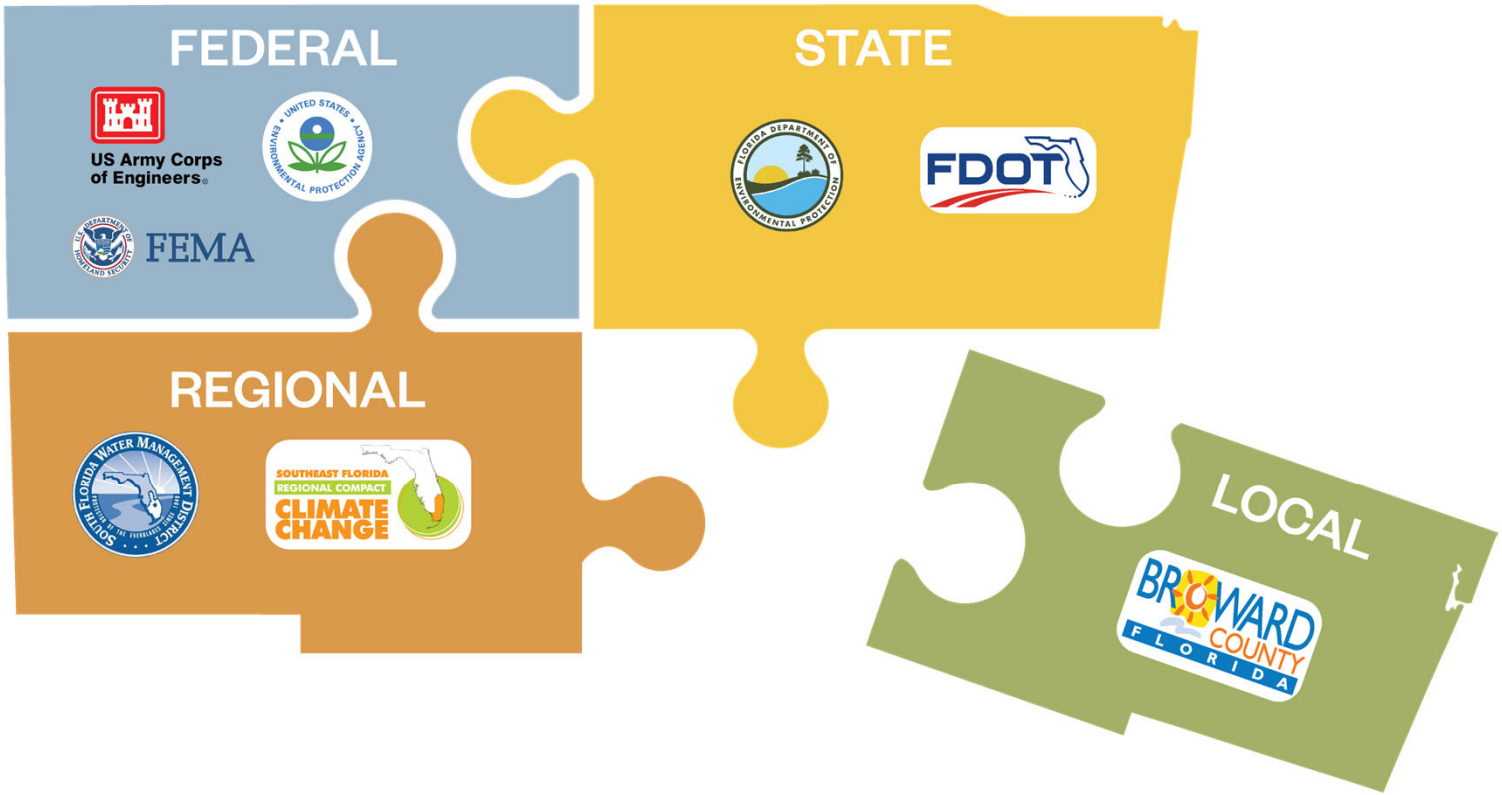
How do the Stakeholders Fit Into the Plan?

Hazen

As it relates to Resilient Broward, stakeholders are both contributors and beneficiaries

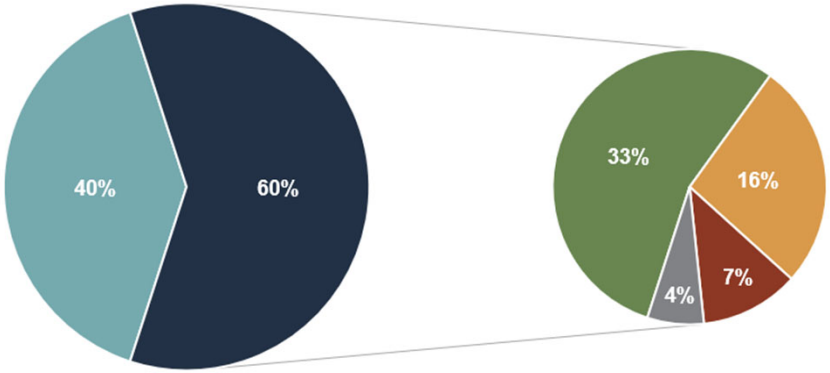


Together, we have to handle our piece of the puzzle

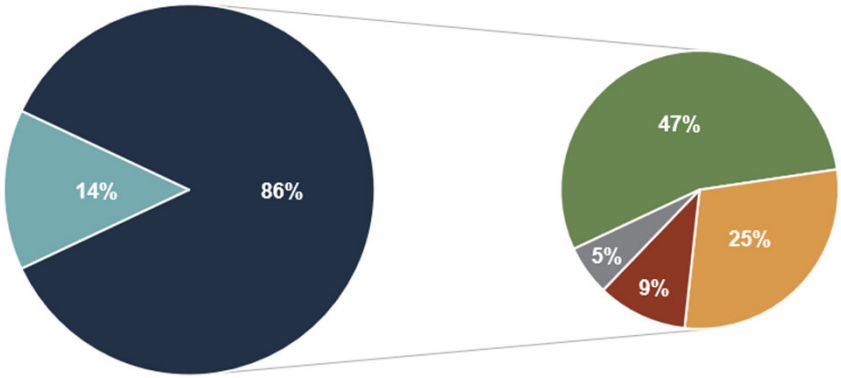


We are incorporating the data received from the stakeholders

Responsiveness of Stakeholders



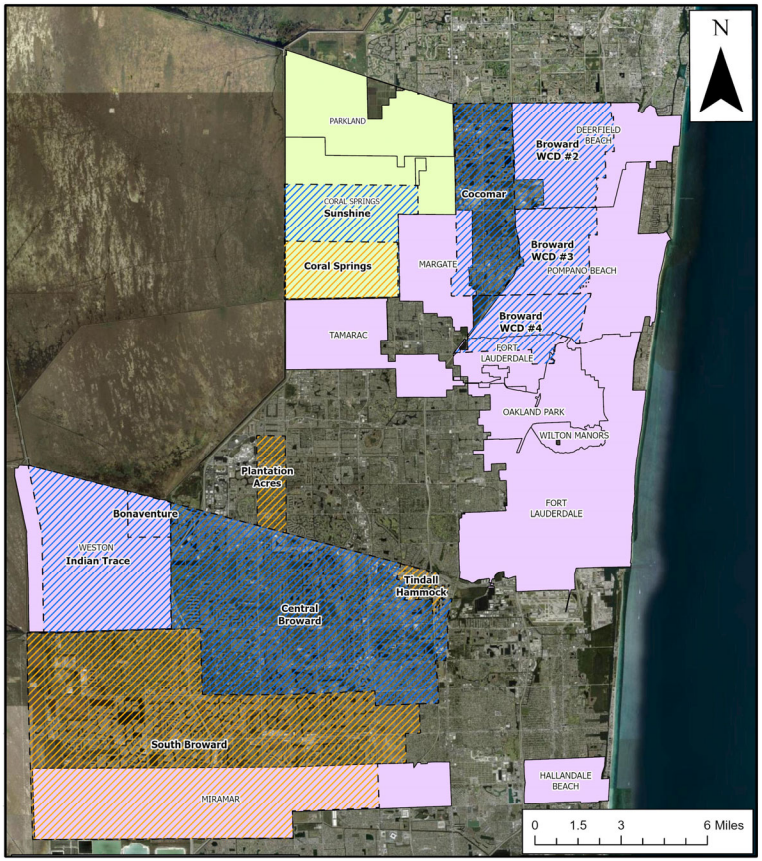
As of 08/10/22



As of 09/08/22

- Responsive
- Non-Responsive to Original Request. Reminder Email Sent.
- Data Received
- Request Noted. Expecting Data.
- Data Not Readily Available
- Data Within Hazen's System

We all play a part in putting together the resilience puzzle



SUBMITTED GIS DATA

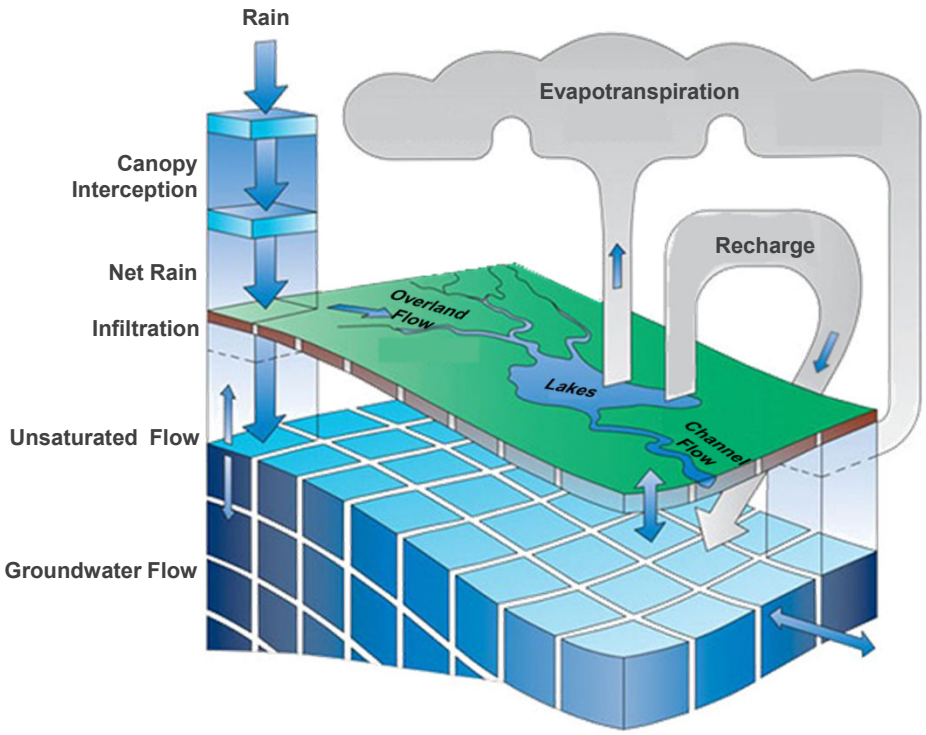
Municipalities - Stormwater Data in GIS

Water Control Districts - Stormwater Data in GIS

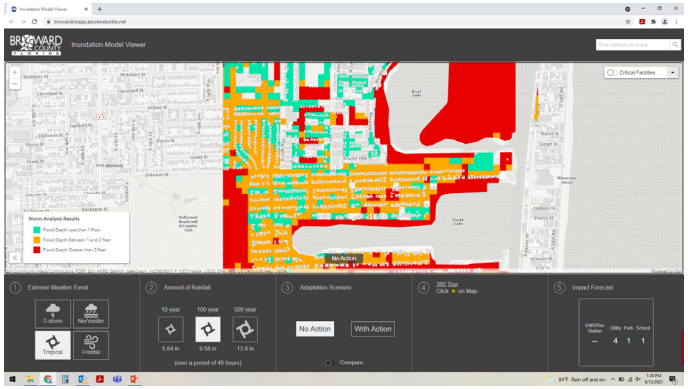
Municipalities - Stormwater Data in PDF Form

Water Control Districts - Stormwater Data in PDF Form

Stakeholders will have the opportunity to review model results

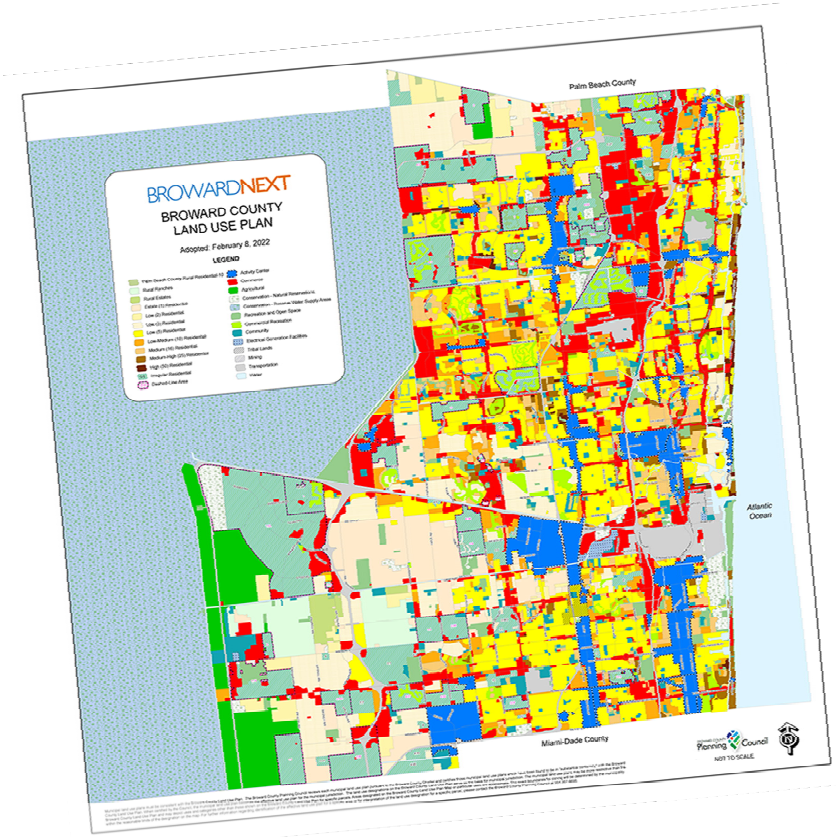


- Review of output for the modeled scenarios



- Provide input regarding selection of focal areas for visualization

Planning & Regulation: Much of the required land use planning and regulation will happen at the local level




9/8/22, 10:18 AM Broward County, FL Code of Ordinances

CODE OF BROWARD COUNTY, FLORIDA VOLUME I

Published by Order of the Board of County Commissioners, 1976
Republished by Order of the Board of County Commissioners, 2001

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PREFACE

The Board of County Commissioners of Broward County herewith presents the "Code of Broward County" being a compilation of County ordinances, resolutions, administrative rules and regulations, and laws of the state, including special acts of direct application to Broward County and general laws and statutes of interest to the county officials during the codification project. Also included are certain state administrative rules and regulations which the county felt would be useful to the users of this Code. For a further analysis of the contents of this Code, the user is directed to the comparative tables, which show the source of each provision and its location in this Code. The source of each section of the Code is also set out in parentheses immediately following each section.

The Code has been republished in 2001 with the inclusion of ordinances received for codification subsequent to the publication of Supplement No. 89 to the 1976 publication, and this republication constitutes a replacement volume to the prior Code.

The inclusion of county ordinances is on the basis of the basis of the authority of their enactment as contained in Article VIII, Section 1 of the State Constitution and Laws of Florida, Chapter 69-32, which provides that counties shall maintain a current compilation of all Ordinances and shall publish them annually.

The titles of acts, ordinances and regulations, as well as stock legislative phrases such as "all laws and parts of laws in conflict herewith are hereby repealed" have been omitted.

The editors have made every attempt to leave the provisions of the Code in their original form, but for the sake of uniformity, minor editorial changes not affecting substantive provisions have been made. For example, a citation in a given provision to another section of the original law or ordinance is changed so that the citation is to a given section of this Code. Section and subsection numbers have also been changed for

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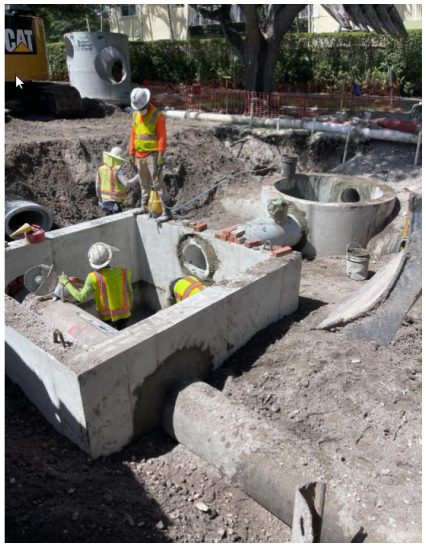
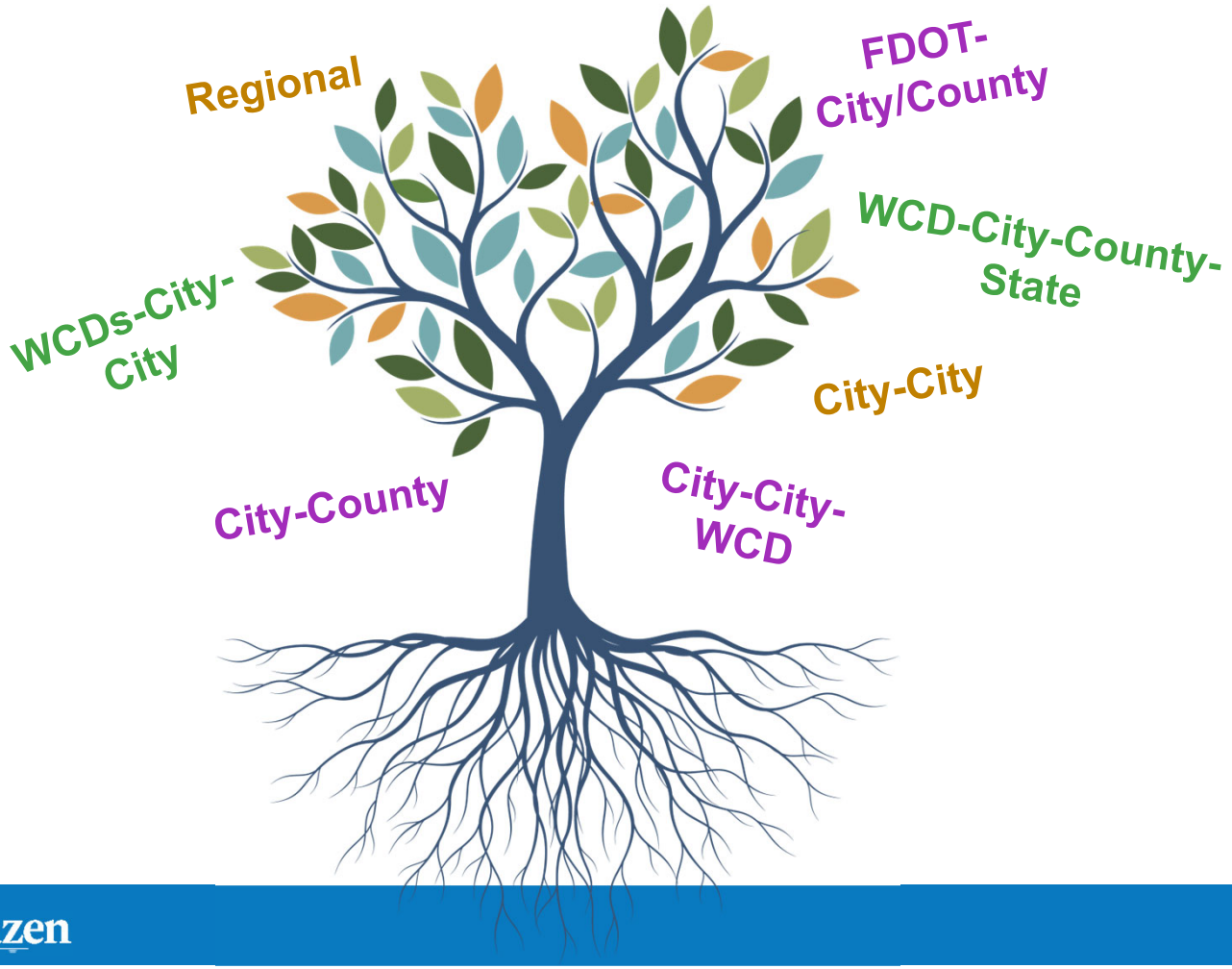
Complementary local infrastructure investments will be necessary



Seawall - Before

Seawall - After

Collaborative Partnership opportunities will be many (and vital to overall success)

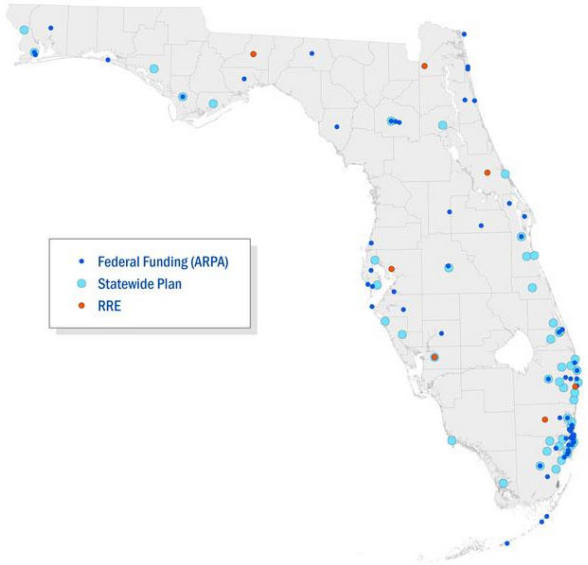


Working together we can maximize resiliency resources Countywide

FEDERAL FUNDING SOURCES

- *FEMA - Building Resilient Infrastructure and Communities*
- *FEMA - Flood Mitigation Assistance*
- *FEMA - Hazard Mitigation Assistance Program*
- ***NEW*** *FEMA - The Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act*
- *NOAA - National Coastal Zone Management Program*
- *NOAA - National Coastal Resilience Fund*
- *USACE - Climate Change Adaptation - Coastal Risk Reduction and Resilience*
- *EPA - Section 319(h)*
- *US Congress - Community Project Funding - Interior, Environment, and Related Agencies*

Projects funded by the Resilient Florida Program for Fiscal Year 2021-22 and 2022-23

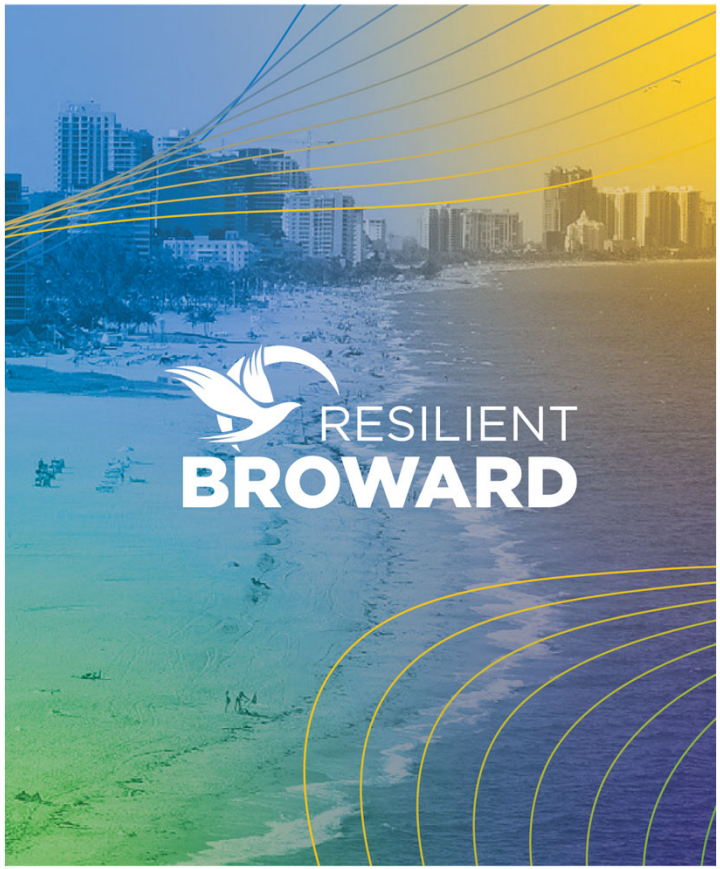


FY 2021-2022:
98 projects totaling over $19 million

FY 2022-2023:
76 projects totaling over $270 million

2022-23 Statewide Flooding and Sea Level Rise Resilience Plan

Project Sponsor	County	Project Title	Approximate Total Project Cost (dollars)	Estimated Requested Funding Total (dollars)	Year 1 Funding	Year 2 Funding	Year 3 Funding
Broward County Aviation Department	Broward	FLL Stormwater Outfall Modifications	$626,066	$313,033	$24,079	$288,954	
City of North Lauderdale	Broward	Pump Station	$7,100,000	$3,550,000	$466,500	$3,083,500	
City of Sunrise	Broward	Springtree Wastewater Treatment Plant Storage and Equipment Building	$1,310,000	$655,000	$5,000	$325,000	$325,000
City of North Lauderdale	Broward	Canal Rehabilitation	$5,200,000	$2,600,000	$976,666	$1,623,334	
City Lauderdale Lakes	Broward	Fire Station 37 Hardening	$6,000,000	$3,000,000	$3,000,000		
Broward County	Broward	FLL Trails End Pump Station	$3,333,672	$1,666,836	$147,152	$1,519,684	
City of Oakland Park	Broward	NE 13th Avenue Stormwater	$3,786,952	$1,893,476	$1,893,476		
City of Oakland Park	Broward	Outfall Replacement	$10,000,000	$5,000,000	$225,000	$2,525,000	$2,250,000
City of Oakland Park	Broward	Fire Station #9	$8,928,571	$2,500,000	$300,000	$2,200,000	
Broward County Aviation Department	Broward	FLL Hilton Parcel Interconnection	$6,099,818	$3,049,909	$187,285	$1,923,524	$939,100



5

Using the Plan to Maximize Benefits Countywide

Hazen

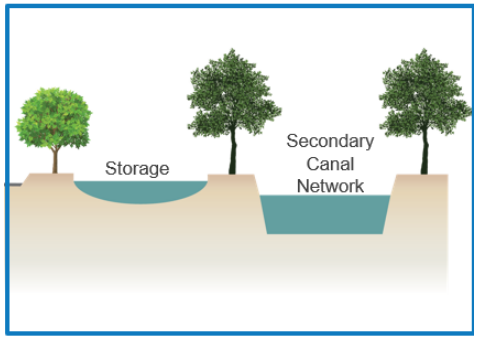
The Resilience Plan will be the base “Vulnerability Assessment” required by the State for future funding efforts for the County

380.093 Resilient Florida Grant Program; comprehensive statewide flood vulnerability and sea level rise data set and assessment; Statewide Flooding and Sea Level Rise Resilience Plan; regional resilience entities.

(c) A **vulnerability assessment** conducted pursuant to paragraph (b) must encompass the entire county or municipality; include all critical assets owned or maintained by the grant applicant; and use the most recent publicly available Digital Elevation Model and generally accepted analysis and modeling techniques. An assessment may encompass a smaller geographic area or include only a portion of the critical assets owned or maintained by the grant applicant with appropriate rationale and upon approval by the department. Locally collected elevation data may also be included as part of the assessment as long as it is submitted to the department pursuant to this paragraph.

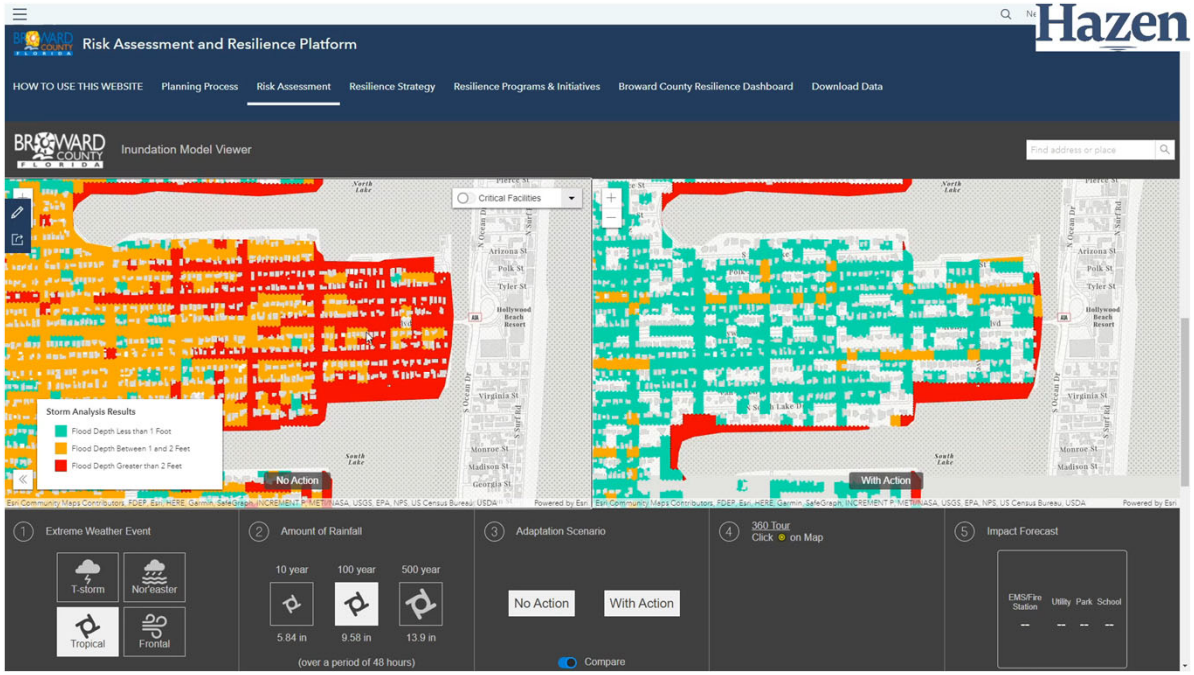
Additionally, efficiencies will likely exist for partnerships within the Region

- Entities that share secondary or tertiary drainage systems
- Entities that could benefit from continuous and/or contiguous projects
- Entities with similar types of projects could benefit from economies of scale



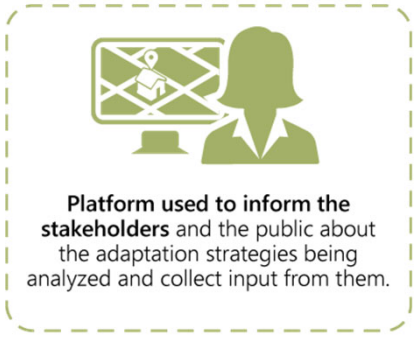
Stakeholders can track project development through the platform…

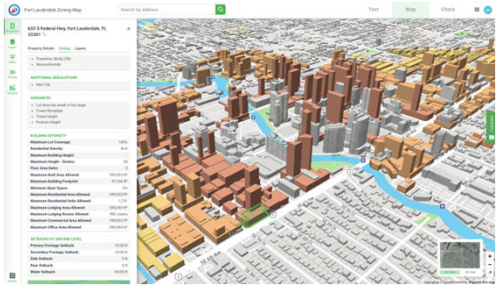
- View inundation scenarios
- Review example Adaptation Strategies
  - Estimated Costs
  - Estimated Benefits for Implementation
- View reduced flooding after implementation
- Potential Policy Updates/Recommendations
- Link to show residents forward progress

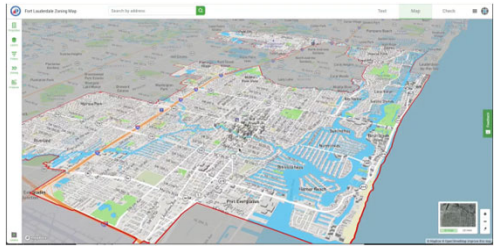


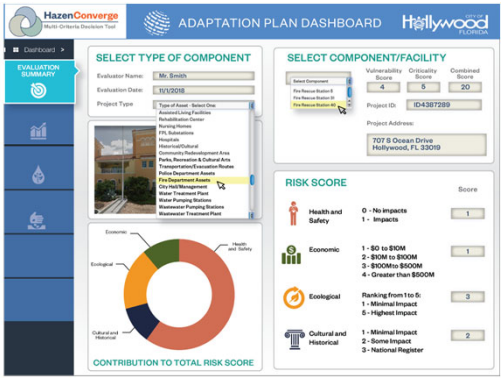
…and view results of adaption implementation through the platform viewer.

The tools and examples, including sample adaptation projects and the inundation viewer, will be available to each user.





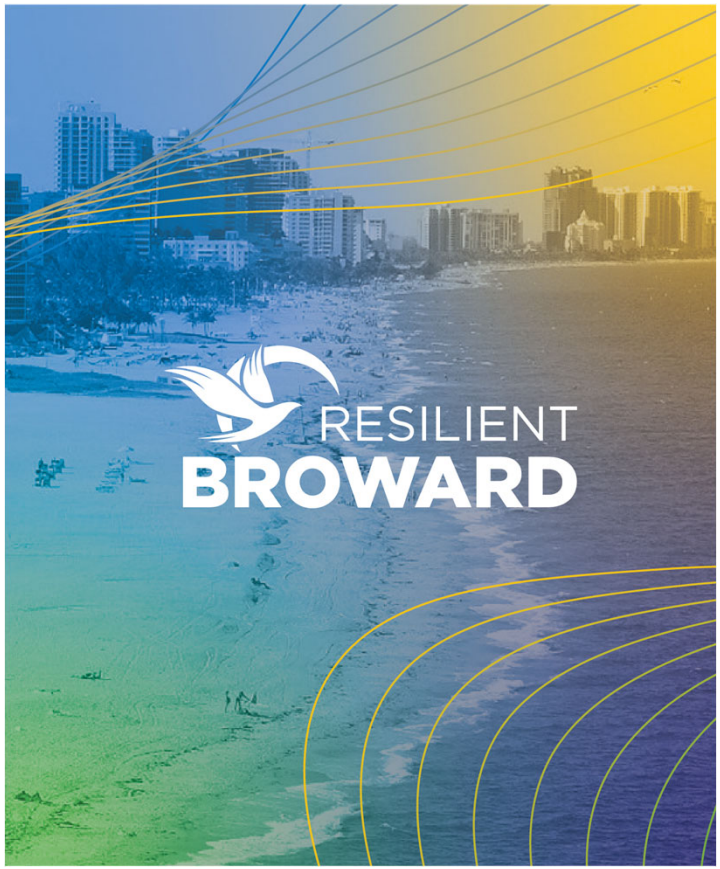




The "Hub" of communications and information sharing → Tool to facilitate outreach and solicit stakeholder feedback → Incorporates visualization and mapping functionality → Includes economic analysis dashboards and investment/ plan progress tracking

Multiple plan deliverables will be available for your future use:

- **GIS tools**
- Hydrologic model results and maps
- Asset analysis assessment methodology and checklist
- **Conceptual adaptation representations and cost estimates**
- Economic modeling methodology and assumptions
- Economics model results and maps
- **10 Property scale proposals**
- Resilience Plan
- **Resilience Platform**



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Questions/Discussion

Hazen

Thank you