

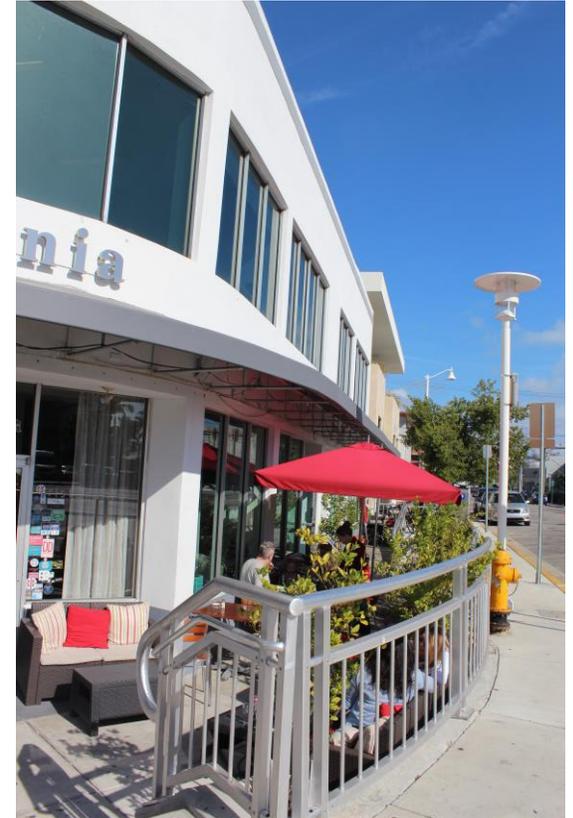


# Miami Beach Stormwater Management & Climate Adaptation

## Advisory Services Panel

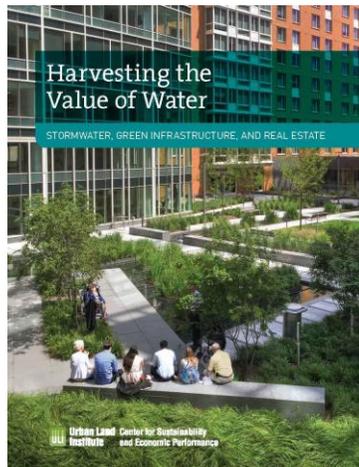
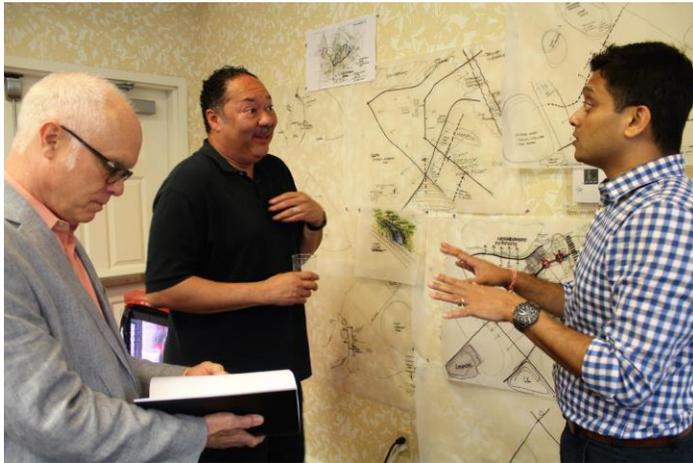
Miami Beach City Commission Chamber

**April 19<sup>th</sup> 2018**



# Urban Land Institute

- 40,000+ global real estate and built environment members
- Mission – Responsible use of land, creating and sustaining thriving communities
- ULI Advisory Services Program – Strategic advice to cities on complex land use challenges
- Panel supported by the Rockefeller Foundation’s 100 Resilient Cities



# Miami Beach Panel

## Panelists:

- **Joyce Coffee**, President, Climate Resilience Consulting & Panel Chair
- **Juanita Hardy**, Senior Visiting Fellow, ULI Center for Creative Placemaking
- **Jeff Hebert**, Vice President for Adaptation and Resilience, The Water Institute of the Gulf
- **Phillip Kash**, Principal, HR&A Advisors
- **Greg Lowe**, Global Head of Resilience and Sustainability, Aon
- **Walter Meyer**, Founding Principal, Local Office Landscape Architecture
- **Christian Nyerup Nielsen**, Global Service Line Leader, Climate Adaptation and Flood Management, Ramboll Water
- **Mark Osler**, National Practice Leader, Coastal Science & Engineering, Michael Baker International
- **Greg West**, President & CEO, ZOM Living & Chair, ULI Southeast Florida/Caribbean

## ULI Staff:

- **Katharine Burgess**, Senior Director, Urban Resilience, ULI
- **Julie Medley**, Executive Director, ULI Southeast Florida and Caribbean
- **Mallory Barker**, Associate, ULI Southeast Florida and Caribbean



# Acted with Courage to Fix Sunny Day & Stormwater Flooding

- Applied good practice for initial pump rollout – Engineering and prioritization
- Initiated street elevations
- Designed for mid-level climate change risk estimates
- Raised funds through fees
- Crafted thoughtful communications materials & vehicles
- Collaborated both interagency and within regional partnerships
- Implemented multiple levers including policy changes
- Examining Cost/Benefit of Current Program

# Comprehensive Vision for Living with Water

- Integrate stormwater management with larger resilience strategy
- Enhance public trust, trust the public, increase transparency
- Elevate aesthetics and function to perpetuate city's cultural relevance
- Actively use green and open space for sponge function
- Amplify aesthetics and function to perpetuate cultural relevance
- Increase long-term financial and comprehensive protection
  
- Go big on the resilience brand – distinguish yourself from your coastal competitors

# Recommended Solutions - Overview

- Infrastructure advancements
- Design typologies
- Creative placemaking
- Governance
- Finance
- Regulation
- Integrated Communications plan

# Improve Flexibility and Robustness of Pump Systems



## IMPLEMENT CITY-WIDE BLUE-GREEN INFRASTRUCTURE

- Miami Beach's pump system is well-tested and the City has implemented appropriate design and management strategies.
- Going forward, the City should introduce blue-green infrastructure developed with a detailed modelling approach that guarantees buy-in and co-benefits. The City should also implement electrical and infrastructure enhancements to mitigate extreme weather.

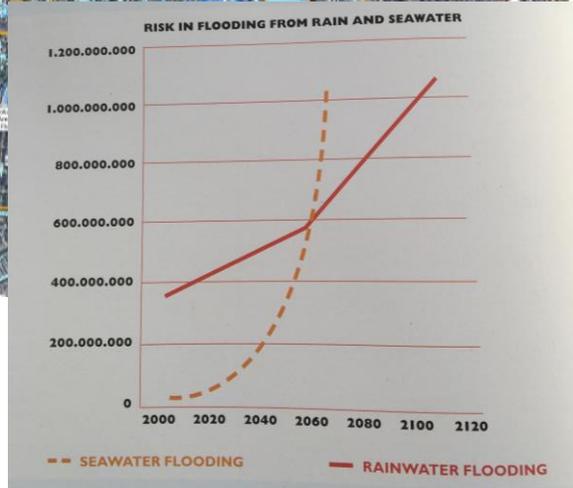
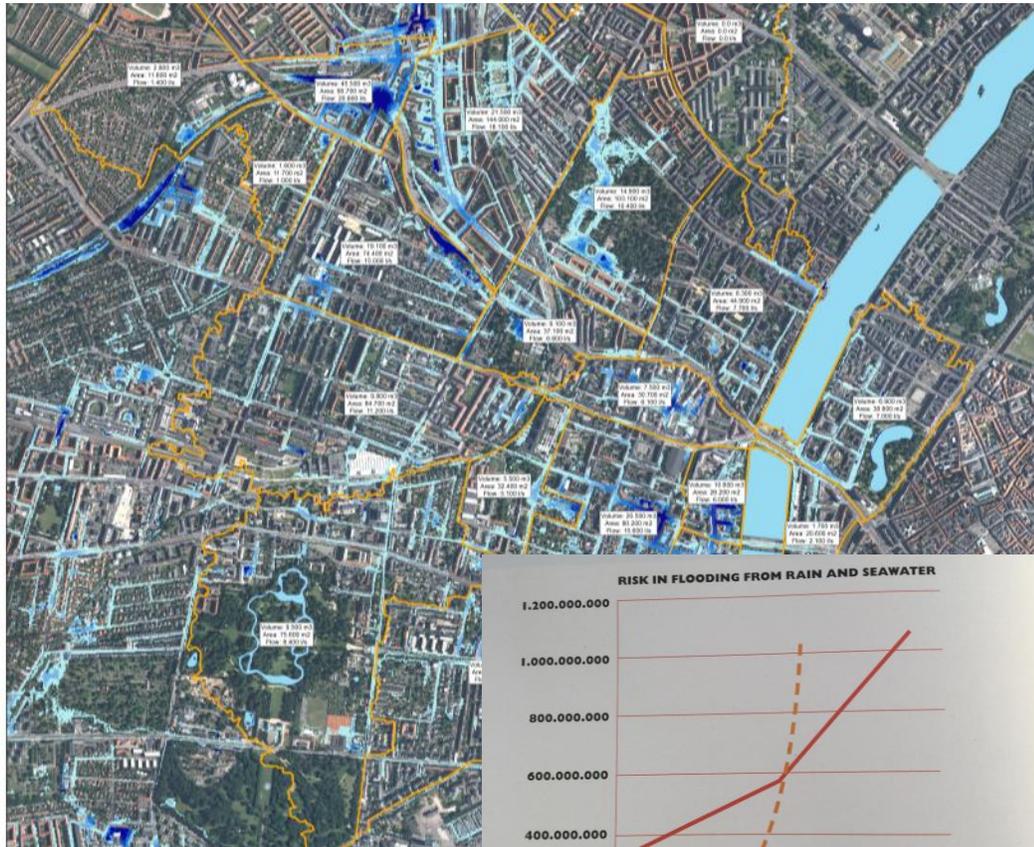
# Blue-Green Infrastructure Also Aids Water Quality



## WATER QUALITY AT THE OUTLETS WILL ALSO BE ENHANCED

- The City's water quality solution is well-tested and easy to maintain.
- However, improvements are needed to enhance performance – this can be accomplished through an implementation of blue-green infrastructure, which will absorb pollutants, increase flexibility and offer co-benefits.

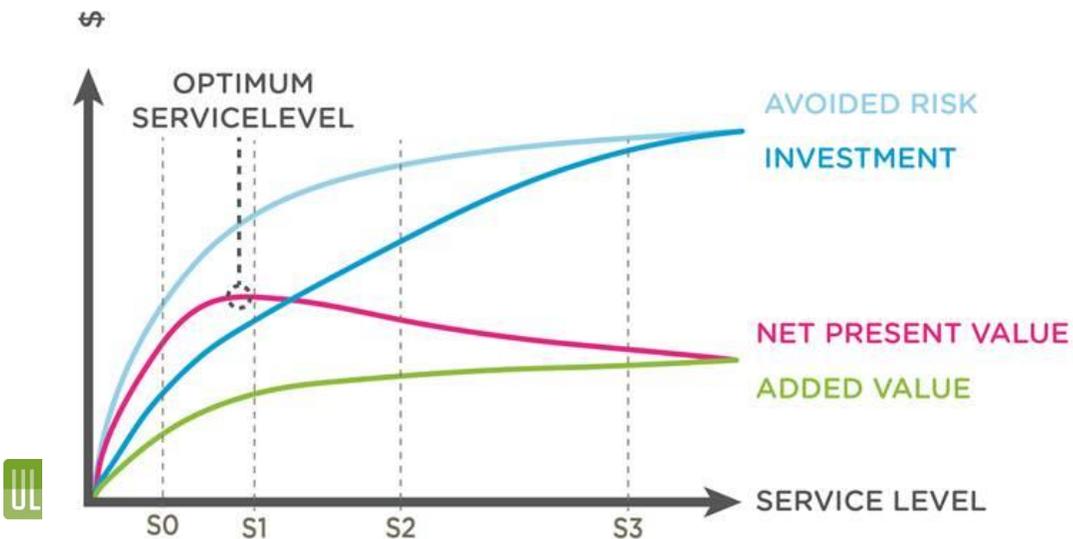
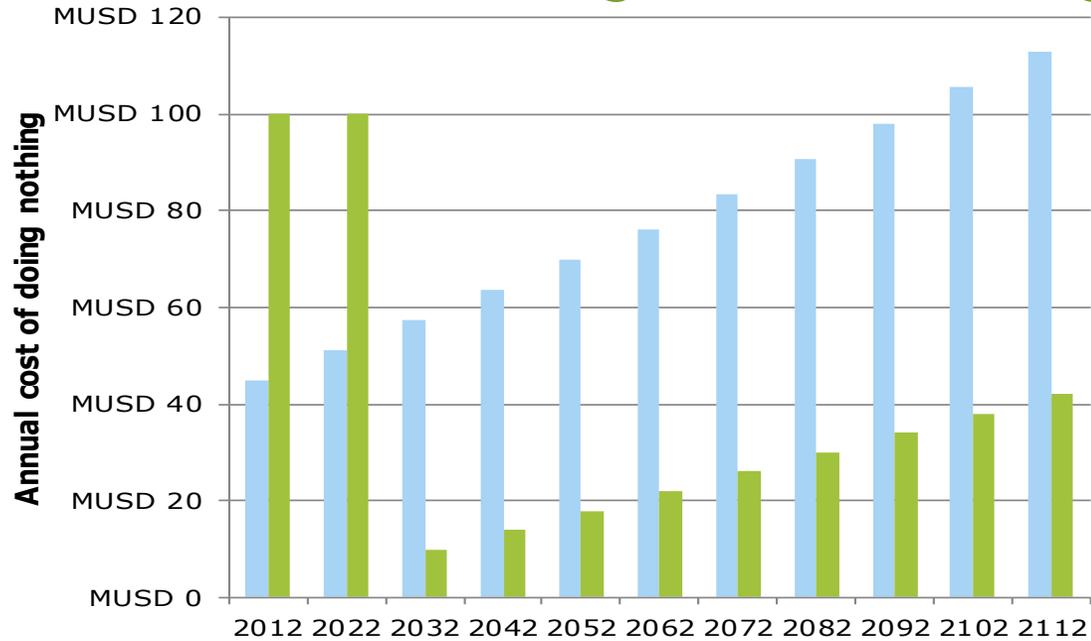
# Informed Decision-Making through Enhanced Modelling



## RE-EXAMINE DECISION SUPPORT TOOLS

- The city has an existing pipe-network model and logs water levels and geology.
- Integrated Water Model - Coupling the pipe-network model with a digital elevation and groundwater model will allow the City to make better decisions regarding increased flood risks. This model would also measure the impact of their solutions.

# Risk Based Management Through an Enhanced Modelling System



## RISK BASED MANAGEMENT WILL BE EASIER TO PREDICT

- The current modelling system anticipates sea level rise and precipitation and initiates a cost-benefit analysis.
- A more comprehensive model would calculate risk for various impacts, help formulate optimal socio-economic protections, and create safer guidelines for densification, climate change, system data and rain statistics.

# Learning to Live with Water – Through Pilot Projects



## MIAMI BEACH IS THE ICON

- The City of Miami is taking a forward-thinking approach to climate adaptation.
- The City should implement “Living with Water” pilot projects that involves the City and its residents to suggest that resiliency strategies are a common cause. This will create enthusiasm for the plan.

# Bishan Park – Singapore Living with water



# Bishan Park – Singapore

## Living with water



Bishan Park – Singapore  
living with water

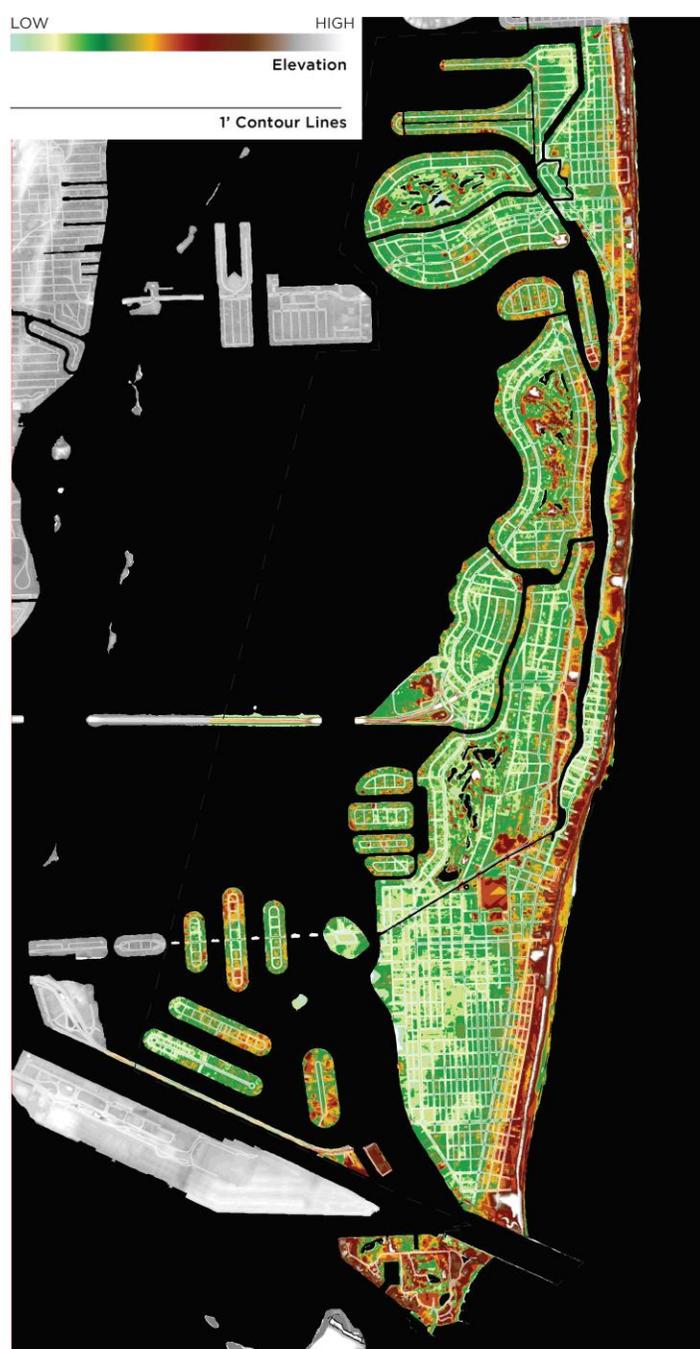


# Infrastructural Enhancements

Asked to 'test the logic for project prioritization and sequencing...'

- Consider a 'level of service' concept to guide future phasing
- Integrated water model to aid decision-making

# The Long-Now

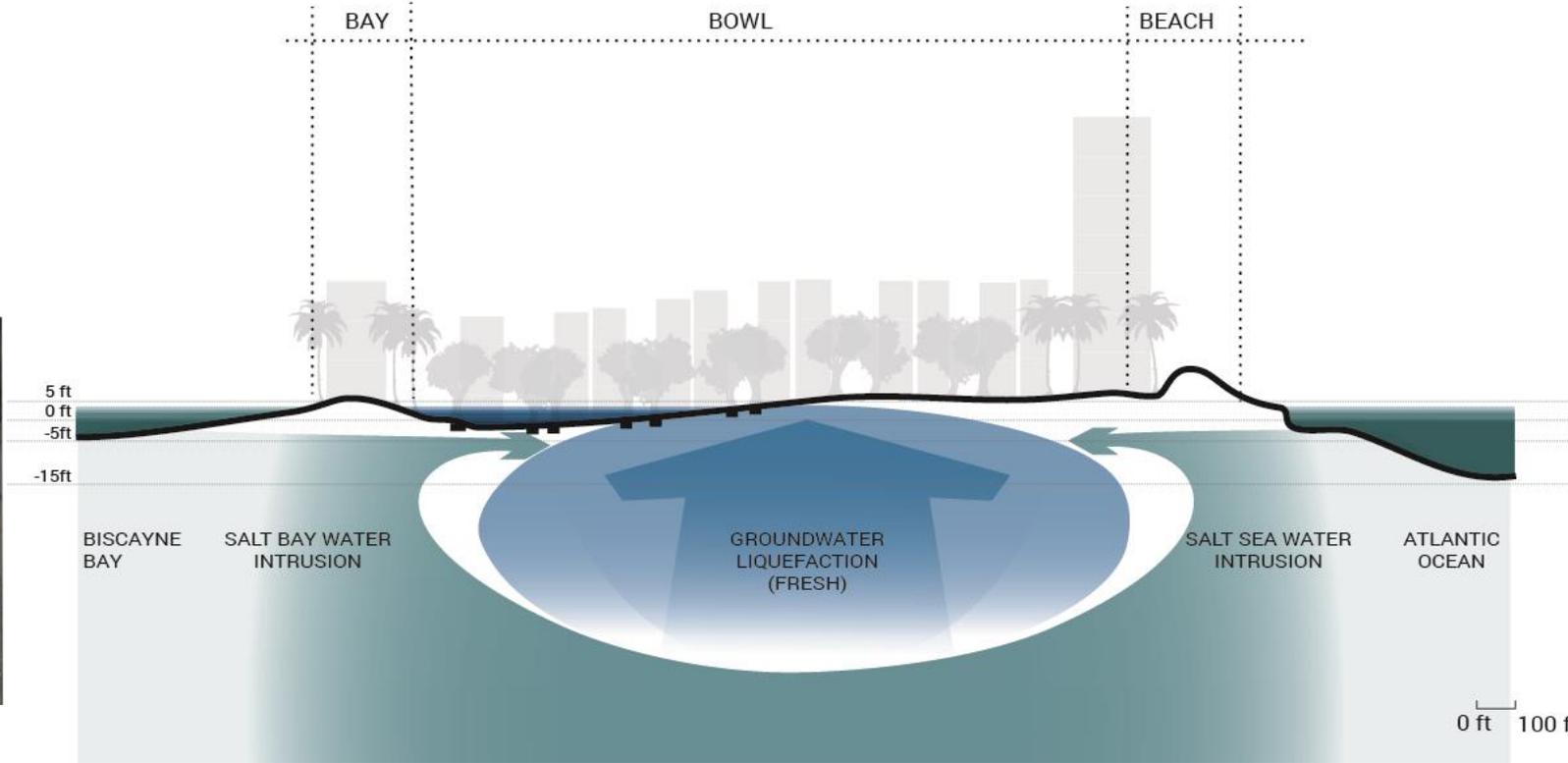


ELEVATION  
Miami Beach



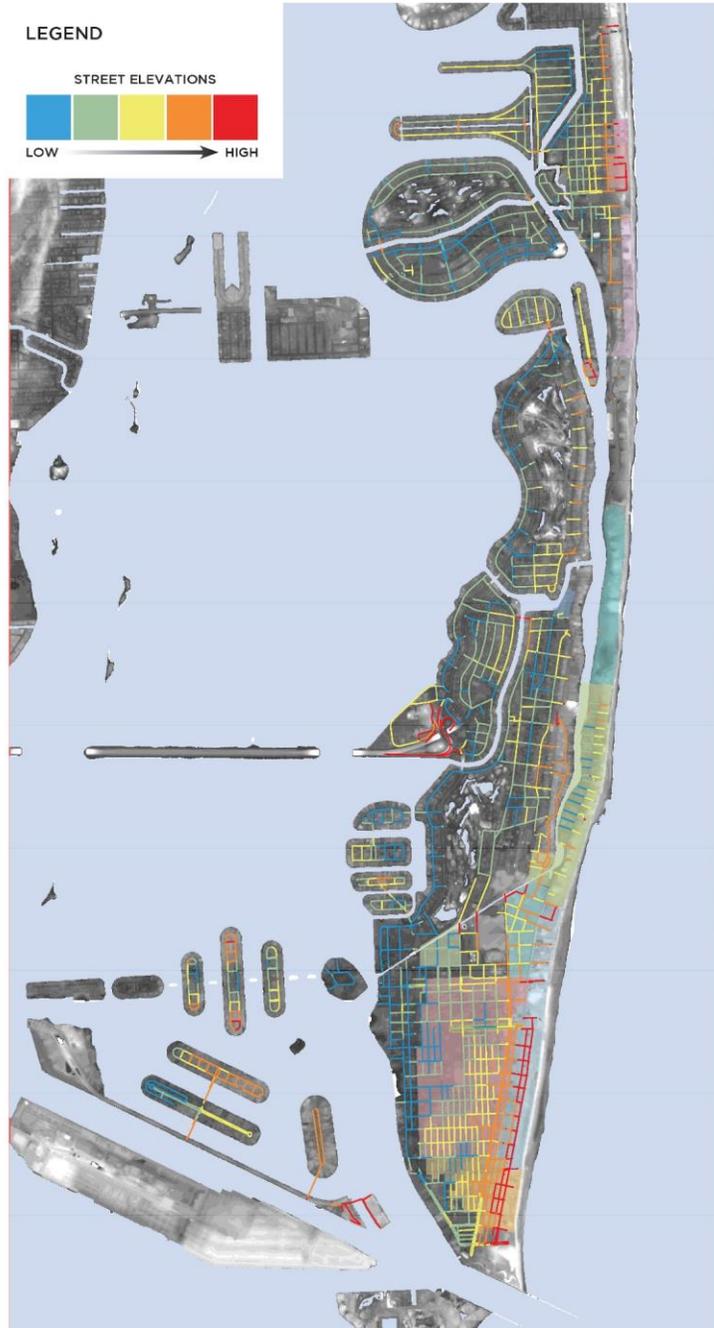
HYDROLOGY  
Miami Beach

# Water Movement





# Amenities, Access & Elevation



ROAD ELEVATIONS IN HISTORIC DISTRICTS  
Miami Beach

**OPEN SPACE BREAKDOWN**

- Area of Parks: 10,461,819 SF (5%)
- Area of Golf Course: 16,544,650 SF (7%)
- Area of Beaches: 10,472,514 SF (5%)
- Other: 194,505,163 SF (84%)
- Area of Miami Beach: 215,439,496 SF



5 MINUTE (1/4 MILE) & 3 MINUTE (800ft) PARK  
BUFFER

# Golf Courses as Storage



## OPEN SPACE BREAKDOWN

Area of Parks:  
10,461,819 SF (5%)

Area of Golf Course:  
16,544,650 SF

Area of Beaches:  
10,472,514 SF (5%)

Other:  
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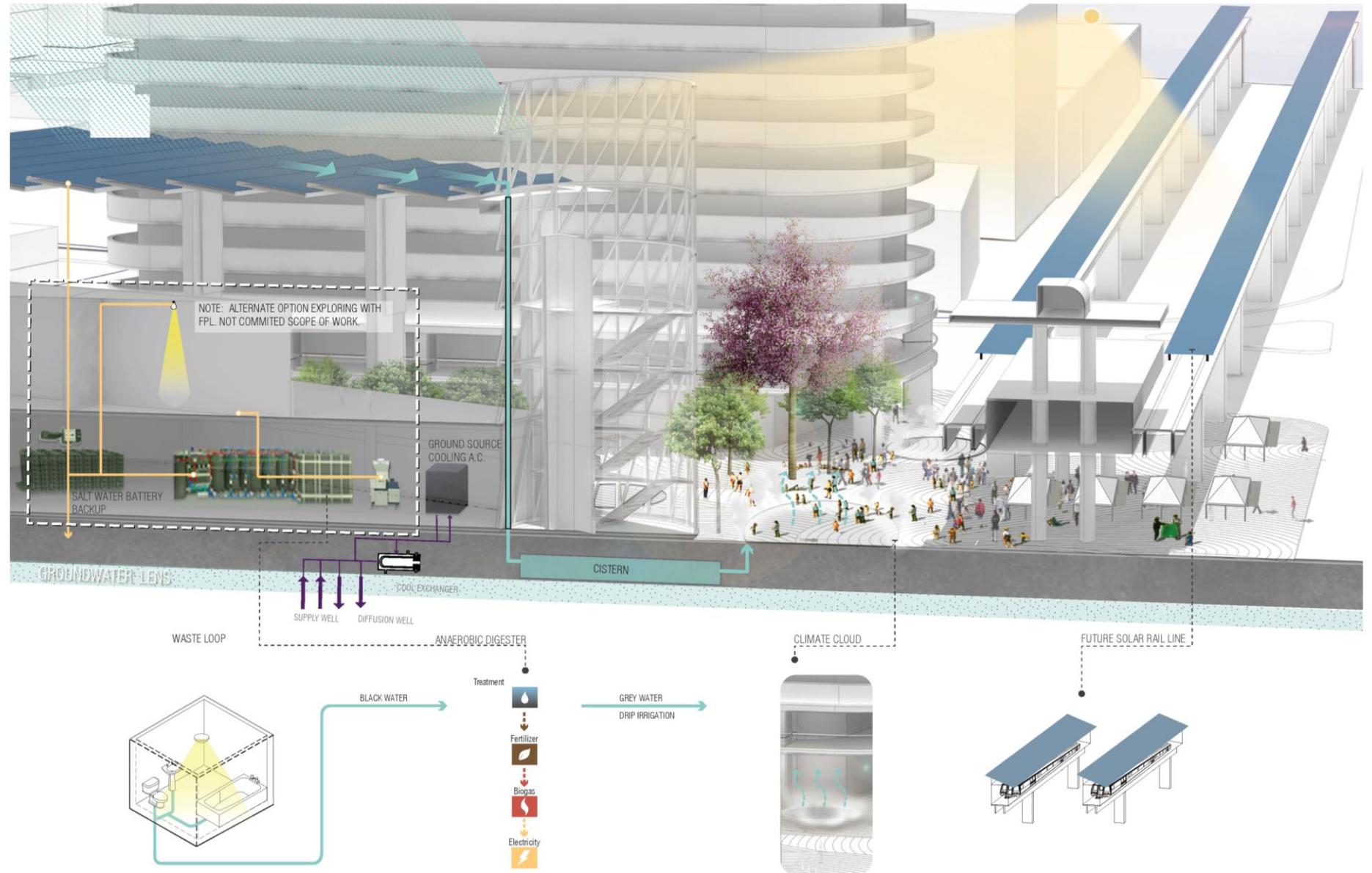
SPACE ALLOCATED TO GOLF COURSES  
Miami Beach

# Income Generating Solar Energy for Backup Power

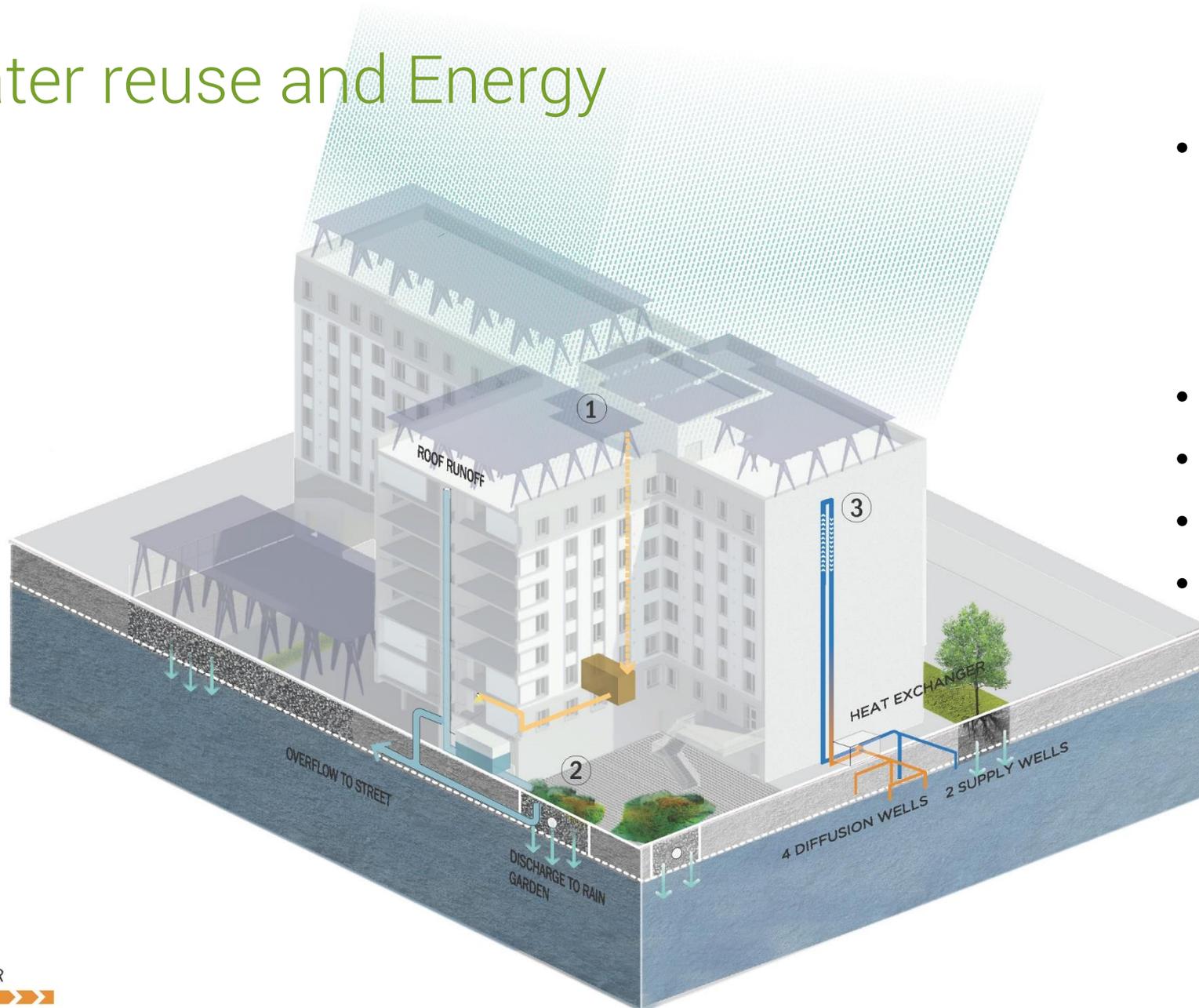


- San Juan, PR 10<sup>th</sup> story rooftop 517 KW solar trellis
- Designed for 185mph winds
- 98% intact after hurricane Maria
- Primary cabling, inverters and superstructure fully operational

# Energy



# Water reuse and Energy



- Couple building infrastructure to natural infrastructure to capture overlooked revenue streams
- Energy from sun and wind
- Cooling from the Earth
- Water from rain and waste
- Flood reduction from habitats

WARM WATER



COOL WATER



# Mayaguez, Puerto Rico

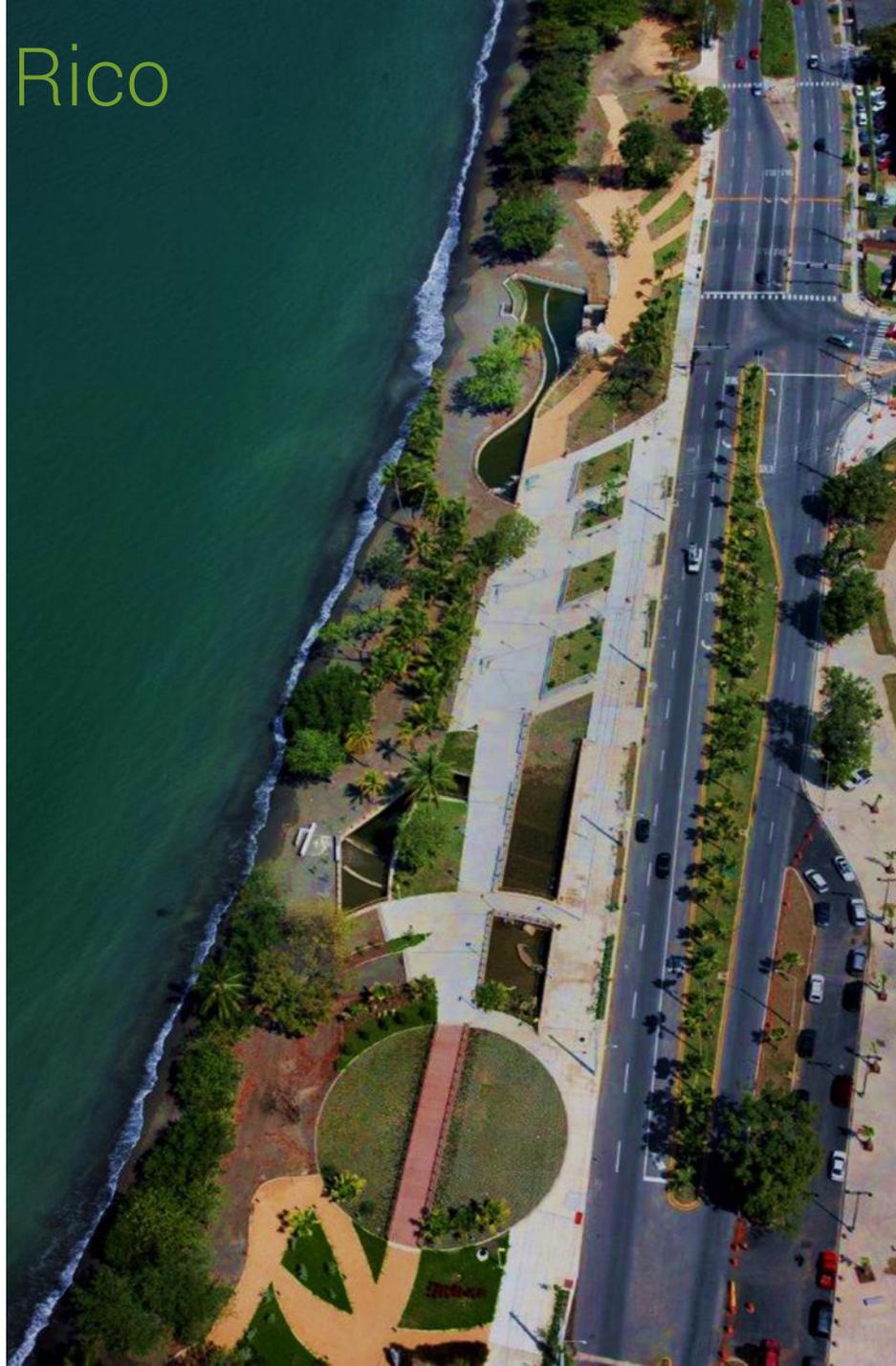
## Parque Litoral

9/18/17, Hurricane Maria,  
Category 4

10 foot waves over 4 foot  
surge

Performance:

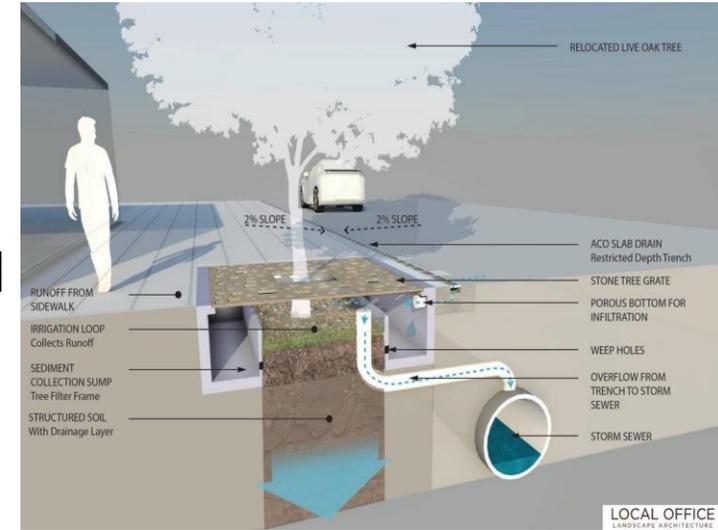
- Coastal forest 91% intact
- Minor damage to railing and lighting
- No loss of drainage through phytoremediation wetland
- Park operational after 2 weeks of debris cleanup
- Grand reopening festival one month after storm
- Adjacent businesses had dry ground floors and opened a week after Maria



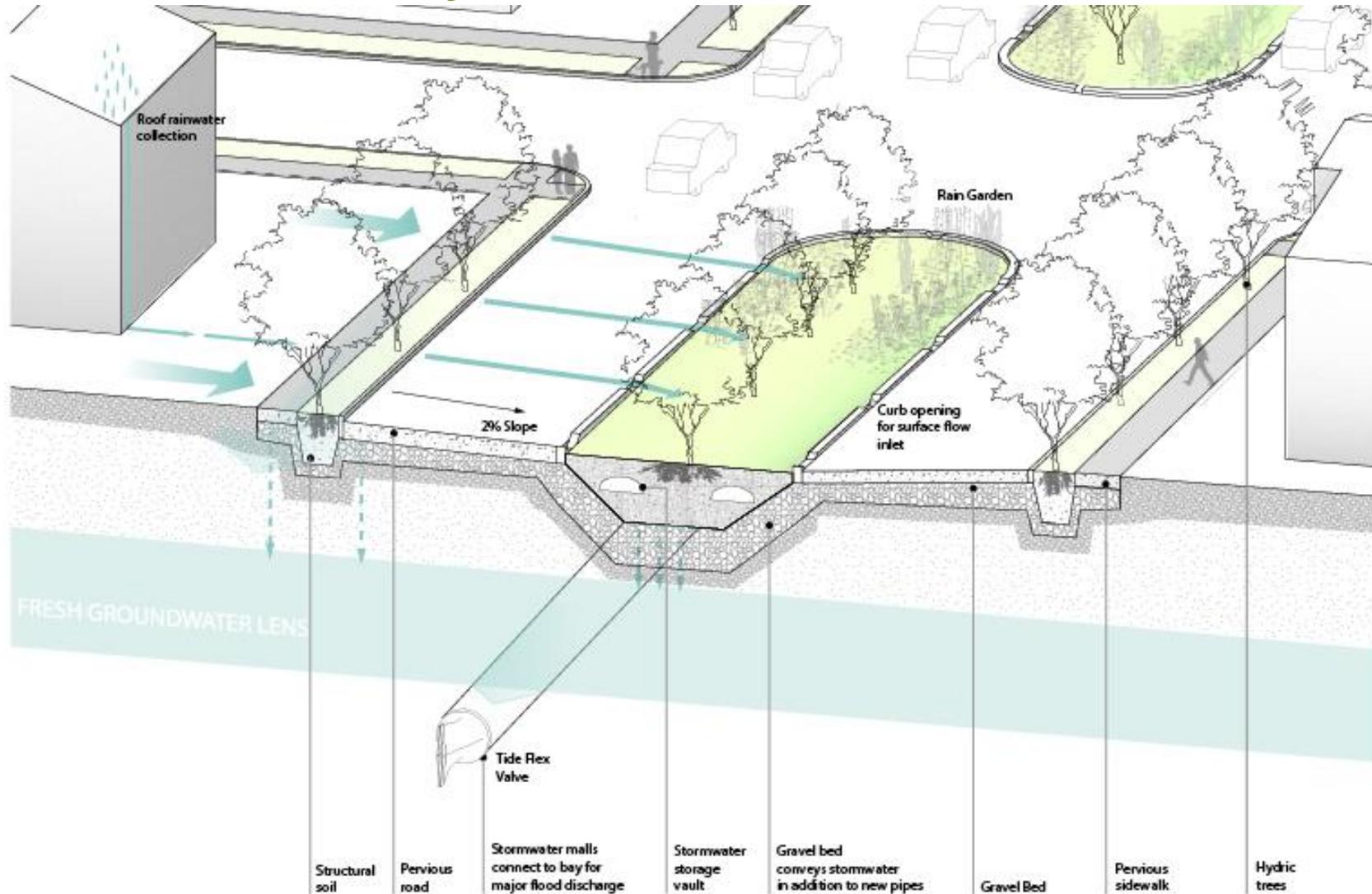
# Stormwater Management

Coral Gables, Miracle Mile and Giralda Ave designed for some the most intense urban rains on the planet, at 7.5" per hour. Hurricane wind resistant planting to accelerate business recovery. Porous paving, structural soil, and decentralized line drains.

Tested by hurricane Irma August 2017, no flooding or tree loss after the highest winds and most intense rains in 25 years, adjacent streets flooded.



# Ocean to Bay – Blue Street Corridor



Long Beach, NY

- Comprehensive Resiliency Plan
- Blue Streets move water from beach to bay
- Surface and subsurface conveyance of storm water through a porous gravel bed
- supplements existing underground storm pipes when saturated in groundwater
- 30% cost increase doubles the life of street, and reduces flooding when pipes and pumps are compromised.

# Living Shoreline

Long Beach, NY

Existing building flooding is alleviated with new development coordination.

Government built Seawall supplemented with new elevated open space, living shore, and roads.



Wall mounted gabion for oyster, mussel and spartina habitat

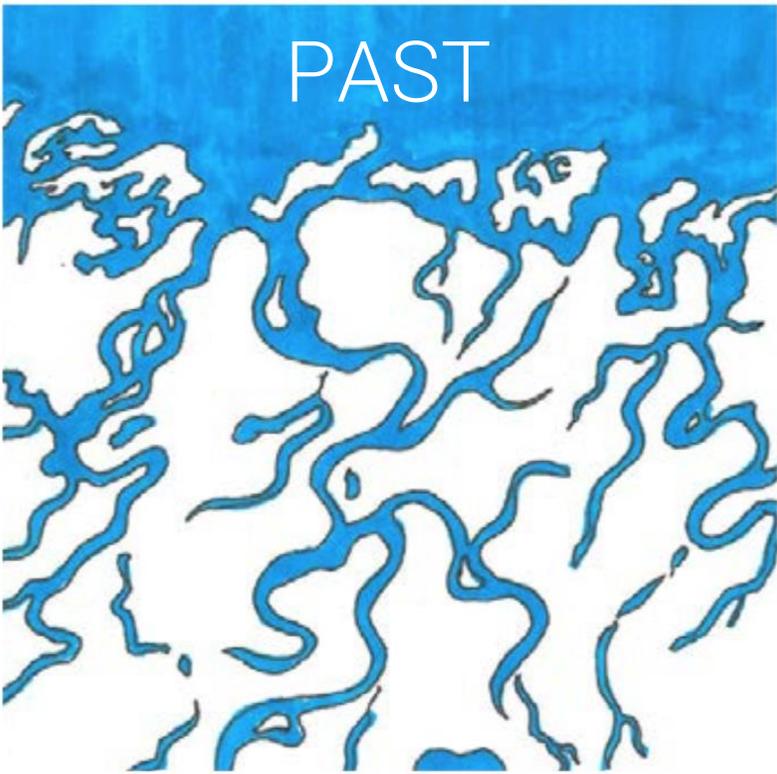
9' Sea wall and esplanade with existing 1% surge protection

+14' Elevated park for supplemental surge protection

Passage through raised road reduces rain flooding for North Park neighborhood

Ball field

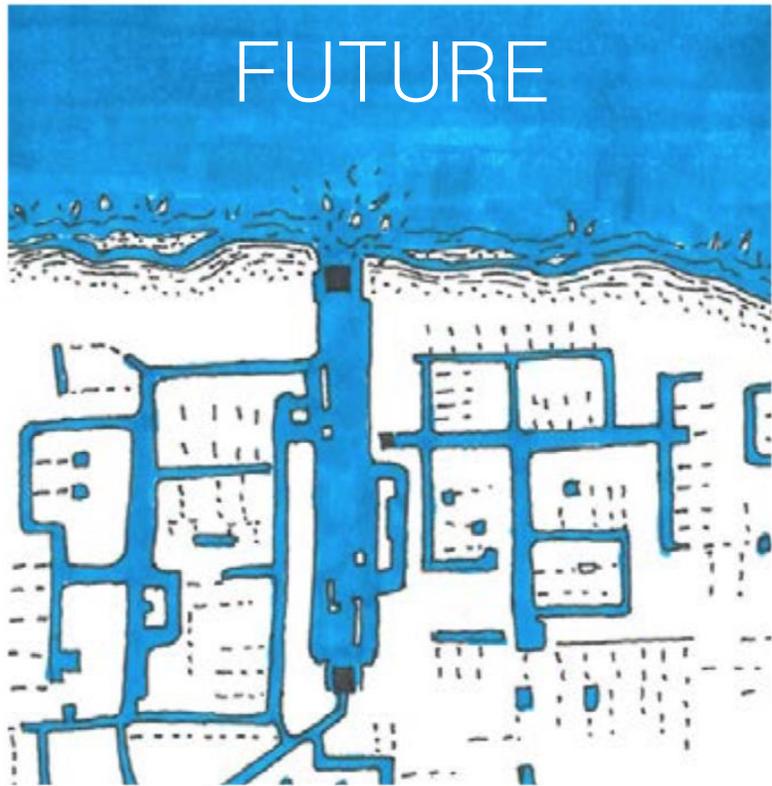
PAST



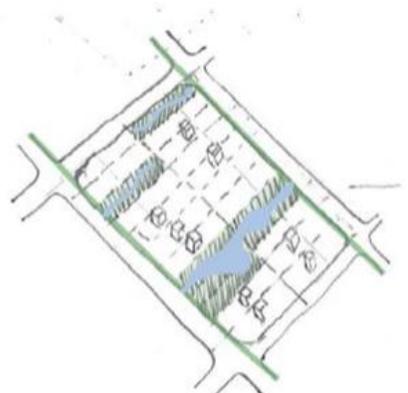
PRESENT



FUTURE



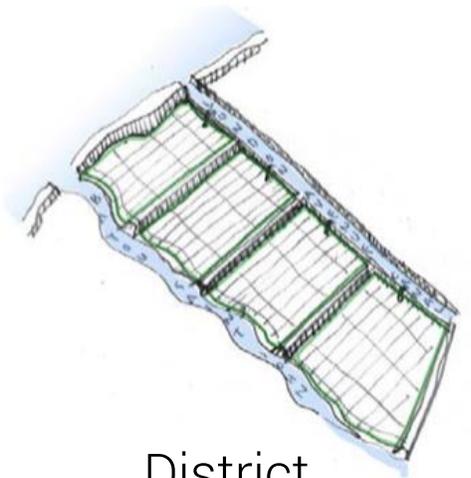
House



Block

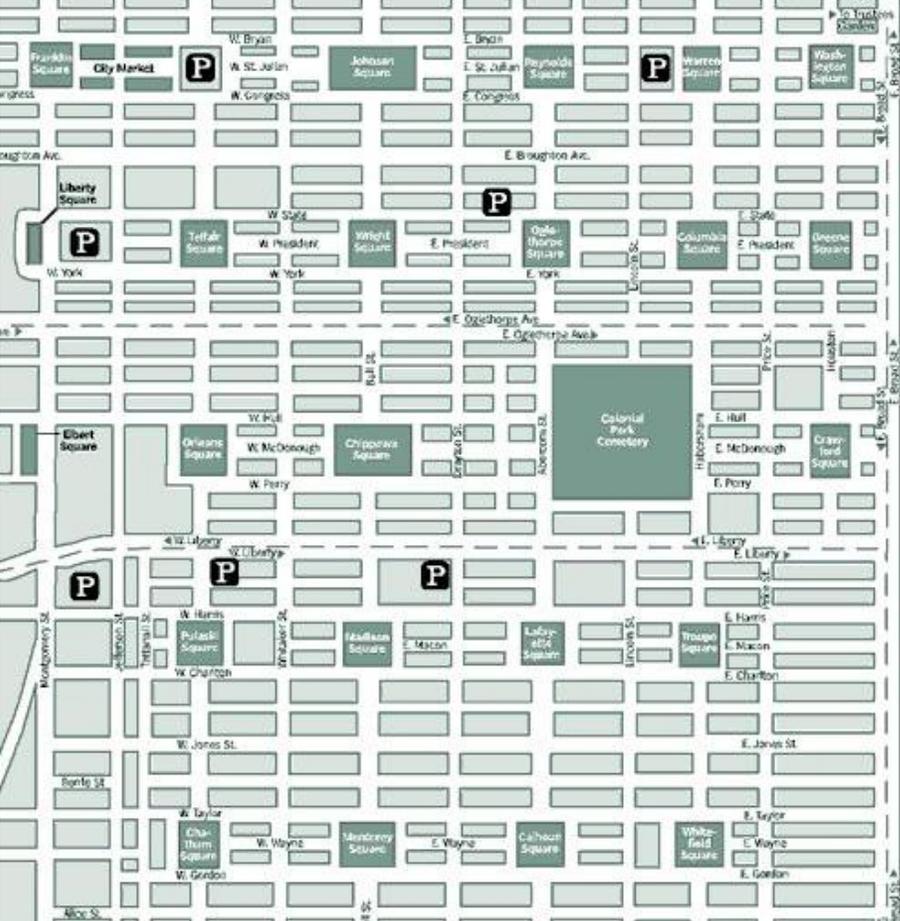


Neighborhood

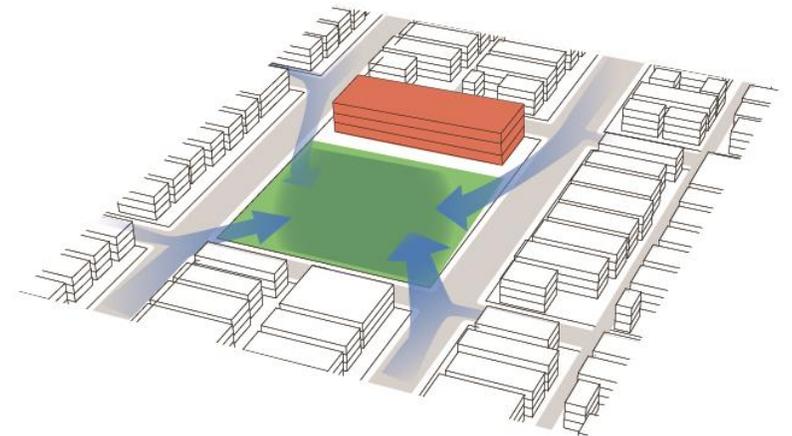
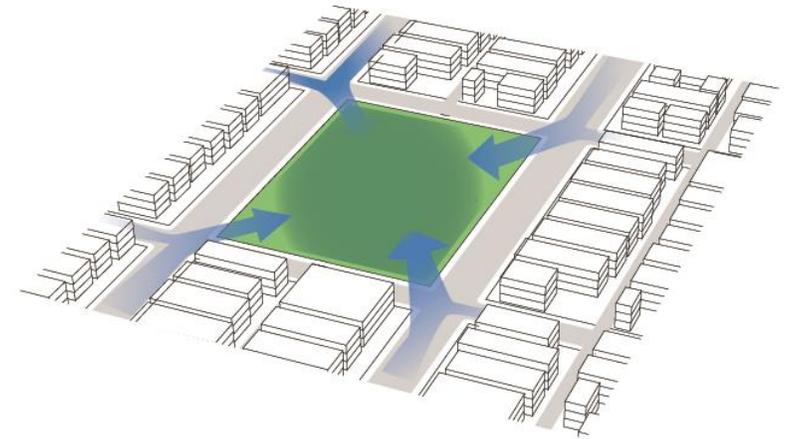
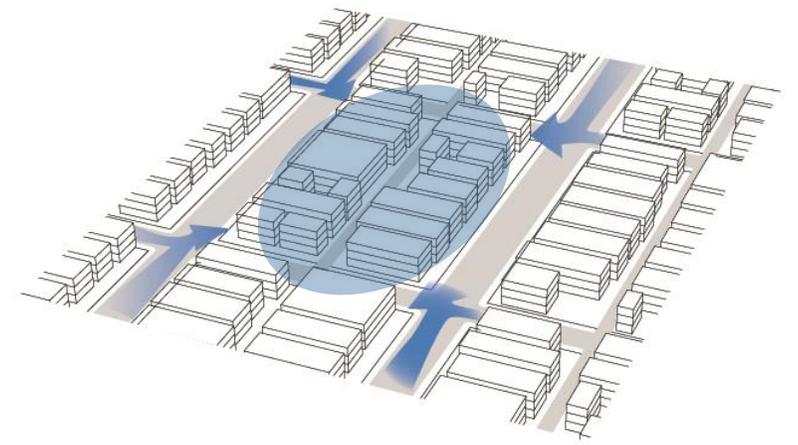


District

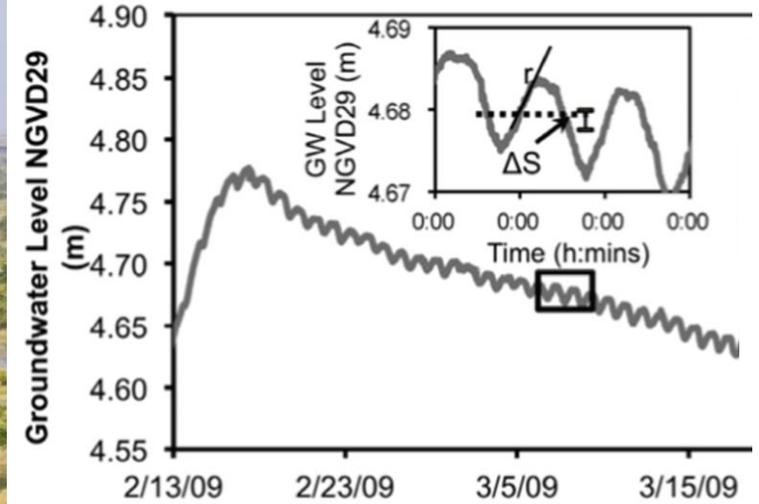
# Savannah, GA – Distributed Park System



# Flood Park



# Habitat Metrics for The City



Groundwater-Surface Water Interactions On Tree Islands In The Everglades, South Florida (Sullivan, Pamela, FIU, 2011)

A mature tree can transpire as much as 109 gallons/day (USGS)

# Miami Beach: A Vibrant, Historic Tropical Community



# Placemaking & Creative Placemaking

Country Club Plaza, Kansas City, MO



# Confluence Park

San Antonio, Texas



*Photos courtesy the San Antonio River Foundation*

# Vine Street Beckoning Cistern

Seattle, Washington



# Buffalo Bayou Park

Houston, Texas



# Tanner Springs Park

Portland, Oregon



# Approach to integrating creative placemaking into resilience program

- Develop vision for the city's art and resilience program
- Build relationships with public and private partners; strengthen existing partnerships with universities
- Engage citizens in the artist selection and procurement process
- Empower the design team – engineers, artists
- Communicate and promote the program

# All stakeholder benefit from integrated art and resilience



# Governance for water management & climate adaptation

- Establish a Miami Beach Rising Above Delivery Office for greater transparency and to monitor and communicate the effectiveness of such a large, dynamic program.
- Establish (or retool) an agency or district to capture increased real estate value for public investment and green/blue infrastructure and the administration of a Community Adaptation Program
- Establish a robust City of Miami Beach Risk Transfer Department that can facilitate the development of risk transfer solutions



Courtesy City of New Orleans



**New Orleans Redevelopment Authority (NORA)**  
**Request for Proposals**  
**Community Adaptation Program (CAP)**  
**Issue Date: September 22, 2017**  
**Due Date: October 27, 2017**

# Governance and strategy for historic preservation

- “New adaptation and mitigation tools are needed to support communities as they respond to the new normal.”
  - The National Trust for Historic Preservation
- “Climate change and rising sea levels mandate a new type of assessment of the vulnerability of historic resources, requiring stakeholders to look at adaptation options and to decide what will be saved for future generations.”
  - John Englander, Preservation Leadership Forum Journal
- This is currently an international conversation that Miami Beach could lead.

## KEEPING HISTORY ABOVE WATER



# Finance is critical for an effective adaptation strategy

- Finance includes three key sources of funding
  - Public capital
  - Private capital
  - Insurance (contingent capital)
- A risk financing strategy will protect homeowners, businesses, and ratepayers
- A holistic approach that recognizes the link between insurance and the cost of capital is needed

# Public finance has a strong local base

- State and Federal funds are limited
- Most public capital comes from the City's real estate tax-base
- There are a number of tools to realize new sources of revenue associated with the benefits of stormwater management and climate adaptation
  - Assessment districts, such as a business improvement district and homeowners associations
  - Incremental finance districts, such as community reinvestment areas

# Innovative insurance solutions should be explored

- Insurance and risk transfer can de-risk the public balance sheet
- Infrastructure can be insured, reducing the burden of debt servicing during disaster recovery
- The long-term viability of NFIP is not certain: insurance pools provide access to affordable insurance
- Innovations in insurance can offer financial protection for chronic weather risks, such as sunny-day flooding.

# A risk finance focus on costs and benefits

- Build on the recently commissioned stormwater business case analysis
- Risk management function should be driven by a total cost of risk approach (TCOR)
  - Look at underlying exposure and expected losses
  - Evaluate risk engineering, insurance, and accepting the risk based on an agreed risk appetite
  - Most efficient use of capital protects taxpayers

# Engage private financial stakeholders

- Credit ratings agencies
- Investors interested in climate risk disclosure: don't be afraid to talk about it. They know.
- Insurers as sounding-boards for stormwater management and climate adaptation solutions

# Regulate Private Development

- Regulation of private development will be an important component of Miami Beach's water management strategy.
- Parcel and building level water management will reduce the burden on pumps and other water infrastructure.
- Regulation is a tool to direct capital from the private market toward Miami Beach's water management goals.



# Leverage Regulatory Boards

- The City should use its existing regulatory infrastructure to incentivize and require increased storm water management at the parcel and building level.

Design Review Board

Historic Preservation Board

Board of Adjustment

Planning Review Board

# Reform Regulatory Boards

- Expand the mission to give equal priority to water management.
- Add board members with backgrounds in water management and development.
- Provide training and technical support to the board members.
- Establish specific measurable water management goals at the district level.
- Add staff or external experts to support the evaluation of proposed projects.

Design Review Board

Historic Preservation Board

Board of Adjustment

Planning Review Board

# Adjust Stormwater Fees

- The City should revise its current stormwater fee structure to be based on stormwater runoff.
- A runoff based stormwater fee will reward property owners that manage water on their property and decrease the burden on pumps.



# Create Island-wide Sea-barrier

- The City should adopt an integrated island-wide approach to creating a sea-barrier and not leave this to individual property owners.
- To undertake an island-wide approach the City will need to dedicate public funds which could come from an assessment district for affected properties, a user fee, or other funding mechanisms.

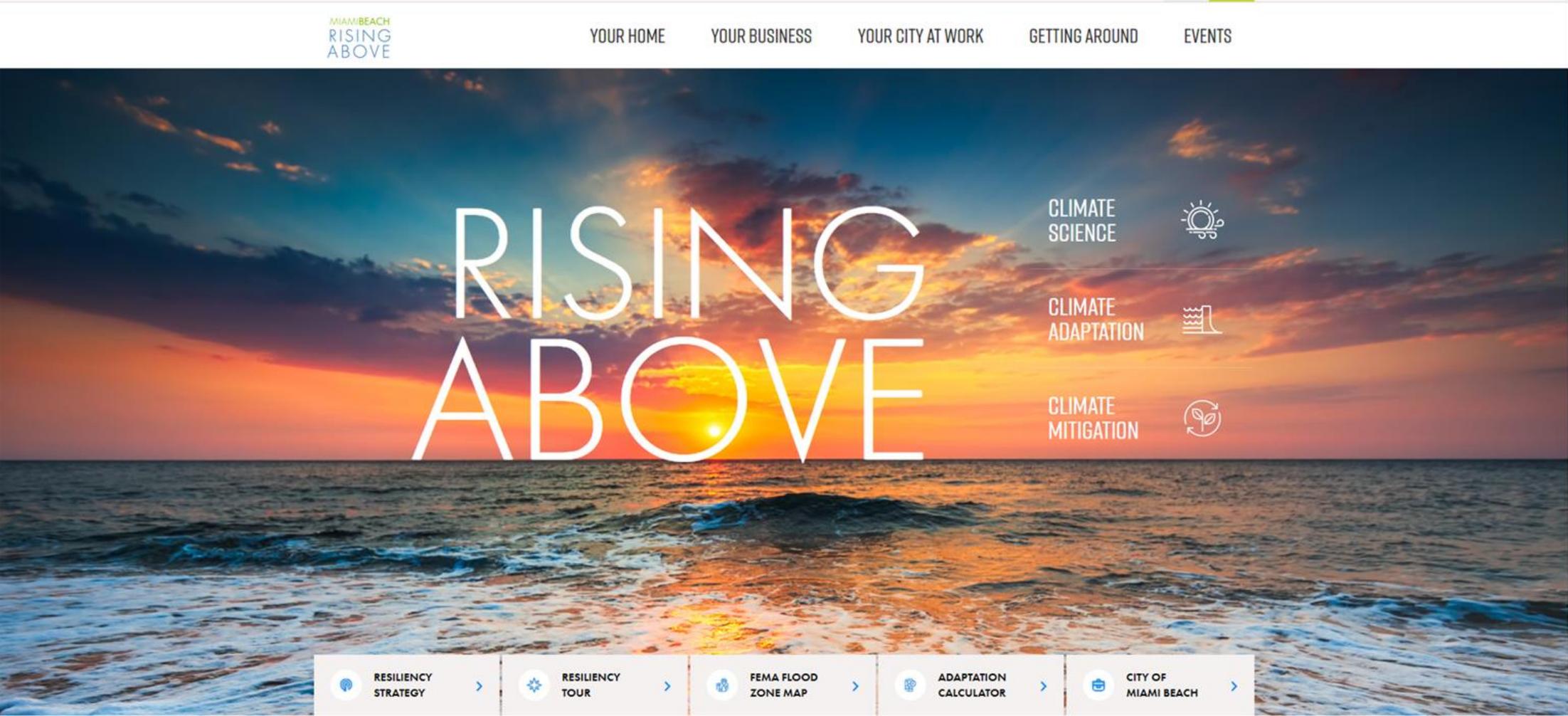


# Allow Elevated Buildings

- The City should continue to allow greater height and density to offset the future loss of useable space as water levels rise.
- To mitigate the impact of taller buildings, a review of appropriate design and use constraints should be undertaken.



# A Tool for Spreading Awareness



# Proactive vs. Reactive Communications

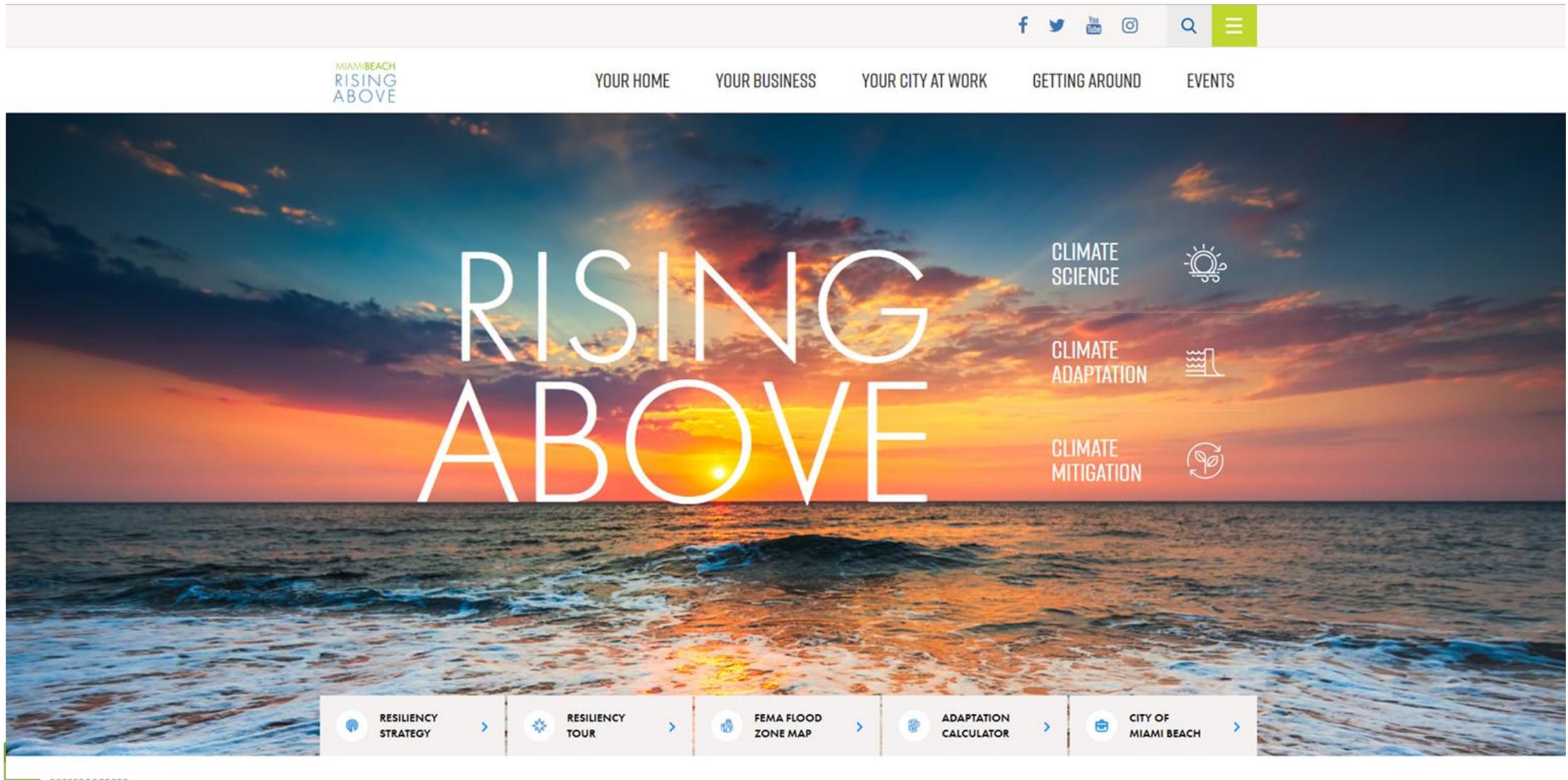


# Proactive vs. Reactive Communications



MIAMI BEACH  
RISING  
ABOVE

# Integrate all facets of resilience communications



# Stormwater and Climate Adaptation Principles

- Maintained Urgency
- Incrementalism & Evaluation
- Transparency
- Ecological Health
- Financial Pragmaticism
- Co-benefits
- Social Equity
- Cultural Identity
- Living with Water

One more thing...

# Questions & Discussion

Thank you for attending today's presentation.

