

# Kingston's Waterfront on the Rise

Climate-adaptive Design Studio

Rondout-East Strand

2018





**Cover Image:**

Actipeligo, 2017  
Yifu Kang  
Xuru Yuan

## Acknowledgements

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Sincerely,

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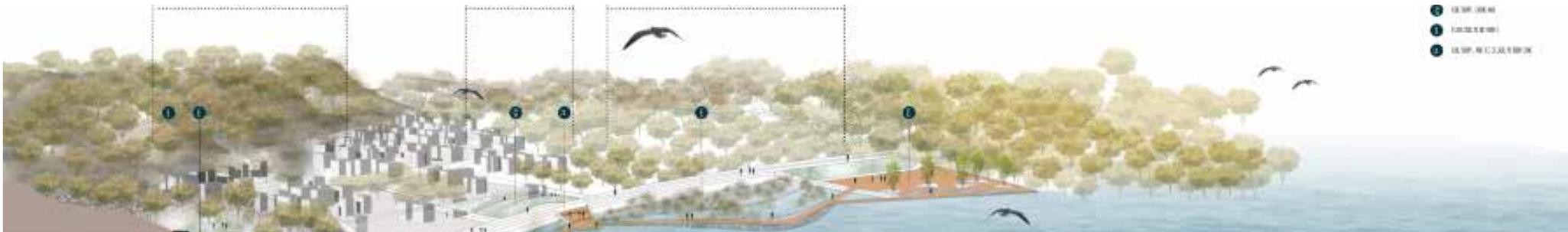
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*Building Bonds, 2018*  
Lijin Liu  
Shan Ling

## Who We Are

### Climate-adaptive Design (CaD)

*Inspiring change for waterfront communities*

The Climate-adaptive Design (CaD) studio is an education and research initiative made possible by a dynamic in partnership between Cornell University Department of Landscape Architecture, the NYS DEC Hudson River Estuary Program, the NYS Water Resources Institute and host communities in the Hudson Valley. The CaD Studio is a semester-long course created by Associate Professor Joshua F. Cerra that links landscape architecture students with Hudson riverfront communities to explore design alternatives for more climate resilient and connected waterfront areas. Community stakeholders are engaged throughout the studio to help inform the design process and support more usable results for the partner municipality.

### CaD wants to help your community...

- Start the conversation on what change could look like in your waterfront
- Feel inspired and knowledgeable about adapting to climate change, especially by using natural and nature-based solutions
- Apply CaD concepts and principles in planning and decision making
- Access new funding and resources
- Increase public awareness and support for climate resilient projects

## What We Learned

- Kingston is a leader in climate resilience
- Rondout waterfront is confronted by an increased risk of projected flooding from sea level rise, surge and stormwater runoff
- Flooding impacts both human-built and natural systems. For example, the Rondout Creek tidal wetland system, currently 111 acres, is projected to suffer one of the largest potential marsh losses in the Hudson River
- Kingston has an important opportunity to apply forward-thinking, climate-adaptive design approaches to existing and future waterfront projects

## What's Next

- **Appoint a coordinator or committee to advance CaD concepts**
- **Host a public event to display CaD posters**
- **Identify design elements for further study**
- **Secure funding to explore design ideas**
- **Advance designs toward implementation**



**A vision of the Rondout waterfront in the year 2080**

*Tuning Up, 2018*  
Xining Wan  
Yixuan Li

# The Climate-adaptive Design Program

## Our Vision

We are building a culture of adaptation in the Hudson Valley as a model for inspiring locally-based, climate-adaptive approaches to growth and conservation that catalyze community and ecological capacity to thrive amidst a changing future.

## Our Mission

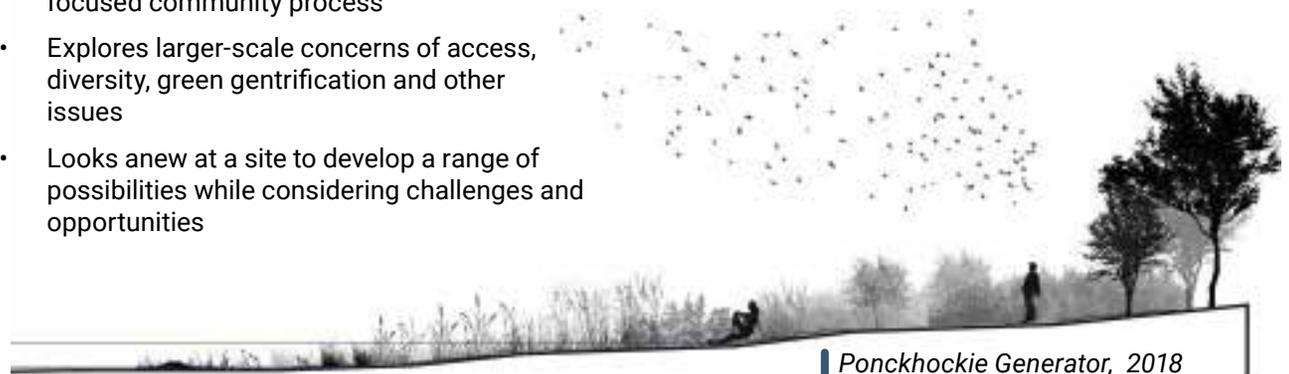
The Climate-adaptive Design studio works with Hudson waterfront municipalities to catalyze action on climate change. An inclusive and constructive design process investigates innovative and nature-based strategies that envision how climate adaptation and resiliency can be incorporated into municipal waterfront futures. Diverse partnerships generate community, research and education benefits as a model for climate-adaptive innovation in the Hudson River Estuary and beyond.

## We are an academic studio that:

- Connects design students with Hudson River communities to envision their waterfront's potential under rapid climate change
- Embraces change, particularly working with nature to adapt to climate change
- Generates design concepts that can be advanced after the studio ends
- Builds capacity for action by enhancing relationships in an inclusive and climate-focused community process
- Explores larger-scale concerns of access, diversity, green gentrification and other issues
- Looks anew at a site to develop a range of possibilities while considering challenges and opportunities

## We are not hired hands who:

- Work solely at the whim of politicians, landowners and other interests
- Provide detailed site-level design that can be implemented without further investigation
- Are prescriptive with our solutions
- Make decisions on the community's future
- Arbitrate or broker community issues beyond the scope of the design efforts at hand



*Ponckhockie Generator, 2018*  
Andrew Berger  
Carsten Schmidt

## Design Principles



### Design a Waterfront

Maximize the value of what a waterfront can be



### Design for Flooding

Working with water may be better than working against it



### Design with Community

Waterfronts should be universally accessible and decidedly memorable



### Design with Nature

A healthy Hudson is good for us and the greater ecology



### Design for Change

Build value into waterfronts as they change over time

# The Climate-adaptive Design Studio Process

## 1. Site and Community Engagement

The design process begins with a site analysis to better understand the place that we are working in and meetings with community stakeholders to understand their vision for a future waterfront. This analysis allows us to identify current and future challenges and opportunities.

## 2. Initial Design Concepts Workshop

We then meet with stakeholders and community members during an onsite stakeholder workshop to share our initial ideas and design concepts for additional feedback and insight.

## 3. Design Development

Back in the campus studio, we refine the design concepts based on the information and feedback gathered during our community and stakeholder

meetings. Ultimately, we seek to incorporate the perspectives of many into a diverse cross section of design ideas ranging from the practical to the visionary.

## 4. Open House Dialogues

At the end of the semester we share our final design work with the community to catalyze further discussion about the value of vibrant and resilient waterfront communities.



**In August:** the CaD team meets with key community members to plan for the upcoming semester and identify stakeholders

**First site visit:** the class visits the host community to meet stakeholders and conduct field visits of the project study area

**Design concept workshop:** students meet with stakeholders to discuss early design ideas

**Open House:** students share their final designs and discuss concepts with stakeholders

September

October

November

December

**Early in the semester:** students collect and review information to become more familiar with the host community

**Back on campus:** student design teams continue their research and begin developing initial design concepts

**Design development:** Key stakeholders are invited to participate in on-campus studio reviews and critiques

**In January:** the CaD team meets with stakeholders to review designs and discuss next steps



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# The City of Kingston

*Leading the Estuary in urban sustainability and resilience*

Kingston is a small city of approximately 40,000 people, situated in the mid-Hudson Valley with the Catskill Mountains to the west. The Kingston waterfront is situated at the confluence of the Hudson River and Rondout Creek, a major tributary influenced by the Hudson's tides. While the waterfront brings many assets to the community, hazards related to flooding are a concern.

The City of Kingston is one of a handful of municipalities that has achieved silver level certification in the New York State Climate Smart Communities program. The city has been making strides toward a more vibrant and resilient waterfront by participating in the Local Waterfront Revitalization Program and Waterfront Resilience Task Force as they plan for the future.



*Tuning Up, 2018*  
Xining Wan  
Yixuan Li

# Project Study Area

New York State



Ulster County



City of Kingston



The CaD studio study area comprised the section of Rondout Creek waterfront running alongside East Strand Street from the City of Kingston's wastewater treatment plant to the Central Hudson brownfield redevelopment site near the mouth of the creek. The study area included the Ponckhockie neighborhood.

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Initial meetings with stakeholders helped student teams identify key themes, challenges and opportunities for the study area:

## Key Themes

- Enhancing waterfront access and circulation, including elevating key roads
- Encouraging economic development and historic preservation
- Attracting tourists while enhancing amenity for residents
- Improving connections between the study area and the rest of the city

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## Challenges

- There is no public access to the waterfront in this section of the Rondout
- Most of site is already in the 10% ("10-year") flood zone
- Key municipal assets, including the wastewater treatment plant and East Strand Street, are vulnerable to flooding
- New York State official sea level rise projections indicate that some areas will be inundated in the future
- There is a need for adequate parking and wayfinding to accommodate visitors

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## Opportunities

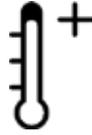
- The Central Hudson brownfield site has been remediated and has potential as a waterfront park
- Funding is secured to create a waterfront promenade within the study area
- The Empire State Trail will pass through the study area, providing opportunities to enhance pedestrian access
- The Kingston Land Trust is working with the city to create the Kingston Greenline, a network of parks and complete streets in multiple locations including the study area
- The Rondout Riverport Community Coalition is a newly-formed group focused on revitalizing the City's Rondout Waterfront

# Climate Risk in Kingston

Our communities face three major climate risks:



Flooding due to extreme precipitation, stormwater runoff, storm surge and sea level rise



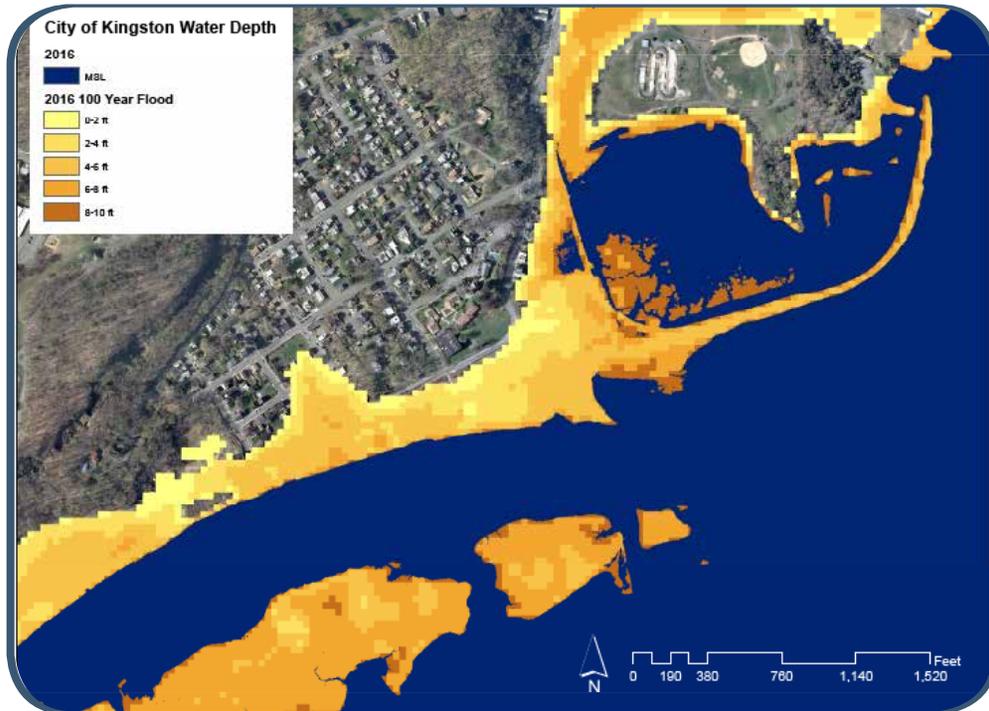
Temperature extremes impacting seasonal conditions and causing dangerous heat waves



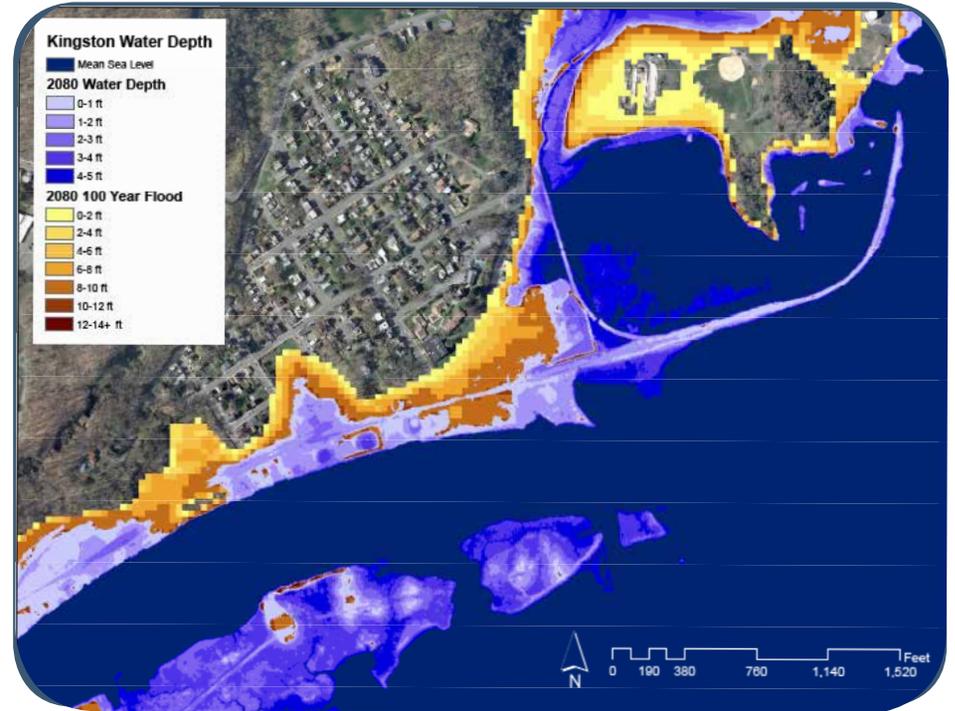
Disrupted precipitation patterns leading to greater likelihood of short term drought

## Flooding and Sea Level Rise

- Today's 1% or "100-year" storm is defined as the flood height that has a 1% chance of happening each year, based on historical storms
- Added up over time, there is a 25% chance of such a storm happening during the span of a 30-year mortgage
- Such storms are likely to occur more frequently by the 2050's due to projected sea-level rise and intense precipitation
- NYS has adopted official projections for sea level rise that are 72" higher than current levels in the mid-Hudson Valley



Depths of temporary flooding anticipated during the "100-year" or 1% flood zone on the Kingston waterfront for the 2016 baseline condition. Source: Climate-adaptive Design studio



Inundation depths (purple) and temporary flooding depths (orange) for the "100-year" or 1% flood condition on the Kingston waterfront during the 2080's. Source: Climate-adaptive Design studio

## Protecting Marsh Migration Pathways

The Hudson estuary includes over 7,000 acres of tidal wetlands, which are important for healthy natural and human communities. Tidal wetlands protect shorelines and help keep water clean. Freshwater, tidal wetlands - like those on the shoreline in Kingston - are globally rare and are extremely valuable to young fish and other animals.

Sea-level rise is influencing where tidal wetlands can flourish, with some mudflats and marshes likely to become submerged by rising waters. If shoreline topography allows, marsh plants may be able to migrate inland to maintain optimal conditions as sea level rises. In many areas, marsh migration may be at odds with human uses, requiring thoughtful decisions about where communities choose to site and maintain waterfront development.

The Rondout Creek tidal wetland system, currently 111 acres, is projected to suffer one of the largest potential marsh losses from sea level rise in the Hudson River. Kingston can explore options to protect marsh migration pathways and select areas to limit waterfront development to help maintain these vital habitats.



Current extent of tidal wetlands on the Rondout and Hudson waterfronts in Kingston. Green indicates marsh, brown indicates mudflats, blue indicates open water. Maps source: Scenic Hudson Sea Level Rise & Marsh Migration Mapper



Projected conditions under high sea level rise, low sediment accretion scenario in 2080 indicates a significant loss of wetlands. Green indicates marsh, brown indicates mudflats, blue indicates open water. Maps source: Scenic Hudson Sea Level Rise & Marsh Migration Mapper

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# Design Strategies

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# Priority Strategies for Kingston

Eight student teams created comprehensive designs for the study area, which can be viewed in detail at <http://trophic.design/cad/>. Common themes across the designs are described on the following pages and are intended to provide a brief introduction to options that Kingston can explore. The featured design strategies address the following CaD principles:



## Design with Nature

### Green Infrastructure

Limiting runoff and infiltrating water using natural features rather than pipes

### Sustainable Shorelines

Using nature-based approaches to limit shoreline erosion while enhancing ecosystems

### Marsh Migration

Protecting inland migration pathways for freshwater tidal marshes.



## Design for Community

### Resilient Waterfront Parks

Enhancing waterfront access and assets for citizens

### Multimodal Mobility

Improving circulation by expanding options for getting around town



## Design for Flooding

### Strategic Relocation and Adaptive Reuse

Reducing water-based hazards and repetitive damage

## Before You Turn the Page...

Each strategy comes along with **Actions to Take** -some that you can do **today**, and others that will take more time and planning to implement.

Each strategy also features student work to visualize possible ways they could be used in Kingston.

Five icons flag important facts about each strategy. Descriptions about these types of information are detailed here:



This section describes how the strategy can create benefits both for people and the ecosystems in Kingston



Look here to find sources of funding to help make this strategy a reality



Important considerations for each strategy are indicated by this icon



These numbers correspond to Climate Smart Community Actions that can earn points for your city



For more information about a strategy, explore the resources in this section. Website URL's are available in the Appendix.

# Green Infrastructure

Green infrastructure practices maintain or restore the pre-development flow patterns of stormwater at a site by allowing runoff to infiltrate into the soil. On a regional scale, green infrastructure includes preserving and restoring natural landscape features, along with reducing impervious surface cover. At the site scale, green infrastructure includes practices that capture stormwater runoff such as vegetated swales, infiltration planters, green roofs, pervious pavement and rain barrels. These practices allow water to soak into the soil, to be used by plants, or to be reused.

Kingston can consider adding green infrastructure components to new development, as well as retrofitting the existing cityscape with these features. Student design teams recommended the installation of vegetated swales, infiltrations planters or rain gardens in Ponckhockie neighborhood to intercept runoff and help control stormwater flooding.



Hunter's Point South, Long Island City

## Actions To Take

- Pursue educational opportunities to become familiar with green infrastructure techniques
- Complete an analysis to prioritize locations that would benefit the most from green infrastructure
- Apply for a grant to design a green infrastructure project
- Adopt green parking lot standards
- Require new development to conserve existing natural features and use green infrastructure before traditional pipe-and-gutter solutions
- Add vegetated swales, rain gardens and/or permeable pavement to municipal parking lots and properties



Green infrastructure can improve water and air quality, store carbon, enhance habitat diversity, and cool urban areas during hot times of the year



DEC HREP || DEC CSC || DEC WQIP || EFC GIGP



Conserving existing natural features like trees is typically an effective and affordable first step  
Green infrastructure offers many aesthetic and ecological co-benefits compared to traditional gray infrastructure

CSC

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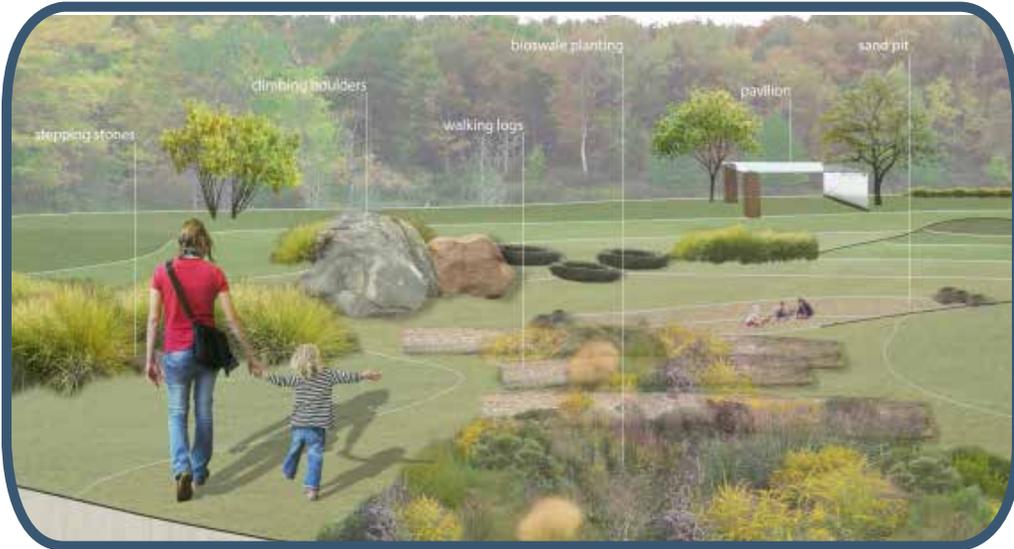


NYSDEC's Stormwater in the Hudson River Valley  
NYS's Stormwater Management Design Manual  
City of Newburgh's Green Infrastructure Guide  
City of Newburgh's Green Infrastructure Feasibility Report



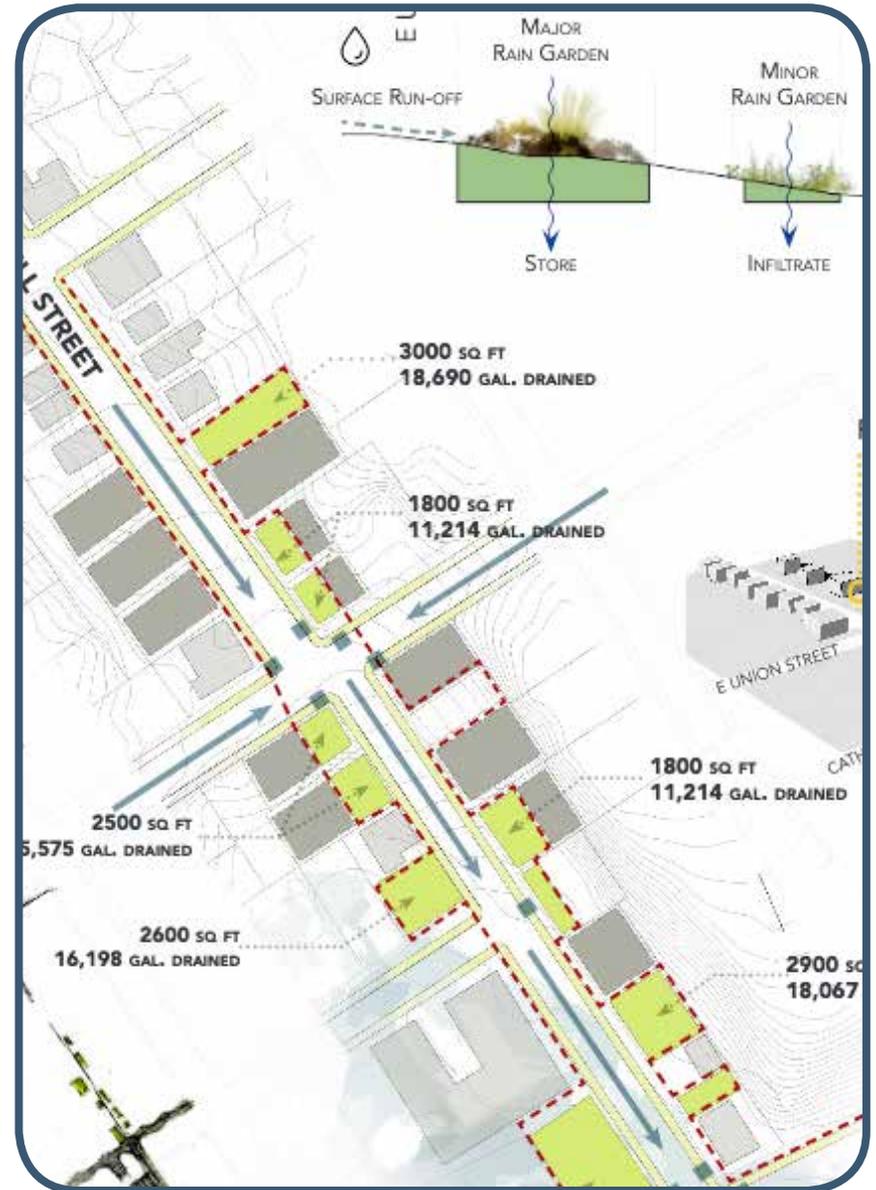
**Beyond stormwater management, green infrastructure contributes to the vitality and aesthetics of a neighborhood**

*Kingston Riverway, 2016*  
 Mark J. Hirschbeck  
 Iliia Savin



**A vegetated swale designed to capture stormwater running through a city park**

*Revelatory Kingston, 2016*  
 Rachel Liu  
 Samuel Packer  
 Susan Rhodes



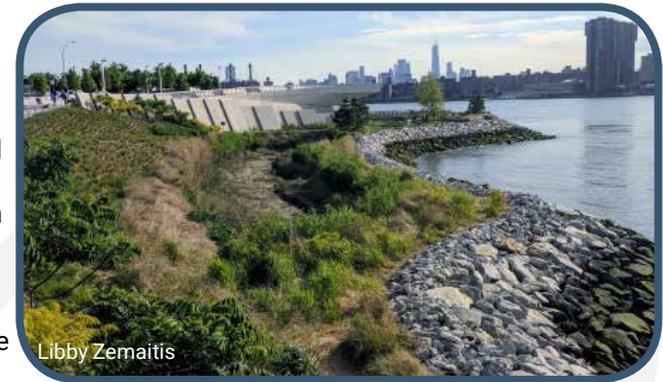
**A stormwater planning concept illustrating possible locations of rain gardens that could be installed over time**

*Revealing Kingston's Waterfront, 2018*  
 Sarah Boutata  
 Kayla Mosebrook

# Sustainable Shorelines

Sustainable shorelines provide erosion control while incorporating coastal vegetation and other 'soft features.' These design techniques also protect the shore zone's wildlife habitat, and provide ecological benefits, recreational assets, community quality of life, and opportunities for water-dependent businesses. In gently-sloped areas, sustainable shorelines can provide pathways for wetland migration as sea levels rise.

The shoreline of Rondout Creek in the study area has been hardened with bulkheads. Previously hardened shorelines that are protecting dense development or key infrastructure may not be suitable for 'softer' shoreline protection techniques, but can still be enhanced with certain ecological features.



Hunter's Point South, Long Island City

## Actions To Take

- Read *Managing Shore Zones for Ecological Benefits on the Hudson River Sustainable Shoreline* website**
- Learn more about sustainable shoreline techniques and regulatory requirements by reading *NYS DEC's Tidal Wetlands Guidance Document***
- Check out your shoreline habitats using the *Hudson Valley Natural Resource Mapper***
- Examine your shoreline using the Rapid Assessment of Shore Zone Condition and Ecological Function protocol
- Consider the need for ongoing monitoring and maintenance as you develop your shoreline plan
- Plan for changing water levels. Visit Scenic Hudson's Sea Level Rise Mapper to understand how rising waters may impact your shoreline



Sustainable shorelines can provide cost-effective erosion control while enhancing aesthetics, ecological function and habitat value of a waterfront area



DEC HREP || DOS LWRP || OPRHP || Hudson Valley Greenway



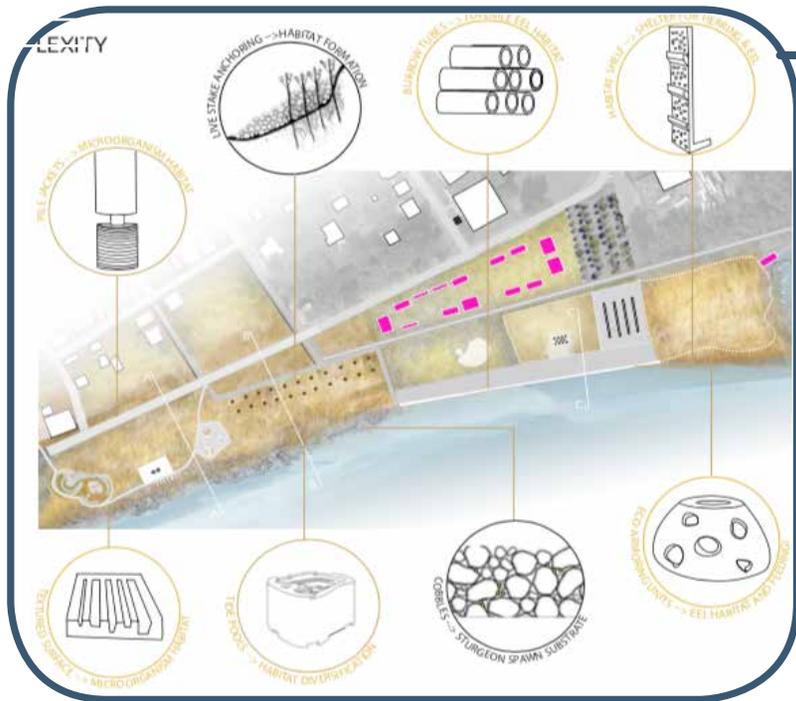
Designing a sustainable shoreline is a methodical and thoughtful practice that considers the needs of people, wildlife and the natural systems upon which we all depend

**CSC**

7.11 || 7.12 || 7.13 || 7.18



Hudson River Sustainable Shorelines  
NYS DEC Tidal Wetlands Guidance Document  
Rapid Assessment of Shore Zone Condition and Ecological Function  
Scenic Hudson's Sea Level Rise Mapper



*Ponckhockie's Working Waterfront, 2018*  
 Eve Anderson  
 Liz Fabis



**Students investigated techniques for adding habitat complexity to bulkheads and sheet piling using eco-concrete, underwater textured surfaces and vegetation**

*The Edge Effect, 2018*  
 Jacob Dilson  
 Sahar Farmand



*Tracing Time, 2017*  
 Tess Russwick  
 Daisy Hoyt

**An example of incorporating nature-based features into a hardened shoreline**

# Marsh Migration

Freshwater tidal wetlands are globally rare and serve as our “rainforests” in terms of the habitat diversity and quality they offer our region. They can help to buffer our waterfronts from storm surges, provide clean air and other benefits. Climate change threatens to drown out much of our marshes if we do not allow pathways for them to migrate inland with sea level rise.

Freshwater tidal marshes at the mouth of the Rondout Creek are at significant risk from sea level rise. Opportunities exist to support the inland migration of marshes in areas around Kingston Point and the East Strand reach of the Rondout. Student teams envisioned possible migration pathways in their long-term design strategies.



The Edge Effect, 2018  
Jacob Dilson  
Sahar Farmand

## Actions To Take

- Visit Protecting the Pathways to learn more about the importance of tidal wetlands and how to identify your wetland pathways**
- View maps of your tidal wetlands and how they might be impacted**
- Determine if your wetland pathways are protected, developed or developable
- Work with regional land trusts to protect wetland pathways through acquisition and easements
- Create and adopt a zoning overlay to protect the pathways from development
- Increase low-impact recreational opportunities for people to enjoy tidal wetlands, like kayak tours and designated viewpoints with interpretive elements that communicate the importance of our marshes
- Manage and restore your tidal wetlands by seeking opportunities to remove hard barriers, restore side channels and foster sustainable shorelines



The Rondout Creek tidal wetland system, currently 111 acres, is projected to suffer one of the largest potential marsh losses in the Hudson Valley from sea level rise



DEC HREP || DEC CSC || DOS LWRP || Hudson River Greenway



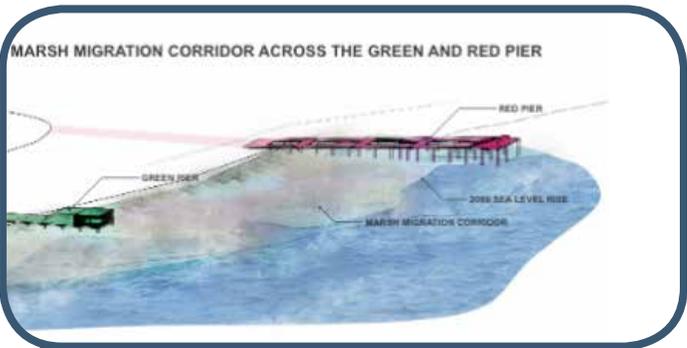
Development and hard shorelines act as barriers to marsh migration pathways, Transfer of development rights (TDR) and buyouts help to strategically relocate existing and future development out of pathways

**CSC**

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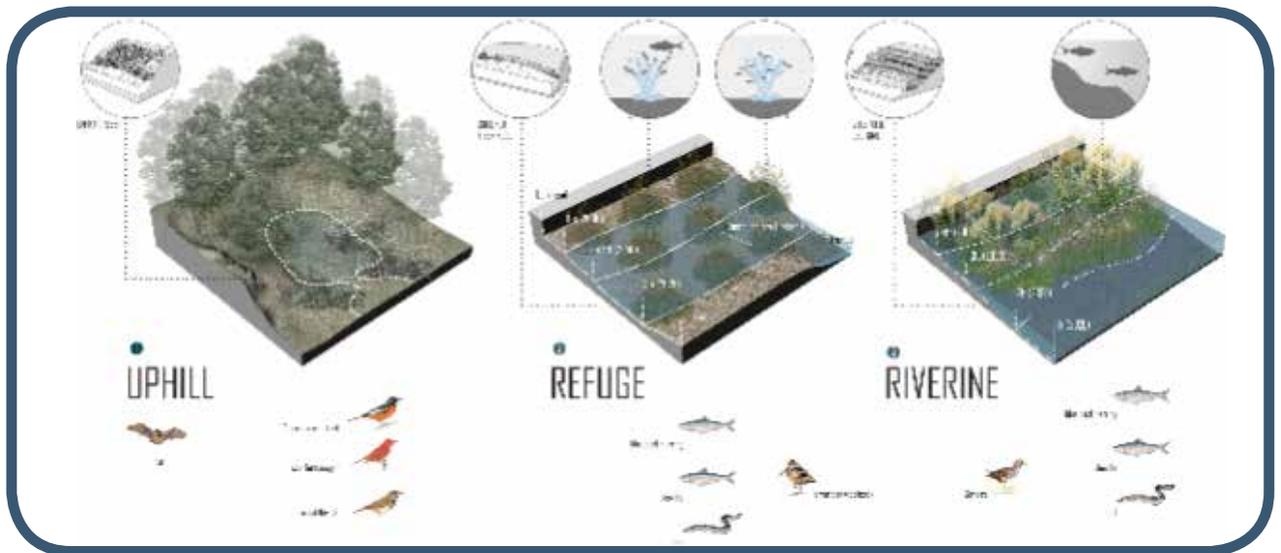


Protecting the Pathways, Scenic Hudson  
City of Kingston’s Open Space Plan and Natural Resource Inventory  
City of Kingston’s Tidal Waterfront Task Force



Interlace, 2018  
Jiamin Chen  
Adrianna Hildago

**Students used available resources to anticipate locations to allow tidal marshes to migrate inland as sea levels rise.**



*Building Bonds, 2018*  
Lijin Liu  
Shan Ling



Designed to adapt to increasing pedestrian use, then transition to recreational use and eventual migration to higher ground as sea levels rise. Walkways, visual screens, and other features allow for continued use of the wetlands while the southern causeway is being created.

**SMALL BOAT CHANNEL**  
The boat channel provides another mode of access and recreation. It also allows water to circulate in and out of the wetland.

**TIDAL STAIRS**  
These stairs provide a direct access to water as sea levels change.

**Accommodating marsh migration pathways may be compatible with recreational uses of the shoreline.**

Tracing Time, 2017  
Tess Russwick  
Daisy Hoyt

# Resilient Waterfront Parks

Waterfront parks are an excellent choice for flood-prone areas - providing memorable destinations, harboring recreational opportunities, shoreline access and habitat, while reducing vulnerability and risk. Waterfront parks should be designed with input from end-users to meet the needs of the community and be universally accessible to people of diverse abilities, needs and resources. The park landscape should accommodate floodwaters and be graded to quickly drain after storm events.

The Kingston waterfront includes Block Park, Gallo Park and Kingston Point Park. The Central Hudson brownfield remediation site has potential as an additional pocket park amenity connecting the Ponckhockie neighborhood with the Rondout promenade project currently underway.



## Actions To Take

- Consult the resources referenced to evaluate the resilience and accessibility of current waterfront parks**
- When establishing new parks and promenades in future flood-prone areas, identify flood-adapted uses and features that can recover quickly from storm impacts**
- Plan for the long-term. When evaluating or designing waterfront parks and promenades, consult online sea level rise mappers to examine the potential for flooding and inundation of the site today and in the future**
- Review policies and procedures of the parks department and revise as needed to require more climate-adaptive and sustainable practices
- Consider the potential for installation of green infrastructure to capture stormwater when designing or evaluating waterfront parks



Naturalized land cover helps to keep urban areas cooler and allows stormwater to infiltrate while providing habitat for wildlife and health benefits for people.



DEC HREP || DEC CSC || EFC GIGP || DOS LWRP || OPRHP || Hudson River Valley Greenway



Design the park so it can recover from flooding with minimal intervention. Choose plants and materials that are unlikely to be damaged from being submerged.



7.12 || 7.14 || 7.16 || 7.18



Design and Planning for Flood Resiliency: Guidelines for NYC Parks  
High Performing Landscape Guidelines: 21st Century Parks for NYC  
Naturally Resilient Communities



*Actipeligo, 2017  
Yifu Kang  
Xuru Yuan*

**A floodable  
playground  
and other  
waterfront  
park feature**



*Blue: Kingston's New Green, 2017  
Parth Divekar  
Sara Vandenbroek*



**Waterfront Park & Promenade - Hunter's Point South, Long Island City**



*Blue: Kingston's New Green, 2017  
Parth Divekar  
Sara Vandenbroek*

# Multimodal Mobility

Providing access for pedestrians, bicycles, wheelchairs, motorized vehicles and public transportation enhances mobility and promotes site accessibility. Adequate wayfinding signage improves waterfront experiences for residents and visitors. Consideration of alternative access routes for flood-prone roadways is an important aspect of a multi-faceted transportation system.

The Kingston East Strand area is a great place to pursue multimodal transportation options for providing waterfront access to walkers, bikers and boaters. Stakeholders identified the need to connect the East Strand and Ponckhockie neighborhoods to the rest of the city via pedestrian and motorized access. The trolley line is a popular feature that appeared as an integral part of several alternative design concepts.



## Actions To Take

- ❑ **The Kingston Greenline and Complete Streets initiatives are exemplary programs that should continue to be developed**
- ❑ **Continue to seek to connect with county, regional and state initiatives, that support local efforts**
- ❑ **Flood-risk, potential inundation, and long-term viability should be considered as part of a feasibility study for waterfront trails, roadways and rail lines**
- ❑ Consider participating in the NYS DEC's Culvert Assessment Program to help assess road-stream crossings for flood resilience and fish passage
- ❑ Consider the potential to incorporate water access for pedestrians and boaters when designing waterfront improvements
- ❑ Conduct studies to identify the most effective sites for green infrastructure in trails and street systems



In addition to improving circulation and mobility for many types of users, a complete streets approach incorporates natural features such as shade trees for cooling and green infrastructure for stormwater management.



DEC CSC || EFC GIGP



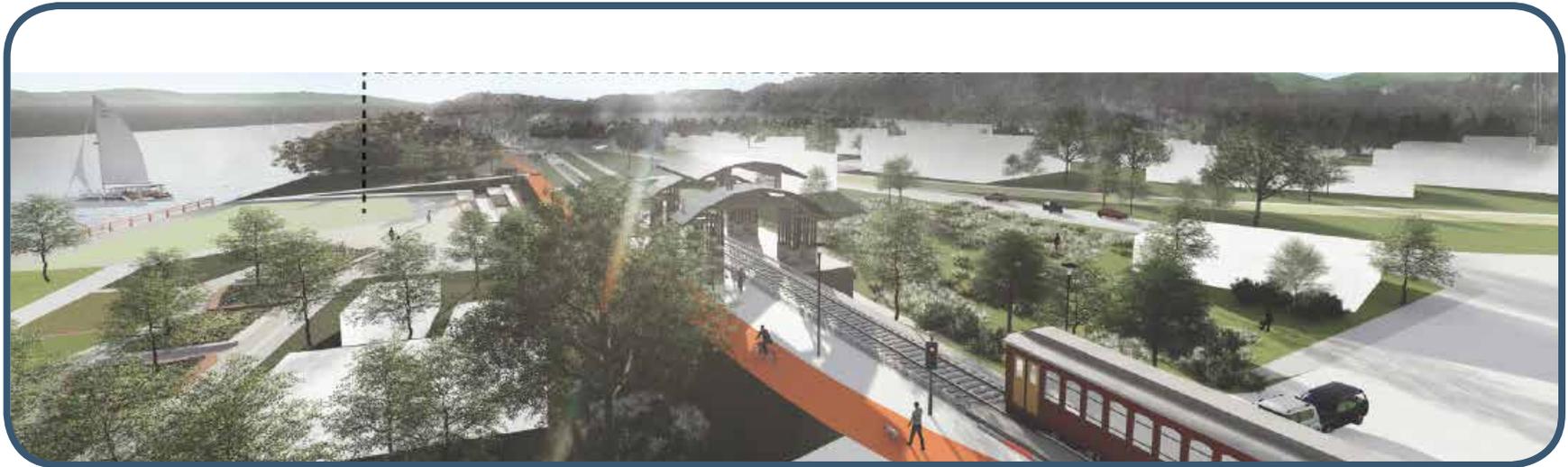
Examine sea level rise projection maps to identify roadways that may become inundated or more frequently flooded in the future and consider options for alternative access

CSC

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NYS DOT – Complete Streets  
NYS Water Resources Institute Culvert Prioritization Project  
Tompkin's County Wayfinding & Interpretive Signage Plan



**This design feature accentuates multi-modal transport; including pedestrian, bicycle, vehicular, trolley and boat access to the Kingston waterfront**

*Tuning Up, 2018*  
Xining Wan  
Yixuan Li

**Relation between land, water and existing elements**



*Blue: Kingston's New Green, 2017*  
Parth Divekar  
Sara Vandenbroek

**A vision of a future shoreline, which incorporates water access, walkability and natural features into the waterfront transportation system**

# Strategic Relocation & Adaptive Reuse

Key assets at high risk for damage or permanent loss under current and future flooding and sea level rise should be relocated out of the flood zone. Alternatively, some structures may be repurposed to minimize loss or adapted to reduce flooding and inundation impacts. These kinds of interventions may benefit from enhanced zoning ordinances, policy measures or incentive programs to facilitate the transition of waterfronts to more adaptive and resilient uses and features.

The City of Kingston can begin exploring options for funding strategic relocation of at-risk infrastructure and properties now to be prepared for future flooding. Options such as FEMA buy-outs and Transfer of Development Rights may provide solutions for repetitive risk properties.



Set Into Motion, 2017

## Actions To Take

- Read more about strategic relocation from the resources referenced in this guide**
- Identify municipally-owned assets that are at high risk from flooding**
- Identify properties that have been repetitively damaged from flooding**
- Explore potential for Transfer of Development Rights (TDR) as an option for strategic relocation
- Create a plan for the relocation of municipally-owned assets, which is stated in your Hazard Mitigation Plan to improve funding options through FEMA
- Identify partnerships and funding opportunities to relocate municipally-owned assets and to assist private property owners with relocation efforts.



Transitioning residences, businesses, infrastructure and services out of the flood-zone reduces risk. Returning floodplain functions provides benefits to people, wildlife and waterways.



DEC HREP || DEC CSC || DOS LWRP || FEMA || HUD CDBG



A fair and equitable approach to strategic relocation is critical to its successful implementation.

**CSC**

7.14



Climigration Network  
NYS Governor's Office of Storm Recovery Buyout & Acquisition Programs  
NYS Department of State Transfer of Development Rights Technical Bulletin



Set Into Motion, 2017  
Thackston Crandall  
Veronica Chan

**An imaginative vision of future re-use of oil tanks at Kingston Point**



**Mobile development modules are structures that can be moved upland as flooding becomes more frequent**

Ponckhockie's Working Waterfront, 2018  
Eve Anderson & Liz Fabis



Re-Zip, 2018  
Houston Harris  
Joaquin Brito, Jr.

**Students analyzed existing zoning and roadway circulation, and made recommendations for changes intended to increased mixed use development, and siting of green spaces in flood-prone areas**

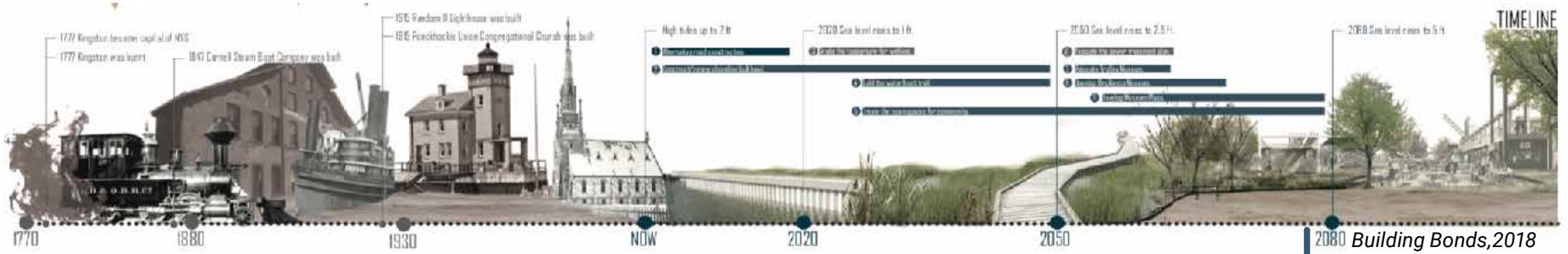
Section 1

Section 2

Section 3

Section 4

# Looking Ahead



2080 *Building Bonds, 2018*  
Lijin Liu  
Shan Ling

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## Actions to Take

- Appoint a committee to advance CaD concepts
- Host a public event to display CaD materials and inform residents of the CaD design principles
- Seek to apply CaD design principles to current projects
- Identify CaD design ideas for further study and advance designs toward implementation
- Consider updating zoning and ordinances to increase resilience
- Seek opportunities to increase local knowledge and capacity for increasing resilience

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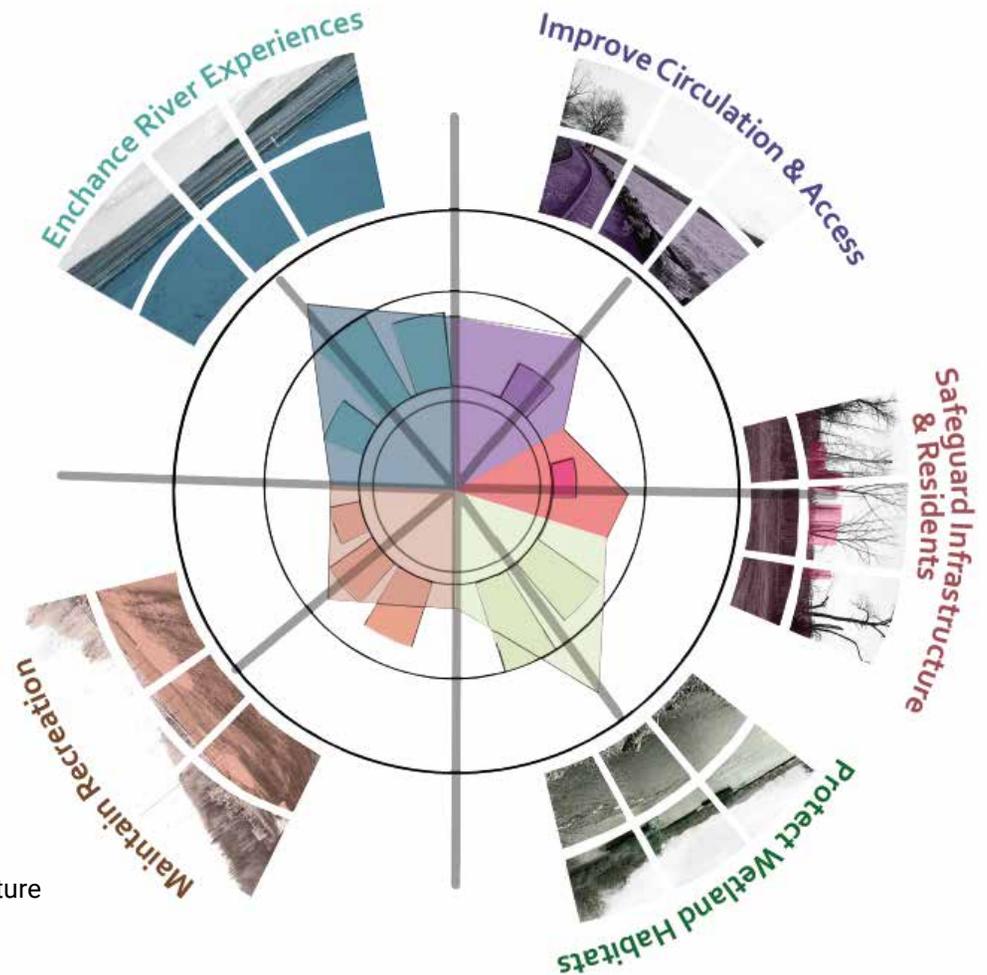
## Keep in Touch!

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Floating With the Tides, 2017  
Kelly Farrell  
Yuting Liu

# Funding Opportunities

State and federal agencies offer financial assistance to municipalities and non-profit organizations for activities building resilience to waterfront flooding, sea level rise and other climate risks.

Agency	Assistance Program	Grant amounts, required match	Municiple Planning	Resilient Structures	Emergency Management	Collaboration and Public Outreach	Waterfront Economy	Floodplain protection
Department of Environmental Conservation (DEC)	Hudson River Estuary Program (HREP)	\$10,500-\$50,000, 15%	•	•			•	•
	Climate Smart Communities (CSC)	\$10,000-\$2M, 50% match	•	•				•
	Water Quality Improvements Program (WQIP)	25-60% match		•				•
	Trees for Tribes	N/A						•
Environmental Facilities Corporation (EFC)	Wastewater Infrastructure Engineering Planning	≤\$100,000, 20% match	•	•				
	Clean Water Revolving Loan Fund	N/A	•	•				•
	Green Innovation Grant Program (GIGP)	10-60% match						•
Federal Emergency Management Agency (FEMA)	Hazard Mitigation Assistance (HMA)	Over \$3M, 25% match	•	•				
	Public Assistance	N/A			•			
	Community Rating System (CRS)	N/A			•	•		
Department of State	Local Waterfront Revitalization Program (LWRP)	15-25% match	•	•		•		
Other	New York State Energy Research and Development Authority (NYSERDA)	≤\$250,000, no match	•	•		•		
	NYS Office of Parks, Recreation and Historic Preservation (OPRHP)	≤\$500,000, 25-50% match					•	•
	US Housing and Urban Development (HUD)	\$50,000 - \$900,000, 0-5%	•	•			•	
	Empire State Development	80% match for soft costs		•			•	
	Hudson River Greenway	\$5,000 - \$10,000+					•	•
	Open Space Funding Options	N/A						•

# Design Strategy References

Design Strategy	Source	URL
<b>Green Infrastructure</b> <i>Use nature to quickly get water back into the ground</i>	Stormwater Management in the Hudson Valley	<a href="http://www.dec.ny.gov/lands/58930.html">http://www.dec.ny.gov/lands/58930.html</a>
	New York State Stormwater Management Design Manual	<a href="https://www.dec.ny.gov/chemical/29072.html">https://www.dec.ny.gov/chemical/29072.html</a>
	City of Newburgh's Green Infrastructure Guide	<a href="https://tinyurl.com/NewburghGreen">https://tinyurl.com/NewburghGreen</a>
	City of Newburgh's Green Infrastructure Feasibility Report	<a href="https://tinyurl.com/NewburghFeasibility">https://tinyurl.com/NewburghFeasibility</a>
<b>Sustainable Shorelines</b> <i>Consider nature-based approaches before hard structural features for erosion protection</i>	Hudson River Sustainable Shorelines	<a href="https://tinyurl.com/SustainableShorelines">https://tinyurl.com/SustainableShorelines</a>
	NYS DEC <i>Tidal Wetlands Guidance Document</i>	<a href="https://tinyurl.com/NYDECTidalWetlands">https://tinyurl.com/NYDECTidalWetlands</a>
	Rapid Assessment of Shore Zone Condition and Ecological Function	<a href="https://tinyurl.com/ShoreZoneCondition">https://tinyurl.com/ShoreZoneCondition</a>
	Hudson Valley Natural Resource Mapper	<a href="https://www.dec.ny.gov/lands/112137.html">https://www.dec.ny.gov/lands/112137.html</a>
	Scenic Hudson's Sea Level Rise Mapper	<a href="http://www.scenichudson.org/slr/mapper">http://www.scenichudson.org/slr/mapper</a>
<b>Marsh Migration</b>	Scenic Hudson's Protecting the Pathways	<a href="https://www.scenichudson.org/tidalwetlands">https://www.scenichudson.org/tidalwetlands</a>
	City of Kingston's Open Space Plan & Natural Resources Inventory	<a href="https://www.kingston-ny.gov/nri">https://www.kingston-ny.gov/nri</a>
	City of Kingston's Tidal Waterfront Flooding Task Force	<a href="https://www.kingston-ny.gov/waterfrontfloodingtaskforce">https://www.kingston-ny.gov/waterfrontfloodingtaskforce</a>
<b>Resilient Waterfront Parks</b>	Design and Planning for Flood Resiliency: Guidelines for NYC Parks	<a href="https://tinyurl.com/NYCParks-DesignforFloods">https://tinyurl.com/NYCParks-DesignforFloods</a>
	High Performing Landscape Guidelines: 21st Century Parks for NYC	<a href="https://tinyurl.com/NYCParksSustainableDesign">https://tinyurl.com/NYCParksSustainableDesign</a>
	Naturally Resilient Communities	<a href="http://nrcsolutions.org/">http://nrcsolutions.org/</a>
<b>Multimodal Mobility</b>	NYS DOT Complete Streets	<a href="https://www.dot.ny.gov/programs/completestreets">https://www.dot.ny.gov/programs/completestreets</a>
	NYS WRI Culvert Prioritization Project	<a href="https://tinyurl.com/CulvertAssessment">https://tinyurl.com/CulvertAssessment</a>
	Tompkins County Wayfinding and Interpretive Signage Plan	<a href="https://www.dec.ny.gov/lands/112137.html">https://www.dec.ny.gov/lands/112137.html</a>
<b>Strategic Relocation &amp; Adaptive Re-use</b>	Climigration Network	<a href="http://www.climigration.org/">http://www.climigration.org/</a>
	NYS GOSR Buy-out and Acquisition Program	<a href="https://stormrecovery.ny.gov/housing/buyout-acquisition-programs">https://stormrecovery.ny.gov/housing/buyout-acquisition-programs</a>
	NYS DOS Transfer of Development Rights Technical Bullitan	<a href="https://www.dos.ny.gov/lg/publications/Transfer_of_Development_Rights.pdf">https://www.dos.ny.gov/lg/publications/Transfer_of_Development_Rights.pdf</a>

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## More Information on Climate Change in the Hudson River Valley

<b>Websites</b>	<b>URL</b>
Resources for resilience	<a href="http://tinyurl.com/resilienceres">tinyurl.com/resilienceres</a>
Hudson River Sustainable Shorelines	<a href="https://www.hrnerr.org/hudson-river-sustainable-shorelines">https://www.hrnerr.org/hudson-river-sustainable-shorelines</a>
NY Climate Smart Communities	<a href="https://climatesmart.ny.gov/">https://climatesmart.ny.gov/</a>
Hudson River Estuary Program grants	<a href="http://www.dec.ny.gov/lands/5091.html">http://www.dec.ny.gov/lands/5091.html</a>
Adaptation Clearinghouse	<a href="https://www.adaptationclearinghouse.org/">https://www.adaptationclearinghouse.org/</a>
NY Community Risk and Resiliency Act (CRRRA)	<a href="http://www.dec.ny.gov/energy/102559.html">http://www.dec.ny.gov/energy/102559.html</a>
Estuary Program's Climate Resilience webpage	<a href="http://www.dec.ny.gov/lands/39786.html">http://www.dec.ny.gov/lands/39786.html</a>
CaD studio Designs from Kingston and other host communities	<a href="https://trophic.design/cad/">https://trophic.design/cad/</a>
<b>Interactive Maps</b>	
Hudson River Flood Mapper	<a href="http://www.ciesin.columbia.edu/hudson-river-flood-map/">http://www.ciesin.columbia.edu/hudson-river-flood-map/</a>
Protecting the Pathways, Scenic Hudson	<a href="https://arcg.is/1jbXG4">https://arcg.is/1jbXG4</a>
Sea Level Rise Mapper, Scenic Hudson	<a href="http://scenichudson.org/slr/mapper">http://scenichudson.org/slr/mapper</a>
<b>Publications</b>	
Financing waterfront resilience fact sheet	<a href="http://tinyurl.com/finres">tinyurl.com/finres</a>
Revitalizing Hudson Riverfronts, Scenic Hudson	<a href="http://tinyurl.com/CSCvideoSLR">tinyurl.com/CSCvideoSLR</a>
New York City's Urban Waterfront Adaptive Strategies	<a href="http://goo.gl/7swlpa">http://goo.gl/7swlpa</a>
Flood Adaptation Strategies for Hudson Riverfront Communities	<a href="https://www.slideshare.net/hrepclimate/flood-adaptation-strategies">https://www.slideshare.net/hrepclimate/flood-adaptation-strategies</a>
NYSERDA's Responding to Climate Change in New York ClimAID	<a href="http://www.nyserda.ny.gov/climaid">http://www.nyserda.ny.gov/climaid</a>
<b>Videos</b>	
Sustainable Shorelines	<a href="http://tinyurl.com/CSCvideoSS">tinyurl.com/CSCvideoSS</a>
Planning for Sea-level Rise	<a href="http://tinyurl.com/CSCvideoSLR">tinyurl.com/CSCvideoSLR</a>
Climate-adaptive Design	<a href="http://tinyurl.com/CSCvideoCAD">tinyurl.com/CSCvideoCAD</a>



Kingston Coves Rising Together, 2017  
Kari Spiegelhalter  
Katherine Goodrich