# THE RESILIENCE TO DISASTERS AND EMERGENCIES INDEX (REDI)

A Unified Index of Resilience Capacity and Survivability Update: March 27, 2014

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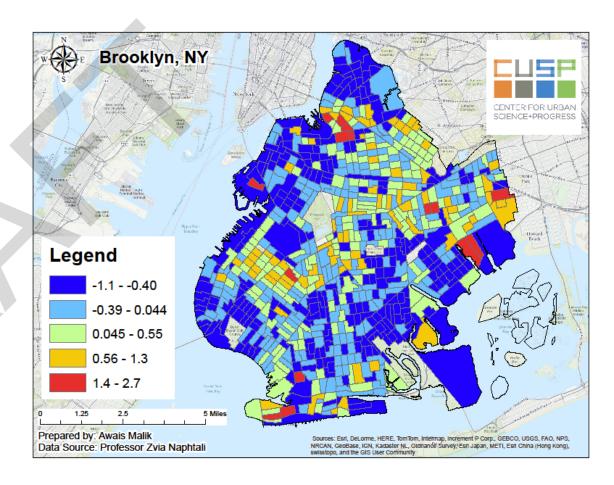


## **Project Objectives**

Provide NYS with a unified, multi-factor index of local and regional resilience capacity and vulnerability. The intent is to create a single statistical measure of resilience and vulnerability – named here the Resilience for Emergencies and Disasters Index (REDI<sup>tm</sup>) - that can be used to benchmark relative resilience capacity across municipalities and neighborhoods and prioritize investment and funding needs across multiple dimensions of physical, social, and economic conditions.

The **REDI Score**<sup>tm</sup> combines measures of physical infrastructure, economic, and social vulnerability and resilience capacity to classify and rank the relative resilience capacity embedded in localized urban systems.

The **REDI Score**<sup>tm</sup> recognizes the importance of community, socioeconomic, and demographic attributes of local neighborhoods and municipalities to their ability to withstand and recover from emergencies and disasters.



### **Data Sources**

- The United States Census Bureau and American Community Survey
- The Federal Emergency Management Agency (FEMA)
- New York City Department of City Planning BYTES of the Big Apple
- NYC Open Data
- U.S. Bureau of Labor Statistics
- NYC Department of Environmental Protection
- NYC Department of Housing Preservation and Development
- NYC Department of Buildings
- NYC Mayor's Office of Long-Term Planning and Sustainability
- Others...

## Methodology: Index Composition

#### **Environmental Conditions**

- -Proximity to and extent of waterbodies (streams, rivers, lakes, ocean, etc.)
- -Topography and hydrology
- -Tree cover
- -Building density and open space

#### Social Infrastructure and Community Connectivity

- -Percent of population with incomes below poverty level
- -Percent of population over 65 years of age
- -Percent and type of subsidized housing
- -Voter participation rates
- -Homelessness rates
- -Health/disability indicators

#### Physical Infrastructure

- -Condition of bridges, tunnels, and other critical infrastructure
- Condition and capacity of energy networks
- Condition and capacity of water and wastewater systems
- -Condition and capacity of transit systems and roadways
- -Extent of distributed energy generation
- -Access and proximity to emergency services

### **REDI**

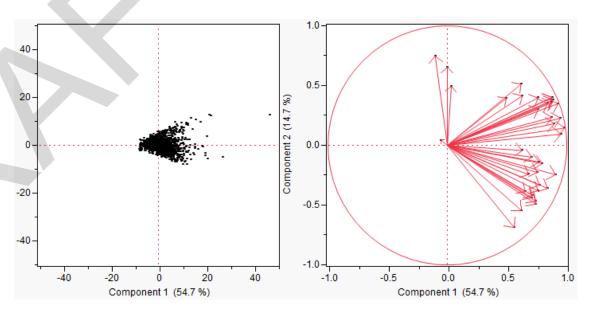
### **Score**

#### Strength of Economy

- -Diversity of local industry composition
- -Growth and stability of regional economy
- -Housing affordability
- Income equality

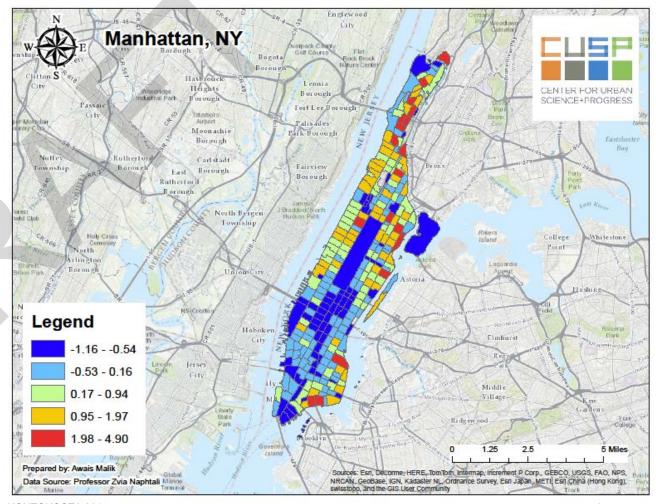
## Methodology: REDI Score Tabulation

- Data cleaning and integration
- Variable identification and prioritization
- Z-score calculation
- Factor analysis
- Predictive regression model
- Final REDI Score calculation and normalization



## Mapping Vulnerability

- ArcGIS: Interactive mapping tool for visualizing data
- Risk assessment by census tract and borough
- Vulnerability heat map as a basis for evaluation
- Social and economic attributes overlaid with critical facilities and infrastructure



## Identifying Vulnerable Populations

- Department of City Planning (DCP)
  - Resilient Neighborhoods Initiative to better manage the risk in costal areas
- A method of evaluation/comparison
- For high vulnerability census tracts, investigate:
  - PLUTO Land Use Data
  - Population Density
  - Median Household Income
  - Sandy and FEMA Predicted Surge Areas
  - Proximity to critical infrastructure

# REDI Raw Index Values - Queens, NY

#### Legend

#### **Vulnerability Index**

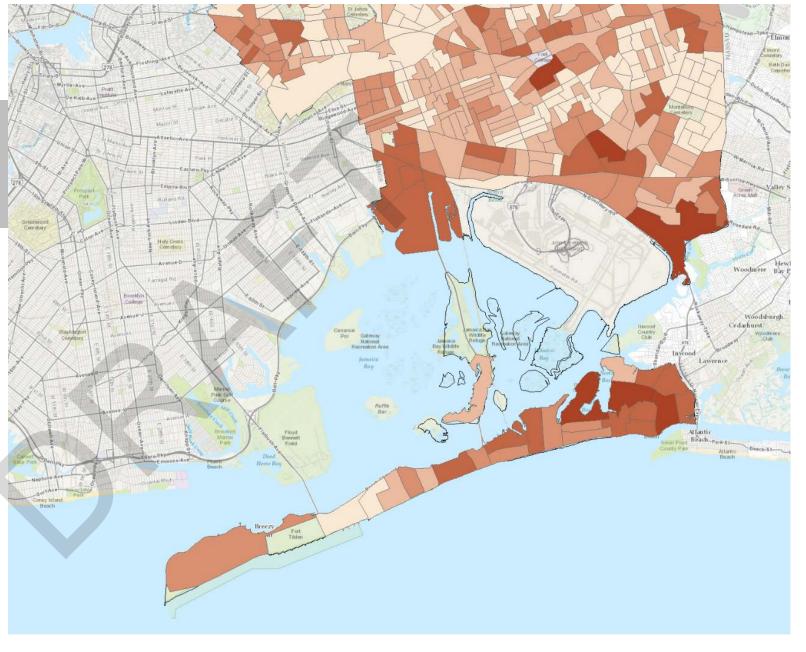
-1.162200 - -0.564700

-0.564699 - -0.184900

-0.184899 - 0.296500

0.296501 - 1.337900

1.337901 - 3.128900



# Above Median Vulnerability

#### Legend

#### **Vulnerability Index**

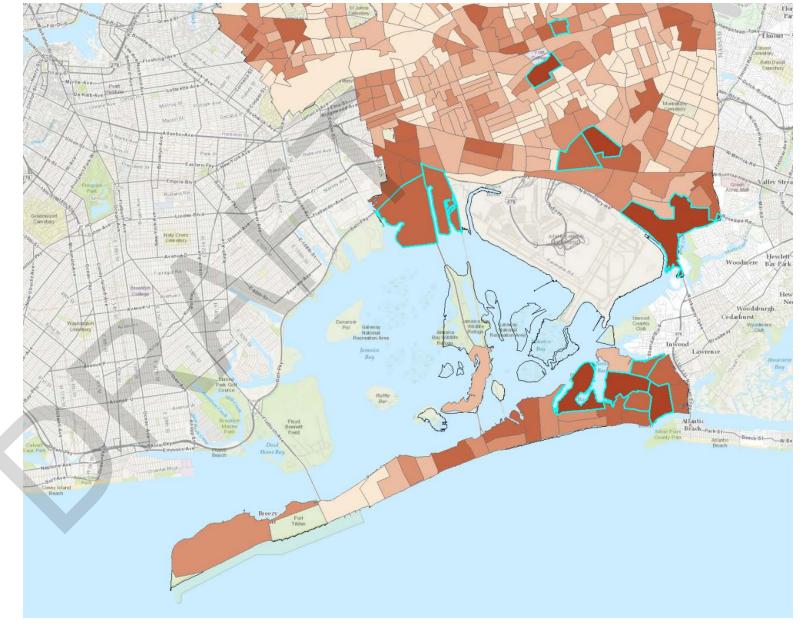
-1.162200 - -0.564700

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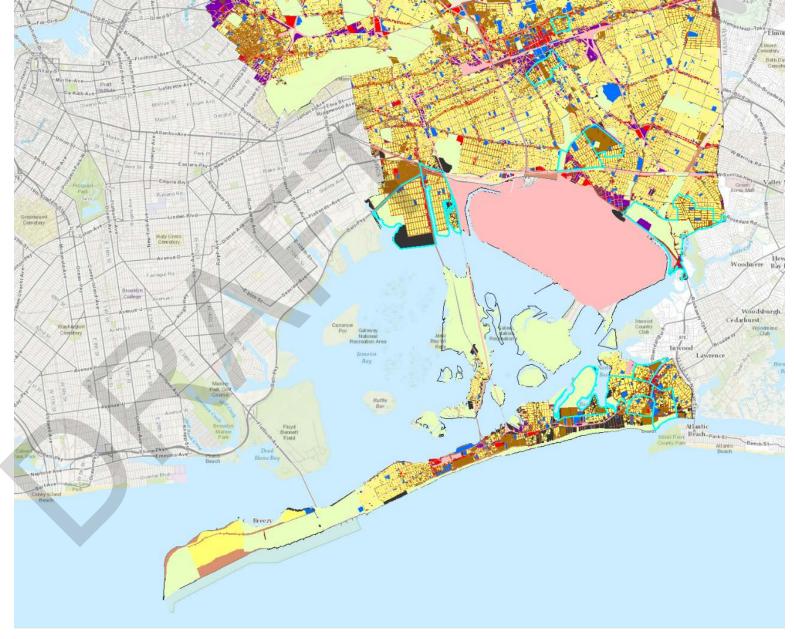


### **PLUTO Land Use**

#### Legend



- One and Two Families
- Multi-families
- Mixed Residential and Commercial
- Commercial and Offices
- Industry and Manufacturing
- Transportation and Utility
- Public Facilities and Institutions
- Open Space and Outdoor Recreation
- Parking Facilities
- Vacant Land



## Median Household Income

#### Legend

#### Median Household Income

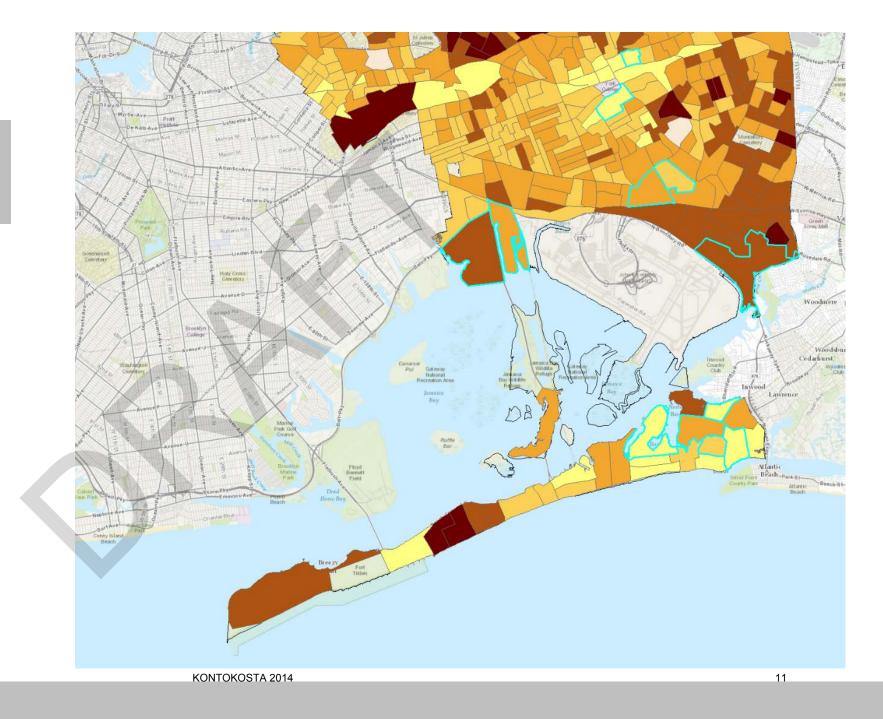
\$13,958.00 - \$41,198.00

\$41,198.01 - \$57,200.00

\$57,200.01 - \$73,370.00

\$73,370.01 - \$94,449.00

\$94,449.01 - \$137,621.00

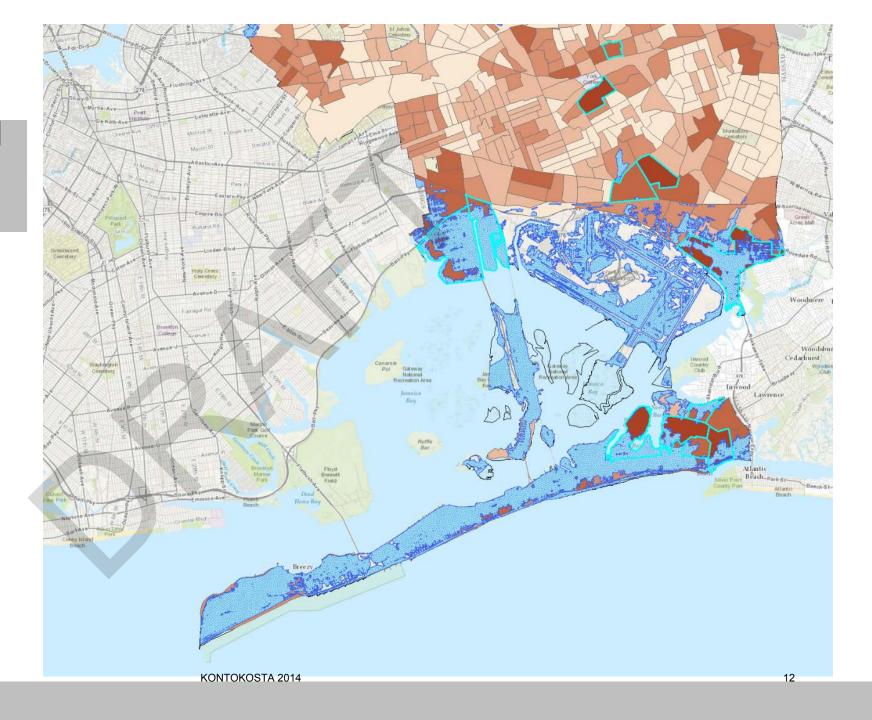


## Sandy Surge Areas and Vulnerable Neighborhoods

#### Legend



Sandy Surge Areas in Queens

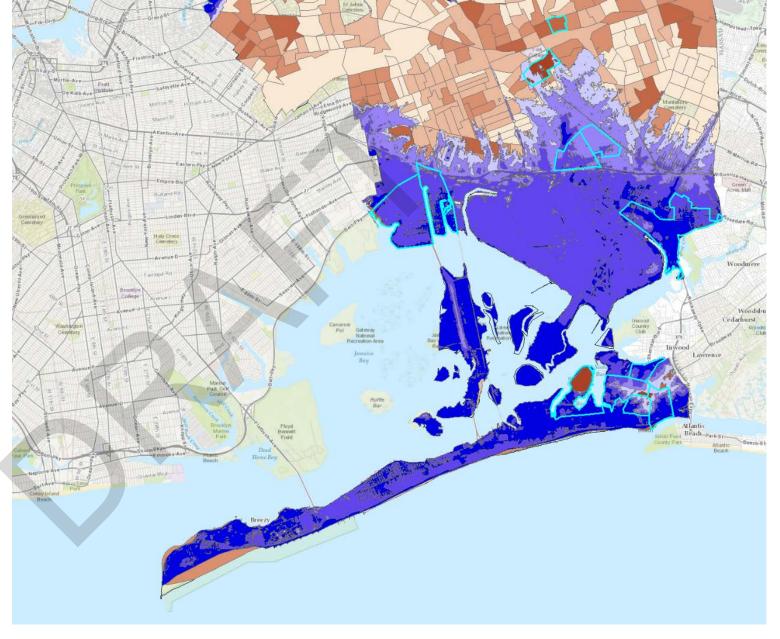


## FEMA Flood Zones and Vulnerable Neighborhoods

# Legend FEMA Surge Areas Zone



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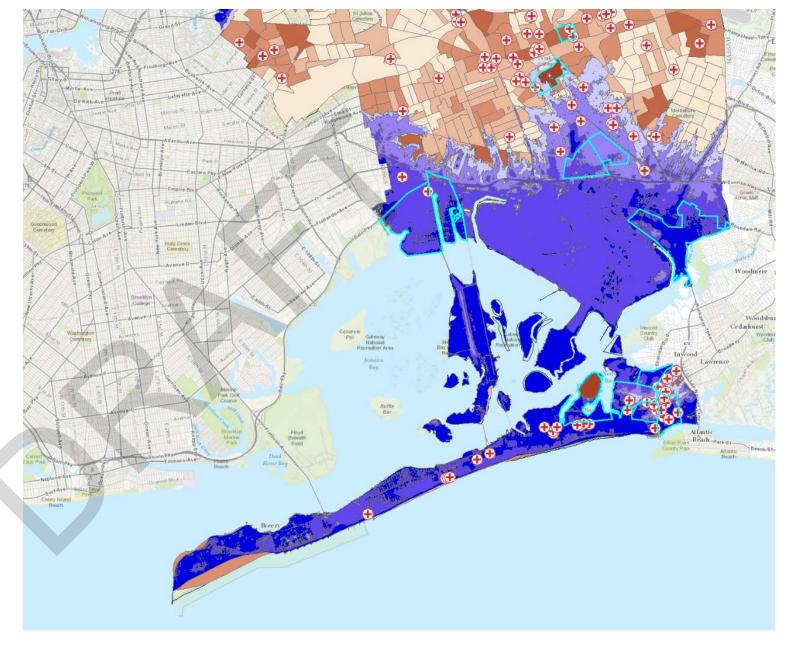


### **Healthcare Facilities**

### Legend FEMA Surge Areas Zone







## Next Steps

- Calculate final RED Index scores and complete data analysis
- Present case studies
- Deliver interim report
- Deliver final report
- Launch interactive visualization tool