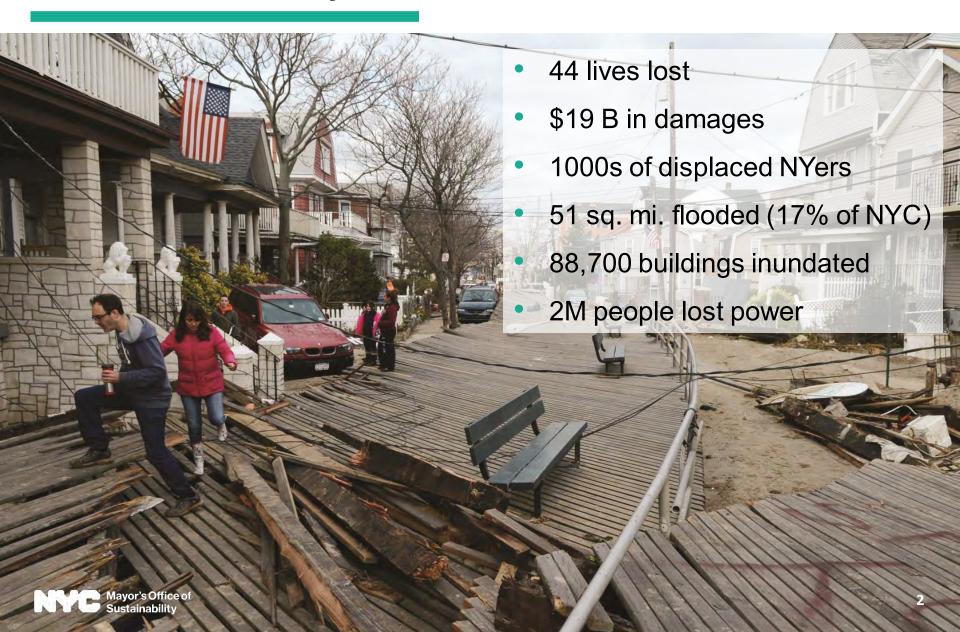
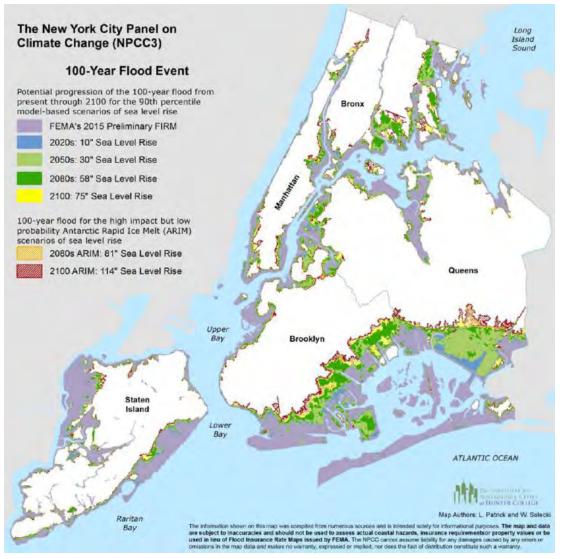


## Hurricane Sandy devastated NYC



#### NYC is vulnerable to climate impacts

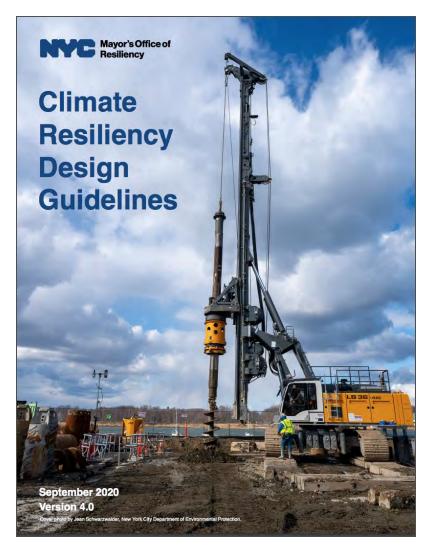


According to the NYC Panel on Climate Change (NPCC), by the 2050s...

- 4-6°F (2.2-3.3°C)
   increase in average
   temperature
- Number of days above 90°F (32.2°C) could triple
- 4-11% increase in average annual precipitation
- Sea levels likely to rise
  1-2 ft (30-61cm); maybe
  2.5 ft (76cm)



## Mitigating Future Risks – Climate Design



- NYC Climate Resiliency Design Guidelines - 2017
- NYC has begun using climate change projections in capital project design to mitigate risk
- Risks addressed:
  - Extreme heat
  - Average higher temperatures
  - Extreme rainfall
  - Tidal flooding with sea level rise
  - Coastal storms



## Climate Design – Temperature Rise

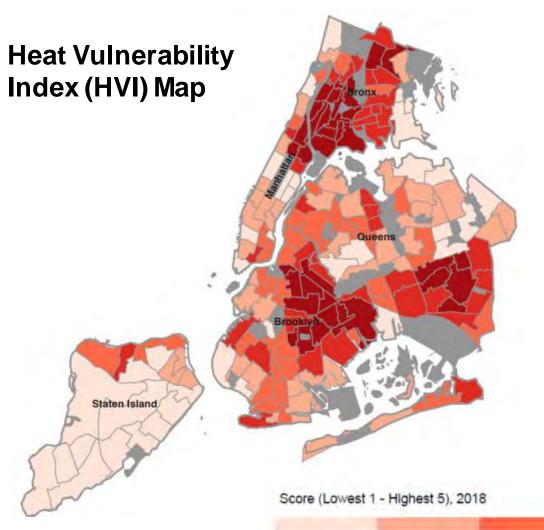
#### Increasing heat will impact facilities, systems and materials

 Design guidelines provide heat projections and criteria to evaluate and mitigate impact

| End of useful life            | Extreme heat events         |                                    |                            | Design criteria            |  |
|-------------------------------|-----------------------------|------------------------------------|----------------------------|----------------------------|--|
|                               | # of heat waves<br>per year | # days at<br>or above<br>90F/32.2C | Annual average temperature | 1% Dry Bulb<br>temperature | Cooling Degree Days (base = 65F/18.3C) |
| Current<br>(1971-2000)        | 2                           | 18                                 | 54F/12.2C                  | 91F/32.8C                  | 1,149                                  |
| 2020s<br>(through to<br>2039) | 4                           | 33                                 | 57.2°F                     | 4                          | 7                                      |
| <b>2050s</b><br>(2040-2069)   | 7                           | 57                                 | 60.6F/15.9C                | 98F/36.7C                  | 2,149                                  |
| <b>2080s</b><br>(2070-2099)   | 9                           | 87                                 | 64.3°F                     | 0-1                        | 41                                     |



#### Climate Design – Urban Heat Island Effect



#### Mitigation strategies include:

- Cool and shade facility lots
- Utilize green roofs and landscape architecture
- Evaluate sources of industrial heat pollution



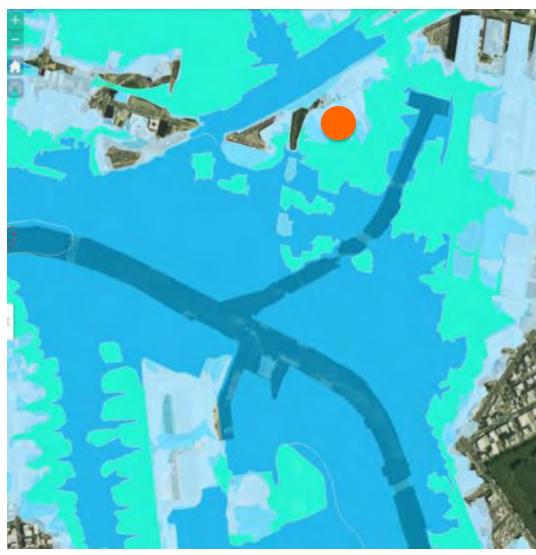
#### Climate Design – Sea Level Rise

#### **Using current floodplain:**

 Site location - base flood elevation (PFIRM 2015)

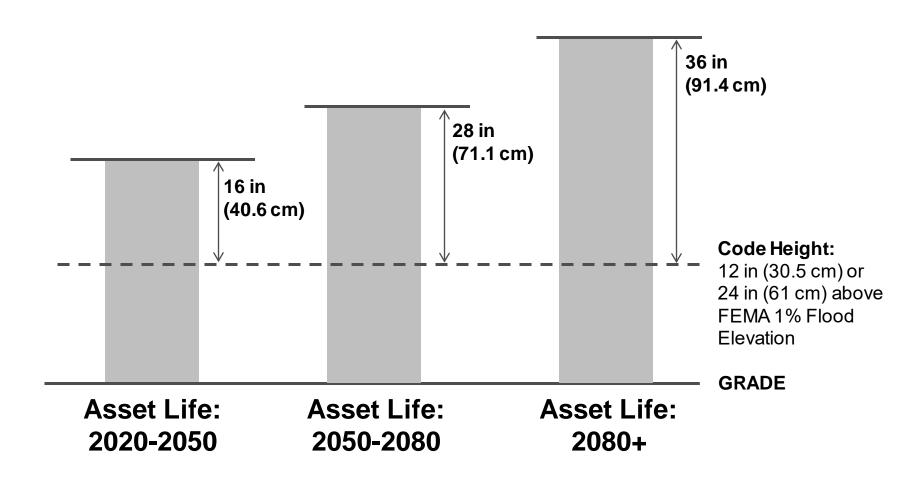
#### Incorporate future floodplain:

Site location in SLR-adjusted flood maps





#### Climate Design – Sea Level Rise





#### Climate Design – Using Local Laws

**2019 NYC Climate Mobilization Act** includes requirement for new construction to install solar and/or green roofs

#### **Green roofs:**

- Offer energy- and costsavings by regulating indoor temperatures
- Lower ambient temperatures, helping reduce the urban heat island effect
- Relieve pressure on drainage systems by absorbing stormwater



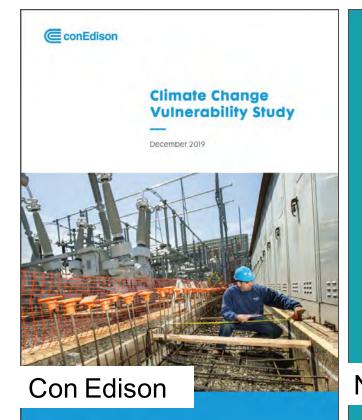


## Climate Design – Electric Utility Advocacy

Since Hurricane Sandy, NYC has invested over \$1 billion (~£765M) in **storm hardening** measures in the utility sector

NYC is currently involved in current energy resiliency planning

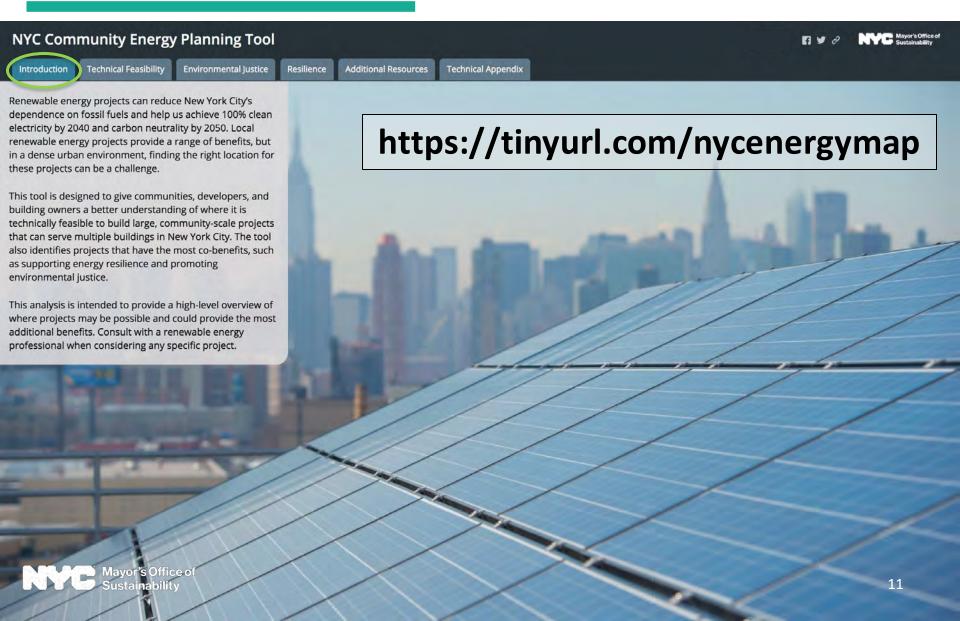
initiatives led by:



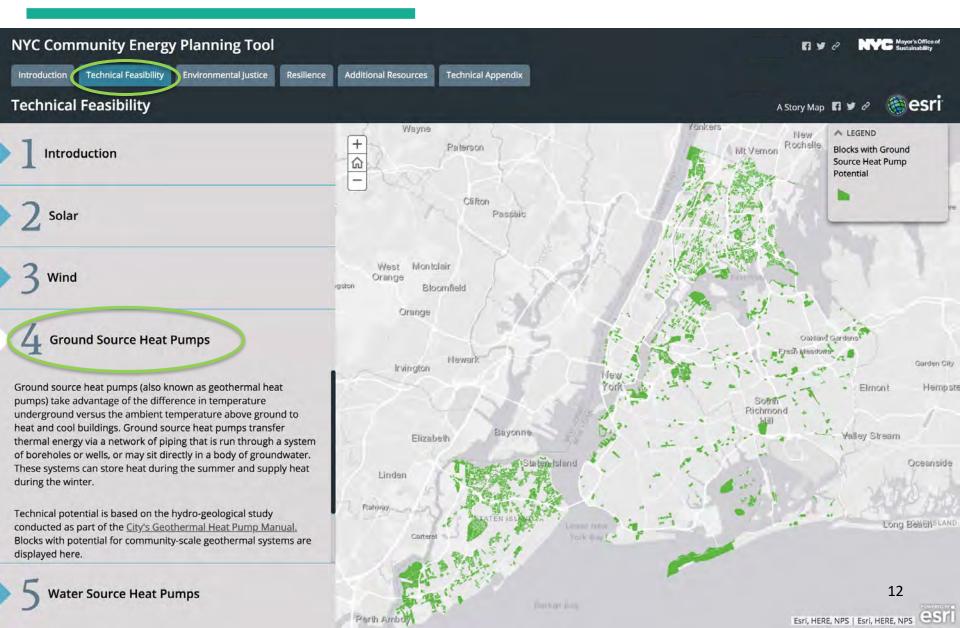
#### Climate Change Impact Phase II An Assessment of Climate Change Impacts on Power System Reliability in New York State **FINAL REPORT** Authors: Paul J. Hibbard Charles Wu Hannah Krovetz Tyler Farrell Jessica Landry September 2020 Draft September 2, 2020 **NYISO** 10



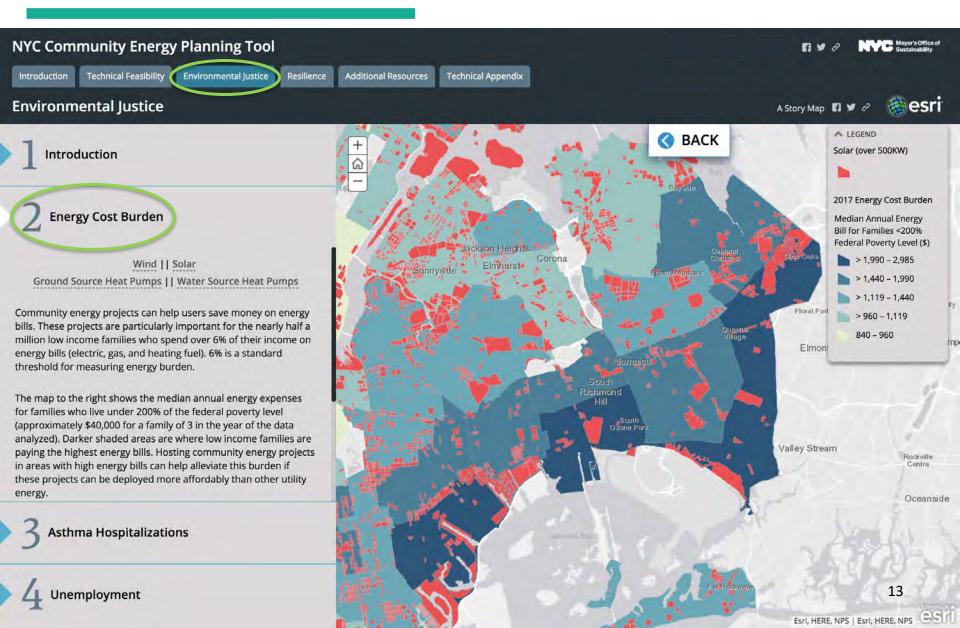
# Climate Design – Community Energy Planning



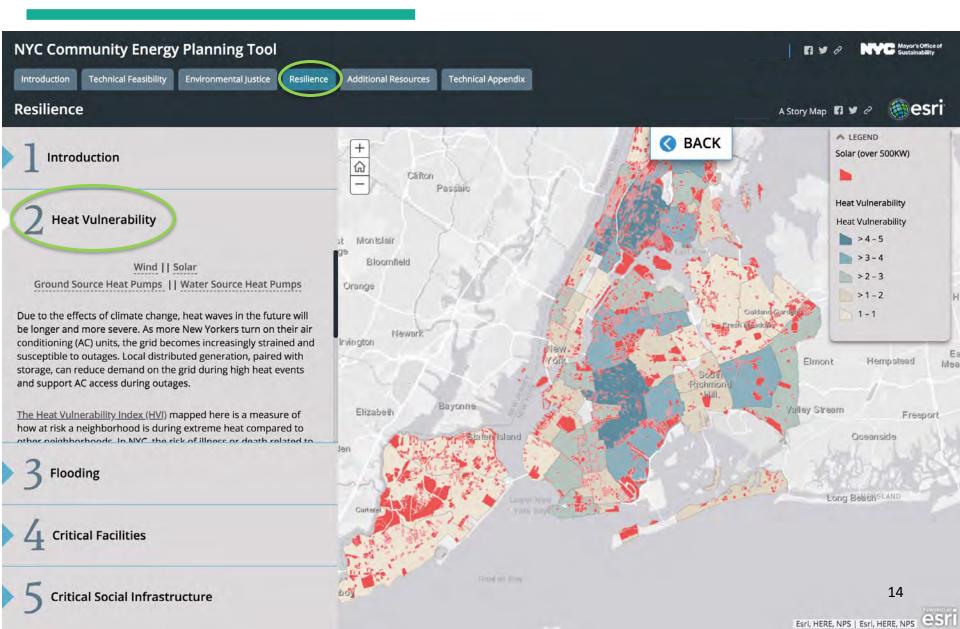
# Community Energy Planning Tool – Feasibility



## Community Energy Planning Tool – EJ



## Community Energy Planning Tool – Resilience



# Thank you

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