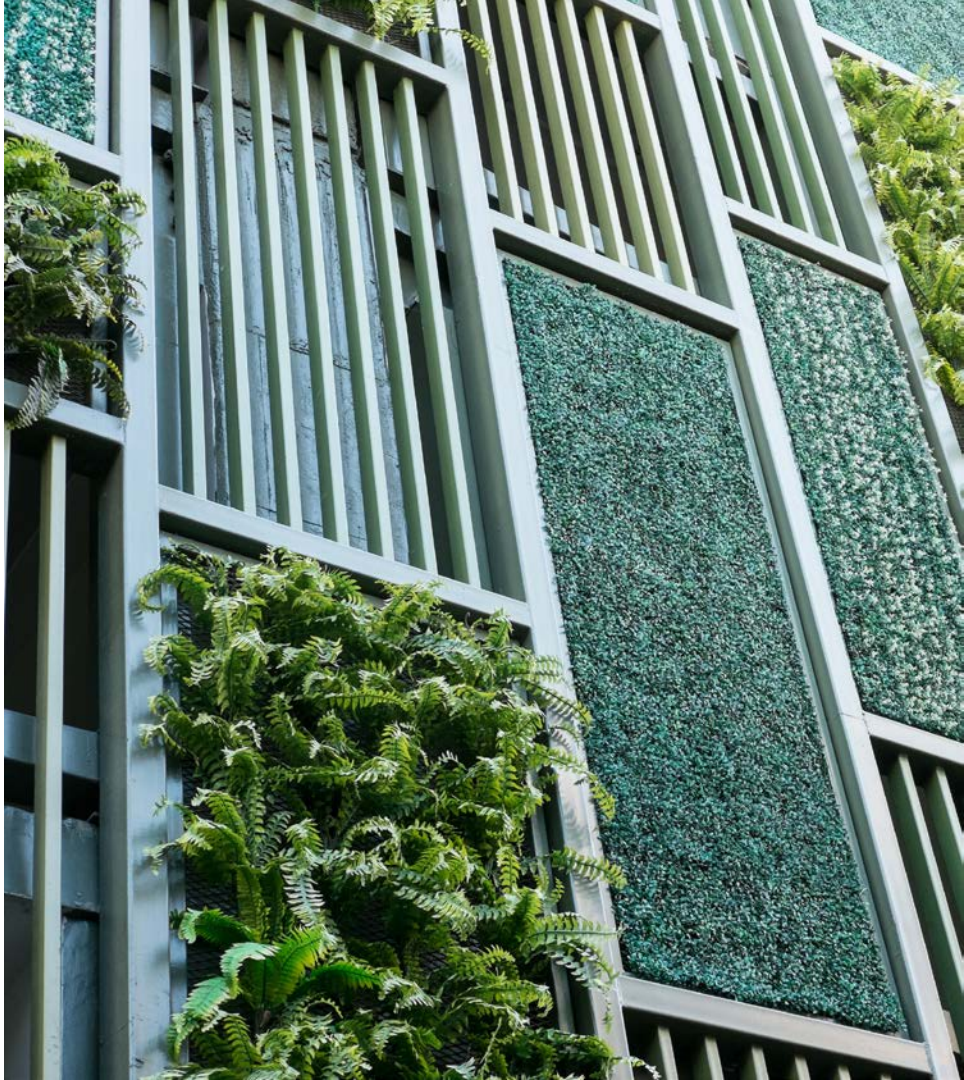
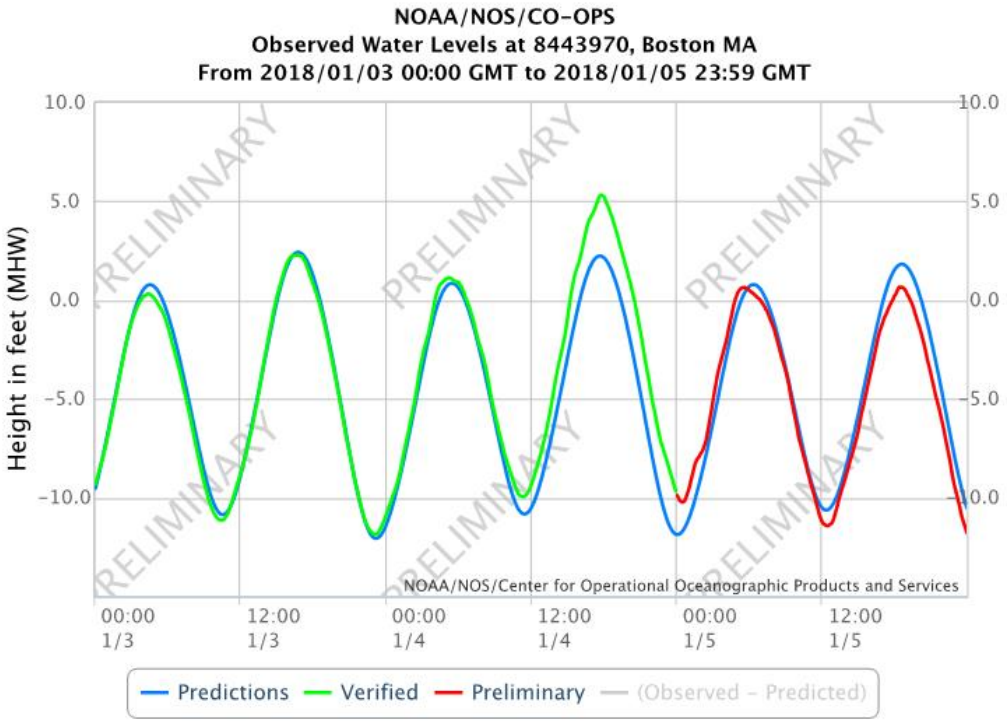
Nareit
ESG forum

Climate Change, Risk & Resiliency

January 24, 2018




NOAA/NOS/CO-OPS
Observed Water Levels at 8443970, Boston MA
From 2018/01/03 00:00 GMT to 2018/01/05 23:59 GMT
Height in feet (MHW)
10.0
5.0
0.0
-5.0
-10.0
PRELIMINARY
NOAA/NOS/Center for Operational Oceanographic Products and Services
00:00 1/3
12:00 1/3
00:00 1/4
12:00 1/4
00:00 1/5
12:00 1/5
Predictions
Verified
Preliminary
(Observed - Predicted)


ATLANTIC WHARF

Prologis

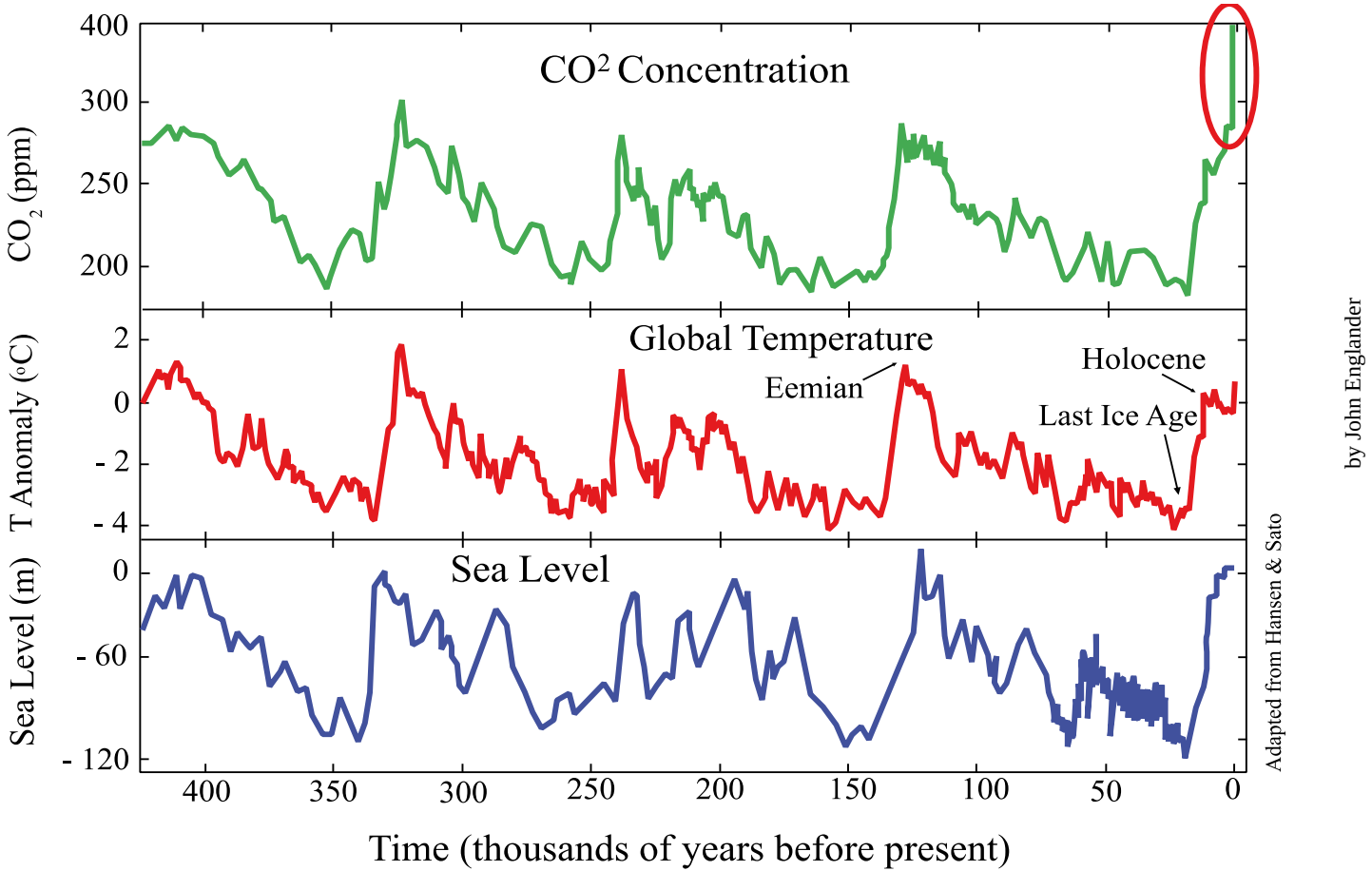
Perspective on Resilience

Session Discussion Questions

- What stance on resiliency has your company taken?
- What are our known exposures to flood risk?
- How may these risks change over time?
- How are government entities planning for sea level rise and how may these efforts impact real estate companies?
- What cost effective measures should we be taking to improve the resilience of our portfolio?
- Why are we talking about this? How does/will resiliency impact the ESG professional?

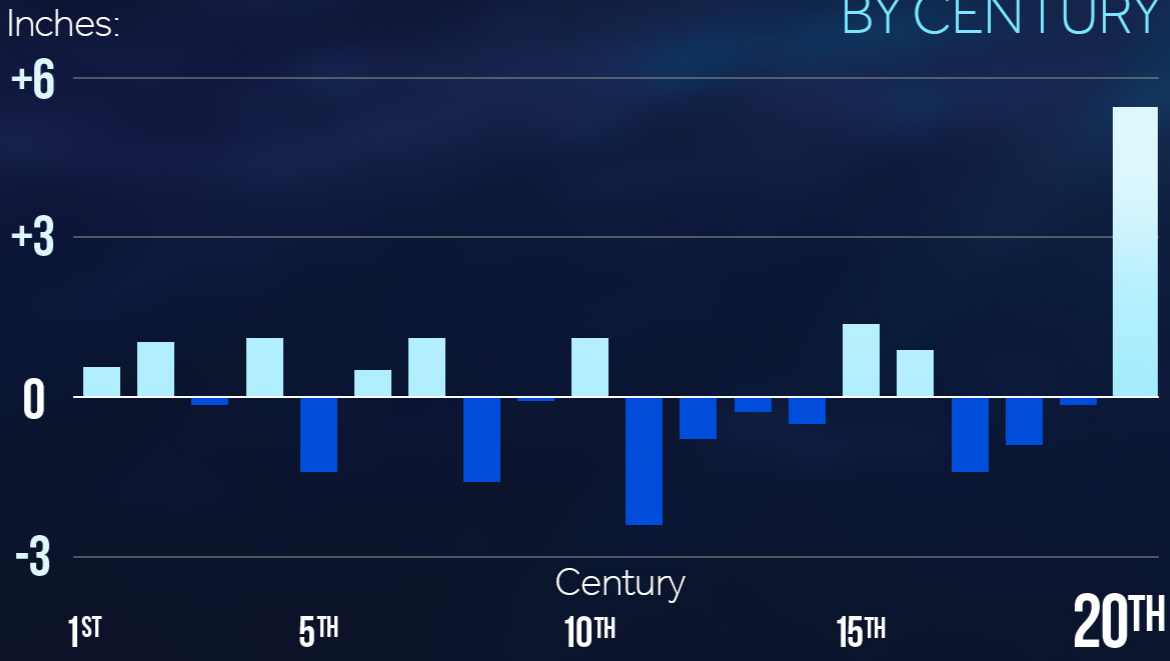
CLIMATE CENTRAL

Dan Rizza
Manager, Program on Sea Level Rise


CO² Concentration
CO2 (ppm)
400
300
250
200
Global Temperature
T Anomaly (°C)
2
0
- 2
- 4
Eemian
Holocene
Last Ice Age
Sea Level
Sea Level (m)
0
- 60
- 120
400
350
300
250
200
150
100
50
0
Time (thousands of years before present)
Adapted from Hansen & Sato
by John Englander

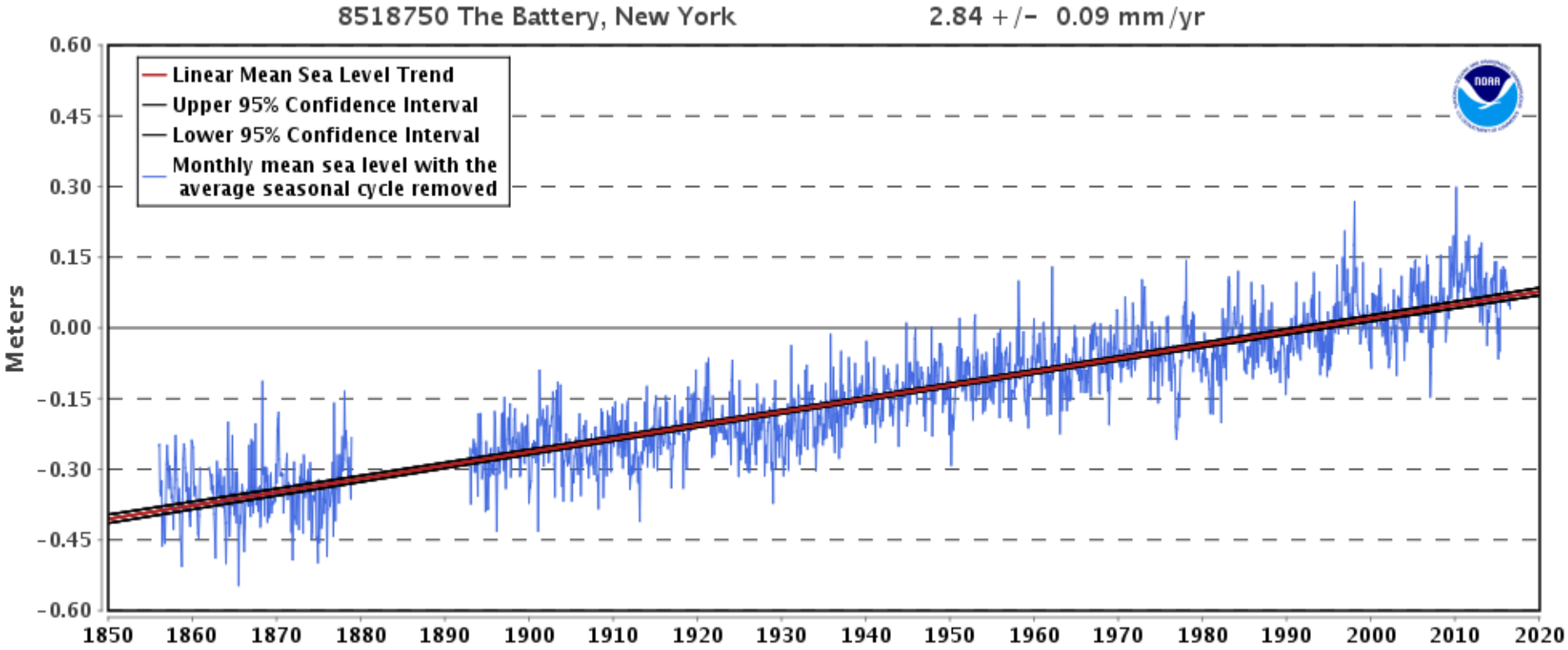
SEA LEVEL RISE

BY CENTURY



Central reconstruction shown
Source: Kopp et al. 2016 (PNAS)

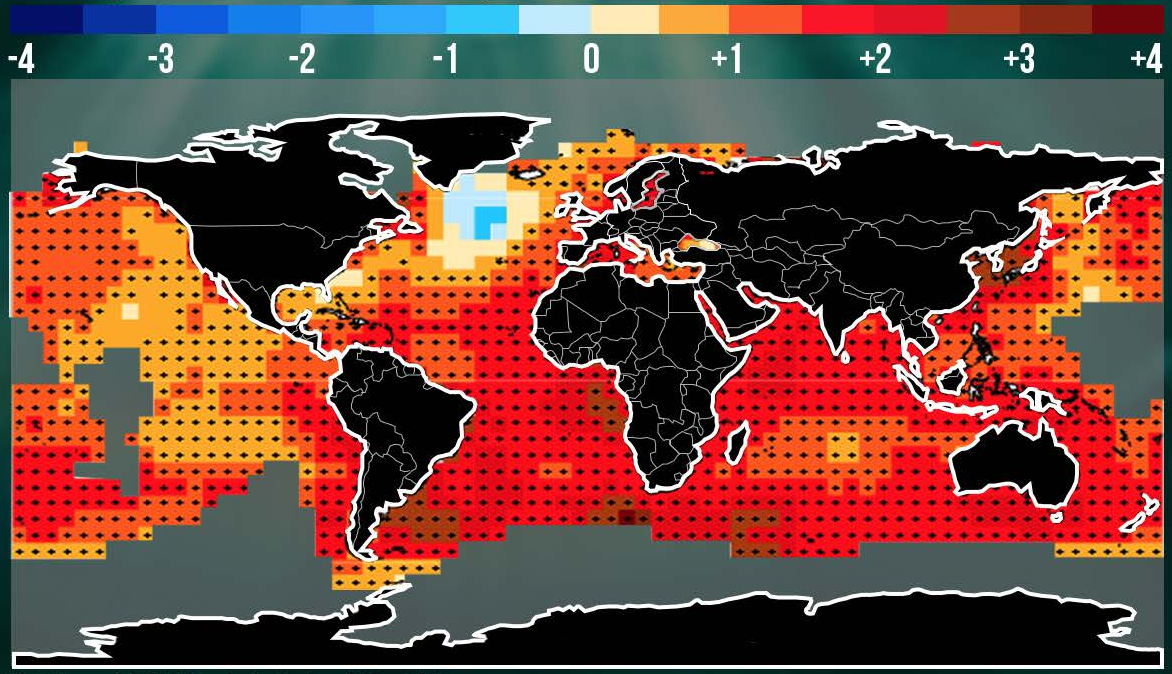
CLIMATE CENTRAL


8518750 The Battery, New York
2.84 +/- 0.09 mm/yr
Linear Mean Sea Level Trend
Upper 95% Confidence Interval
Lower 95% Confidence Interval
Monthly mean sea level with the average seasonal cycle removed
Meters
0.60
0.45
0.30
0.15
0.00
-0.15
-0.30
-0.45
-0.60
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020

Map created by gesla

OCEANS HEATING UP

Change in Sea Surface Temperature (°F) Since 1901:



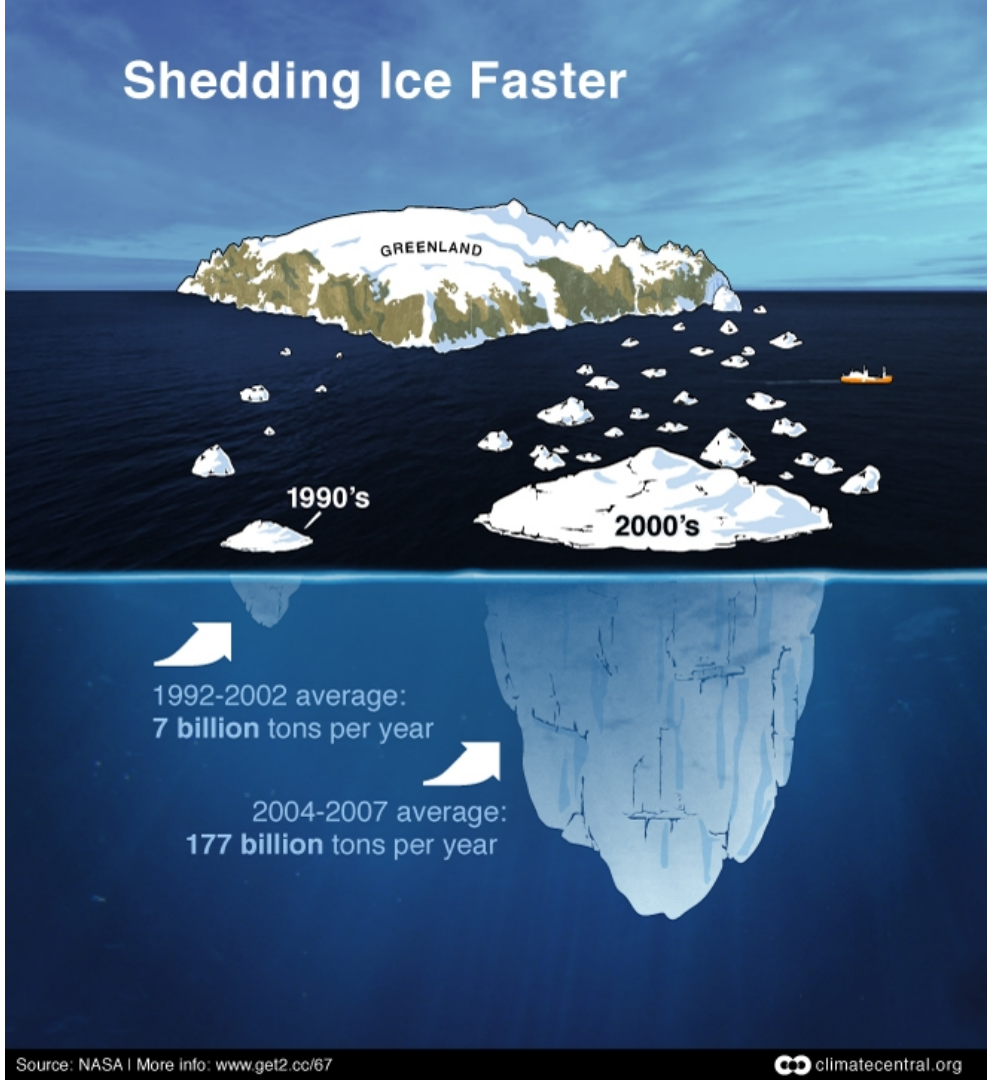
Data through 2014. Gray indicates insufficient data
"+" Indicates statistically significant trend
Source: IPCC, NOAA: Merged Land-Ocean Surface Temp Analysis

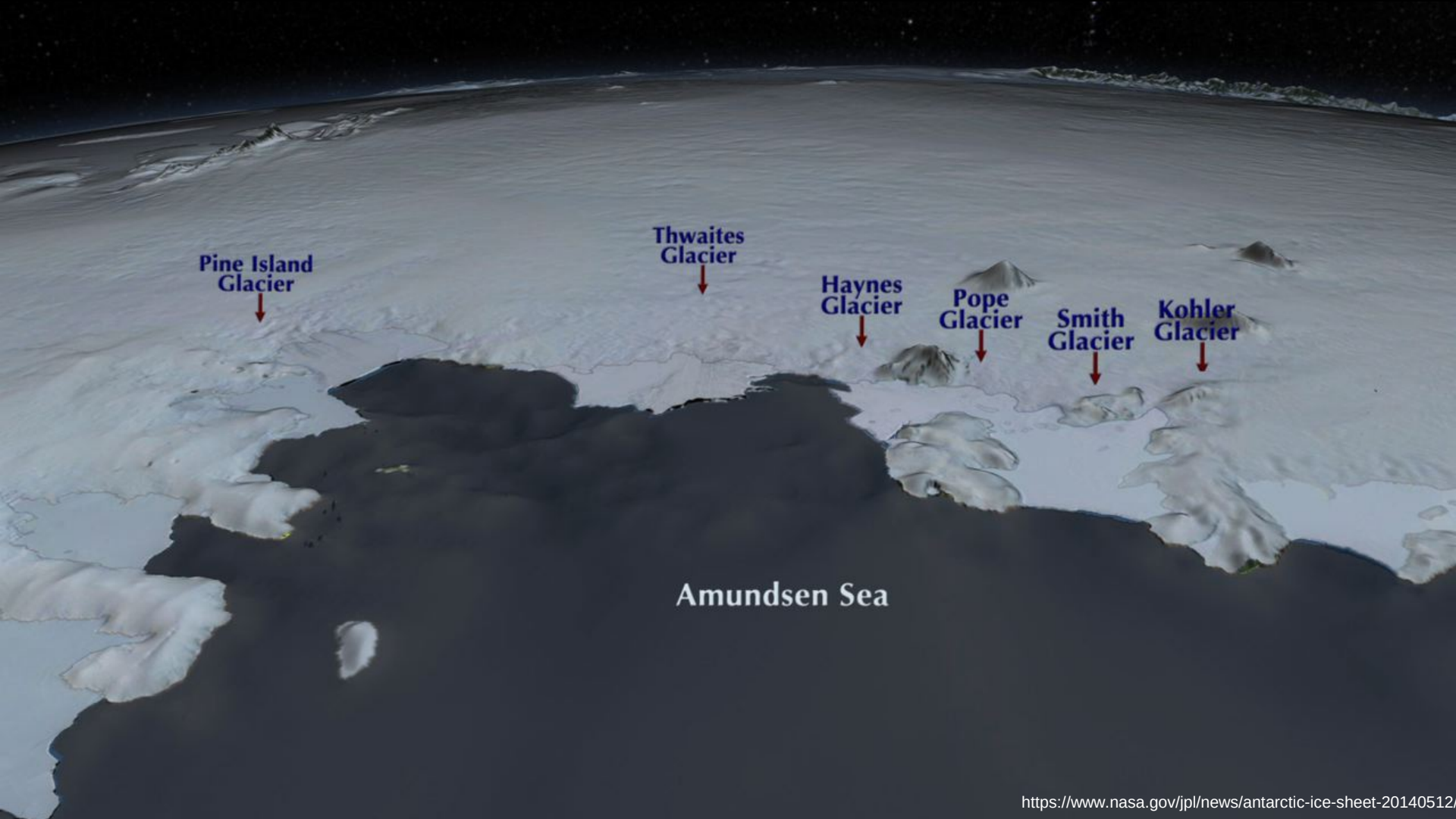
CLIMATE CENTRAL

Muir and Riggs Glaciers, Alaska

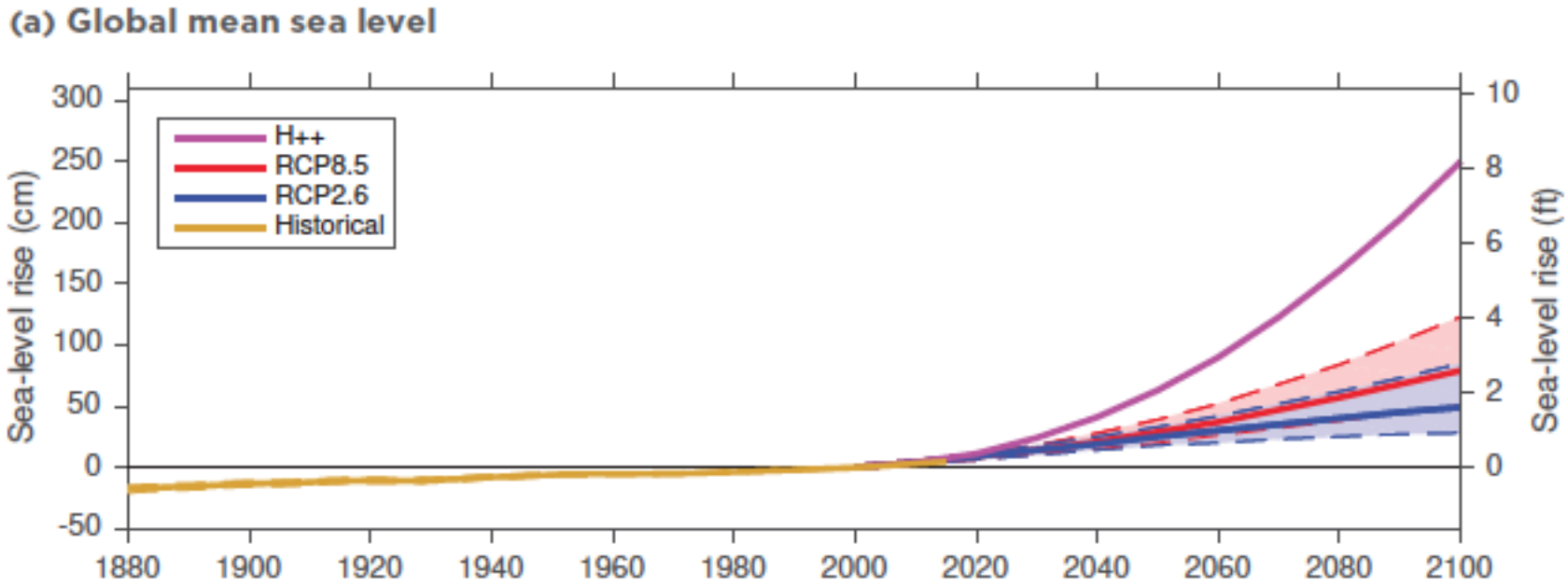
USGS

1941 **1950** **2004**


Shedding Ice Faster
GREENLAND
1990's
2000's
1992-2002 average:
7 billion tons per year
2004-2007 average:
177 billion tons per year
Source: NASA | More info: www.get2.cc/67
climatecentral.org

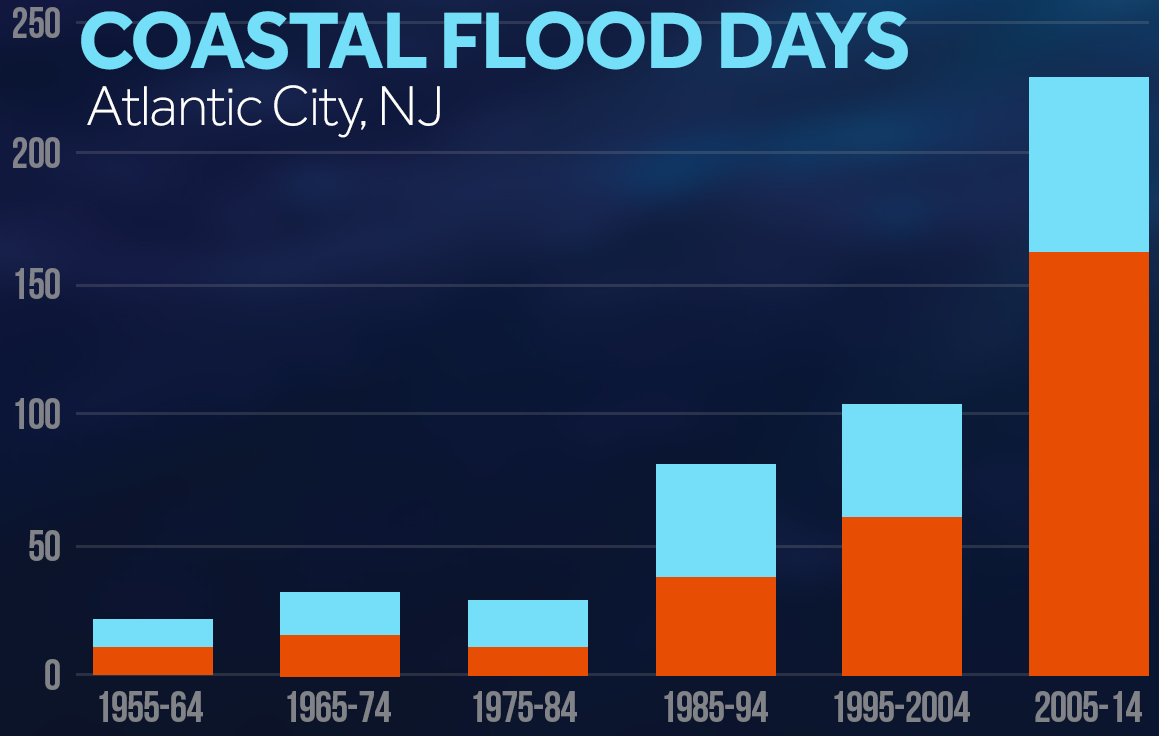


https://www.nasa.gov/jpl/news/antarctic-ice-sheet-20140512/



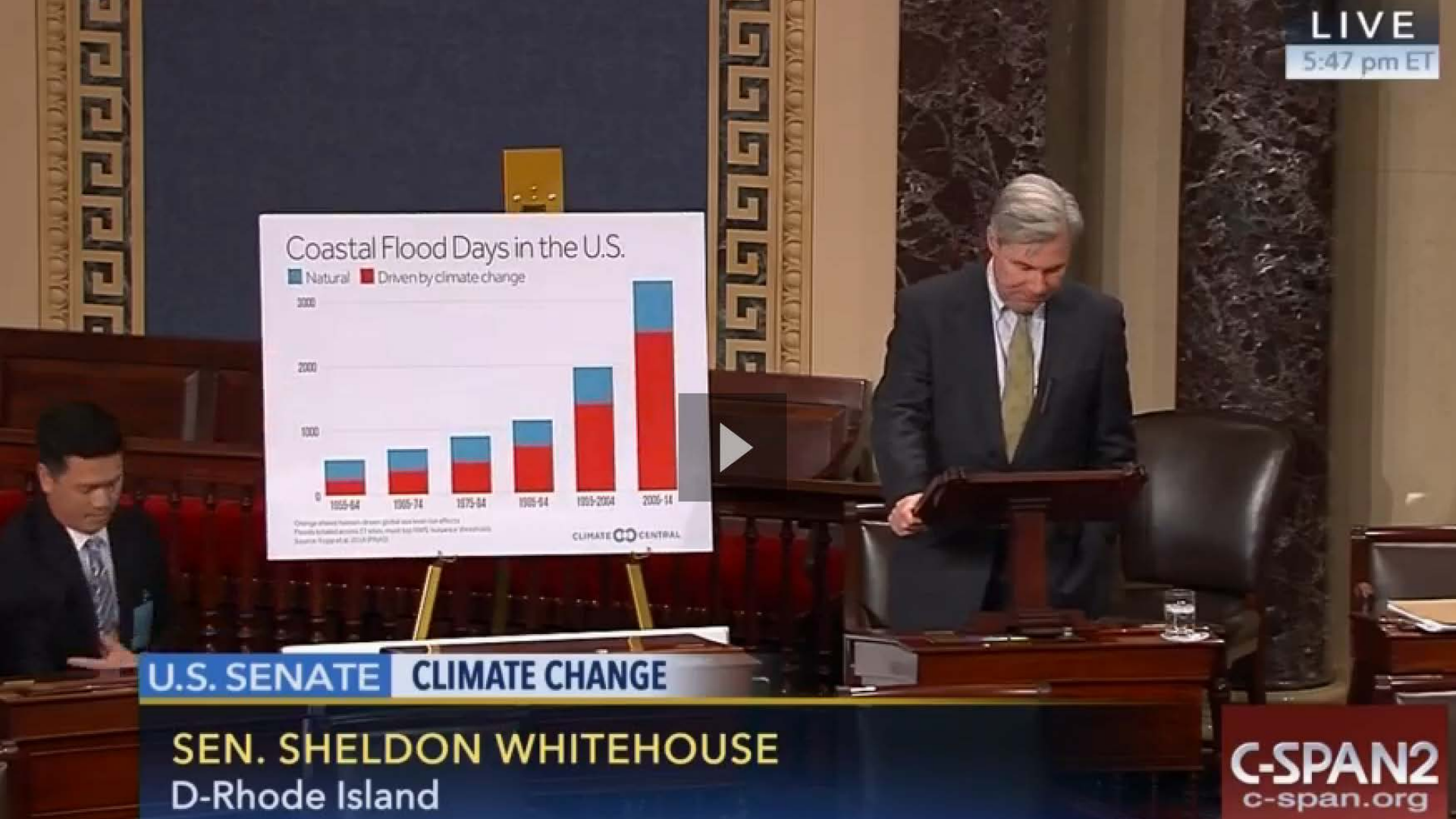
Griggs, G, Árvai, J, Cayan, D, DeConto, R, Fox, J, Fricker, HA, Kopp, RE, Tebaldi, C, Whiteman, EA (California Ocean Protection Council Science Advisory Team Working Group). Rising Seas in California: An Update on Sea-Level Rise Science. California Ocean Science Trust, April 2017.

NATURAL + HUMAN-CAUSED
COASTAL FLOOD DAYS
Atlantic City, NJ

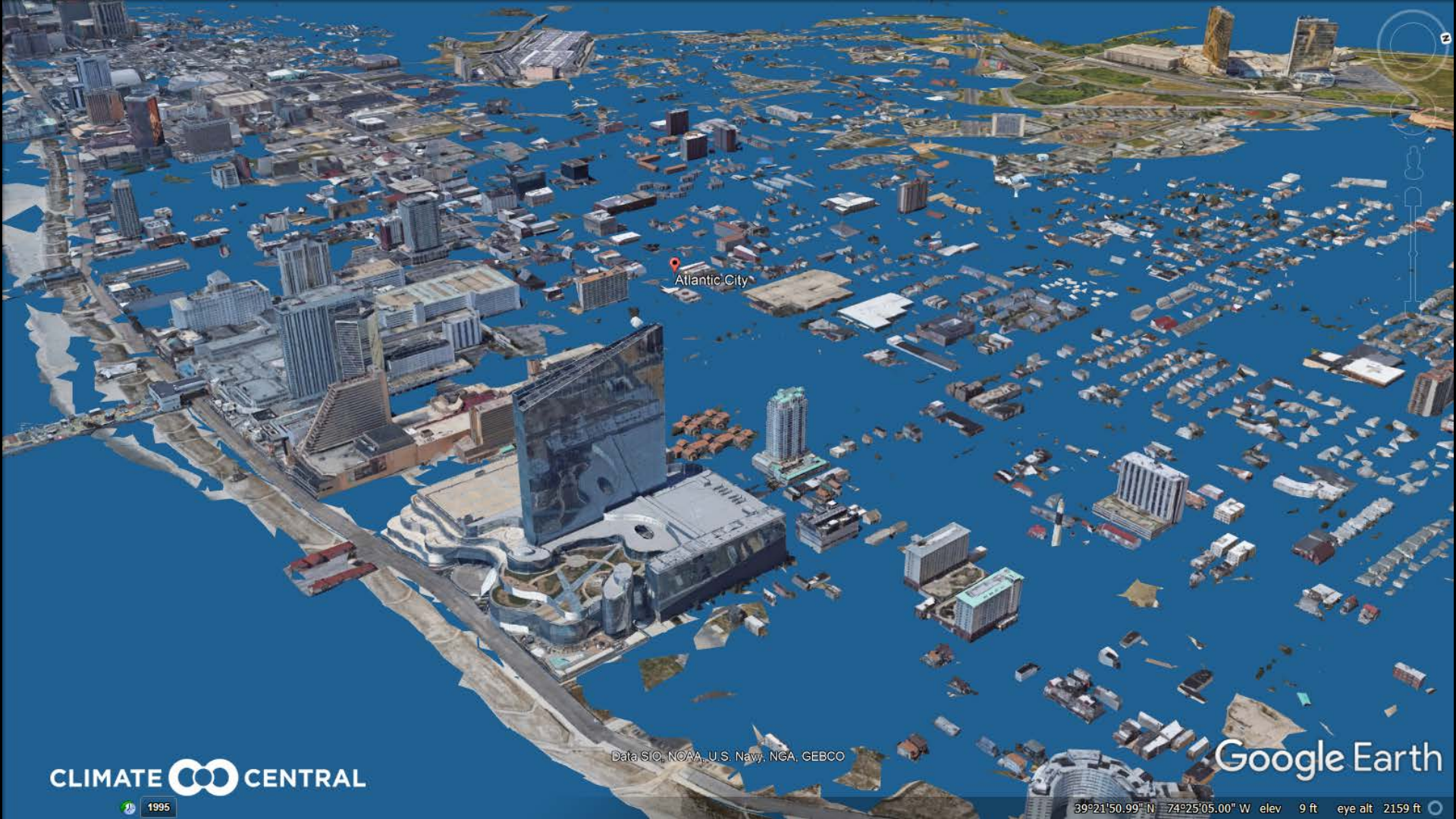


Orange shows human-caused global sea level rise effects
Must top NWS 'nuisance' thresholds
Source: Kopp et al. 2016 (PNAS), NOAA, & Climate Central

CLIMATE CENTRAL


LIVE
5:47 pm ET
Coastal Flood Days in the U.S.
Natural
Driven by climate change
2000
1000
0
1955-64
1965-74
1975-84
1985-94
1995-2004
2005-14
CLIMATE CENTRAL
U.S. SENATE
CLIMATE CHANGE
SEN. SHELDON WHITEHOUSE
D-Rhode Island
C-SPAN2
c-span.org


Atlantic City
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth
CLIMATE CENTRAL
1995
39°21'50.99" N 74°25'05.00" W elev 9 ft eye alt 2159 ft


Atlantic City
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
CLIMATE CENTRAL
1995
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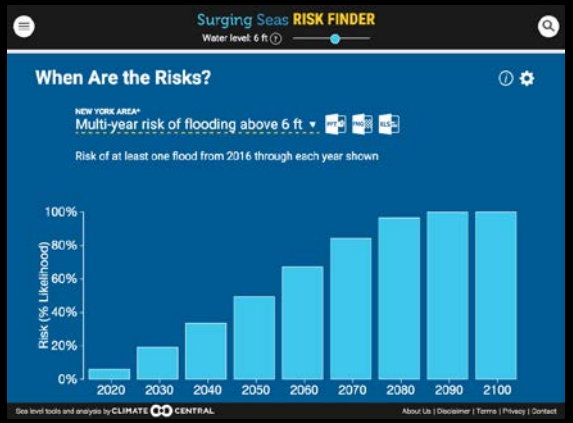
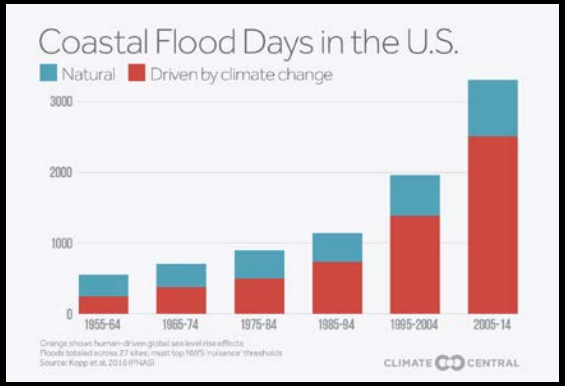
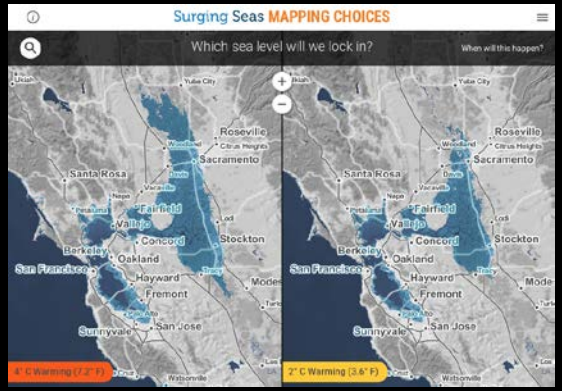
39°21'50.99" N 74°25'05.00" W elev 9 ft eye alt 2159 ft

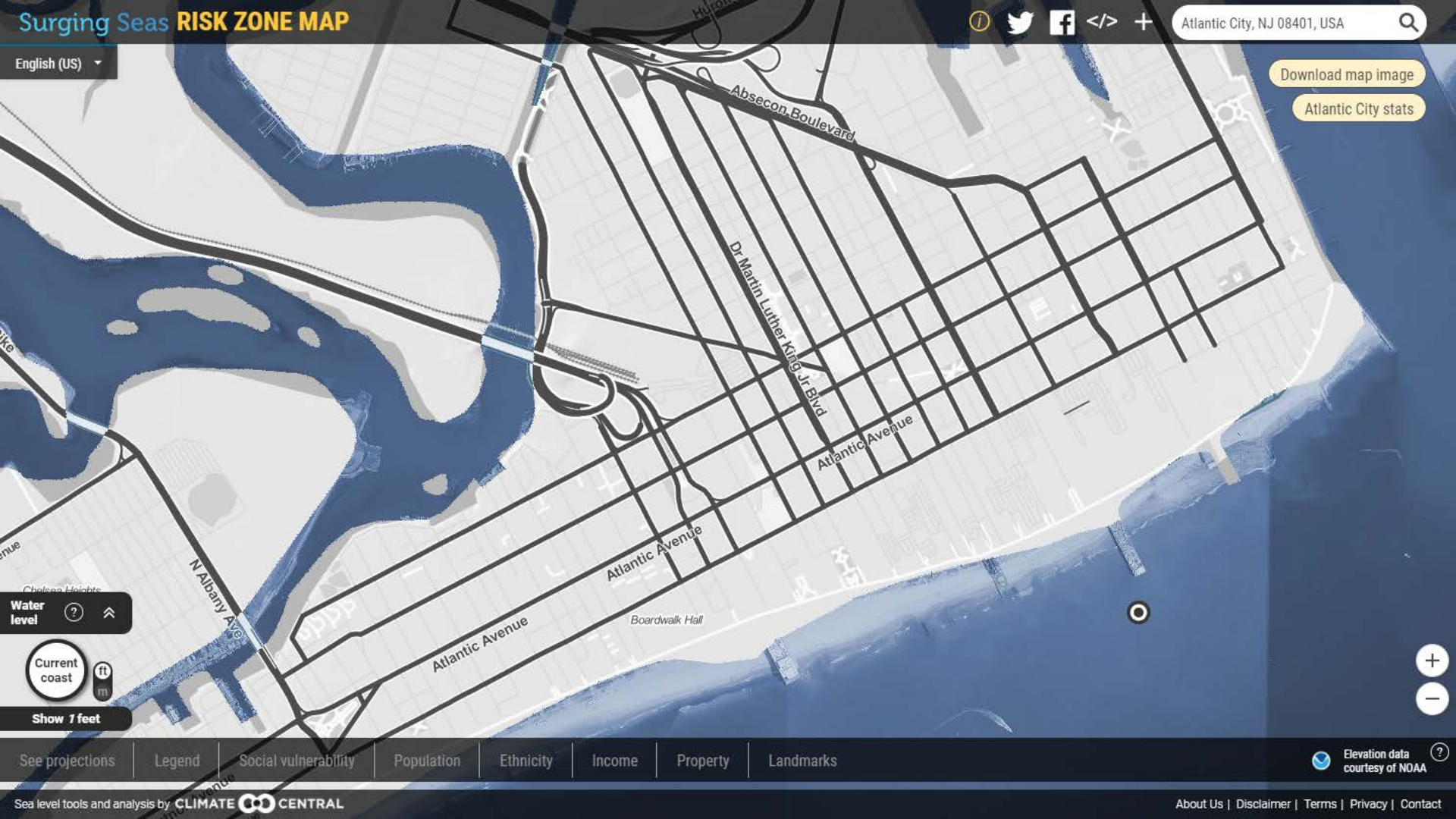




Past, Present and Future Sea Level Threats

Climate Central Studies, Web Tools & Visualizations




Surging Seas RISK ZONE MAP
English (US)
Atlantic City, NJ 08401, USA
Download map image
Atlantic City stats
Absecon Boulevard
Dr Martin Luther King Jr Blvd
Atlantic Avenue
Atlantic Avenue
Atlantic Avenue
N Albany Ave
Boardwalk Hall
Water level
Current coast
ft
m
Show 1 feet
See projections
Legend
Social vulnerability
Population
Ethnicity
Income
Property
Landmarks
Elevation data courtesy of NOAA
Sea level tools and analysis by CLIMATE CENTRAL
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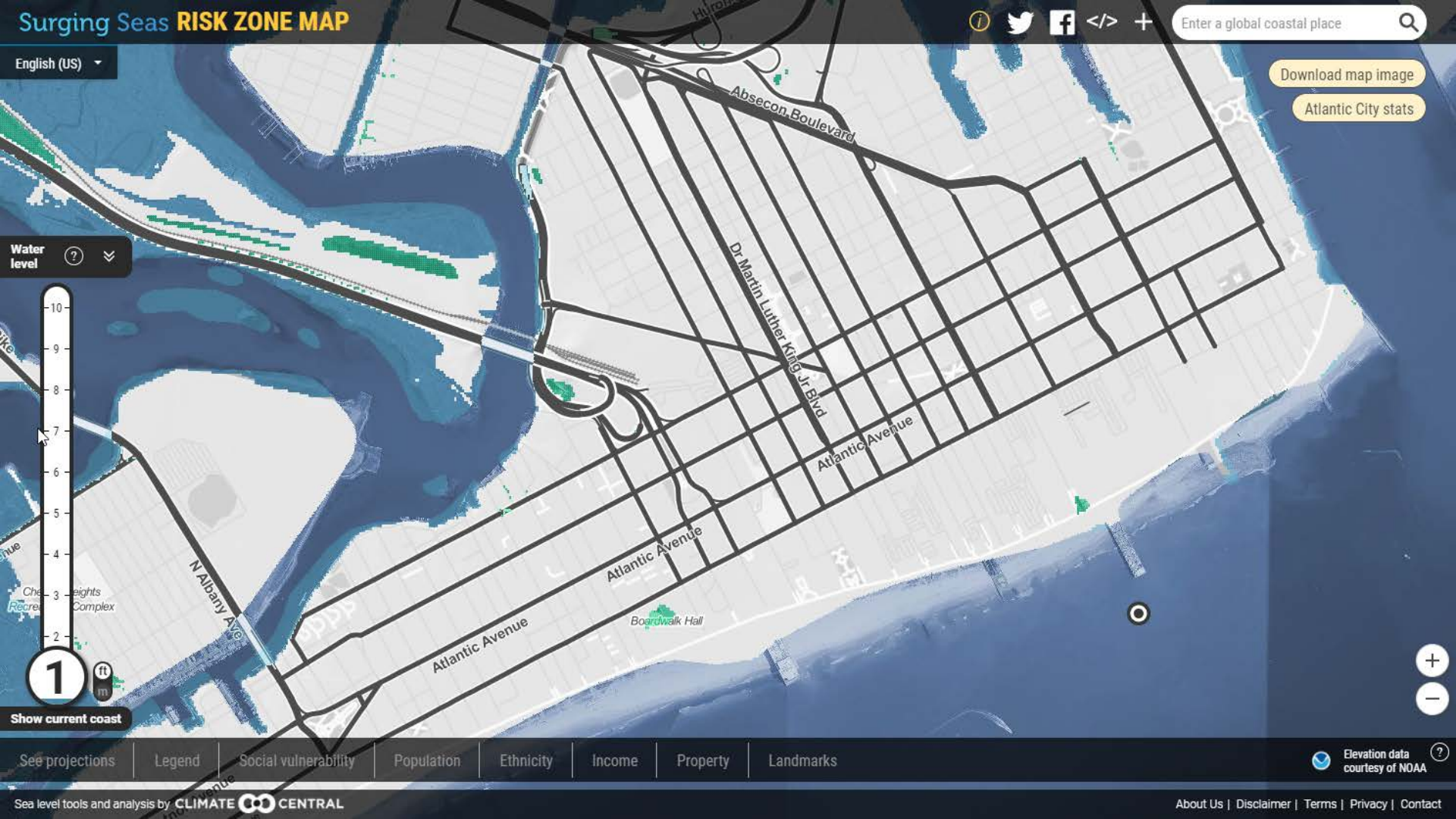
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English (US)
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Boardwalk Hall
Water level
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m
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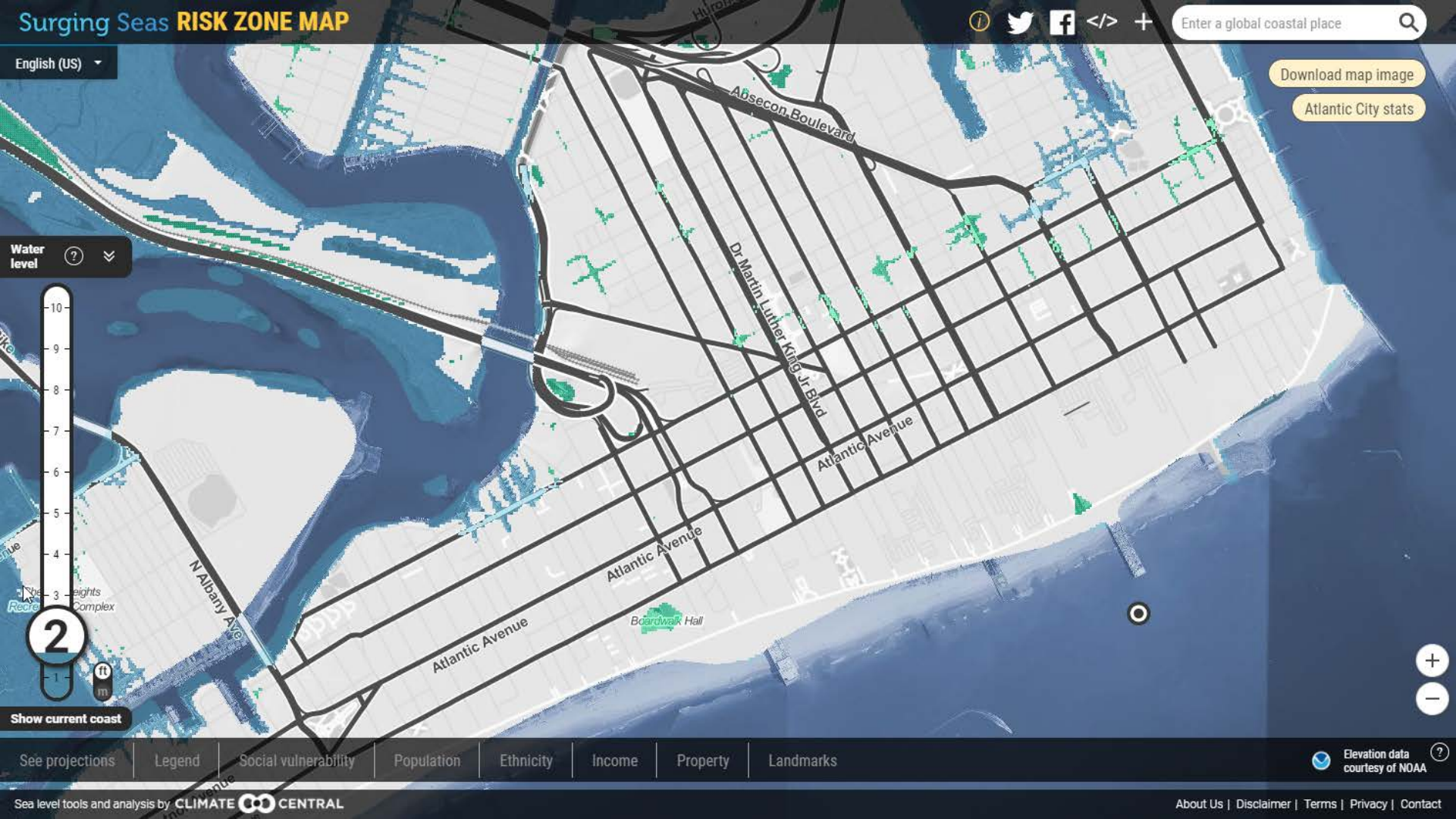
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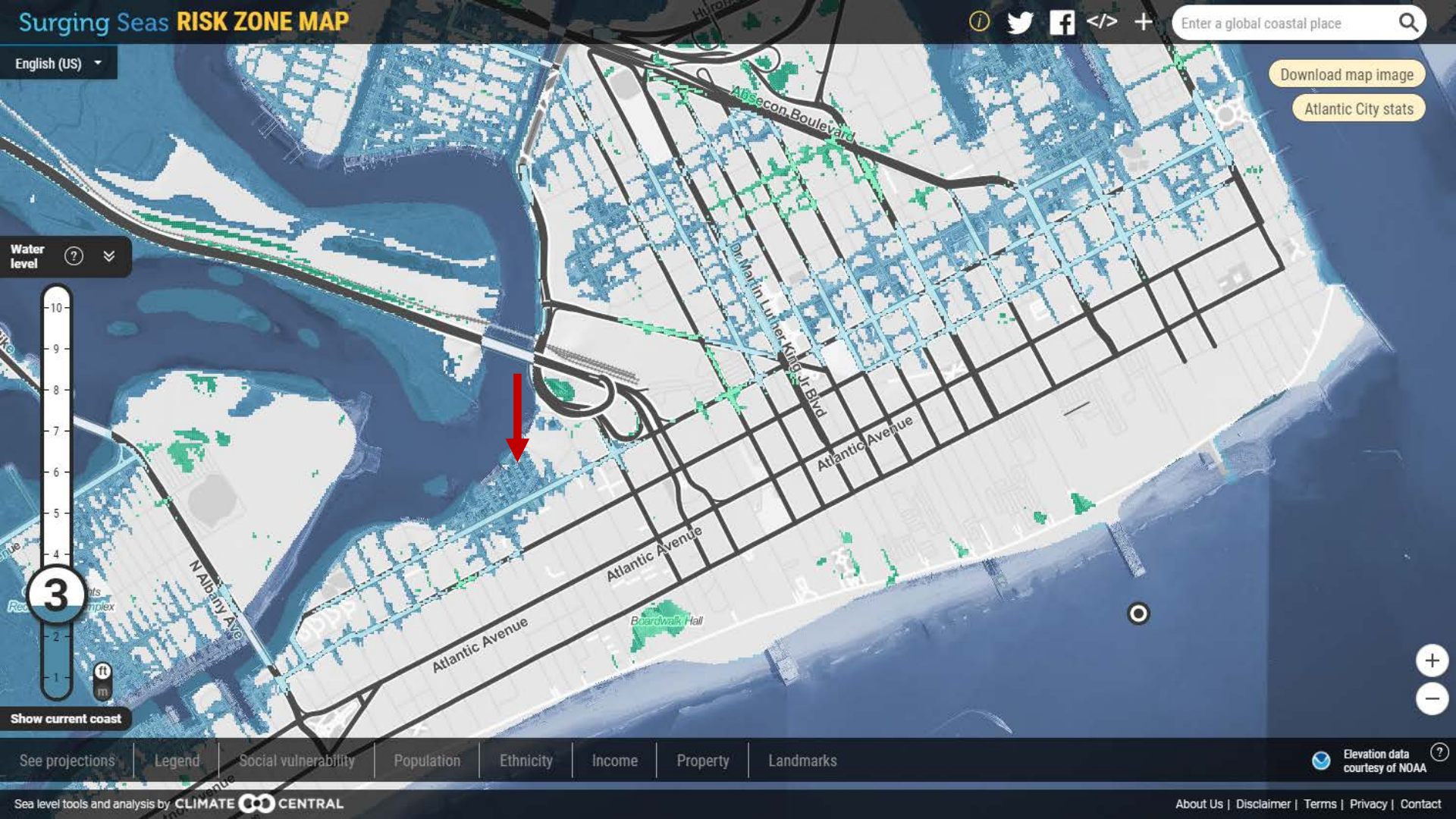
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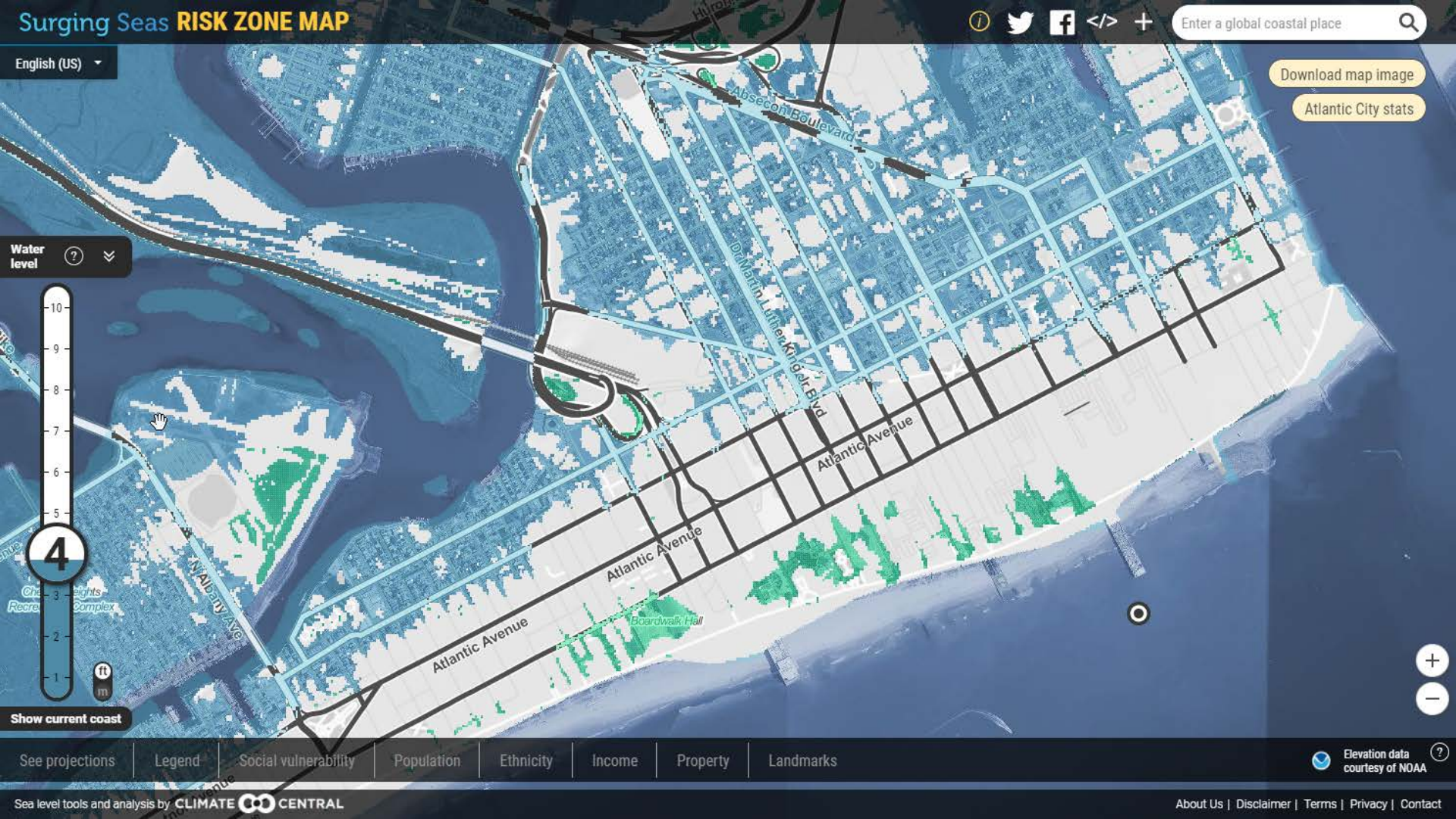
Credit: Ted Blanco, Climate Central

John Upton, Climate Central


CALIFORNIA AVE.
NO CASINO BUS TRAFFIC
Arizona Ave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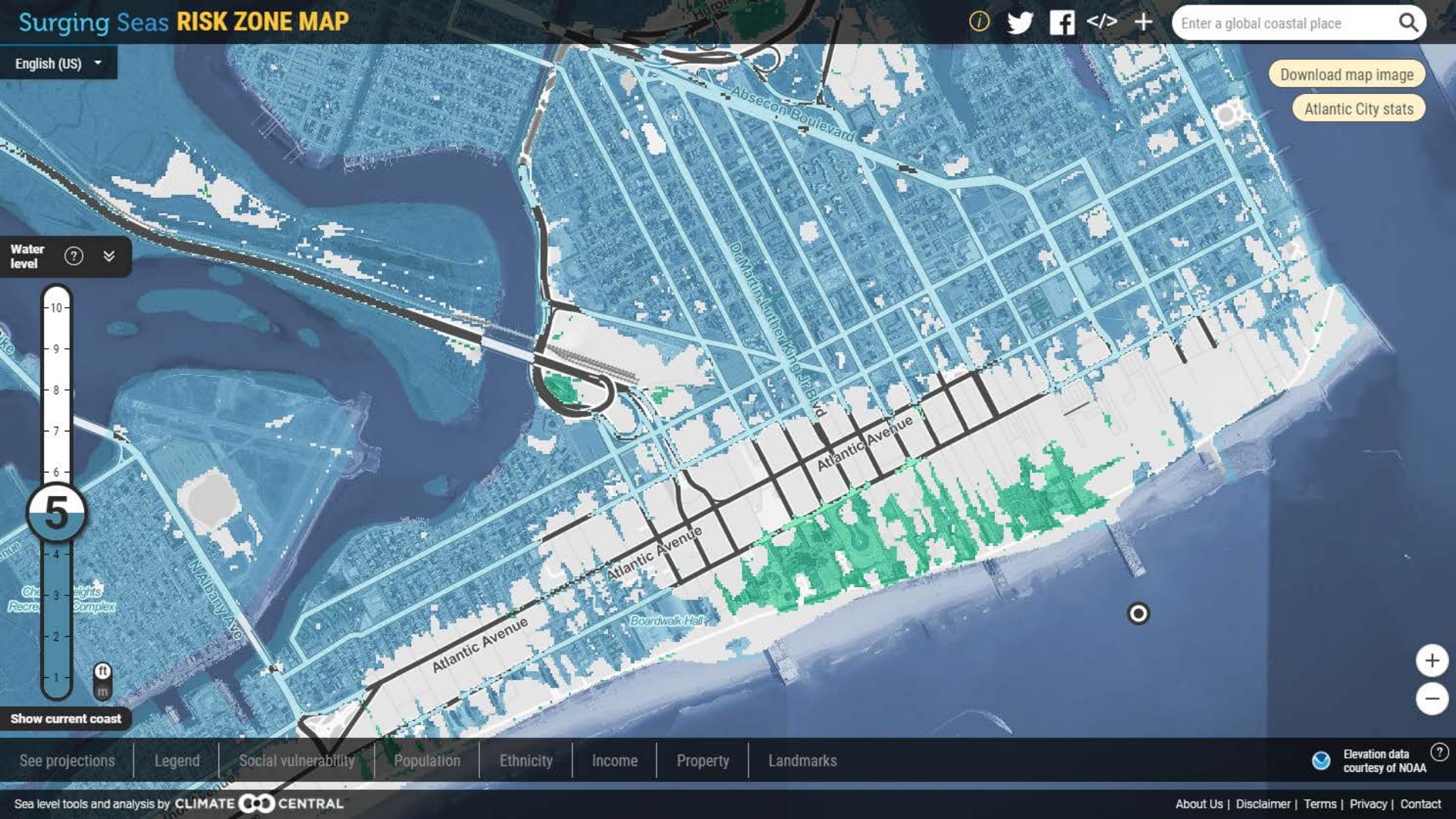
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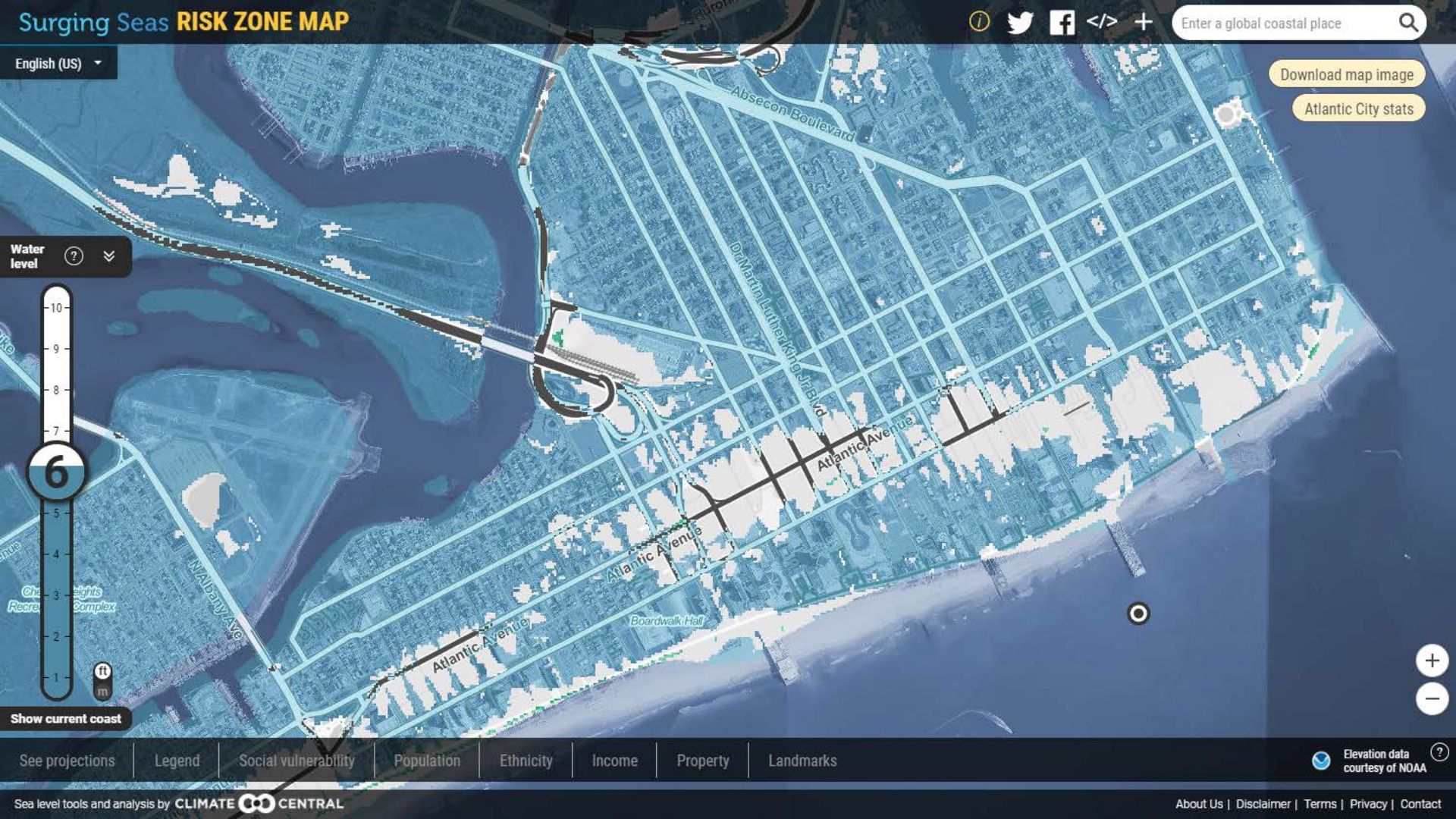
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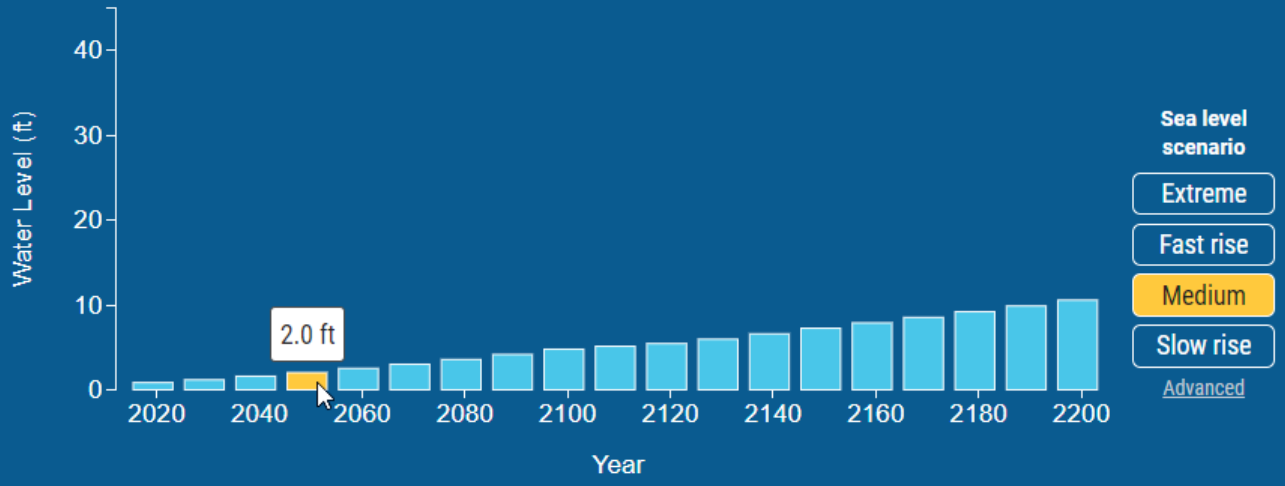
Atlantic City, NJ, USA

When Are the Risks?

ATLANTIC CITY AREA*

Projected sea level rise ▼ PPT PNG XLS

A localized projection



*At Atlantic City water level station, 2 miles from Atlantic City

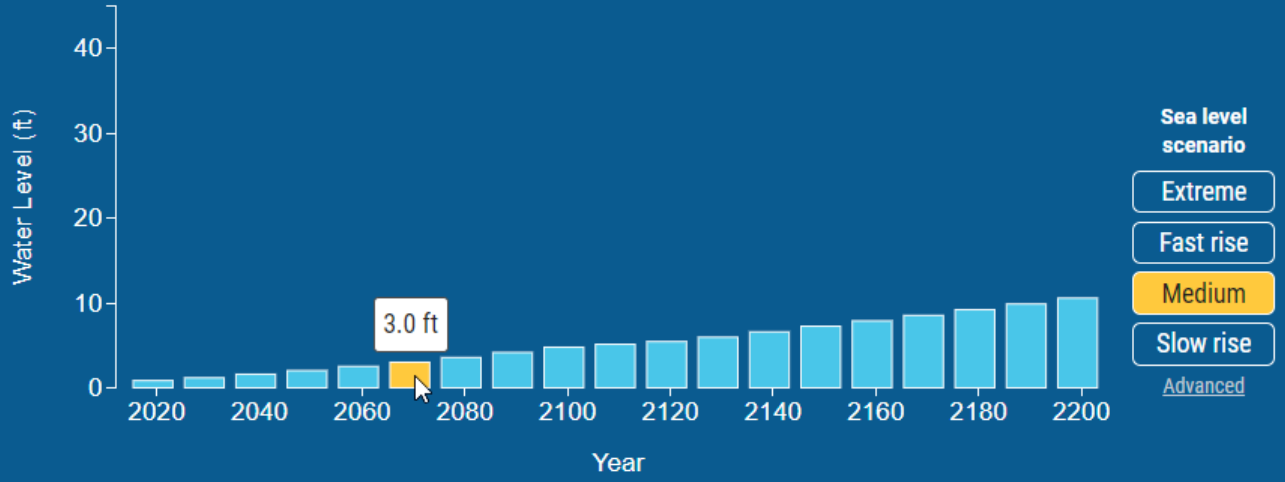
Atlantic City, NJ, USA

When Are the Risks?

ATLANTIC CITY AREA*

Projected sea level rise ▼ PPT PNG XLS

A localized projection



*At Atlantic City water level station, 2 miles from Atlantic City

Surging Seas **RISK FINDER**

Enter a coastal place

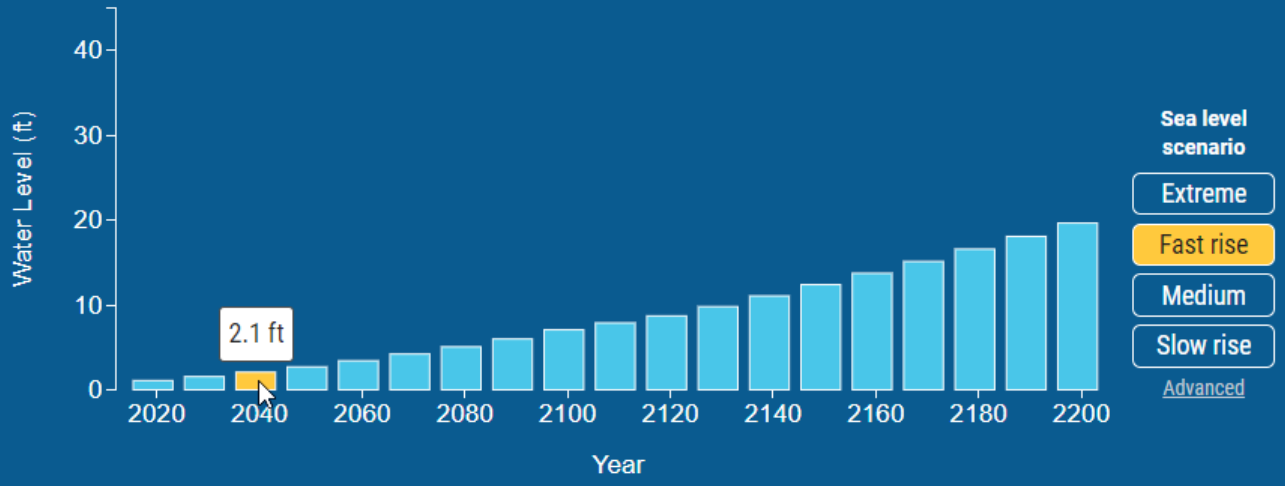
Atlantic City, NJ, USA

When Are the Risks?

ATLANTIC CITY AREA*

Projected sea level rise ▼ PPT PNG XLS

A localized projection



*At Atlantic City water level station, 2 miles from Atlantic City

Water level (ft)

10
9
8
7
6
5
4
3
2
1

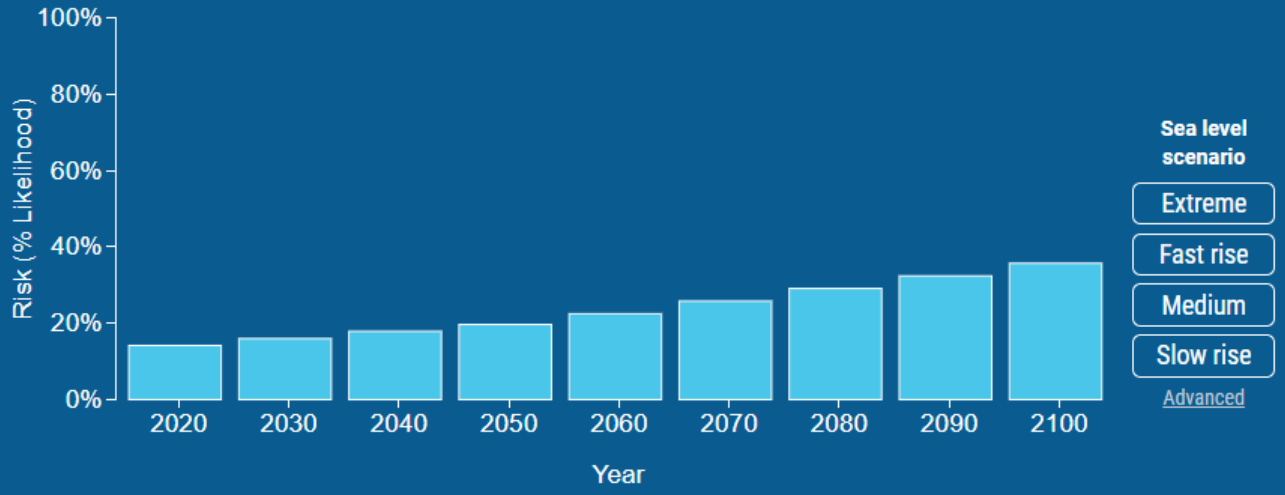
When Are the Risks?

ATLANTIC CITY AREA*

Single-year risk of flooding above 3 ft ▼

PPT PNG XLS

Risk of at least one flood within each year shown



Sea level scenario

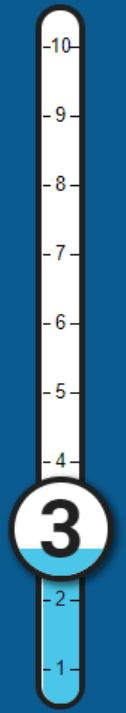
- Extreme
- Fast rise
- Medium
- Slow rise

Advanced

*At Atlantic City water level station, 2 miles from Atlantic City

Analysis uses sea level projections based on local factors only, assuming no global sea level rise or warming (useful for comparisons). Key notes

Water level (ft)



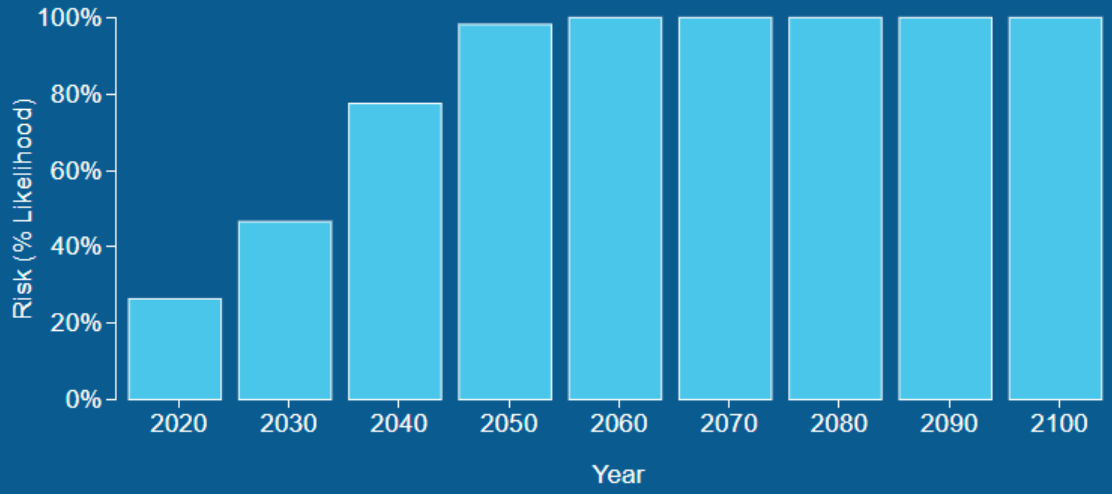
When Are the Risks?

ATLANTIC CITY AREA*

Single-year risk of flooding above 3 ft ▼

PPT PNG XLS

Risk of at least one flood within each year shown



Sea level scenario

- Extreme
- Fast rise
- Medium
- Slow rise

Advanced

At Atlantic City water level station, 2 miles from Atlantic City

Analysis uses sea level projections localized from the intermediate high global sea level scenario of the U.S. National Climate Assessment (2014). Key notes

Water level (ft)

10
9
8
7
6
5
4
3
2
1

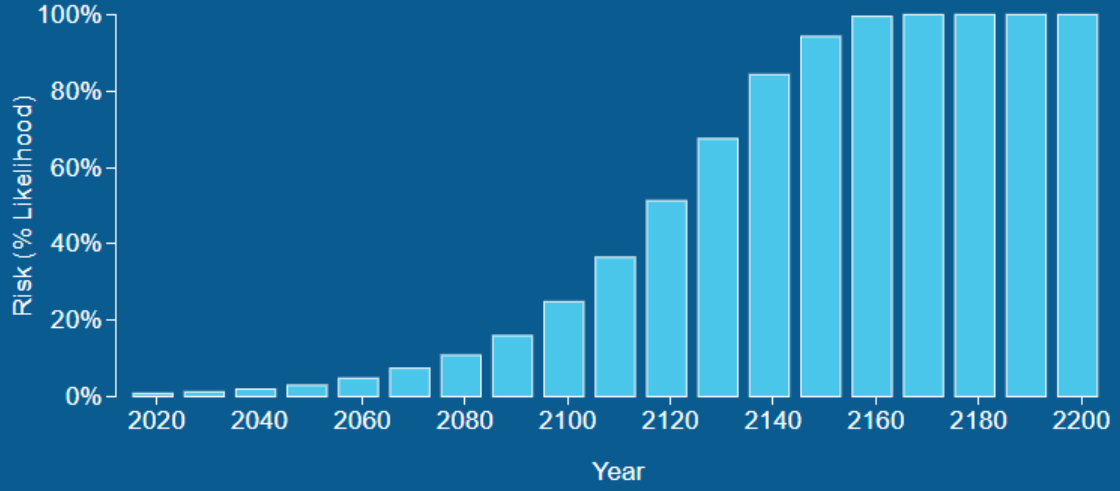
When Are the Risks?

ATLANTIC CITY AREA*

Single-year risk of flooding above 5 ft ▼

PPT PNG XLS

Risk of at least one flood within each year shown



Sea level scenario

- Extreme
- Fast rise
- Medium
- Slow rise

Advanced

At Atlantic City water level station, 2 miles from Atlantic City

Analysis uses median local sea level projections based on the intermediate low scenario from NOAA Technical Report NOS CO-OPS 083 (2017), intended for the 2018 U.S. National Climate Assessment.

Water level (ft)

10
9
8
7
6
5
4
3
2
1

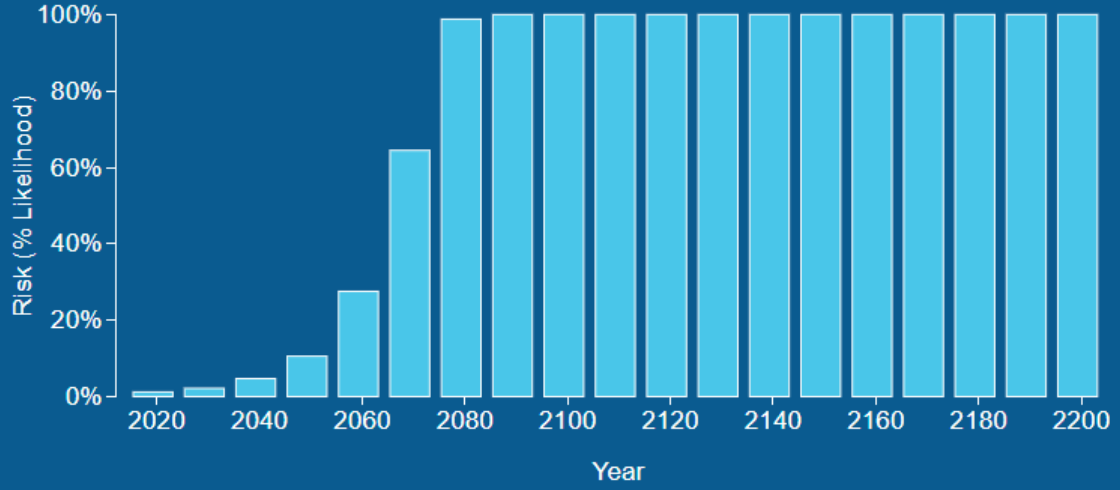
When Are the Risks?

ATLANTIC CITY AREA*

Single-year risk of flooding above 5 ft ▼

PPT PNG XLS

Risk of at least one flood within each year shown



Sea level scenario

- Extreme
- Fast rise
- Medium
- Slow rise

Advanced

*At Atlantic City water level station, 2 miles from Atlantic City

Analysis uses median local sea level projections based on the intermediate scenario from NOAA Technical Report NOS CO-OPS 083 (2017), intended for the 2018 U.S. National Climate Assessment. Key

Water level (ft)

10
9
8
7
6
5
4
3
2
1

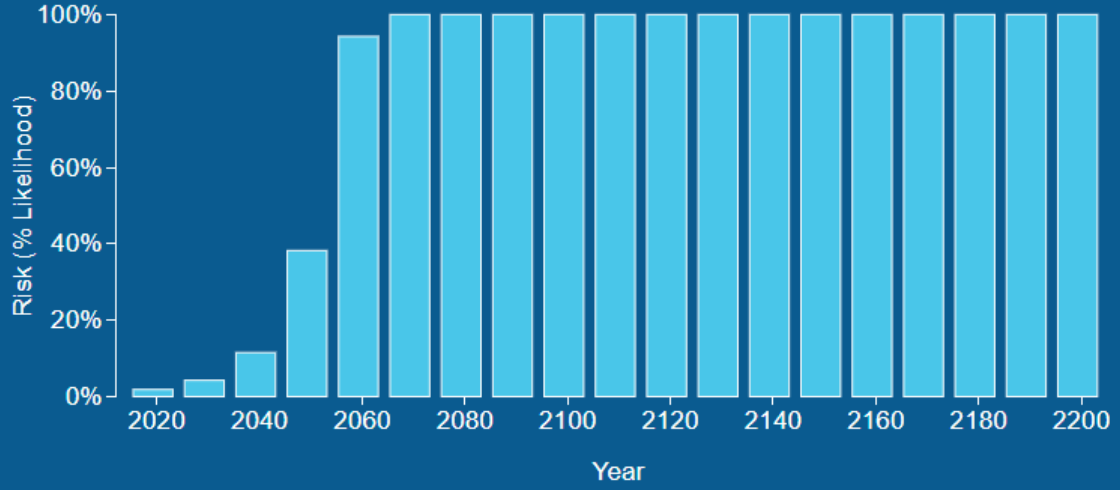
When Are the Risks?

ATLANTIC CITY AREA*

Single-year risk of flooding above 5 ft ▼

PPT PNG XLS

Risk of at least one flood within each year shown



Sea level scenario

- Extreme
- Fast rise
- Medium
- Slow rise

Advanced

At Atlantic City water level station, 2 miles from Atlantic City

Analysis uses median local sea level projections based on the intermediate high scenario from NOAA Technical Report NOS CO-OPS 083 (2017), intended for the 2018 U.S. National Climate Assessment.

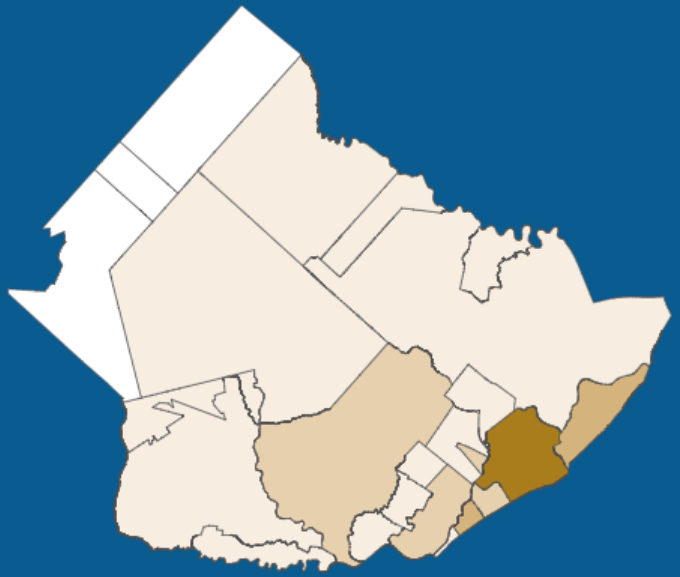
Water level (ft)

10
9
8
7
6
5
4
3
2
1

Choose a threat to map using the scrollable list above

Total roads below 5ft in Atlantic County by municipality

PPT PNG XLS



Miles of road

89 miles
46 miles
28 miles
12 miles
0

Legend values are bin upper limits

Top threats on map

Atlantic City	89 miles
Brigantine	46 miles
Margate City	39 miles
Ventnor City	28 miles
Egg Harbor Twp.	24 miles

Sources for raw roads data: Census 2012 | *Details*

Values exclude sub-5ft areas potentially protected by levees or other features.

Water level (ft)

What Is at Risk?

Population | Buildings | Infrastructure | Contamination Risks | Land

Total population below 5ft in Atlantic City

Population: All	Total
Population	29,482
Population of color	22,567
High social vulnerability population	20,087
African-American population	13,188
Medium social vulnerability population	9,395
Hispanic population	8,855
Caucasian population	7,835

Sources for raw population data: Census 2010 | Details

Values exclude sub-5ft areas potentially protected by levees or other features.

Water level (ft)

10 9 8 7 6 **5** 4 3 2 1

What Is at Risk?

Population | Buildings | Infrastructure | Contamination Risks | Land

Total infrastructure below 5ft in Atlantic City

Infrastructure: All	Total
Roads	89 miles
Local roads	84 miles
Secondary roads	7 miles
FM radio transmitter sites	5
Federal roads	4 miles
Heliports	4
Mainline rail	3 miles

Sources for raw roads data: Census 2012 | *Details*

Values exclude sub-5ft areas potentially protected by levees or other features.

www.riskfinder.org

Exposure analysis of over 100 demographic, economic, infrastructure, and environmental variables

- High social vulnerability population
- Medium social vulnerability population
- Low social vulnerability population
- Property value
- Population
- Caucasian population
- Population of color
- African-American population
- Asian population
- Hispanic population
- Native American population
- Homes
- Hospitals
- Schools
- Colleges and Universities
- Libraries
- Theater, music & arts buildings
- Museums
- Houses of worship
- Government buildings
- City Halls
- Roads
- County roads
- Federal roads
- Local roads
- Primary roads
- Secondary roads
- State roads
- Railroads
- Amtrak rail
- Mainline rail
- Non-mainline rail
- All passenger rail
- Intermodal freight terminals
- Passenger stations
- Amtrak stations
- Intercity bus stations
- Ferry stations
- Intercity passenger stations
- Rail stations
- Commuter or intercity rail stations
- Rail transit stations
- Transit passenger stations
- Airports
- Major airports
- Military airports
- Private airports
- Public airports
- Regional airports
- Heliports
- Power plants
- Commercial & industrial power plants
- Independent power plants
- Major power plants
- Minor power plants
- Utility power plants
- TV transmitter sites
- FM radio transmitter sites
- Brownfields
- EPA listed sites
- ACRES sites
- Biennial Reporters
- Superfund (CERCLIS) sites
- NPDES sites
- National Priorities List sites
- OIL sites
- OTAQREG sites
- RADINFO sites
- RMP sites
- SSTS sites
- TRI sites
- TSCA sites
- Hazardous materials facilities
- Listed carcinogen facilities
- Extreme hazmat facilities
- Oil facilities
- Pesticide facilities
- Hazardous waste sites
- Major hazwaste source sites
- Minor hazwaste source sites
- Unspecified hazardous waste sites
- Landfills
- Wastewater sites
- Major wastewater sites
- Nonmajor wastewater sites
- Sewage plants
- Land
- Protected land

Moody's Warns Cities to Address Climate Risks or Face Downgrades

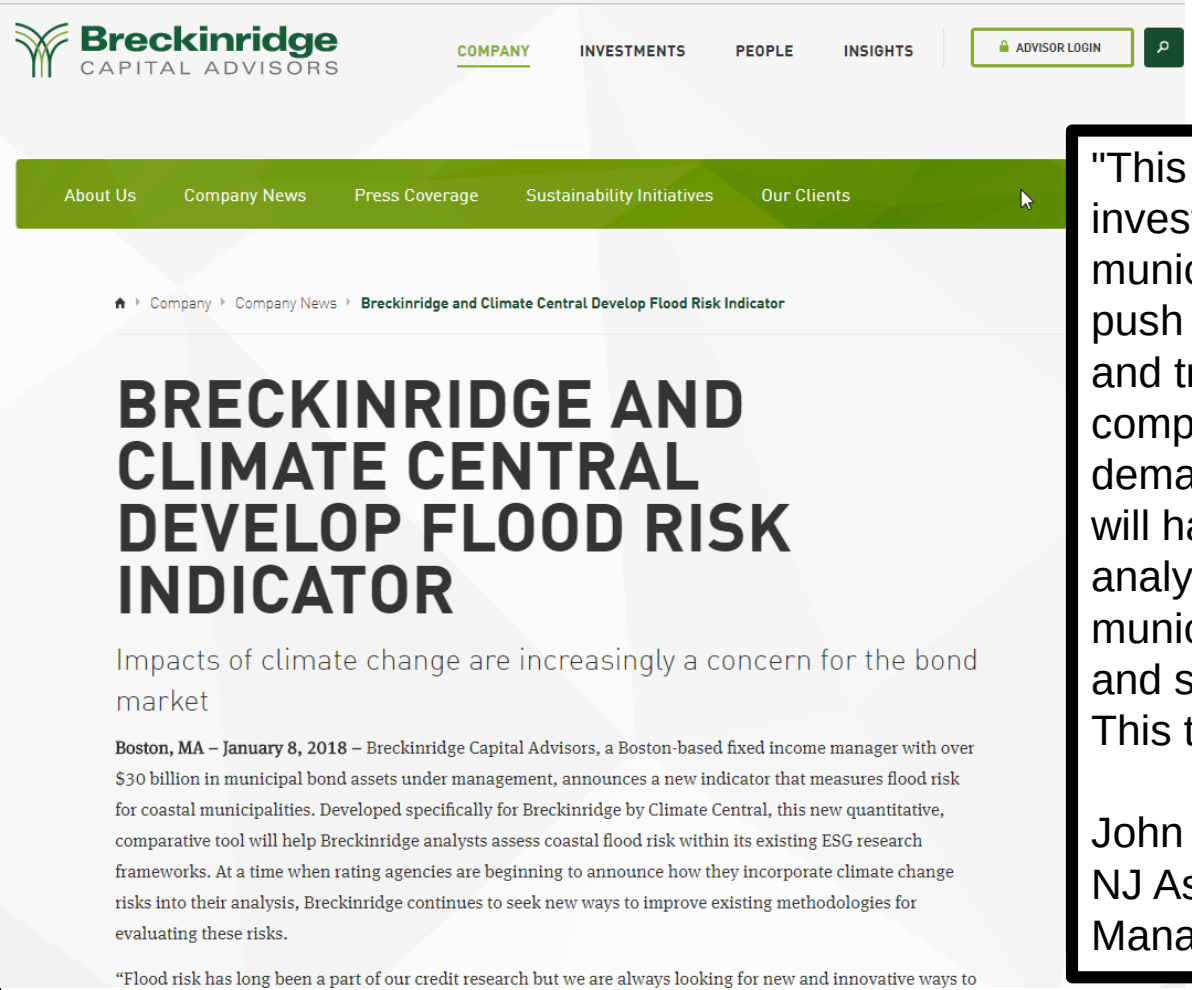
By **Christopher Flavelle**
November 29, 2017, 4:00 AM EST
From **Climate Changed**

- Communities in Texas, Florida, other coastal states at risk
- Credit rating agency says it's adding climate to credit risks

Coastal communities from Maine to California have been put on notice from one of the top credit rating agencies: Start preparing for climate change or risk losing access to cheap credit.

In a report to its clients Tuesday, Moody's Investors Service Inc. explained how it incorporates climate change into its credit ratings for state and local bonds. If cities and states don't deal with risks from surging seas or intense storms, they are at greater risk of default.

"What we want people to realize is: If you're exposed, we know that. We're going to ask questions about what you're doing to mitigate that exposure," Lenny Jones, a managing



"This is an inflection point - an major investor understanding climate risk in municipal bonds… …Investors will push for more granular understanding and transparency, credit rating companies will have to respond to demand for disclosure, underwriters will have to ask issuers for more analysis of revenue impacts, and municipalities will have to have a plan and start taking action on adaptation. This train is picking up speed.“

John Miller
NJ Association for Floodplain Management

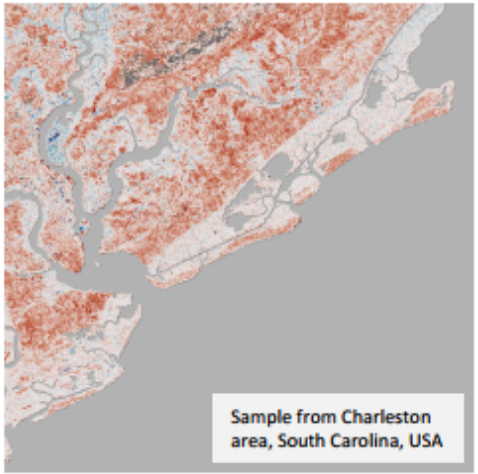
CLIMATE CENTRAL

CoastalDEM™

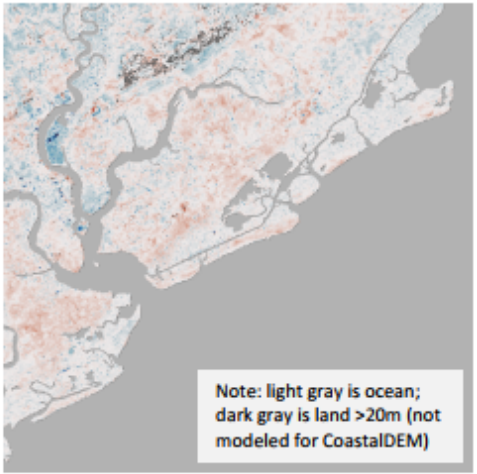
A global leap forward for coastal terrain elevation data

Light/white tones indicate low/no error. Reds indicate that elevation is overestimated – and flood risk is underestimated.

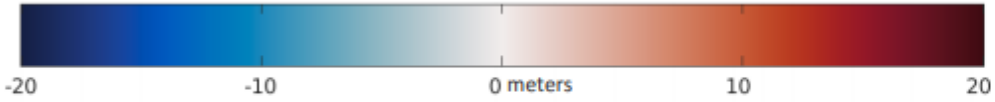
NASA's SRTM 3.0



CoastalDEM™ 1.1



Elevation differences vs. top-accuracy reference data (lidar-based bare earth elevations)

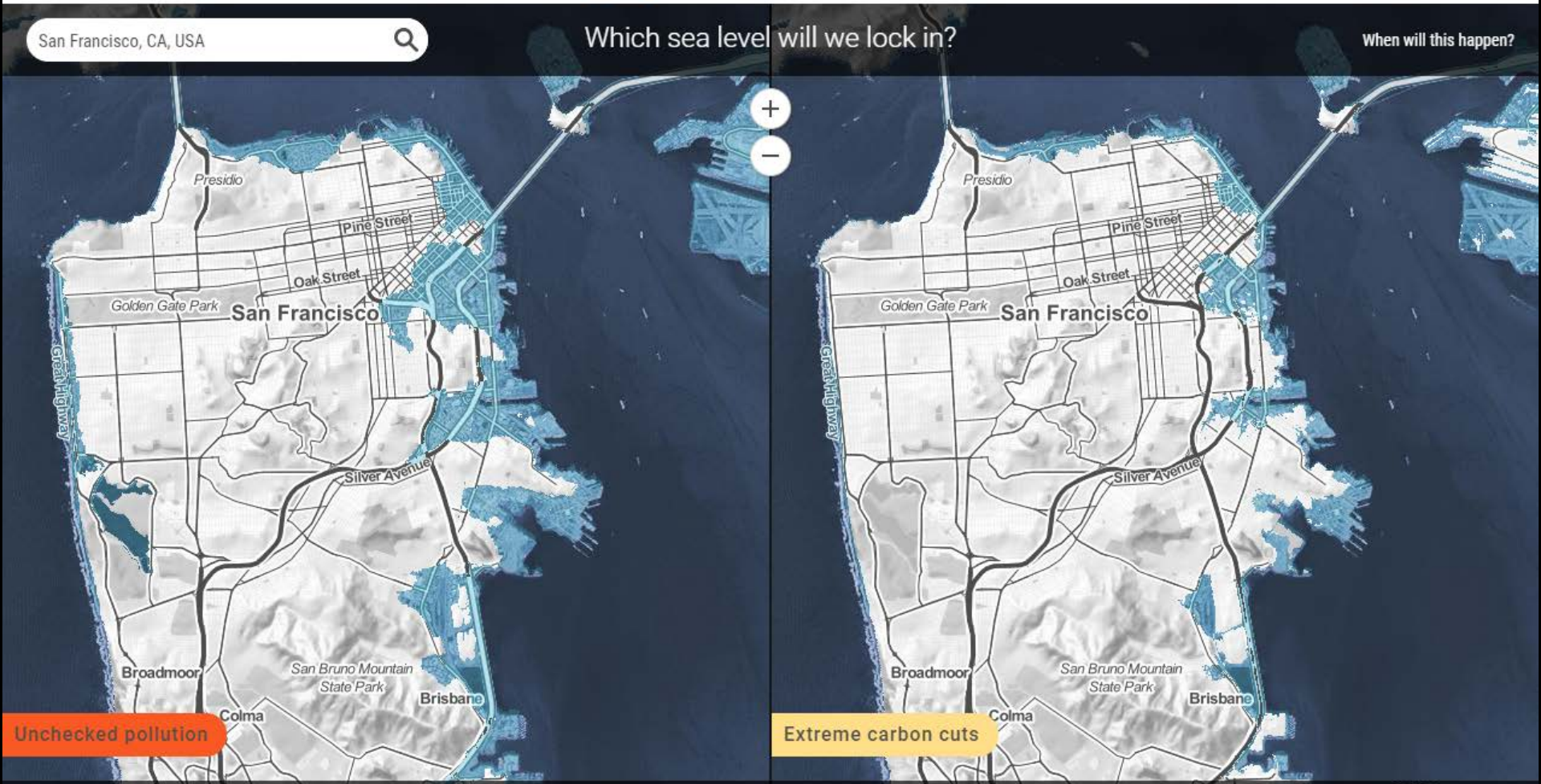


What if we do nothing about carbon emissions?

San Francisco, CA, USA

Which sea level will we lock in?

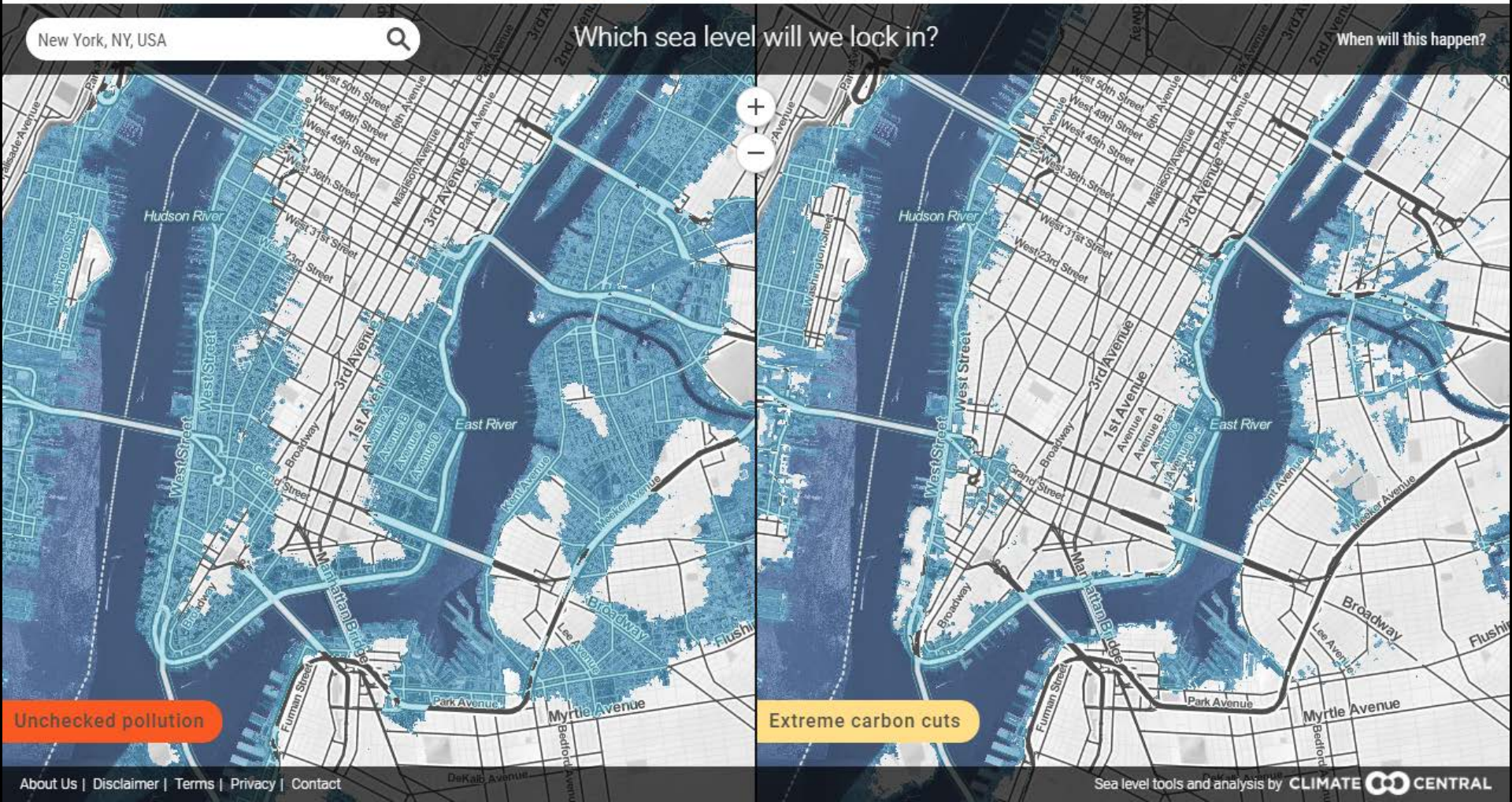
When will this happen?

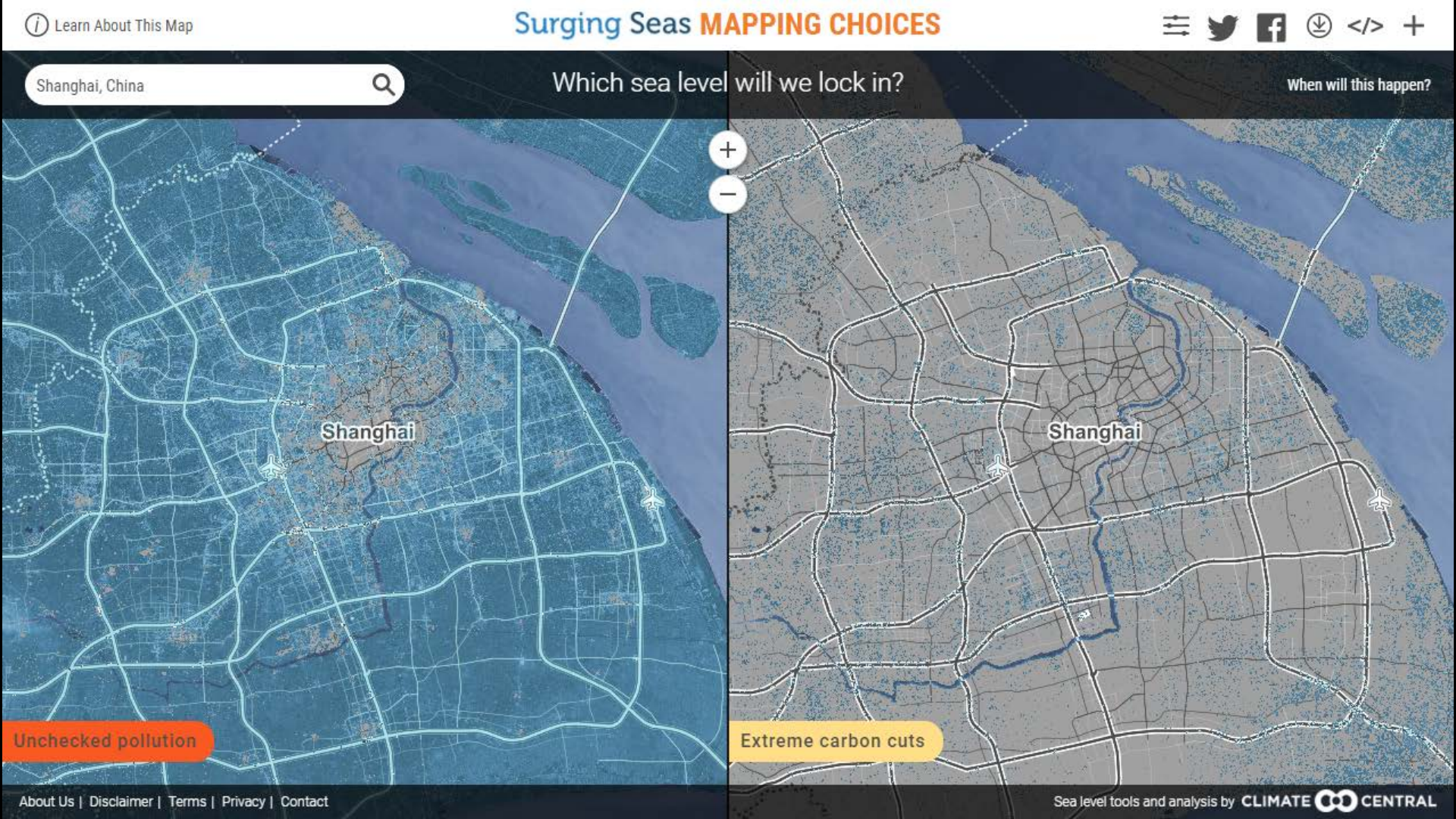


New York, NY, USA

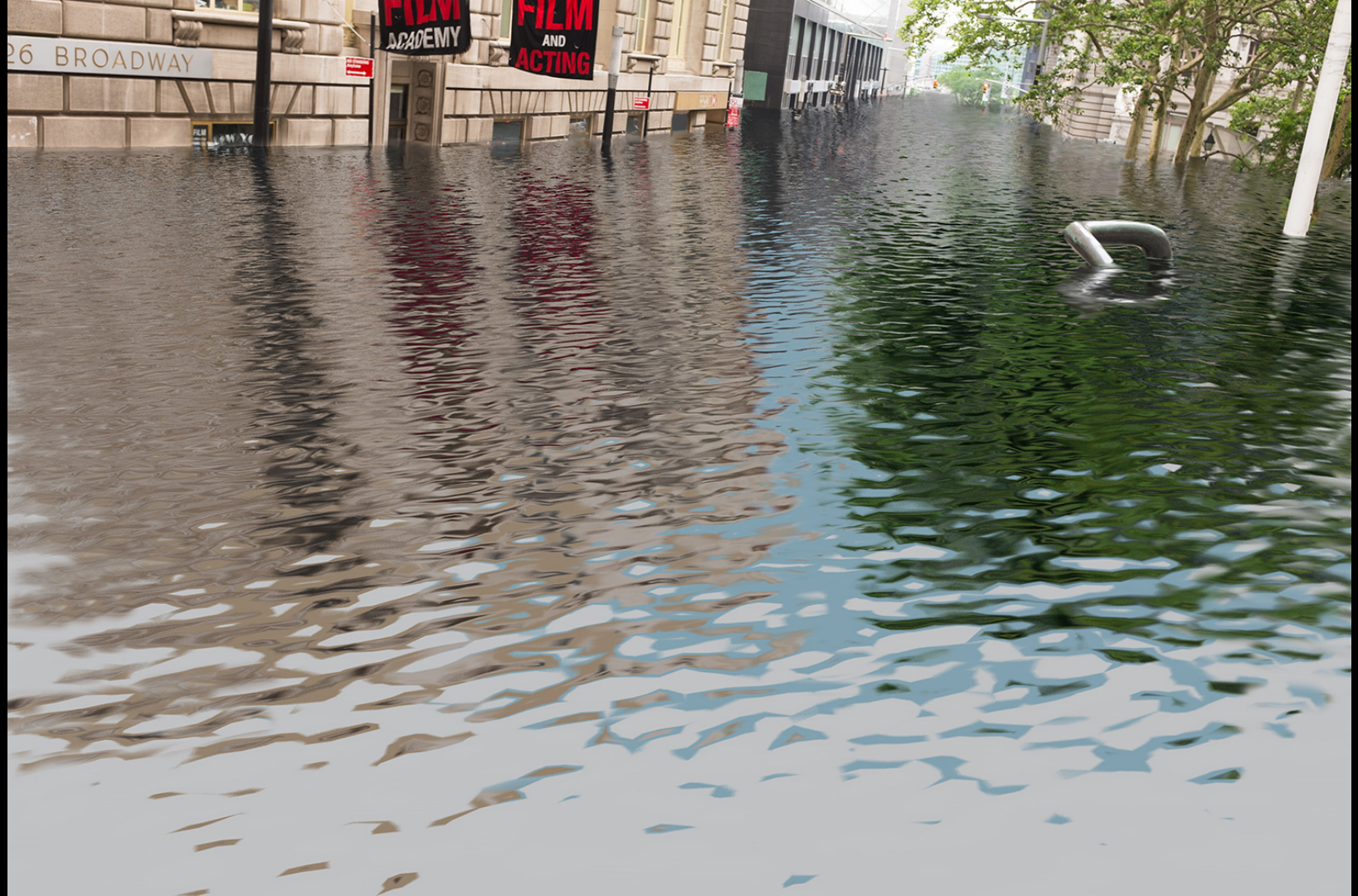
Which sea level will we lock in?

When will this happen?




Learn About This Map
Surging Seas MAPPING CHOICES
Shanghai, China
Which sea level will we lock in?
When will this happen?
Shanghai
Shanghai
Unchecked pollution
Extreme carbon cuts
About Us | Disclaimer | Terms | Privacy | Contact
Sea level tools and analysis by CLIMATE CENTRAL


26 BROADWAY
FILM
ACADEMY
FILM
AND
ACTING


26 BROADWAY
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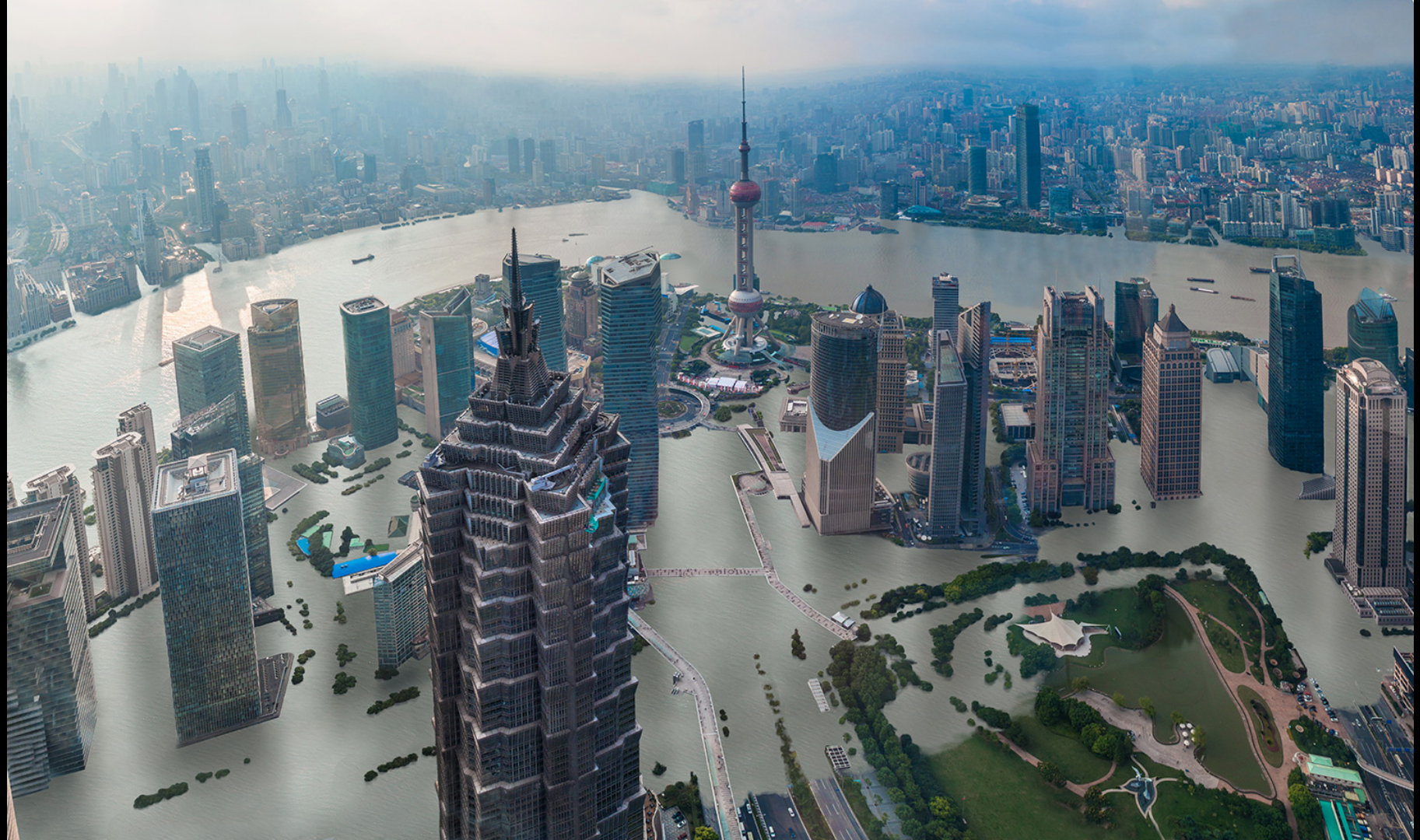


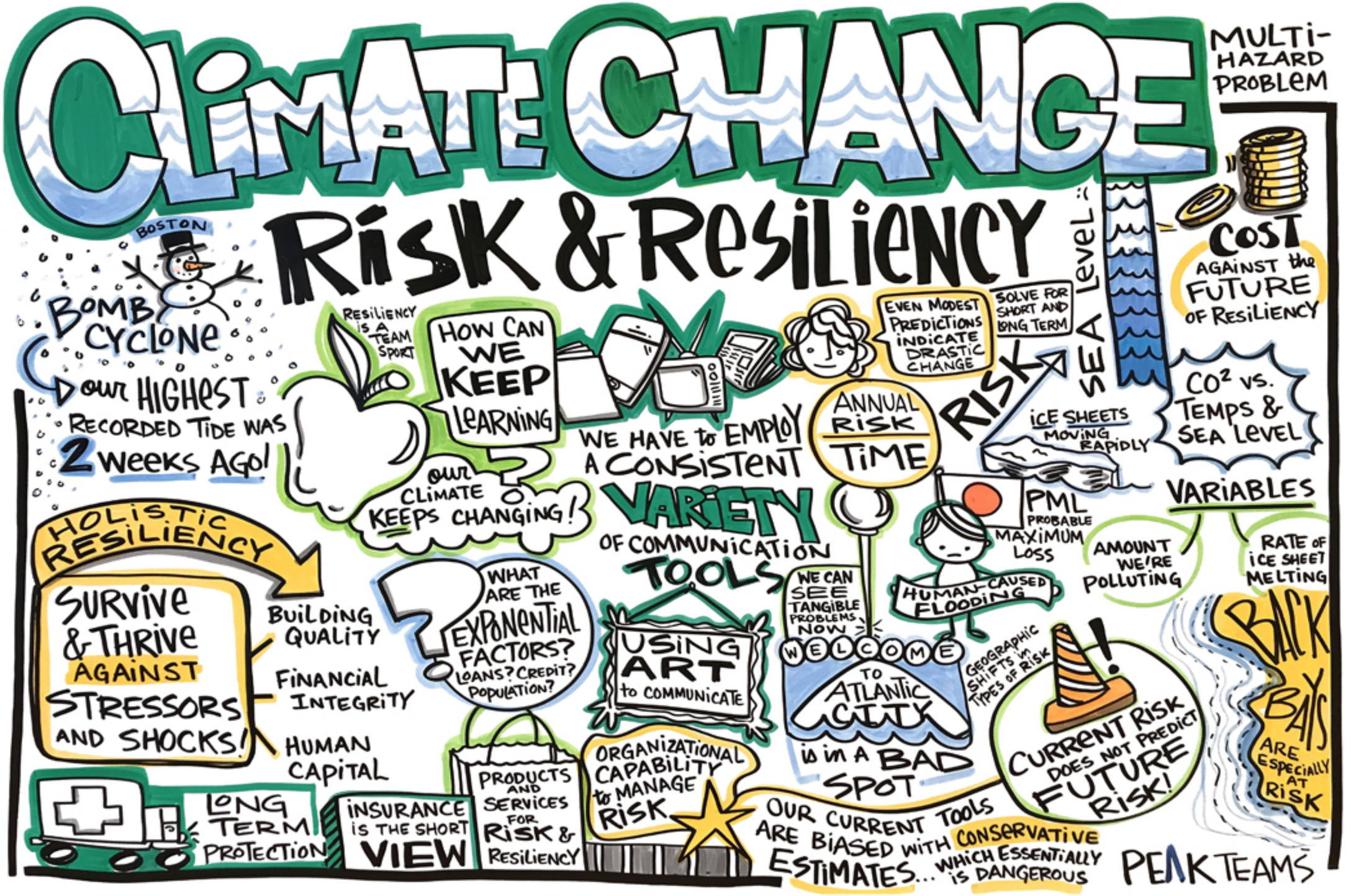
Tools & Resources

www.riskfinder.org

If you have any questions, please contact Dan Rizza

Dan Rizza
Manager for Program on Sea Level Rise
Climate Central
direct: 609-945-7821
drizza@climatecentral.org

Q&A


CLIMATE CHANGE
RISK & RESILIENCY
MULTI-HAZARD PROBLEM
BOSTON
BOMB CYCLONE
our HIGHEST RECORDED TIDE WAS 2 weeks AGO!
RESILIENCY is a TEAM SPORT
HOW CAN WE KEEP LEARNING
our CLIMATE KEEPS CHANGING!
WE HAVE to EMPLOY A CONSISTENT VARIETY OF COMMUNICATION TOOLS
EVEN MODEST PREDICTIONS INDICATE DRASTIC CHANGE
SOLVE FOR SHORT AND LONG TERM
SEA Level
RISK
ANNUAL RISK
TIME
ICE SHEETS MOVING RAPIDLY
COST
AGAINST the FUTURE OF RESILIENCY
CO² vs. TEMPS & SEA LEVEL
VARIABLES
PML
PROBABLE MAXIMUM LOSS
AMOUNT WE'RE POLLUTING
RATE OF ICE SHEET MELTING
HUMAN-CAUSED FLOODING
HOLISTIC RESILIENCY
SURVIVE & THRIVE AGAINST STRESSORS AND SHOCKS!
BUILDING QUALITY
FINANCIAL INTEGRITY
HUMAN CAPITAL
WHAT ARE THE EXPONENTIAL FACTORS? LOANS? CREDIT? POPULATION?
USING ART to COMMUNICATE
WE CAN SEE TANGIBLE PROBLEMS NOW
WELCOME TO ATLANTIC CITY
is in a BAD SPOT
GEOGRAPHIC SHIFTS IN TYPES OF RISK
CURRENT RISK DOES NOT PREDICT FUTURE RISK!
BACK BAYS ARE ESPECIALLY AT RISK
LONG TERM PROTECTION
INSURANCE is THE SHORT VIEW
PRODUCTS AND SERVICES FOR RISK & RESILIENCY
ORGANIZATIONAL CAPABILITY to MANAGE RISK
OUR CURRENT TOOLS ARE BIASED WITH CONSERVATIVE ESTIMATES... WHICH ESSENTIALLY IS DANGEROUS
PEAK TEAMS

CLIMATE change, RISK & RESILIENCY

CLIMATE CHANGE is a RISK

"THIS is REAL" "BE READY"

ALREADY in the PRESENT.

RESILIENCE is: THE CAPACITY to SURVIVE & THRIVE ... IN the FACE of HARDSHIP

HOW TRANSPARENT ARE WE RE: WHAT IS AT RISK?

HOW CAPABLE ARE YOU to PLAN FOR THIS?

RESILIENCE FROM a HOLISTIC PERSPECTIVE

WATER OVER the SEA WALL: IMPACT to DEVELOPERS

NEW DEVELOPMENT PREPAREDNESS: REQUIRES TREMENDOUS FUNDING ...

THIS HAS to DO with EMISSION LEVELS!

CITY INVESTMENT to MITIGATE THIS ...

IMPACTS the SITE SELECTION PROCESS

RESPONSIBILITY of BUSINESS OWNERS to THINK LONG TERM ...

THIS is an IMMEDIATE PROBLEM!

SEA LEVEL RISE

ANTARCTIC IS A BIG RISK

HUMAN CAUSED: 2/3

MAP AVAILABLE ONLINE:
- SEA LEVEL RISE
- COASTAL FLOODING

SEA LEVEL RISE HAS DOUBLED/TRIPLED the RISK of COASTAL FLOODING

ONLINE TOOL

RISKFINDER.ORG

PLANNERS ACROSS the COUNTRY: KEEPING a CLOSE EYE on THIS

FINANCIAL IMPACTS

POLITICAL SUPPORT IMPACT

COMMUNICATION SYSTEM is KEY

INDIVIDUAL PROBLEM vs. SOCIAL/ SOCIETAL PROBLEM

COSTS ARE HITTING the BOTTOM LINE