

Rising Seas: Causes, Impacts and Predictions of Sea Level Rise

FE-550

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Team 3

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Problem Statement

- Use data viz to tell a story on sea level rise: its causes and impacts now and in the future

- We chose this topic due to the team's interest in environmentalism

- We considered several other topics (finance, mathematical data, animal conservation) before narrowing it down to sea level rise

- Challenges

- How to visualize data beyond maps

- As we dive more into the data, we may need to revisit/revise scope to ensure we produce an interesting product in the time allotted



<https://www.jpl.nasa.gov/edu/learn/video/nasas-earth-minute-sea-level-rise/>

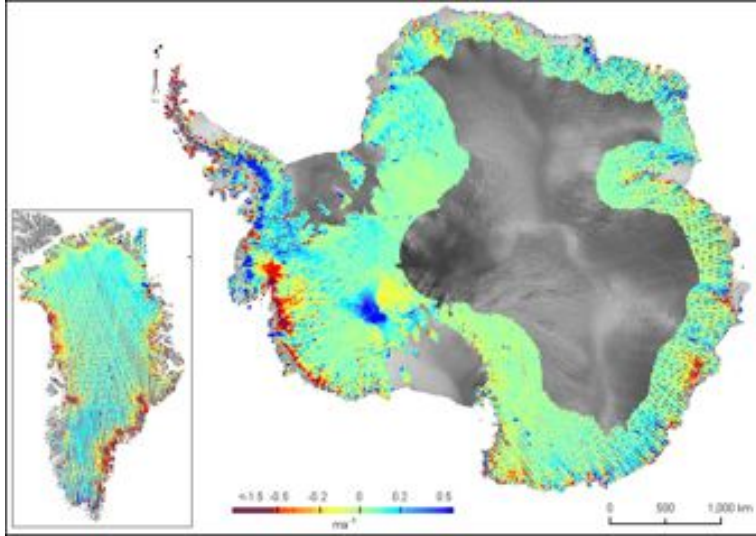
What Causes Sea Level Rise?

Research Questions

- What is the evidence for sea level rise?
- How has sea level rise changed over time (i.e., is it accelerating?)
- What are the impacts of sea level rise?
 - High tide flooding
 - Hurricane storm surge
 - Coastal populations
 - Economic impacts
- What are the predictions for sea level rise?

Sea Level Rise is one of the many by-products of Global Warming

Melting Ice



(Credit: British Antarctic Survey/NASA)

Red shows thinning ice in Antarctica and Greenland

Source:

<https://sealevel.nasa.gov/understanding-sea-level/global-sea-level/ice-melt>

Thermal Expansion

- 90% of the heat trapped by greenhouse gases is absorbed by the world's oceans
- Between 1971 and 2010, sea level rise was estimated to be between 0.4 and 0.8 millimeters per year

Sources:

<https://sealevel.nasa.gov/understanding-sea-level/global-sea-level/thermal-expansion>

<https://sealevel.nasa.gov/publications/4327>

Impacts

Storm Surge – Rockaway Beach after Superstorm Sandy (2012)



Source:
Personal photos of
Erika (from Damage
Survey)

Impacts

High Tide Flooding

High Tide Flood Events Are Significantly Increasing Around the U.S.

What is high tide flooding?

Flooding which causes public inconvenience.

What are the impacts of high tide flooding?

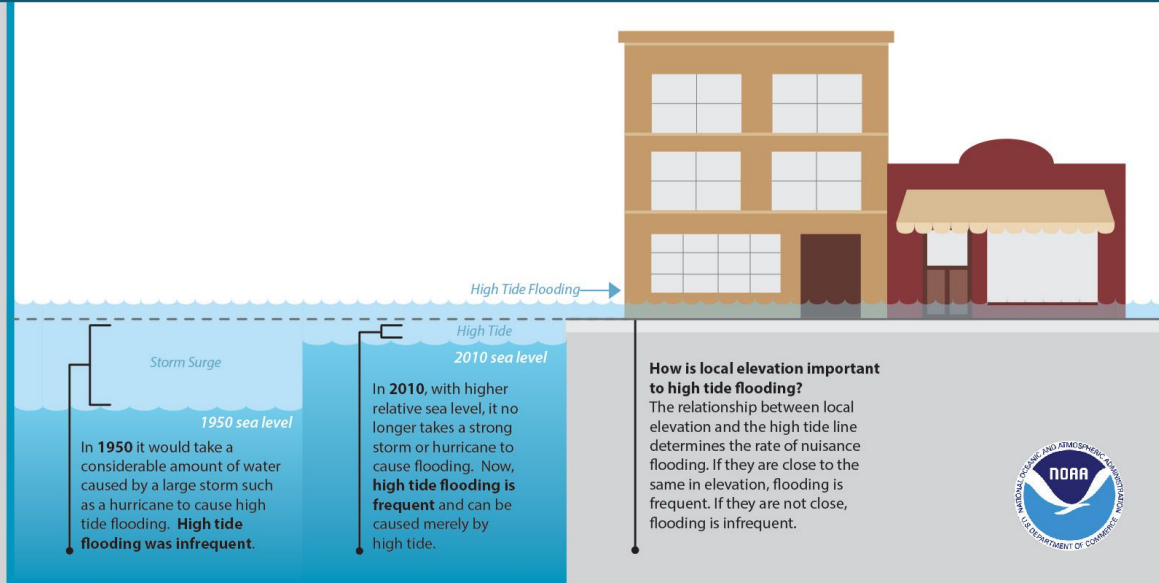
Frequent road closures, overwhelmed storm drains, and deterioration of infrastructure such as roads and rail.

Where is this happening?

High tide flooding is increasing around the coastal U.S., with more rapid acceleration along the East and Gulf Coasts.

Why is this happening?

High tide flooding is increasing due to climate-related sea level rise and land subsidence (sinking) combined with loss of natural coastal barriers.



<https://oceanservice.noaa.gov/facts/high-tide-flooding.html>

Data Sources

Potential Resources for Visualization

- Historical Trends and Current State of Affairs
 - [NASA Sea Level Change](#)
- Impacts
 - [Sea Level Rise and Nuisance Flood Frequency Changes around the United States](#)
 - [Storm Surge Hazard Maps](#) (NHC)
 - [Coastline Population Continues to Grow](#) (US Census)
 - [National Coastal Population Report: Population Trends from 1970 to 2020](#) (NOAA)
- Projections
 - [NYC Open Data Projected Sea Level Rise](#)
 - [A Bayesian Network to Predict Vulnerability to Sea-Level Rise: Data Report](#)
 - [Sea Level Rise Viewer](#) (NOAA)

Data Preparation

Analysis on Sea Level Rise Data

- Merge historical and current measurements with projections for future sea level rise and impacts
- Analysis on what areas will be most affected by sea level rise

Design Decisions

- **Visualizations**

- **Maps**

- Time-based interactivity
 - Time lapse of sea level rise
 - Zoom capability
 - User-directed exploration

- **Comparison charts/graphs**

- Change over time
 - Projections into the future

- **Economic impacts?**

- **Tools**

- Data Prep: Excel, R and/or Python
 - Visualization: Tableau and D3



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