# Understanding Risk

## AKA The First Step to Reducing Vulnerability

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Tampa, FL • 08/07/2019

NORTHERN GULF OF MEXICO

# Risk & Vulnerability: Can't have one without the other

# A few definitions…

- Vulnerability – state of being exposed to the possibility of being attacked or harmed

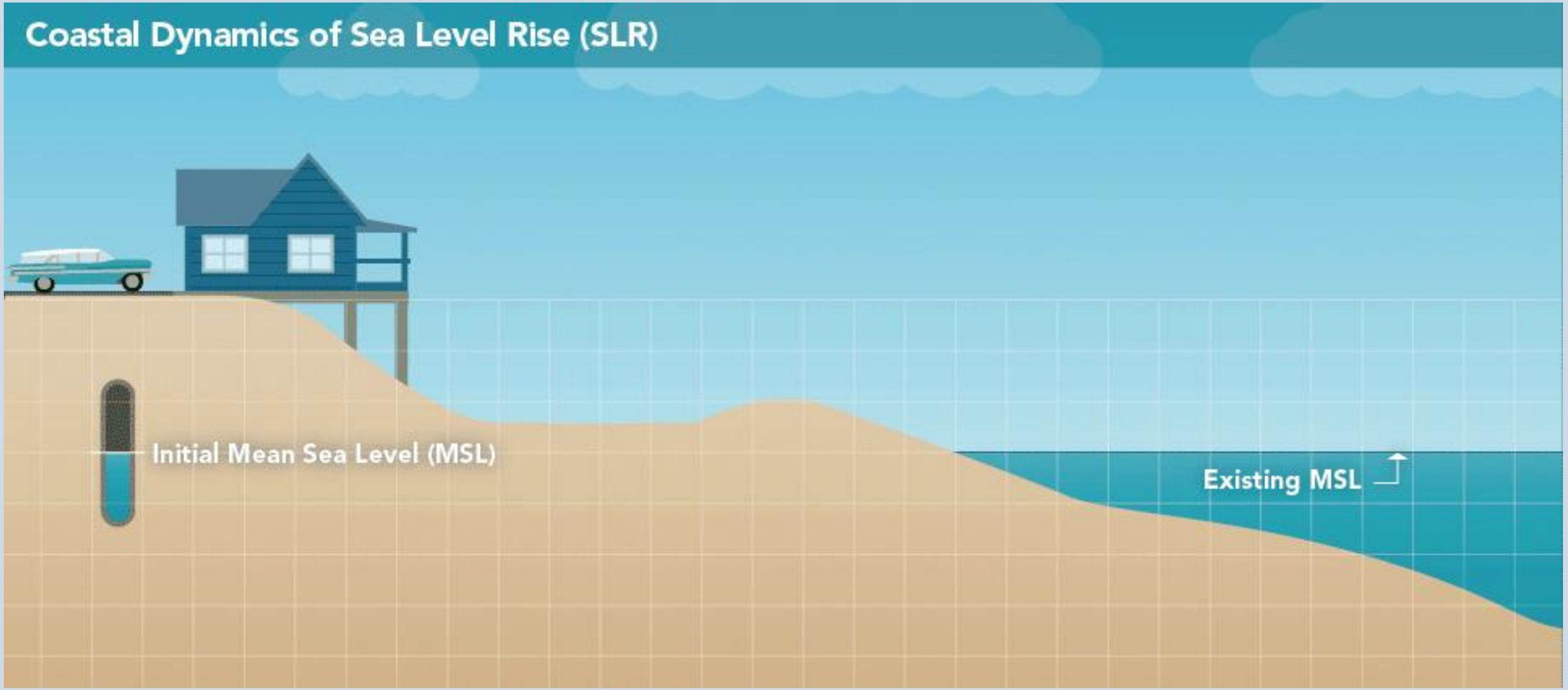
- Risk – possibility of loss or injury

**Vulnerability means you're at risk**

# Where we’re heading today…

- Sea-level rise increases risk
- Risk and uncertainty
- Risk-tolerance based planning
- Understanding vulnerability

# Small Rise Causes Big Changes

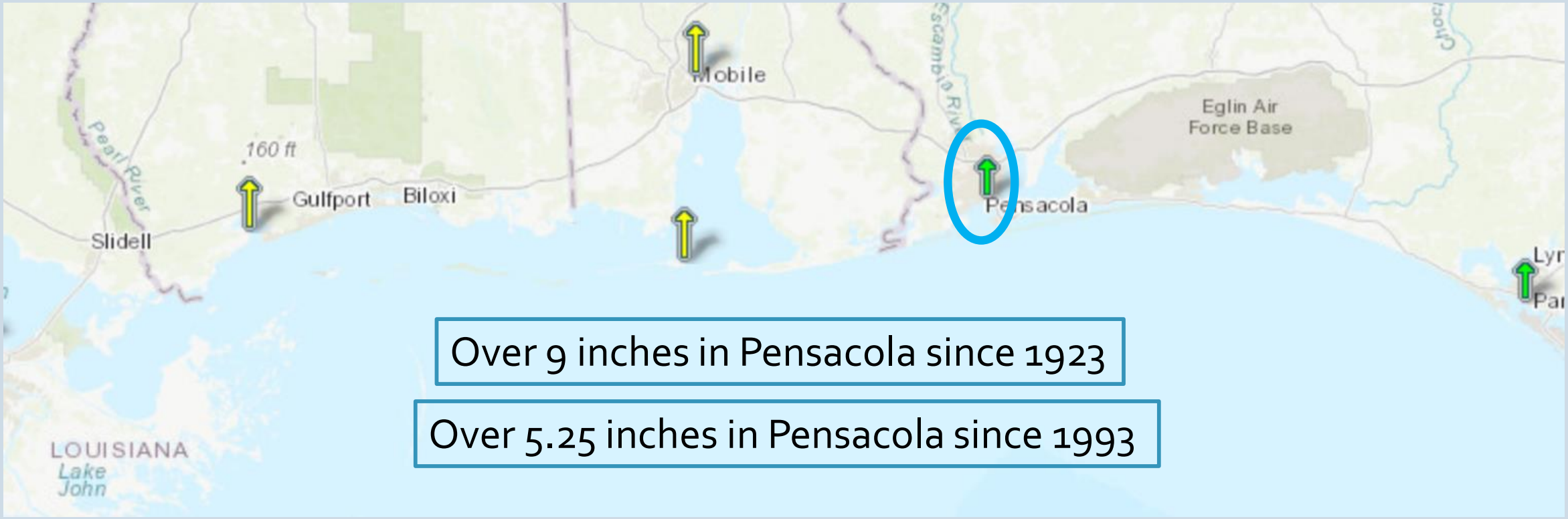



AGU Journal *Earth's Future* Special Issue on Gulf Sea Level Rise

# Exacerbates existing risks:

- Storm surge
- Nuisance flooding
- Erosion
- Salt-water intrusion
- Storm water management

# How do we know?




Over 9 inches in Pensacola since 1923

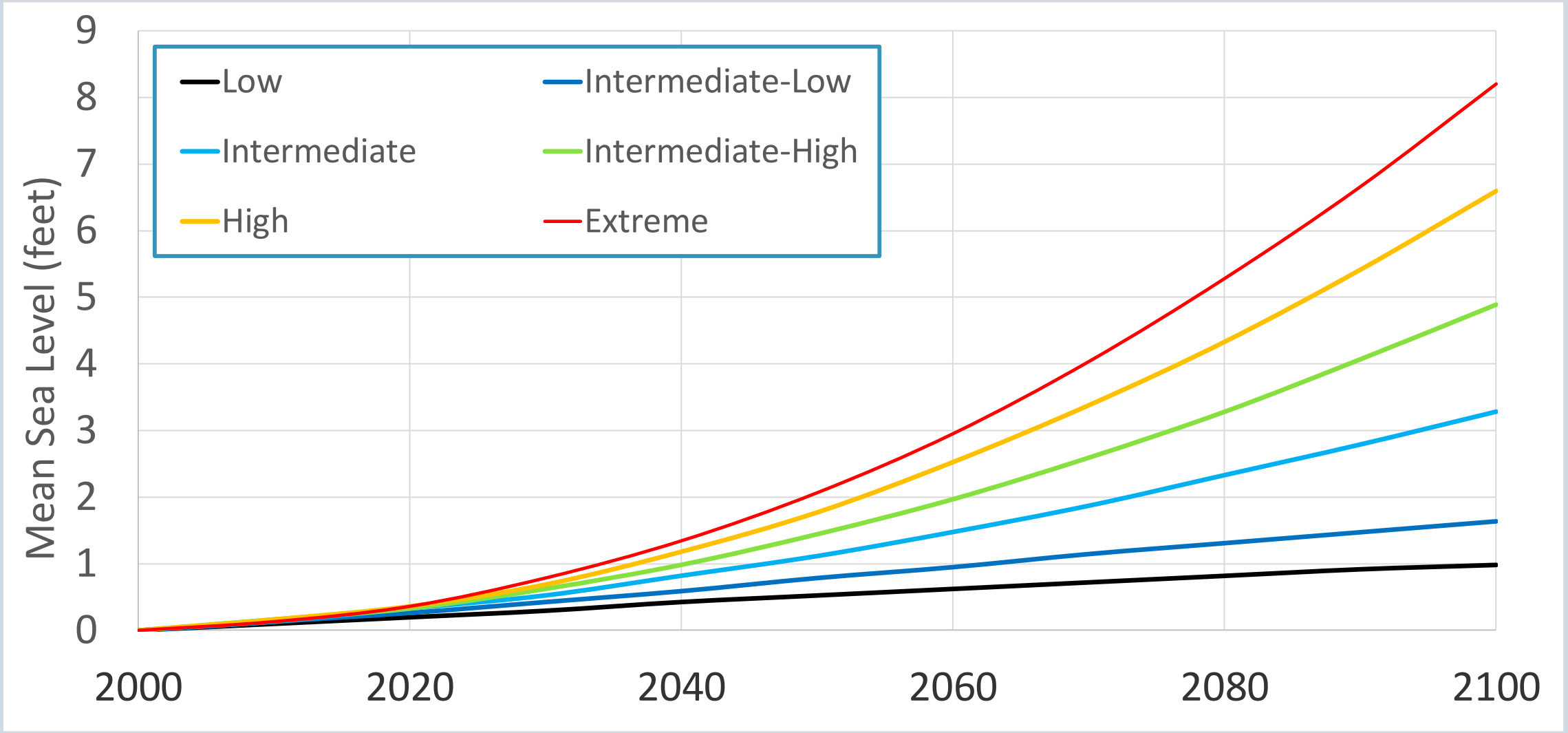
Over 5.25 inches in Pensacola since 1993

https://tidesandcurrents.noaa.gov/sltrends/

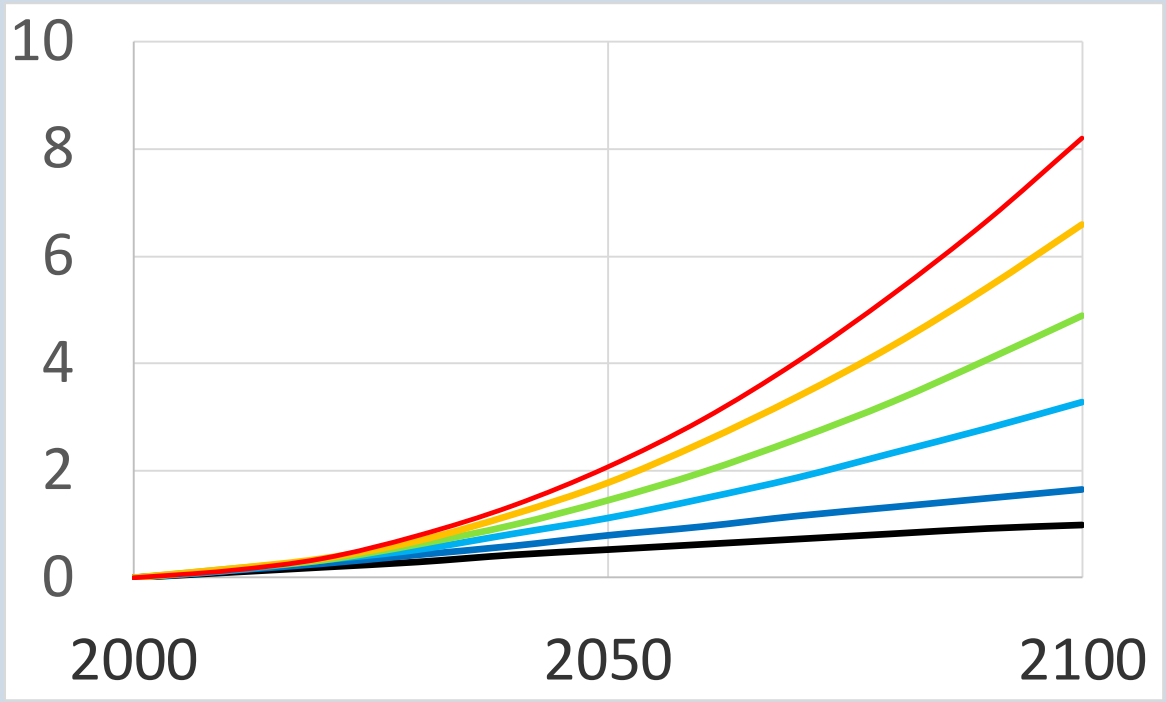

NEXT EXIT
RESILIENCE

# Risk and Uncertainty

# Global Scenarios - 2017



# Why such a large range?

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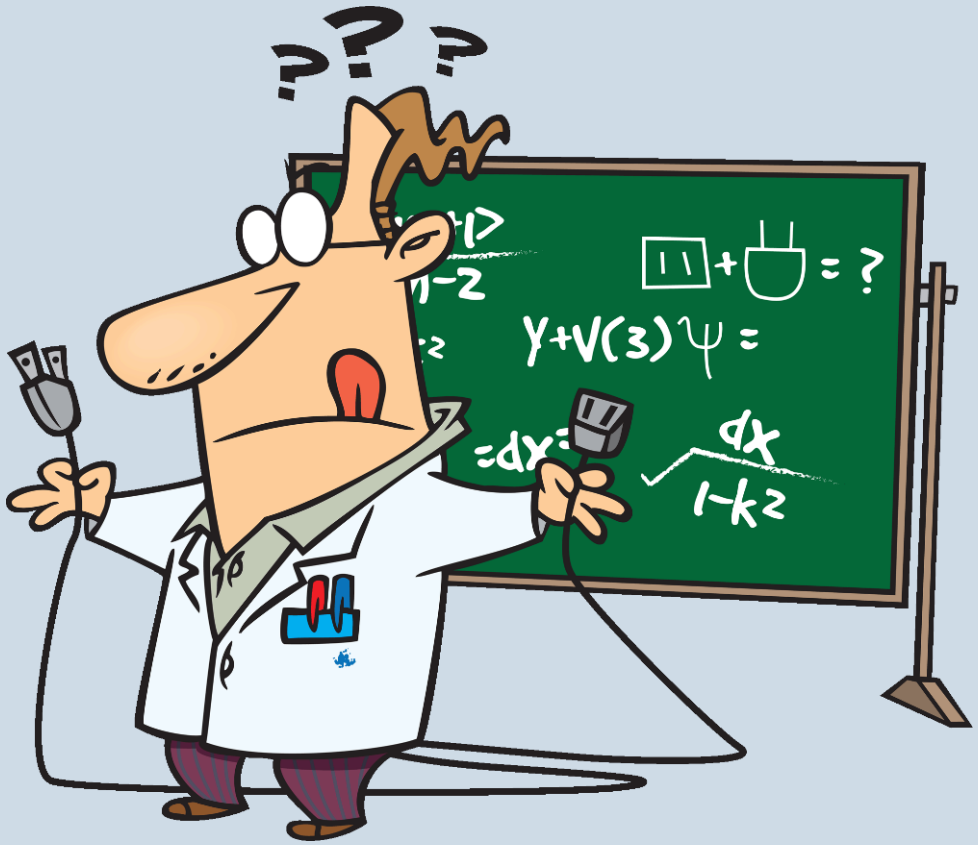


# Three major reason

Big companies' climate chang
are 'unambitious', say analyst

Ireland secures ‘fair deal’ on carbon
emissions under EU pact

Implementing the Paris Agreement in the Pacific

**by 2% in 2012-15**

PTI | Oct 25, 2017, 02.23 PM IST

U.S. NEWS

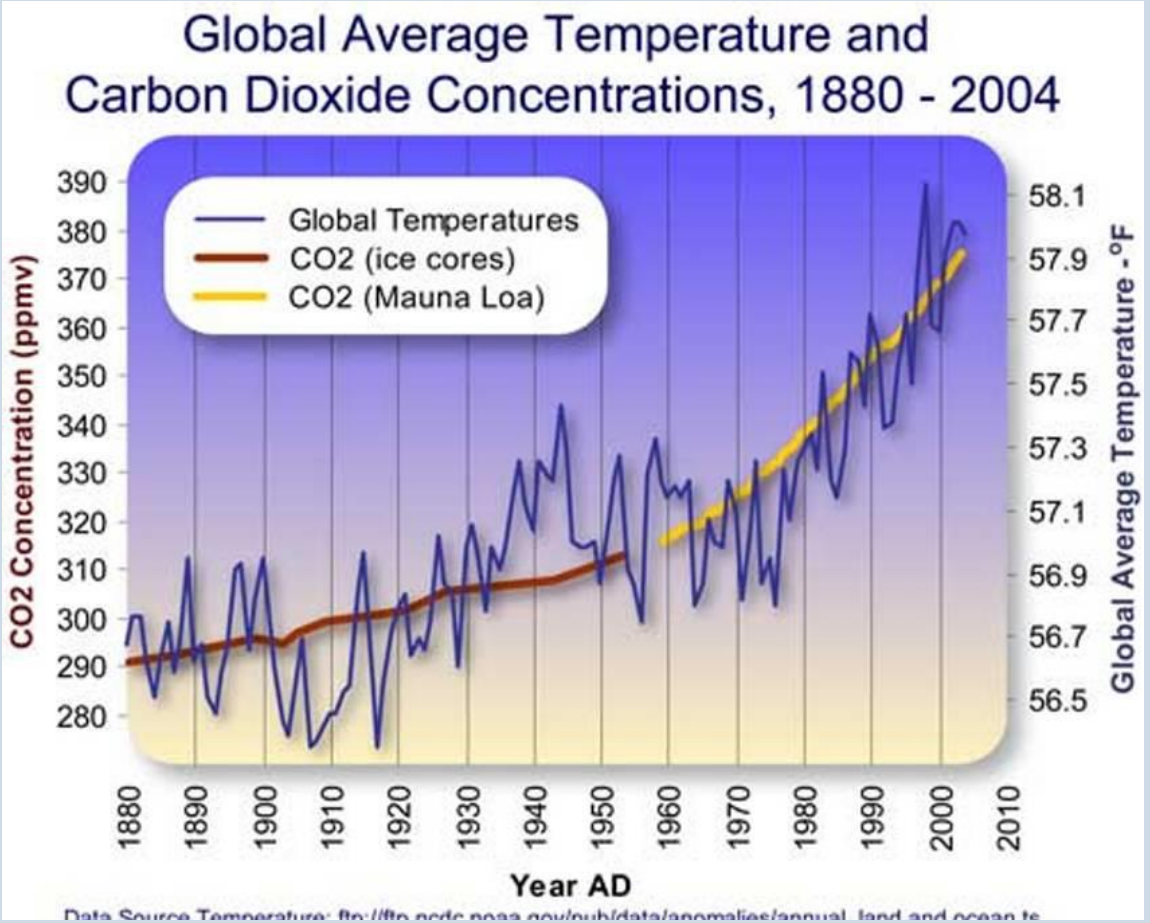
US companies act on climate despite Trump: Survey

- Companies are still among the most ambitious in setting targets to combat
ump's plans to quit the Paris

a 2017 "A list" of 159 companies
g climate change and protecting

1 – We do not know how much carbon will be in the atmosphere.

# Three major reasons for scenarios

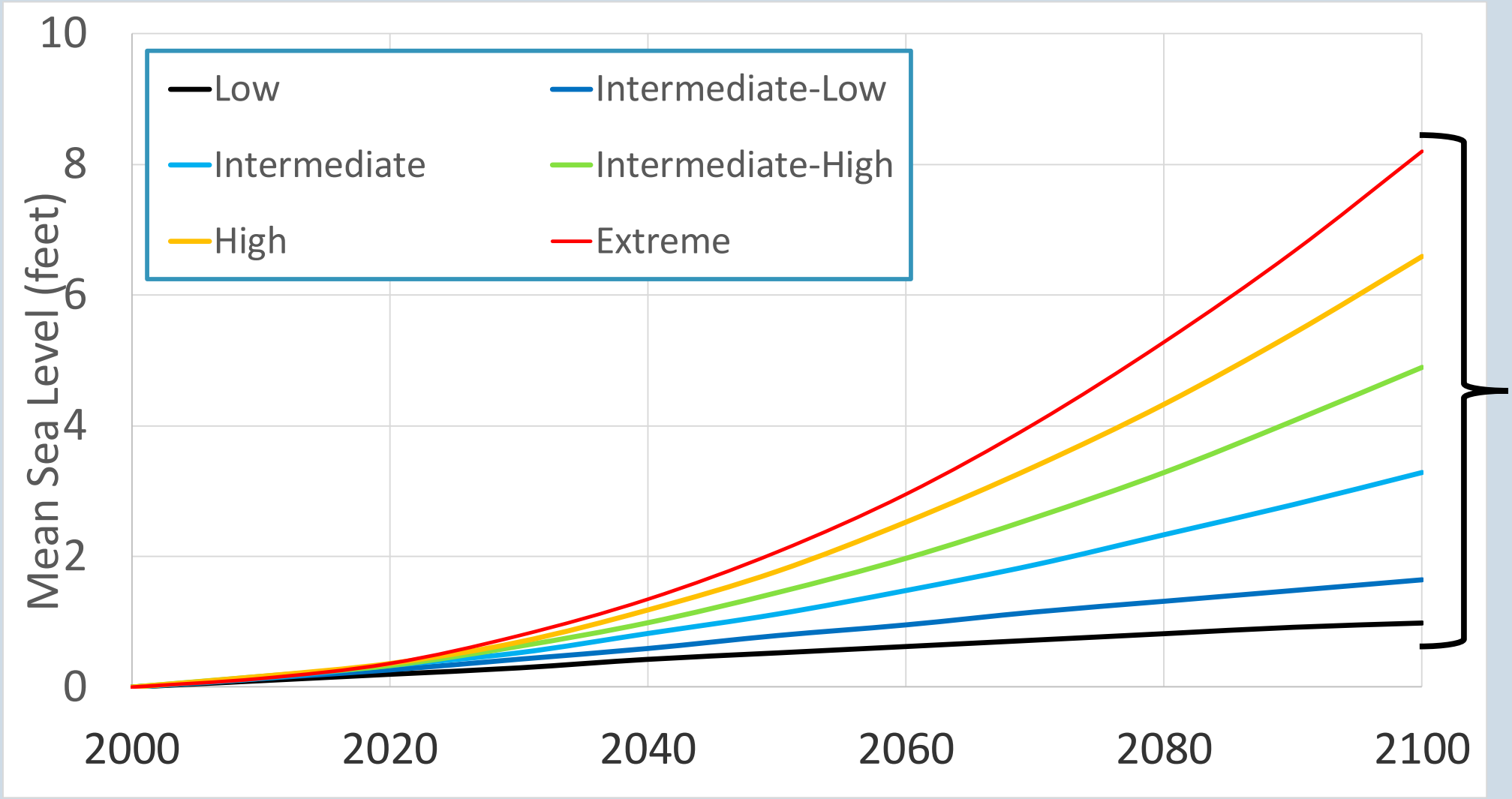



2 – Natural variability

# Three major reasons for scenarios

3 – Still studying the ice sheet melt – the science to watch!

# Global Scenarios - 2017




Range of scientifically possible scenarios

# Working with uncertainty

## Step 1 - Understanding probabilities

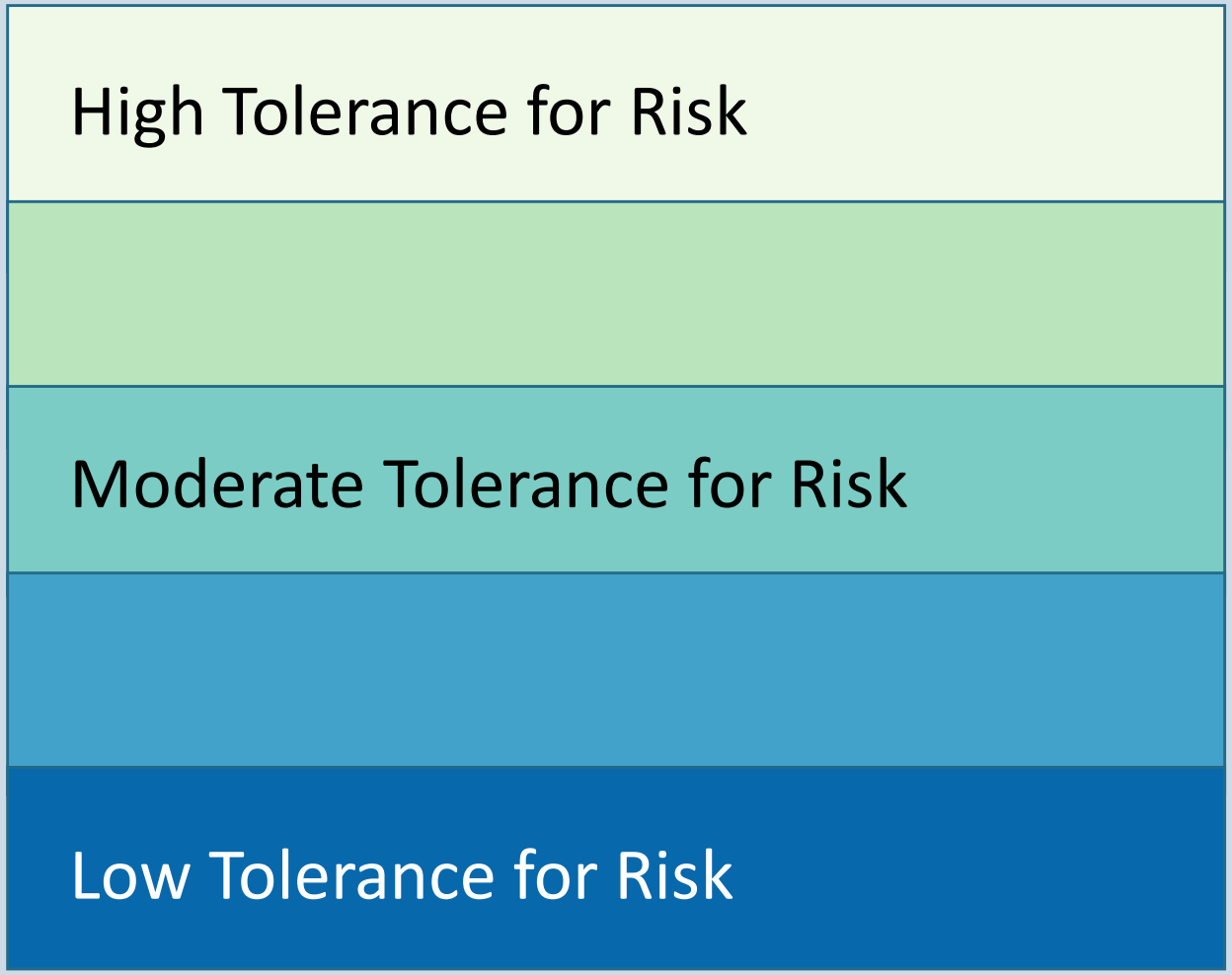
# Likelihood of scenarios

| Global Sea Level Rise Scenario | RCP2.6 dramatic reduction of carbon emissions | RCP4.5 modest reduction in carbon emissions | RCP8.5 no change in carbon emissions |
|---|---|---|---|
| Low | 94% | 98% | 100% |
| Intermediate-low | 49% | 73% | 96% |
| Intermediate | 2% | 3% | 17% |
| Intermediate-high | 0.4% | 0.5% | 1.3% |
| High | 0.1% | 0.1% | 0.3% |
| Extreme | 0.05% | 0.05% | 0.1% |

# Working with uncertainty

## Step Two - Identify your risk tolerance

# What is your flood risk tolerance?



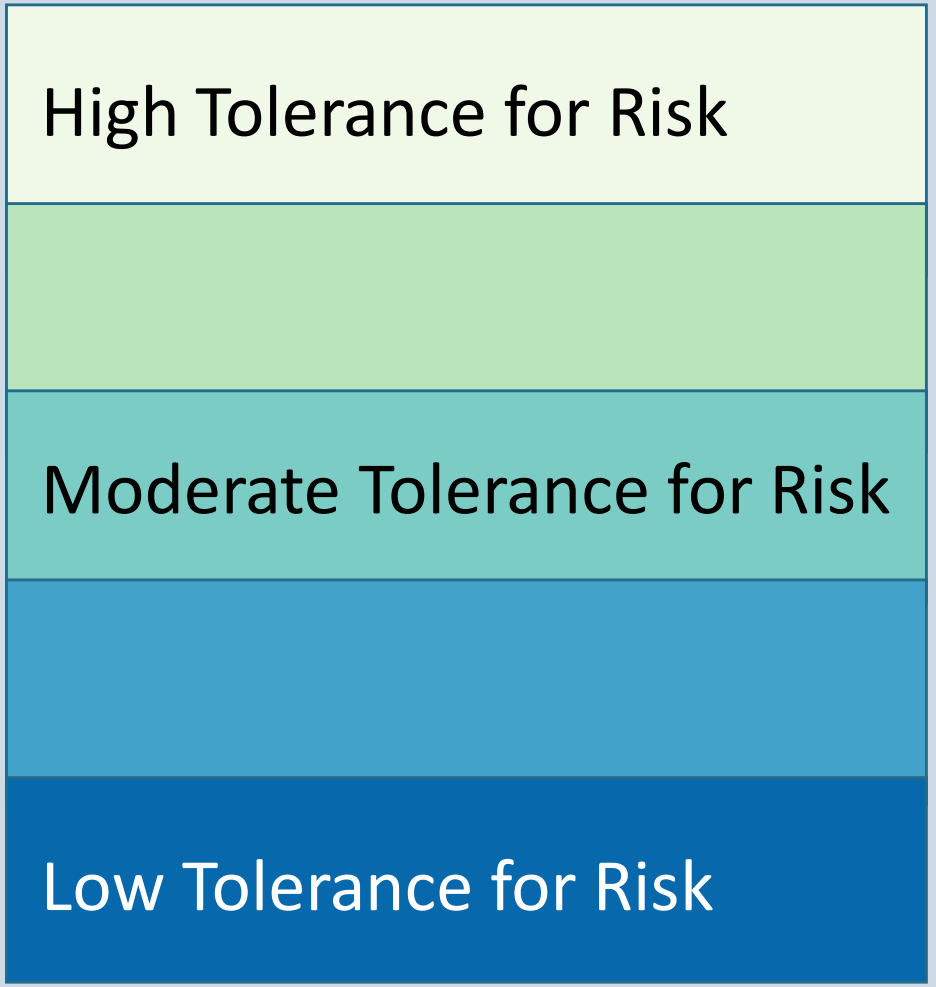

Minor Impact

Moderate Impact

Major Impact

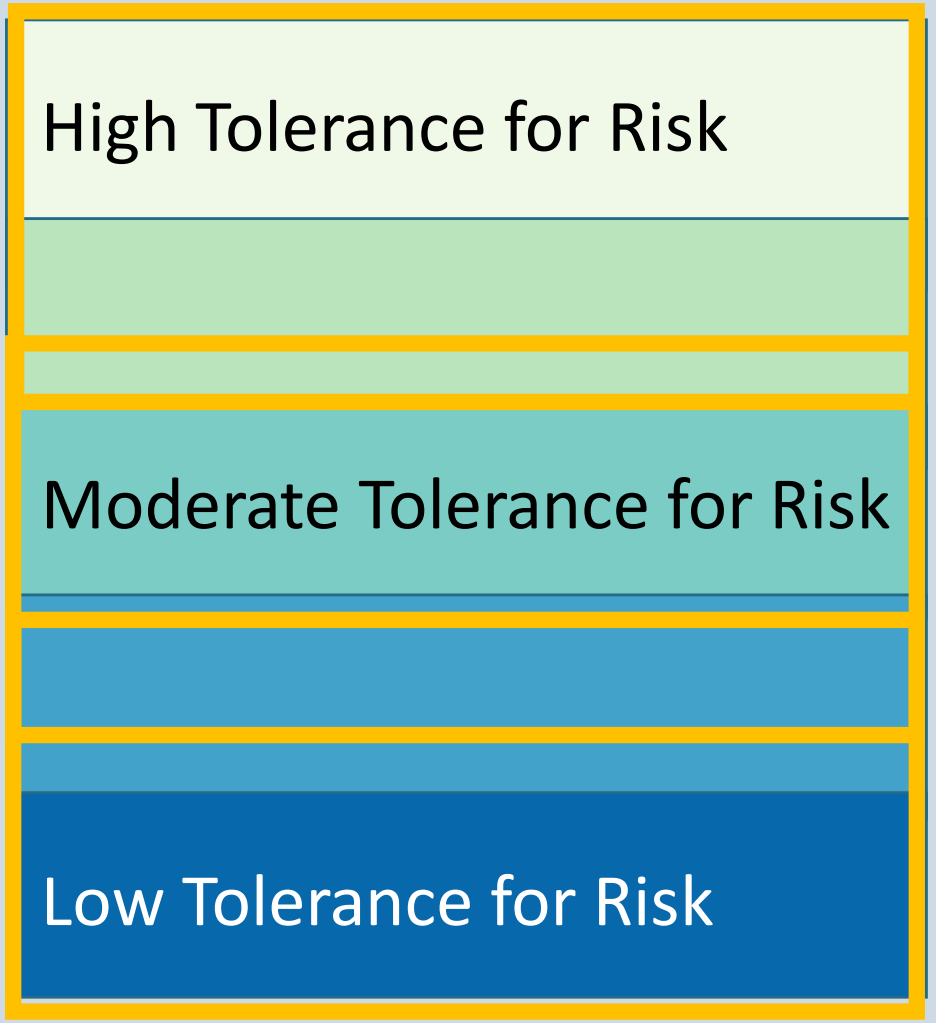
# Thinking about your risk tolerance

- Scale dependent
- Location dependent
- Cost/value
- Function
  - Critical service?
  - Number of people impacted
- Length of Time



# Risk Tolerance Examples

- Hospital
  - High Expense
  - Critical function
  - Long-term
- Buying A Home
  - Moderate Expense
  - Critical function – to who?
  - Mid-term (30 years)
- Shed
  - Minor Expense
  - Not critical
  - Short-term



# Working with uncertainty

## Step 3 - Linking flood risk tolerance and probabilities

# Linking risk tolerance & likelihood

| Sea level rise scenario | Likelihood |
|---|---|
| Low | 100% |
| Intermediate-low | 96% |
| Intermediate | 17% |
| Intermediate-high | 1.3% |
| High | 0.3% |
| Extreme | 0.1% |


Low chance of happening, but would have a big impact

# Putting it all together

**Looking at data, time frame, risk, and probability together.**

# Hospital in a Coastal County

Risk tolerance?

- Low

Scenario?

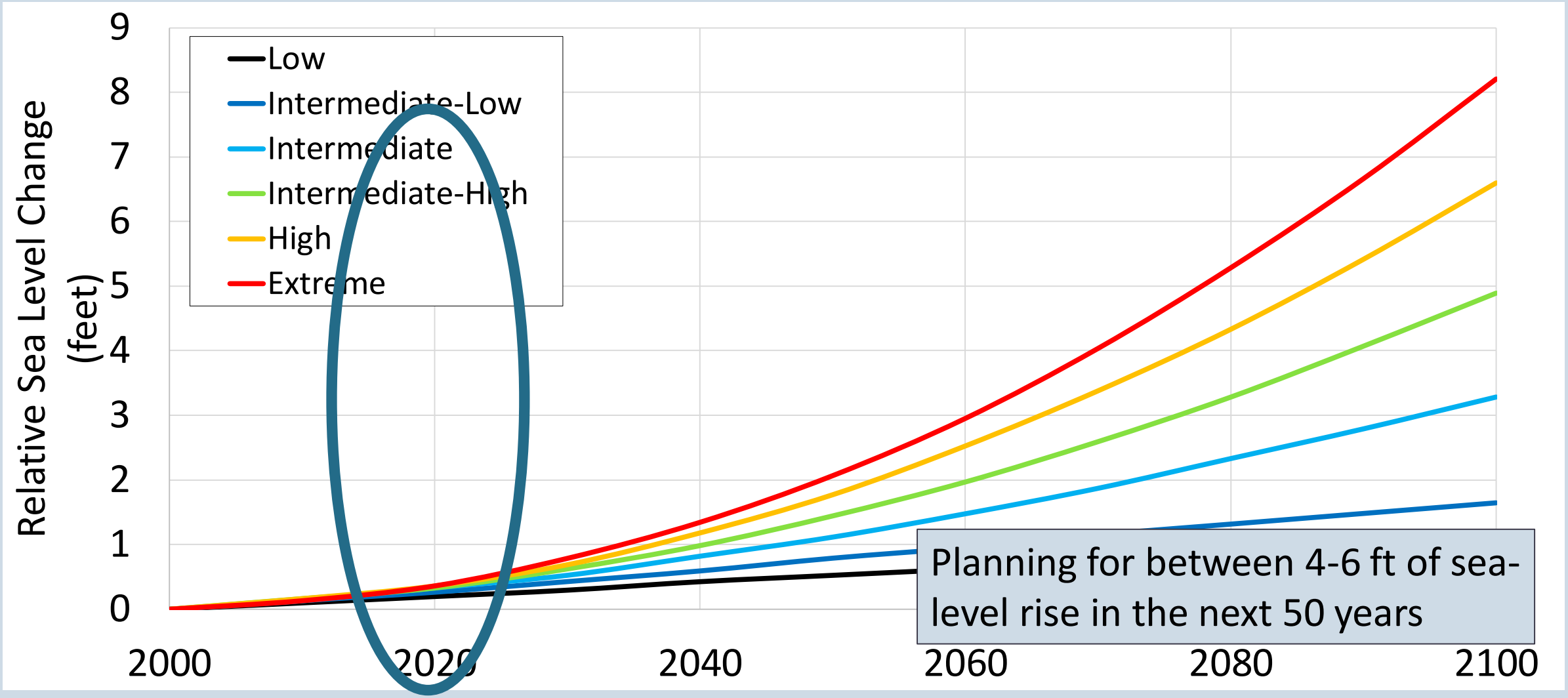
- High or Extreme

High Tolerance for Risk

| Sea level rise scenario | Likelihood |
|---|---|
| Low | 100% |
| Intermediate-low | 96% |
| Intermediate | 17% |
| Intermediate-high | 1.3% |
| High | 0.3% |
| Extreme | 0.1% |

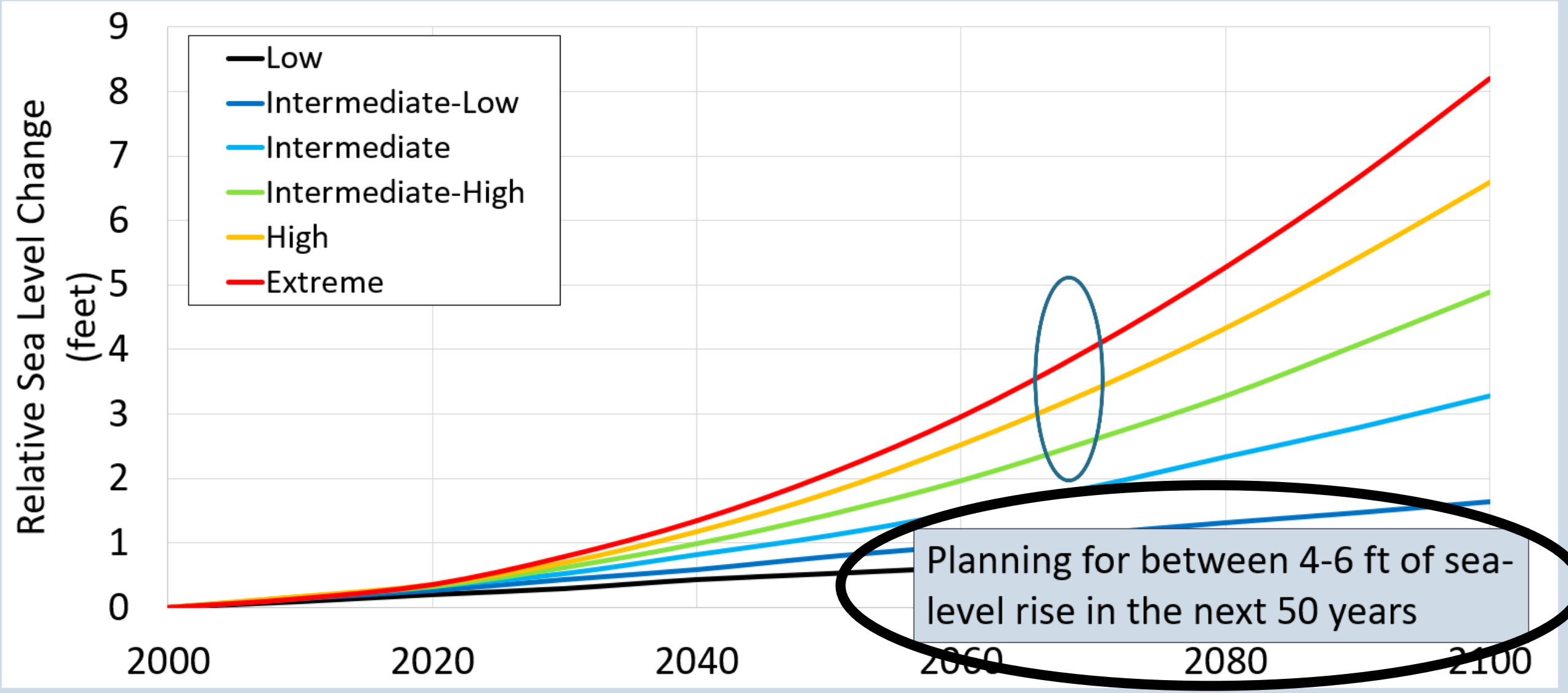
Low Tolerance for Risk

# Hospital in Coastal County

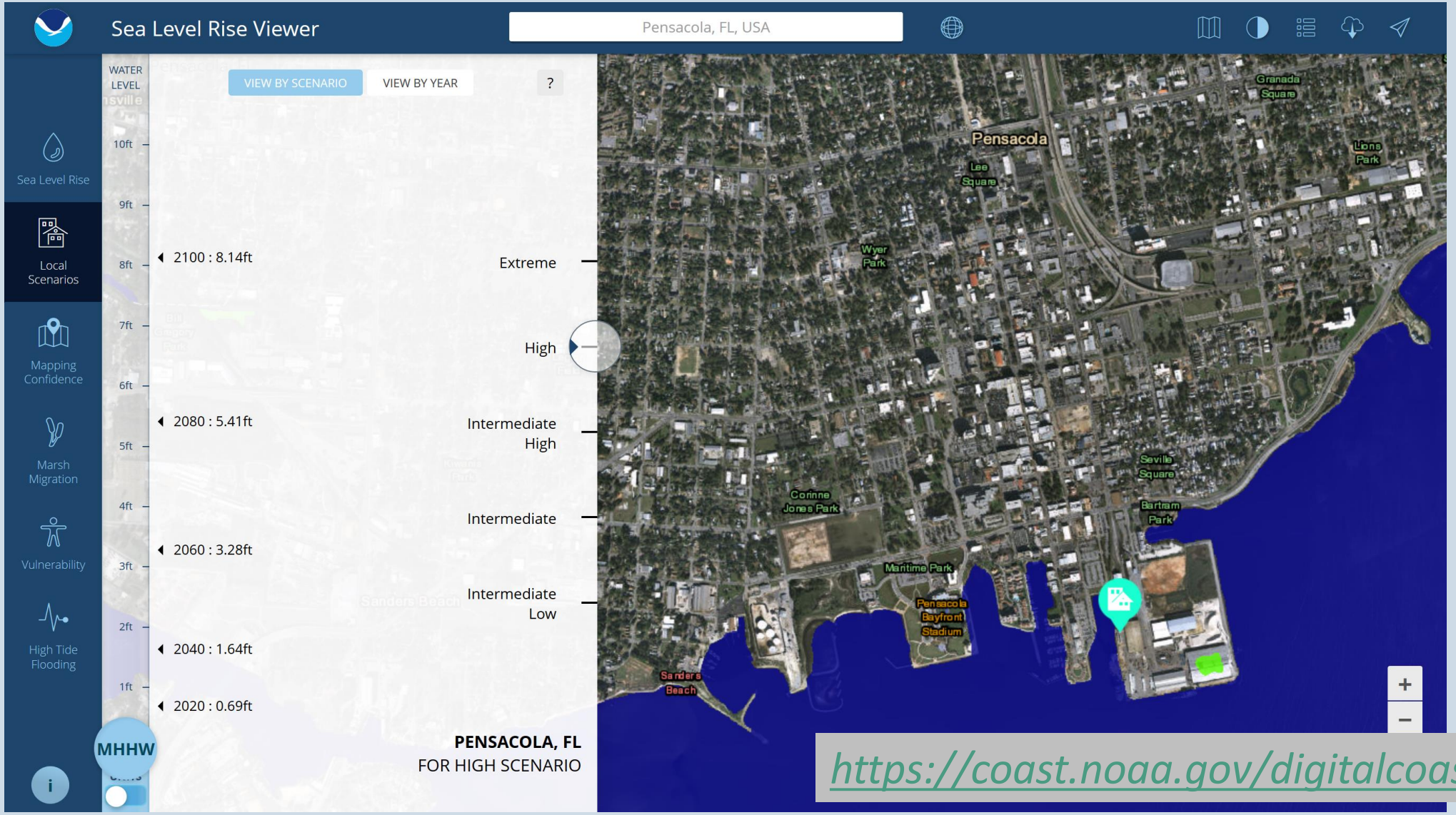


# Next Steps

## AKA – How to reduce vulnerability?


Relative Sea Level Change (feet)
9
8
7
6
5
4
3
2
1
0
2000
2020
2040
2060
2080
2100
Low
Intermediate-Low
Intermediate
Intermediate-High
High
Extreme
Planning for between 4-6 ft of sea-level rise in the next 50 years

# Translate your scenario – new high tide




https://coast.noaa.gov/digitalcoast/tools/slr

# Translate your scenario – future storm surge

An EESLR-NGOM Story Map

## Coastal Dynamics of Sea Level Rise: Simulated Storm Surge

### Stillwater Storm Surge

Download the data

By using state-of-the-art high-resolution astronomic tide, wind-wave, and hurricane storm surge modeling, **return period (percent annual chance) stillwater elevation** maps under four different sea level rise scenarios were developed. These 1% and 0.2% annual chance data (commonly referred to as 100 and 500 year flood plains) were developed to assess the effects of future coastal change on stillwater storm surge under different SLR scenarios.

**Inundation depth above ground (m)**

6.0+ (m)
4
2
0.1 (m)

Stillwater storm surge inundation depth above ground (in meters) in 2100 for Low (+0.2m or 0.7ft in left panel) and Intermediate-High (+1.2m or 3.9ft in right panel) sea level rise scenarios. Data ranges shown are equivalent to 0.3 to 19.7 feet.

Shown at right are the 1% annual chance probability of storm surge inundation in 2100 for **Low** (+0.2m or 0.7ft in left panel) and **Intermediate-High** (+1.2m or 3.9ft in right panel) SLR scenarios.

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**Try this:**

*Slide* the bar to see changes in storm surge inundation depth between these two scenarios. Enter 'Pensacola, FL' in the location search box (top right) to see storm surge differences near Pensacola, FL.

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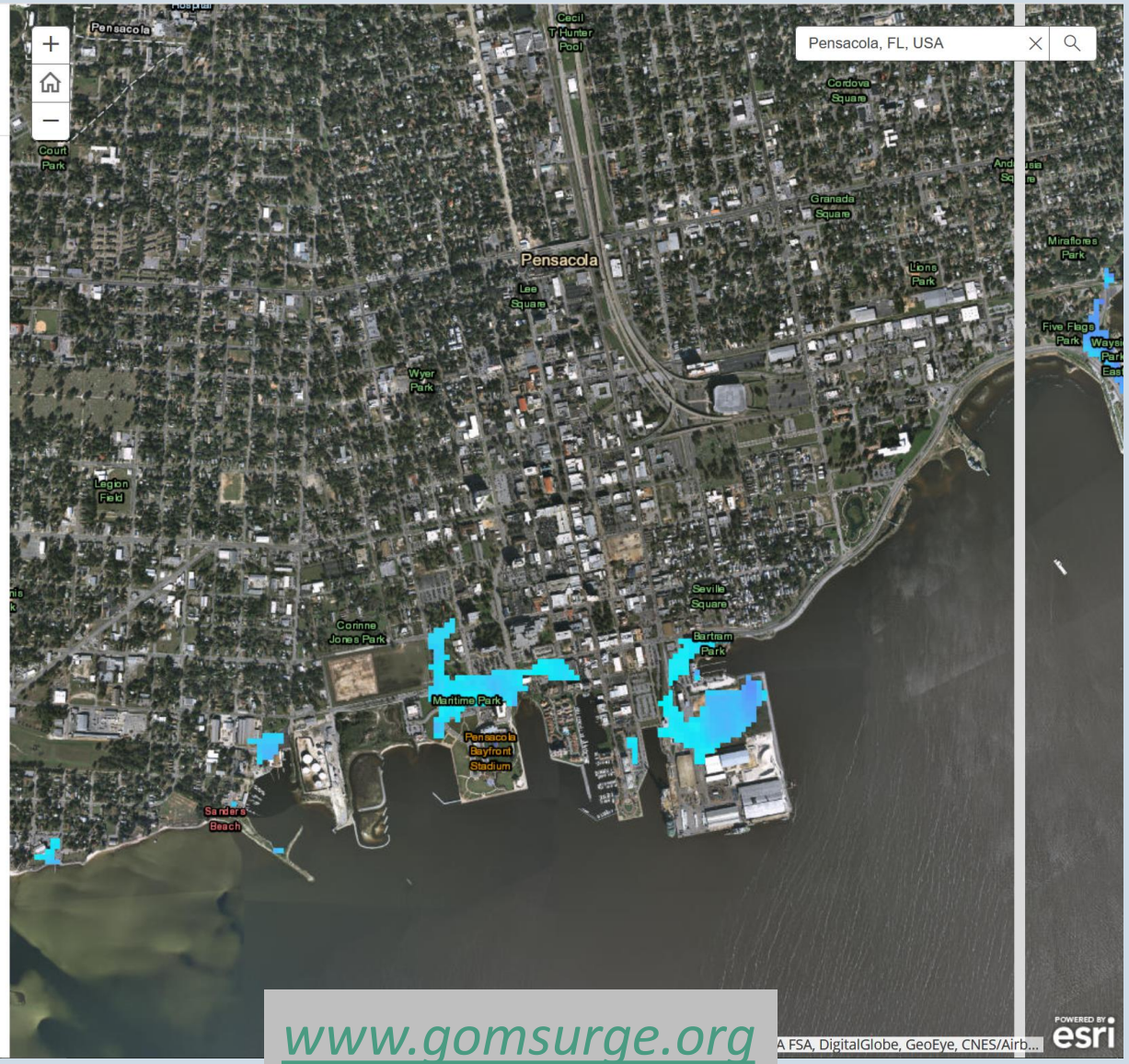
To see the potential impact of future stillwater levels under Low (left) and




www.gomsurge.org

# Recap

- Scenario probabilities = planning power
- Risk-tolerance planning is a useful approach to handling uncertain risk
- Scenario selection is step one of integrating sea-level rise
- Use that information to understand and reduce your vulnerability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# Questions???

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Sea Grant
Mississippi-Alabama