Smart Coast California

Protect Our Coast

Smart Coast California Stakeholders

Thursday, October 27, 2022

Matt Chamberlain

FCAS, CSPA, MAA

Principal & Consulting Actuary

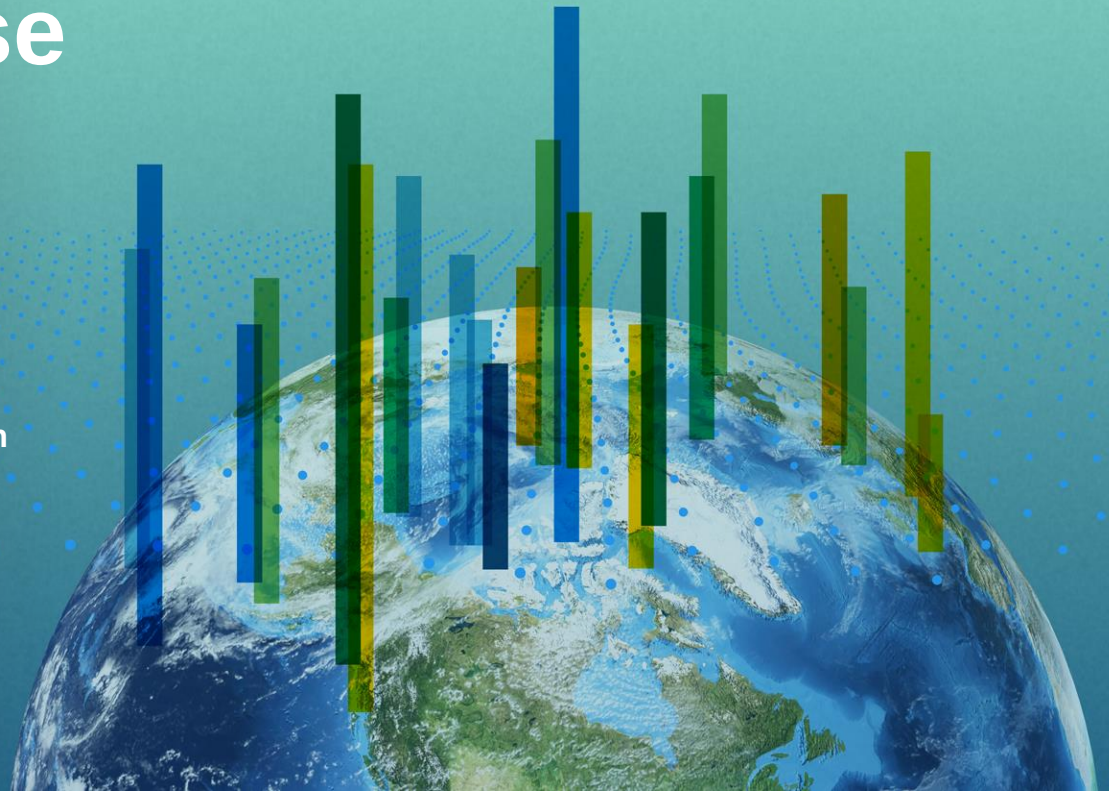
Milliman

Case Study: Value at Risk from Sea Level Rise

Smart Coast California Webinar

Matt Chamberlain, FCAS, MAAA
Principal & Consulting Actuary, Milliman

October 27, 2022



Milliman

Agenda

- Highlights of Milliman work in flood and climate change
- Milliman work with Smart Coast California
- Review for Smart Coast California
  - Purpose and Scope
  - Data and Methodology
  - Overview by City
  - Conclusions

Highlights of Milliman work in flood and climate change

National Association of REALTORS®

Education and analysis to support legislative strategies with regards to flood insurance market

FEMA / FIMA / NFIP Risk Rating 2.0

Strategic transformation of NFIP pricing and communication of flood risk

Milliman Climate Resilience Initiative

Climate risk mitigation and adaptation, flood insurance, catastrophe model analysis, and more

Urban Land Institute (ULI)

Partners with ULI and other industry leaders to provide in-depth analysis on climate risk and real estate

Milliman Work with Smart Coast California (1/2)

Understanding California Sea Level Rise

Purpose

- Understanding the information used by the Coastal Commission and local planners in the Local Coastal Program amendment process
- Is everything being done consistently and reasonably?

Scope of review

- Four sea level rise studies that have been pertinent to the Coastal Commission over the past decade
- Coastal Commission’s guidance on incorporating sea level rise considerations into the Local Coastal Programs
- Seven local climate change vulnerability studies

Milliman Work with Smart Coast California (2/2)

Understanding California Sea Level Rise

Findings

- There is uncertainty in future sea level rise scientific projections
- Probabilities can be challenging to understand and use
- Coastal Commission guidance is useful and necessary, but there are opportunities to improve
- Local communities' vulnerability assessments: Inconsistency in assumptions, scenario planning, and modeling process

Purpose and scope of Milliman review

Purpose

- Estimate the market value of residential properties at risk from sea level rise and storm event
- Evaluate the feasibility of managed retreat as a response to climate change

Scope of review

- Cities of Carlsbad, Coronado, Imperial Beach, Santa Cruz and Santa Barbara
- Six sea level rise scenarios, from 0.25 meters to 2 meters.
- 20-year and 100-year storm event

Data Sources (1/2)

Residential building, parcel and assessment data from LightBox SmartFabric Professional

- LightBox provides footprint level property information
- Automated Valuation Model (AVM): provides estimate of market value for a property
- Residential property was included in this analysis

Data Sources (2/2)

- Coastal Storm Modeling System (CosMoS) from the United States Geological Survey (USGS)
  - Prediction of storm-induced coastal flooding, erosion, and cliff failures over large geographic scales
  - Has scenarios for future sea level rise and accounts for long-term coastal evolution (i.e. beach changes and cliff/bluff retreat)
  - Currently available for California coast south of Point Arena. Will eventually be available for the entire state

Methodology

Identifying Buildings at Risk

Begin with all parcels

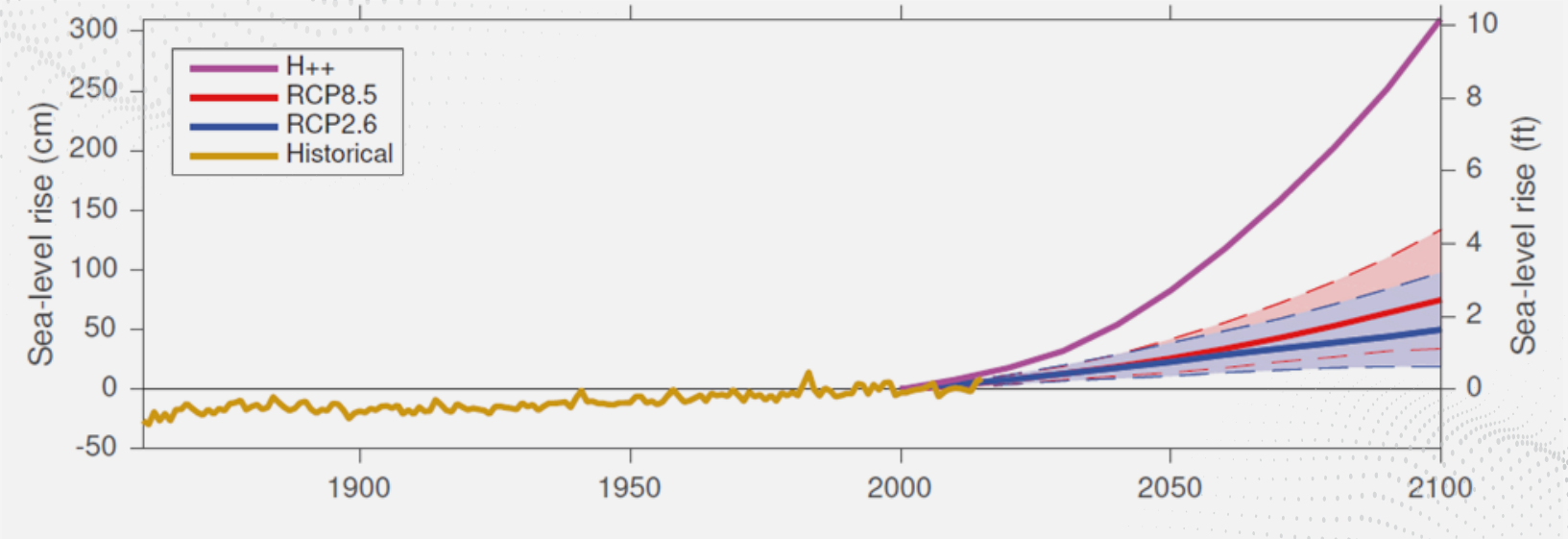
Parcels within city limits

Intersect hazard scenario

Buildings with more than 50% of area in hazard scenario

Different global scenarios could result in drastically different local outcomes

Relative sea level in San Francisco, Rising Seas (2017)



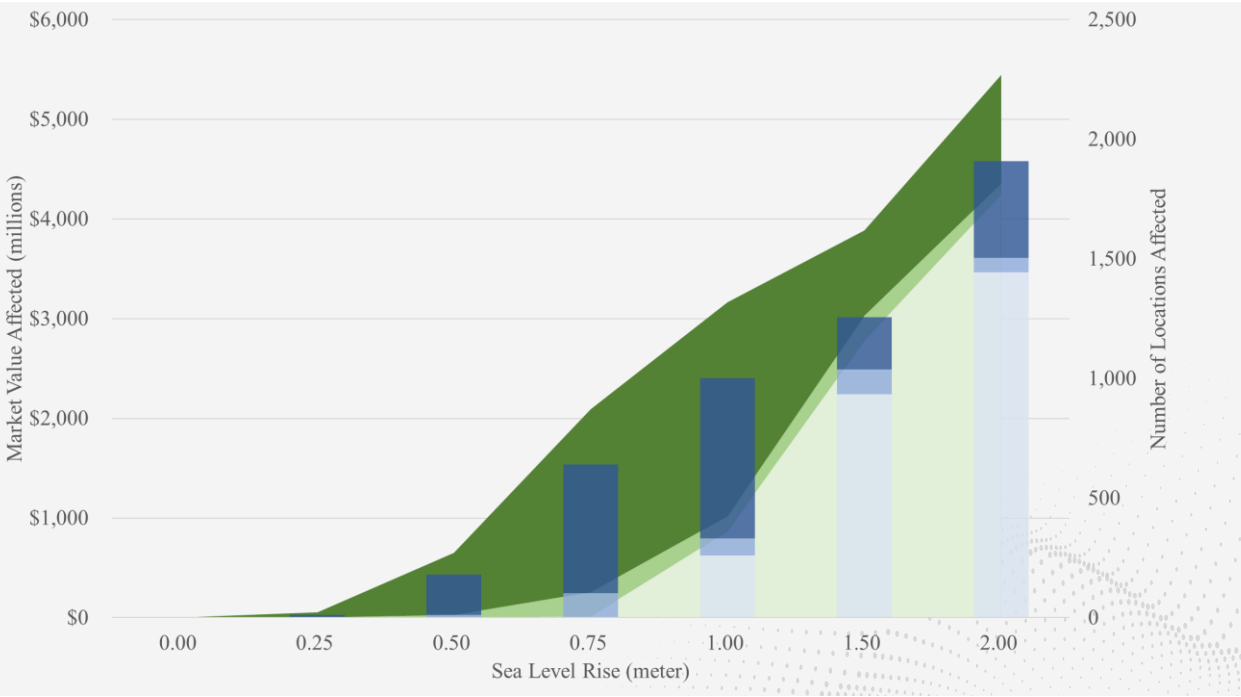
Source: "Rising Seas in California: An Update on Sea-Level Rise Science," California Ocean Protection Council Science Advisory Team Working Group, 2017..

City of Coronado

Affected Market Value and Locations

- **2022-2023 Budget: $107 million[1]**
- **A 20-year storm event today would not flood any residential buildings**
- **A 0.5 meter sea level rise (SLR), coupled with a 100-year storm event, would flood residential buildings with market value of $649 million**
- **A 2 meter SLR would flood residential buildings with market value of $4.3 billion, without a storm event**

1. Fiscal 2022/2023 Adopted Budget, City of Coronado, California

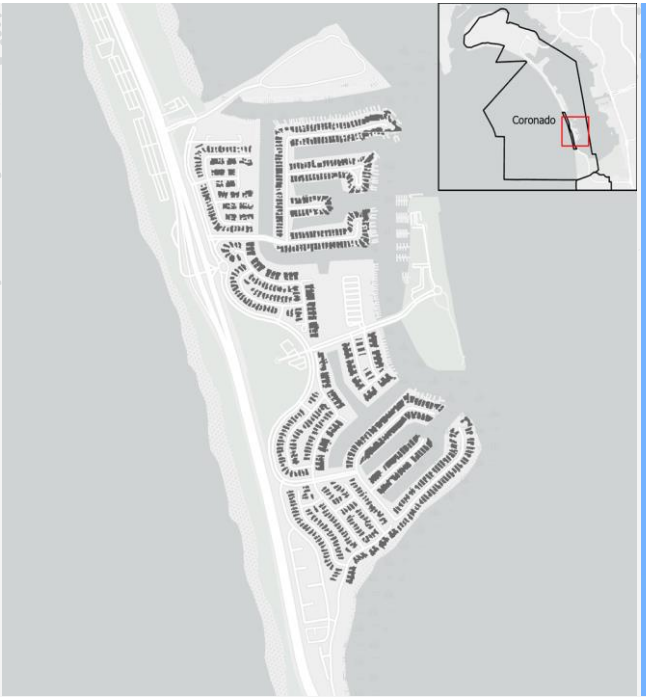


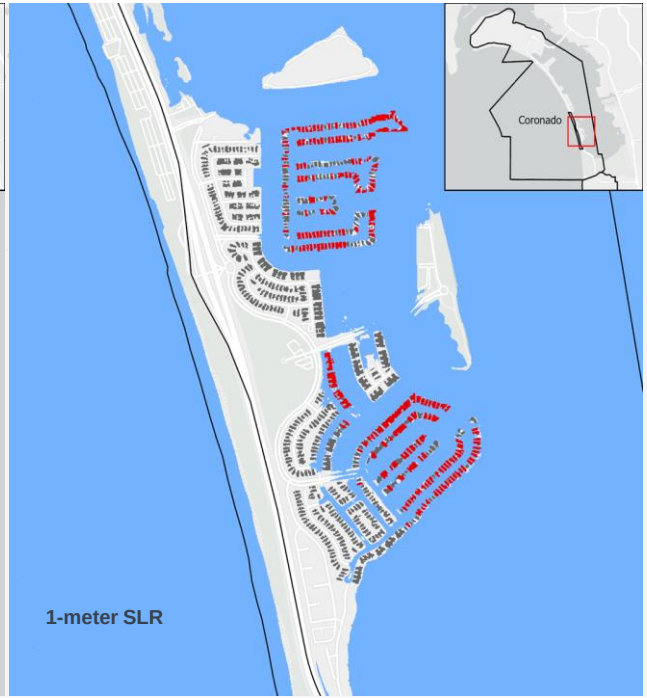
City of Coronado (south)

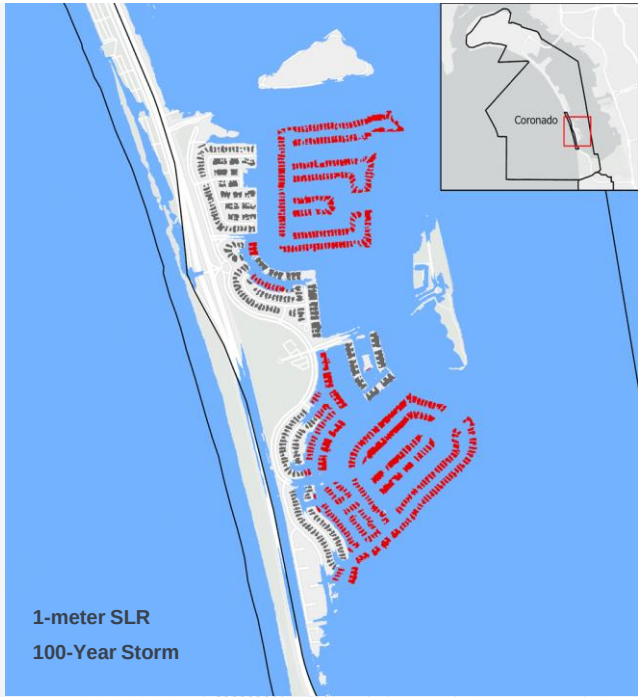
Progression of Sea Level Rise (SLR)

City of Coronado (south)

Progression of Sea Level Rise (SLR)

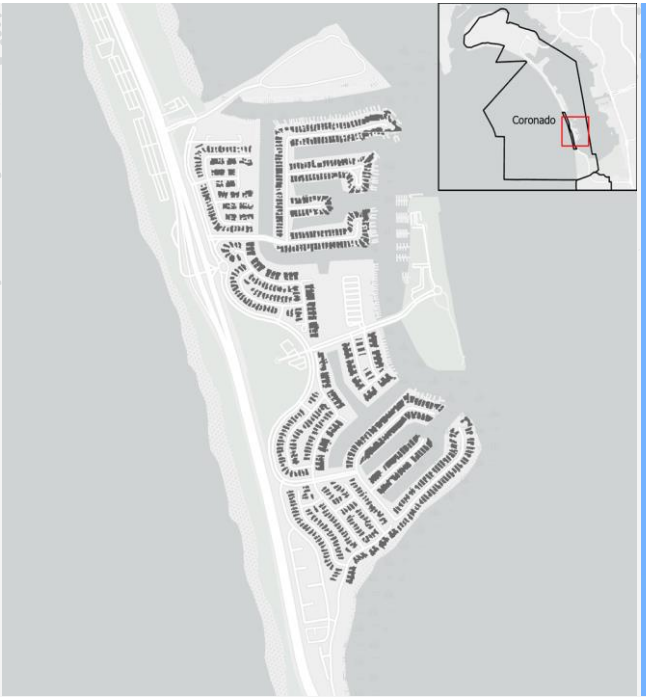


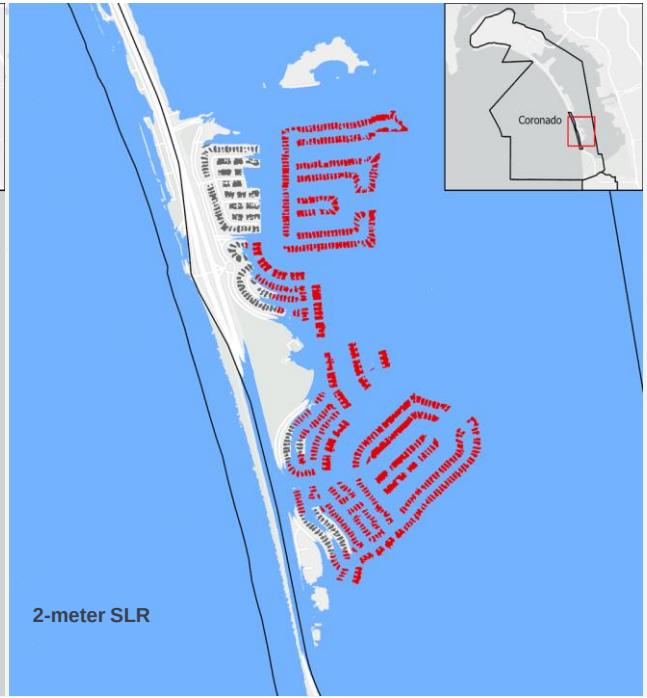


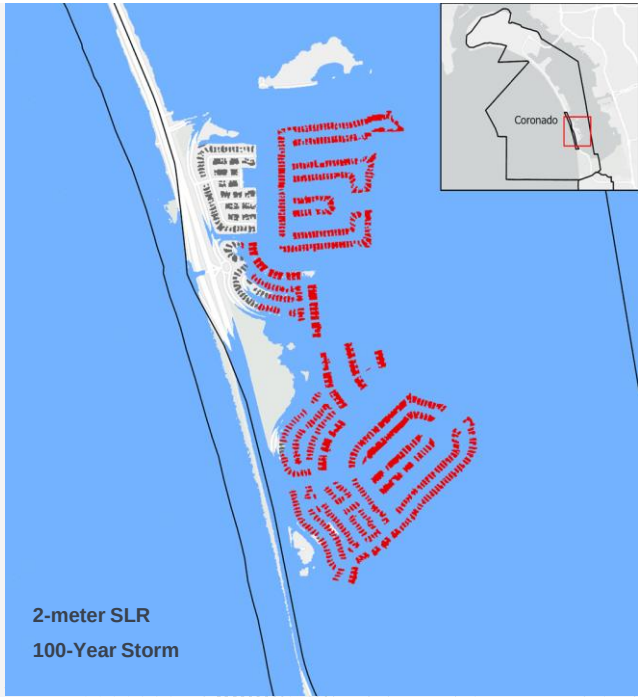


City of Coronado (south)

Progression of Sea Level Rise (SLR)

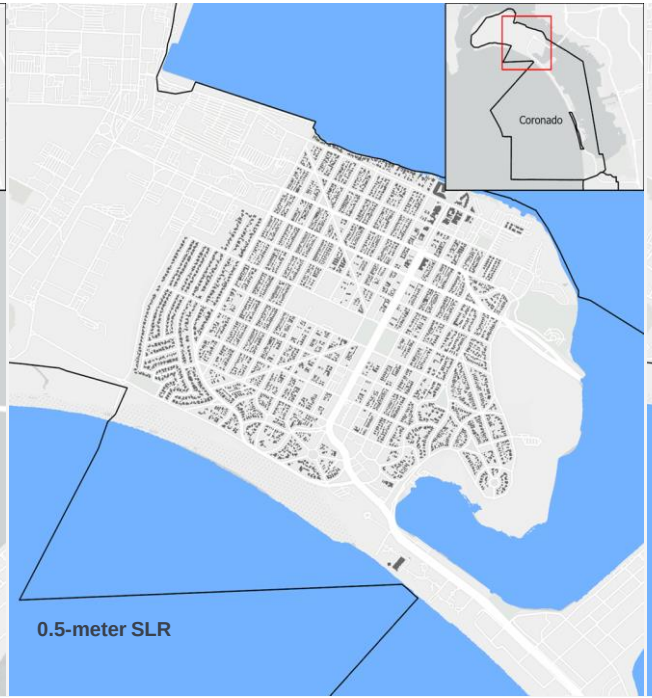


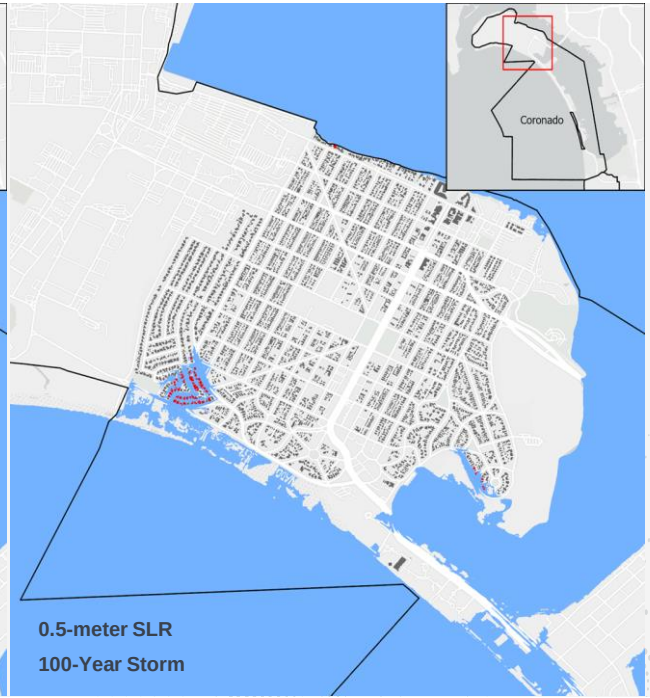




City of Coronado (north)

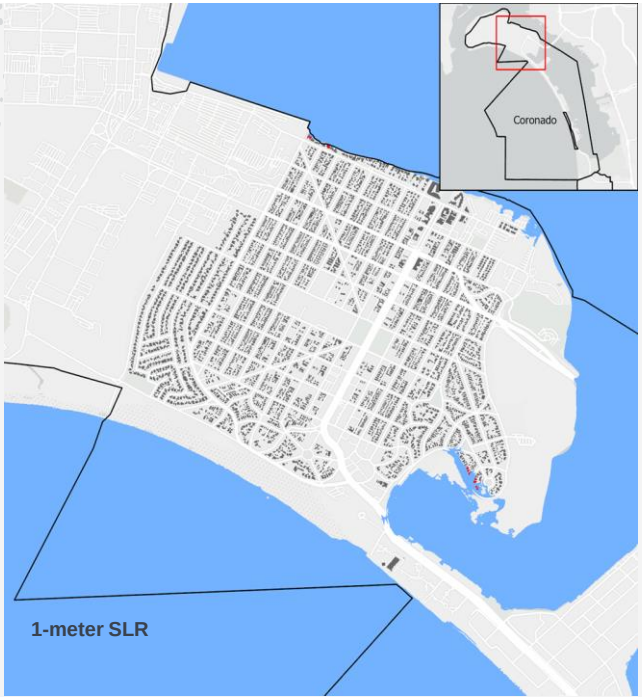
Progression of Sea Level Rise (SLR)

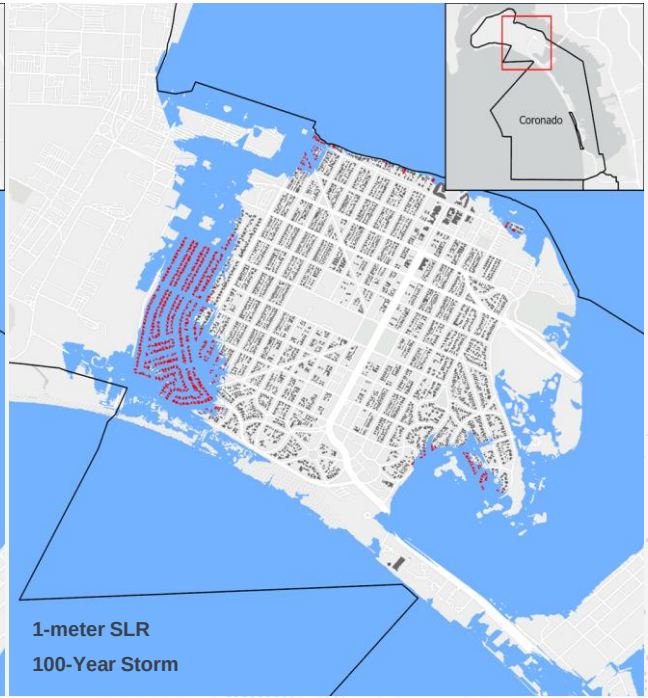




City of Coronado (north)

Progression of Sea Level Rise (SLR)





City of Coronado (north)

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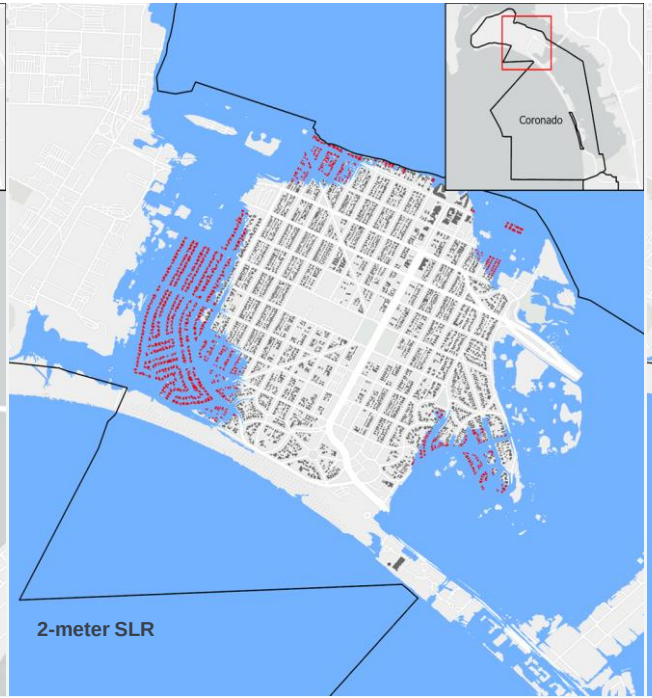
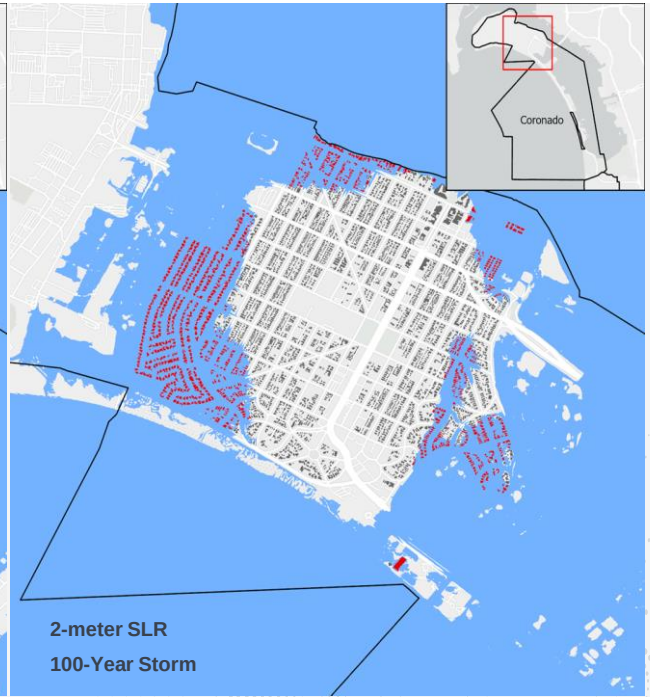
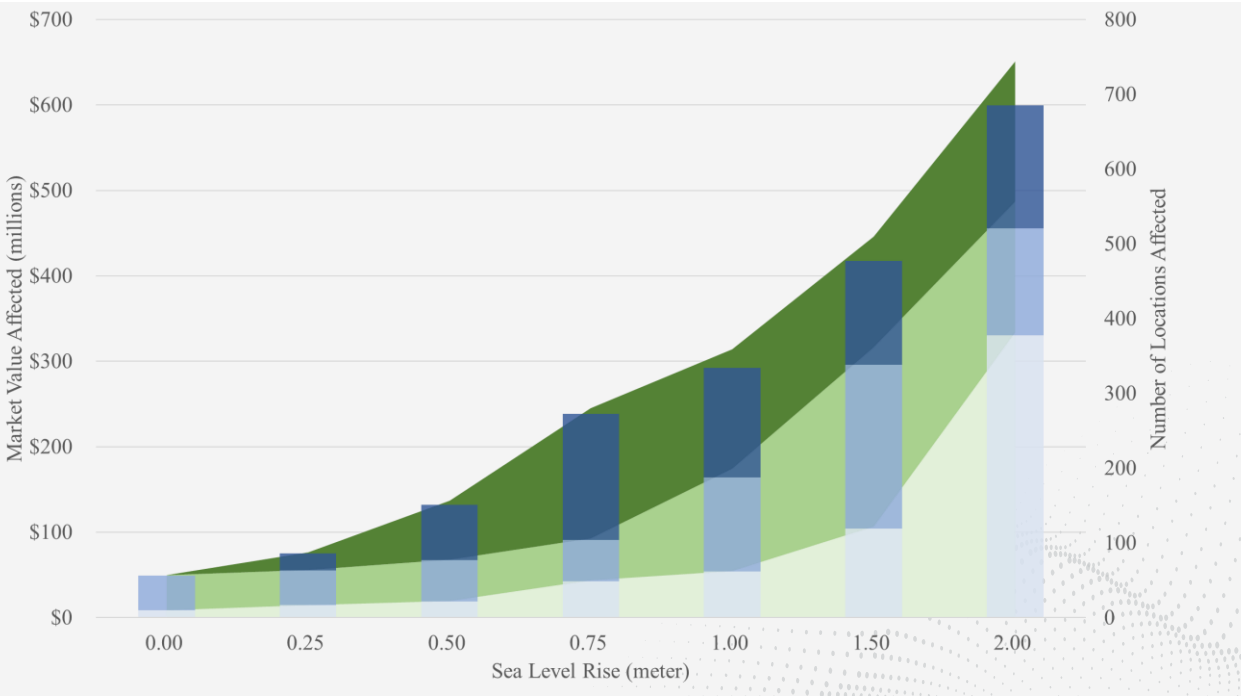




City of Imperial Beach

Affected Market Value and Locations

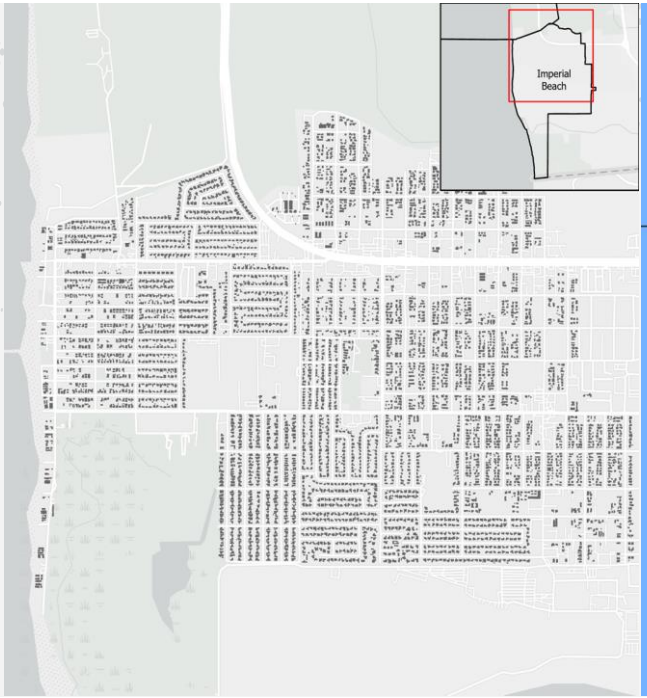
- **2022-2023 Budget: $40 million[1]**
- **A 20-year storm event today would flood $50 million in residential building market value.**
- **A 0.5 meter SLR, coupled with a 100-year storm event, would flood residential buildings with market value of $137 million**
- **A 2 meter SLR would flood residential buildings with market value of $334 million, without a storm event**

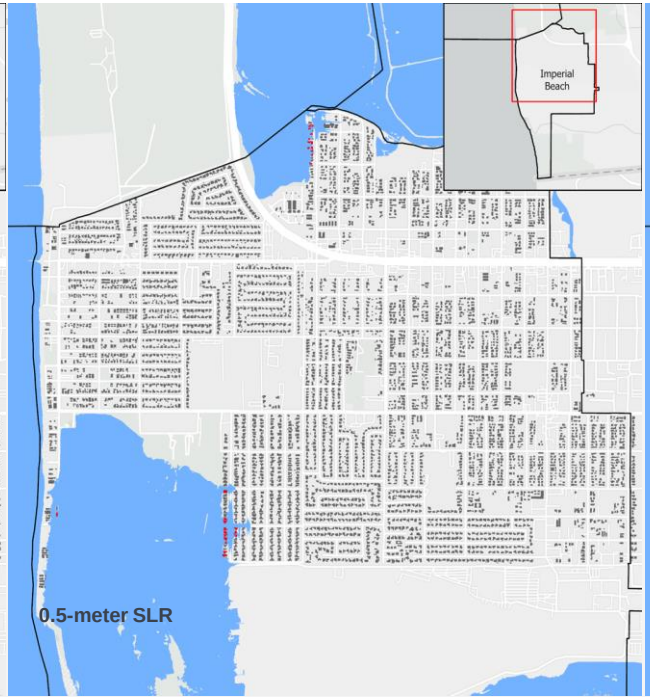


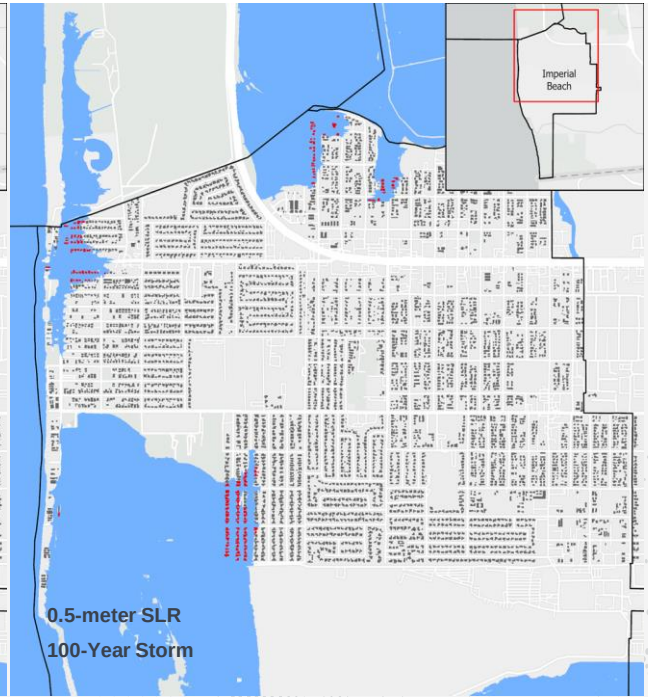
1. 2022-2023 Biennial Budget

City of Imperial Beach

Progression of Sea Level Rise (SLR)







City of Imperial Beach

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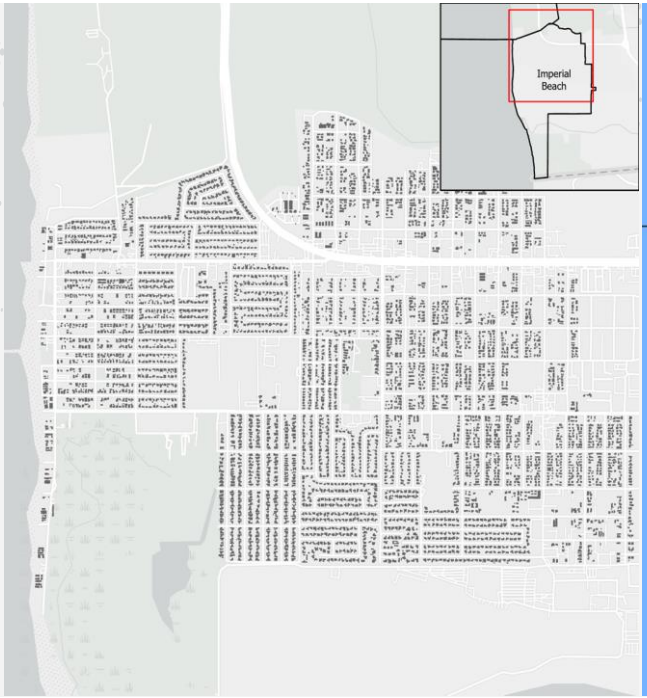

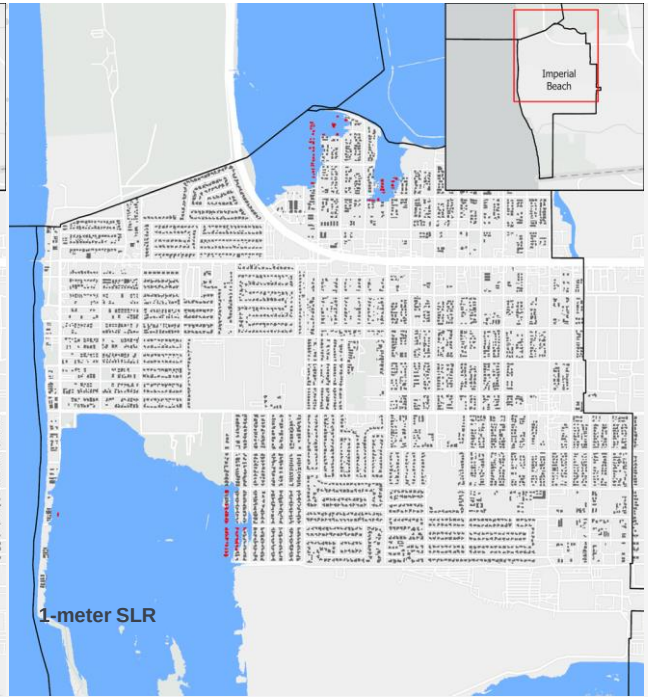

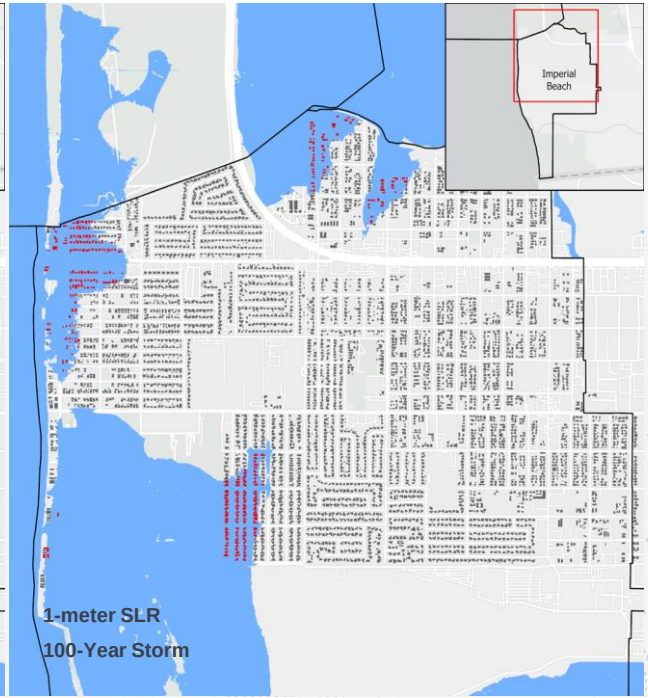

City of Imperial Beach

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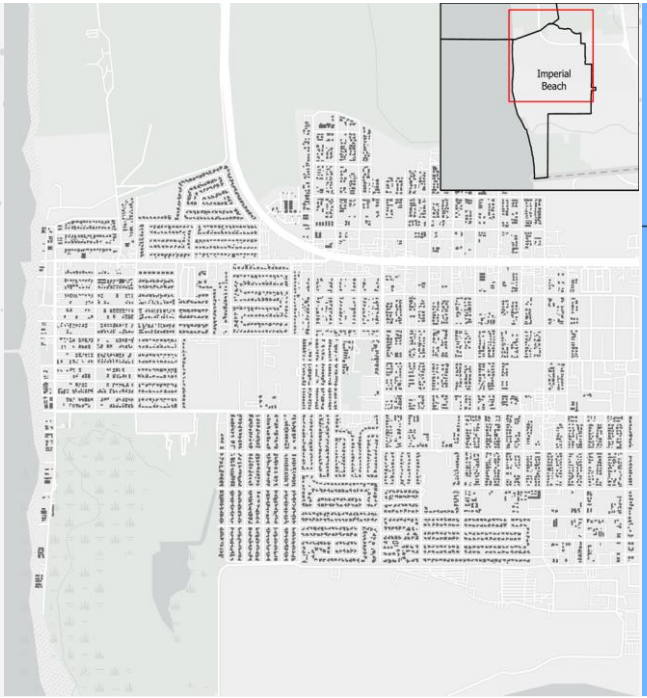
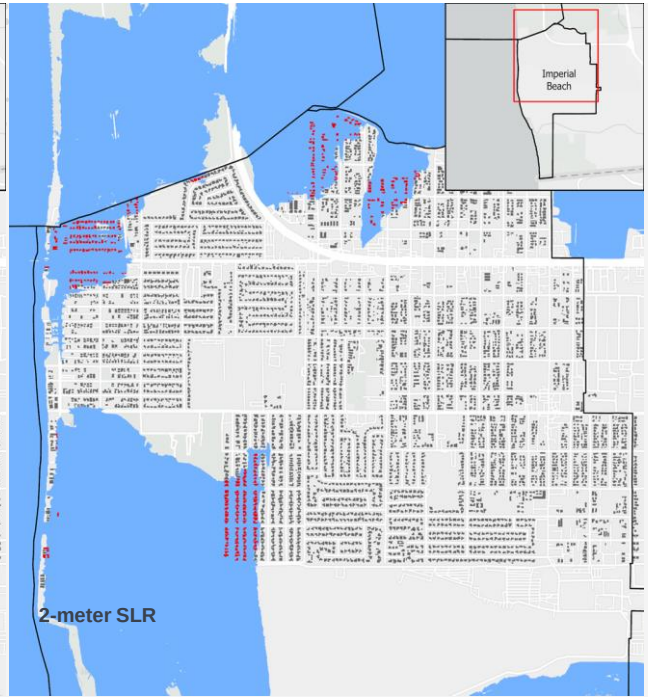
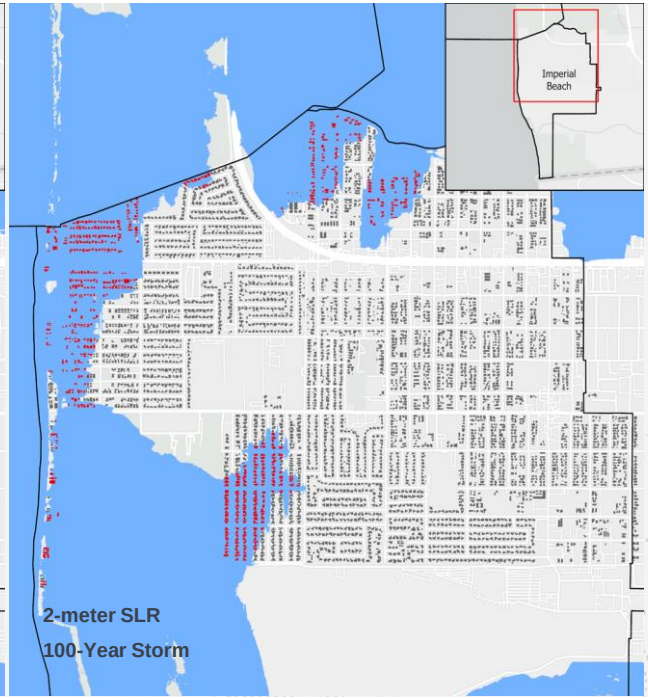




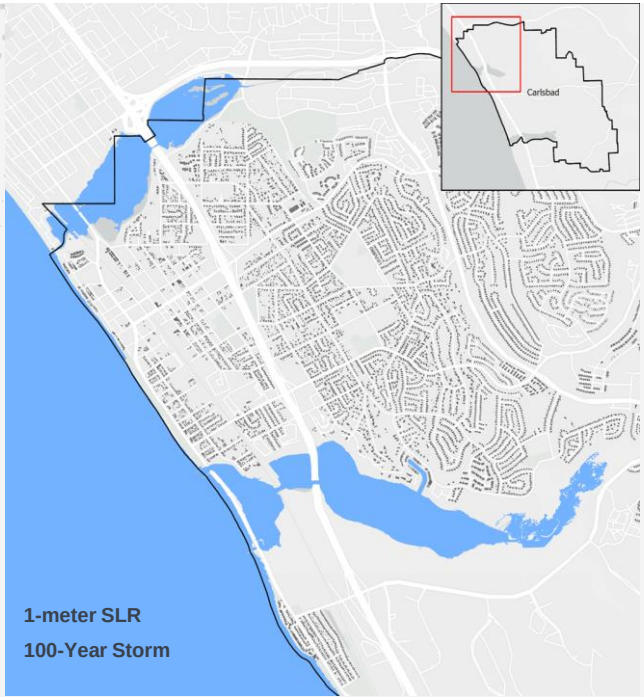


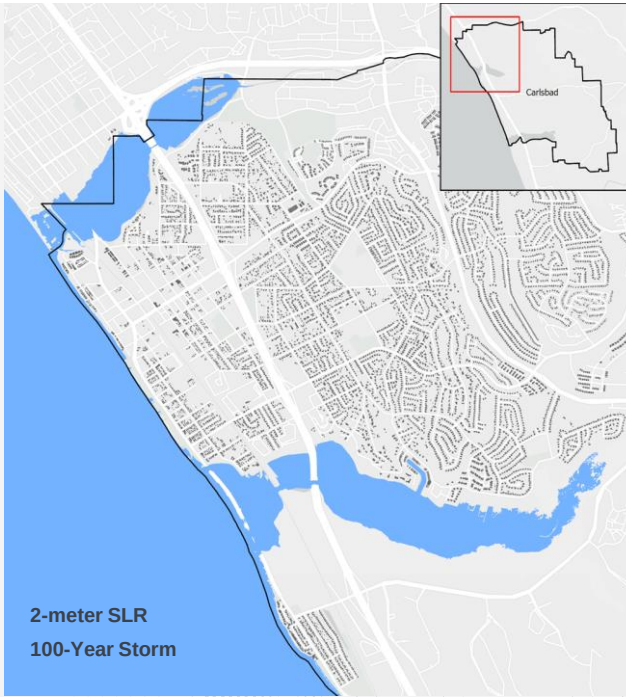
Cities of Carlsbad, Santa Barbara and Santa Cruz

- Less flooded than Coronado and Imperial Beach
- Under the most severe scenario (2-meter sea level rise with 100-year storm)
  - Carlsbad
    - Not flooded
  - Santa Barbara
    - 2.4% of total residential buildings flooded
    - $408 million market value, which is 86% of the city budget
  - Santa Cruz
    - 0.3% of total residential buildings flooded
    - $39 million market value, which is 10% of the city budget

City of Carlsbad

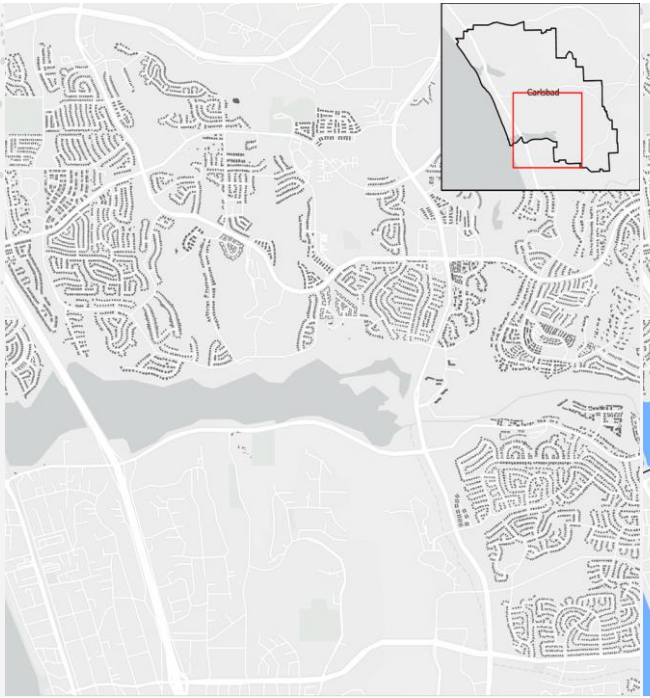
Progression of Sea Level Rise (SLR)

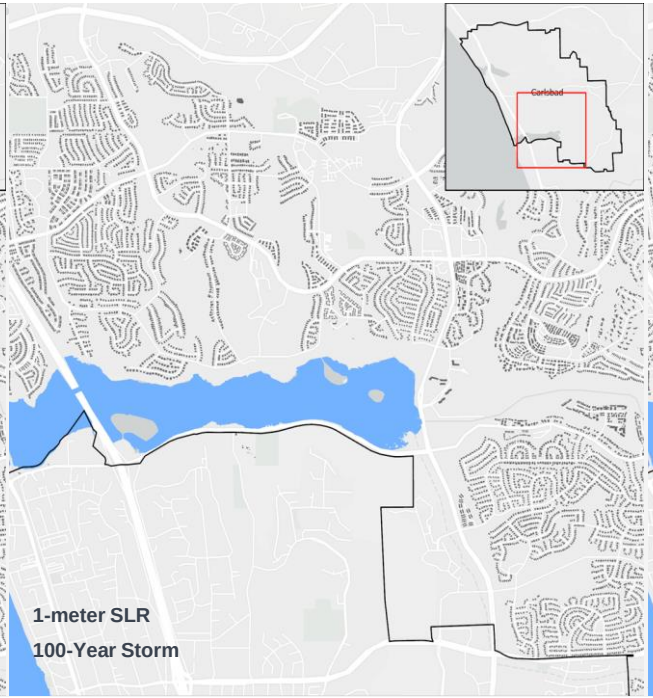


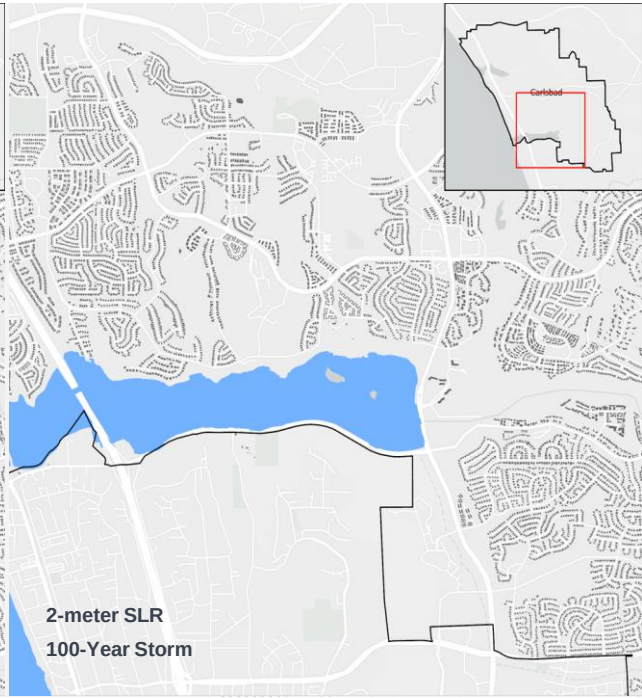


City of Carlsbad

Progression of Sea Level Rise (SLR)

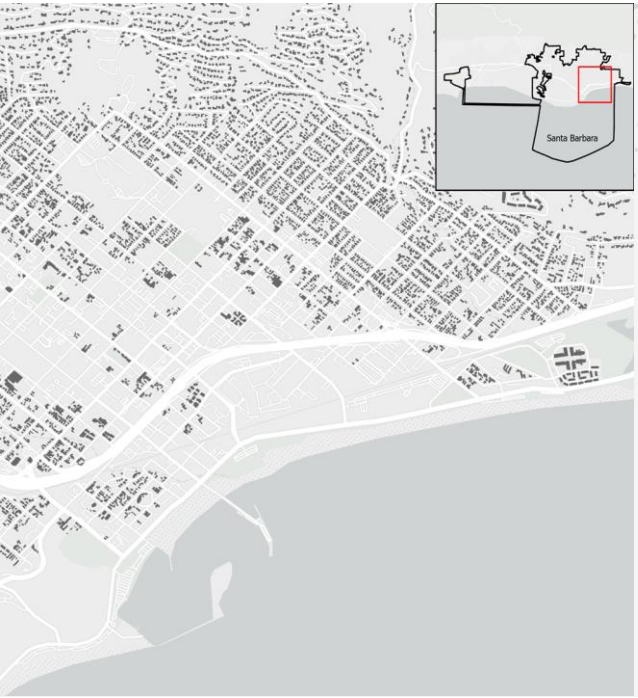


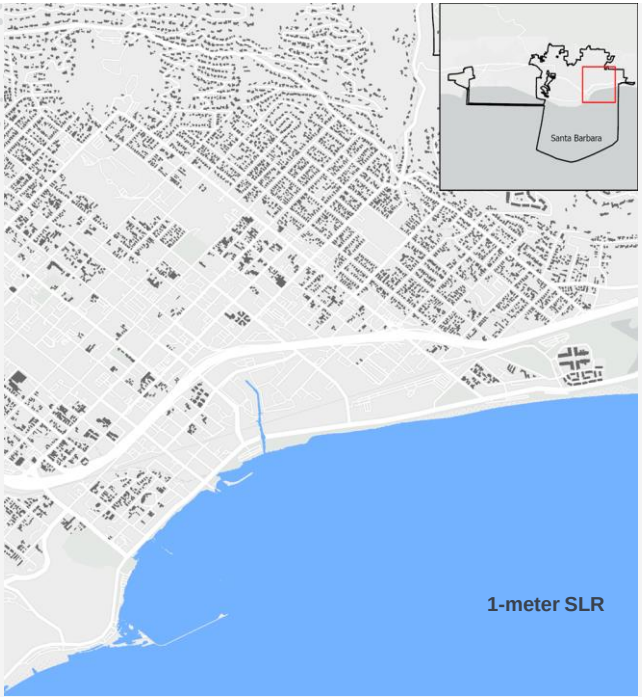


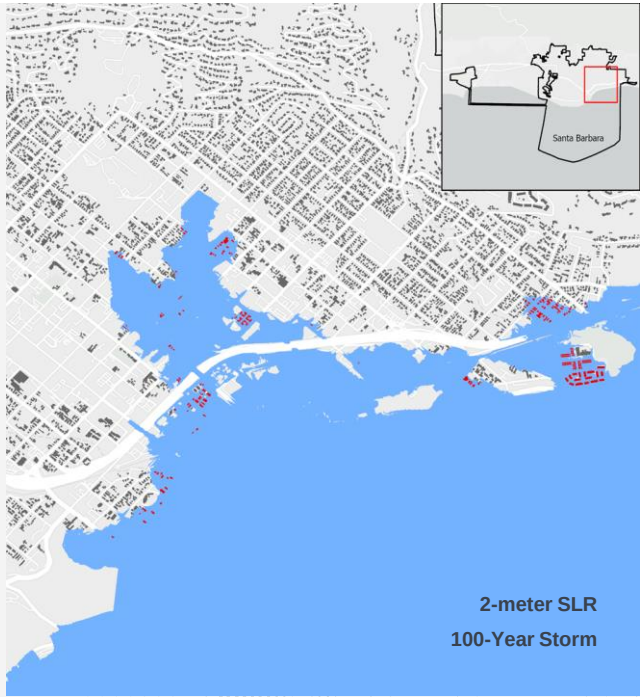


City of Santa Barbara

Progression of Sea Level Rise (SLR)

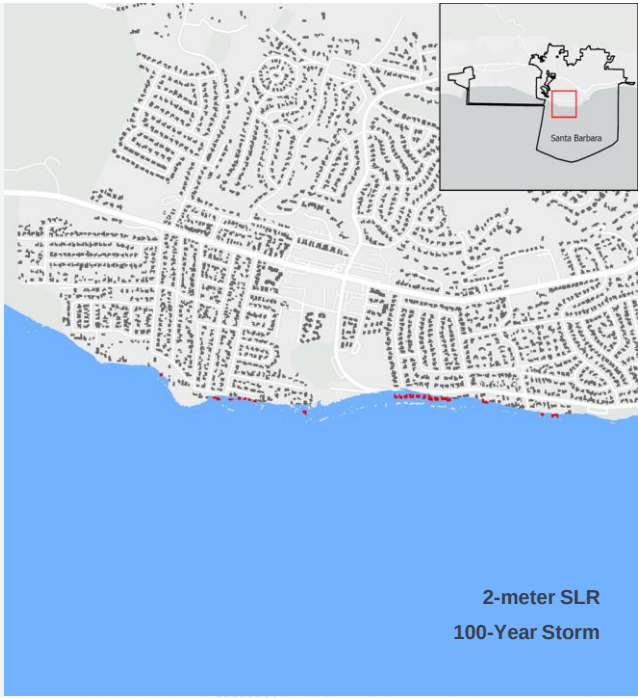






City of Santa Barbara

Progression of Sea Level Rise (SLR)



City of Santa Barbara

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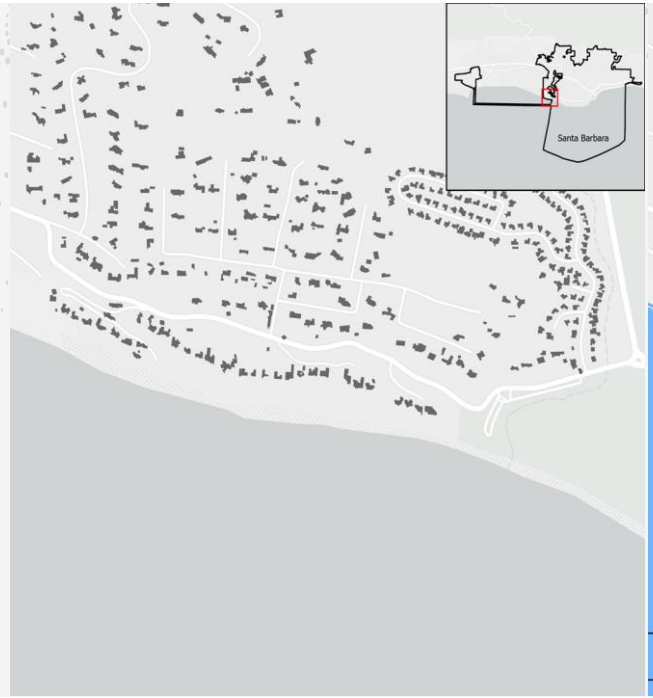
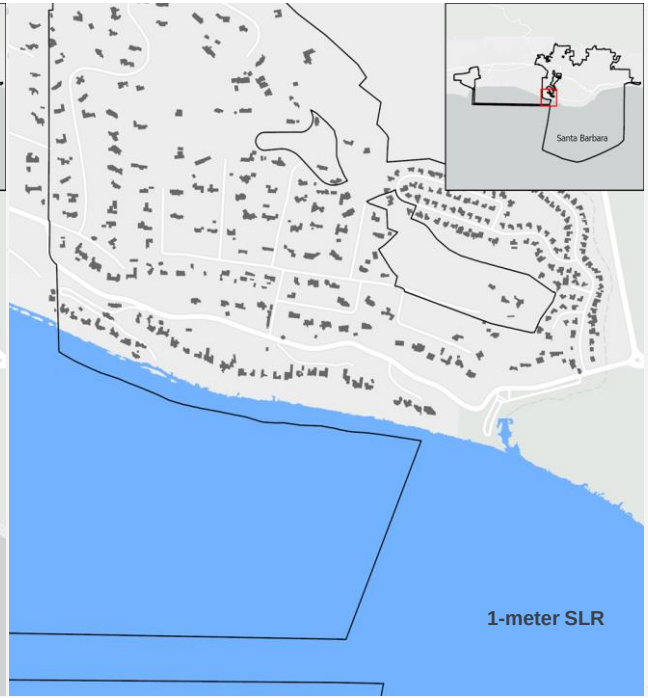
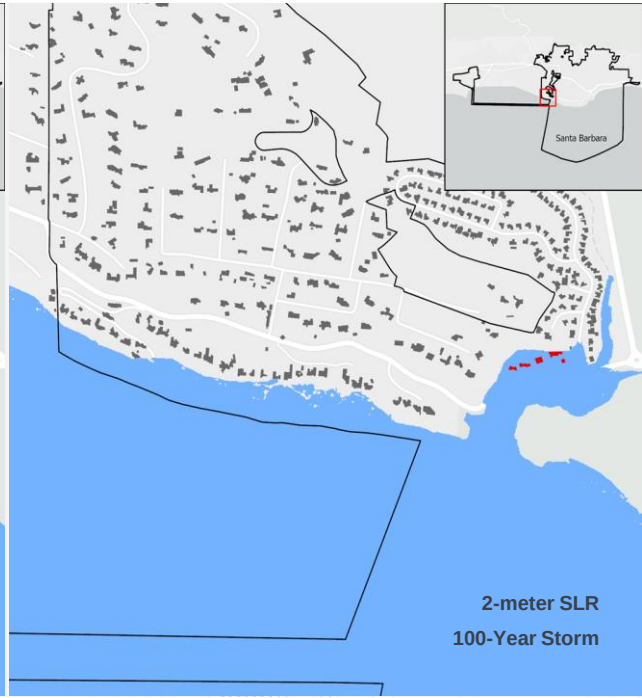
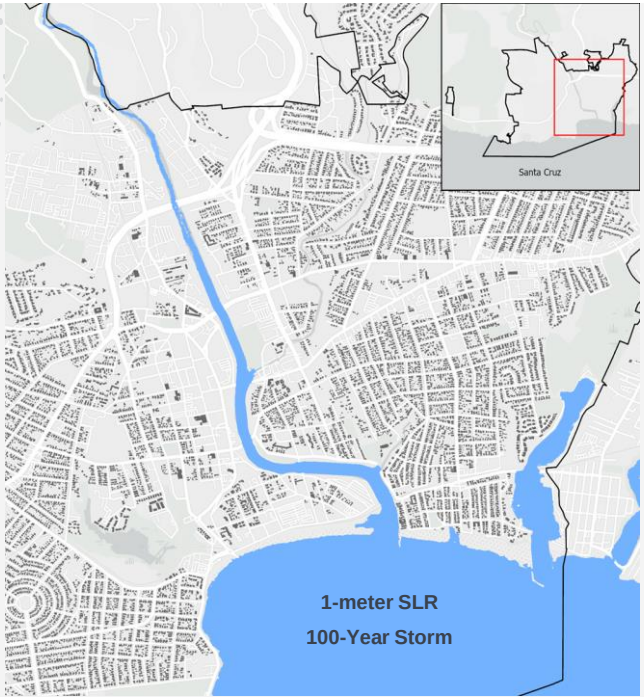


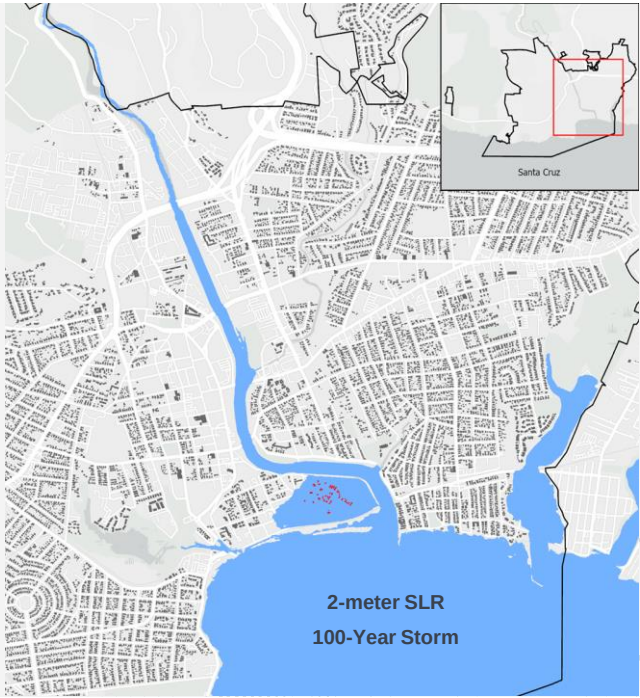




City of Santa Cruz

Progression of Sea Level Rise (SLR)





Conclusions

- Some cities will be heavily impacted by sea level rise. For others the impact will be small.
- For small amounts of sea level rise impacts will be primarily driven by infrequent storms. As sea level rise increases, properties may be inundated even without storms.
- There is considerable uncertainty in when different amounts of sea level rise will occur. It can be helpful to think about the impact from different amounts of sea level rise, instead of forecasting when sea level rise will occur.

Limitations

Qualifications. The undersigned professional is currently member in good standing of the American Academy of Actuaries (AAA) and the Casualty Actuarial Society (CAS), and has satisfied the Current Continuing Education requirements of the CAS and the AAA.

Data Reliances. In performing this analysis we relied upon information obtained from CosMoS and LightBox, and other publicly available information. We have not audited or verified this data and information. If the underlying data or information is inaccurate or incomplete, the results of our analysis may likewise be inaccurate or incomplete. In that event, the analysis may not be suitable for its intended purpose.

We performed a limited review of the data used directly in our analysis for reasonableness and consistency. We did not find material defects in the data. If there are material defects in the data, it is possible that they would be uncovered by a detailed, systematic review and comparison of the data to search for data values that are questionable or relationships that are materially inconsistent. Such a detailed review was beyond the scope of our assignment.

Uncertainty. We based our results on generally accepted actuarial procedures and our professional judgment. Our results reflect assumptions that are built into the CosMoS model, as well as other assumptions..

Model Reliance. Our analysis is based on the CosMoS model. To the extent that the model is biased, the results of our analysis may be biased.

Milliman

Questions?

Matt Chamberlain

matt.chamberlain@milliman.com

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