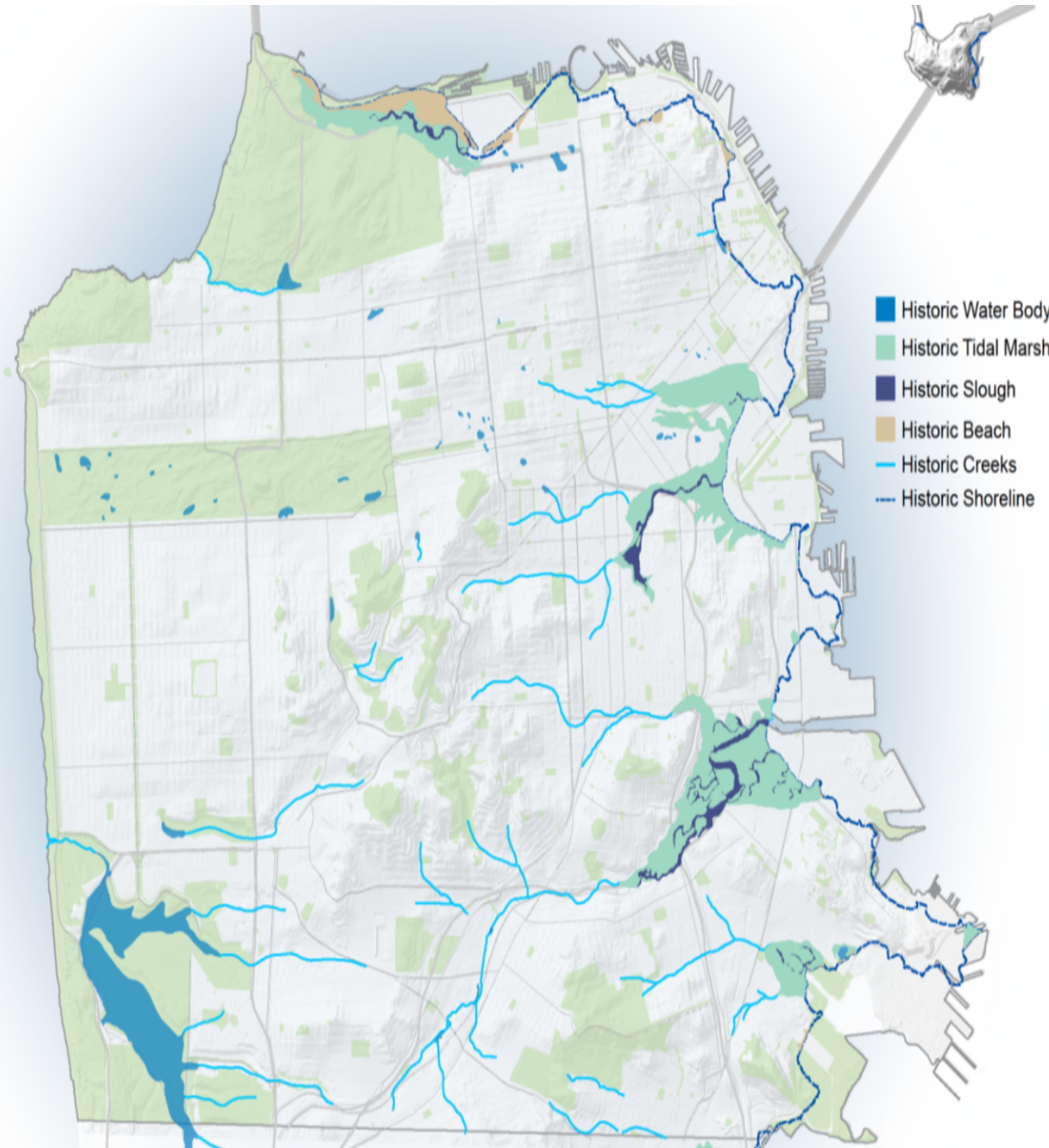


# Resilience on a City Scale

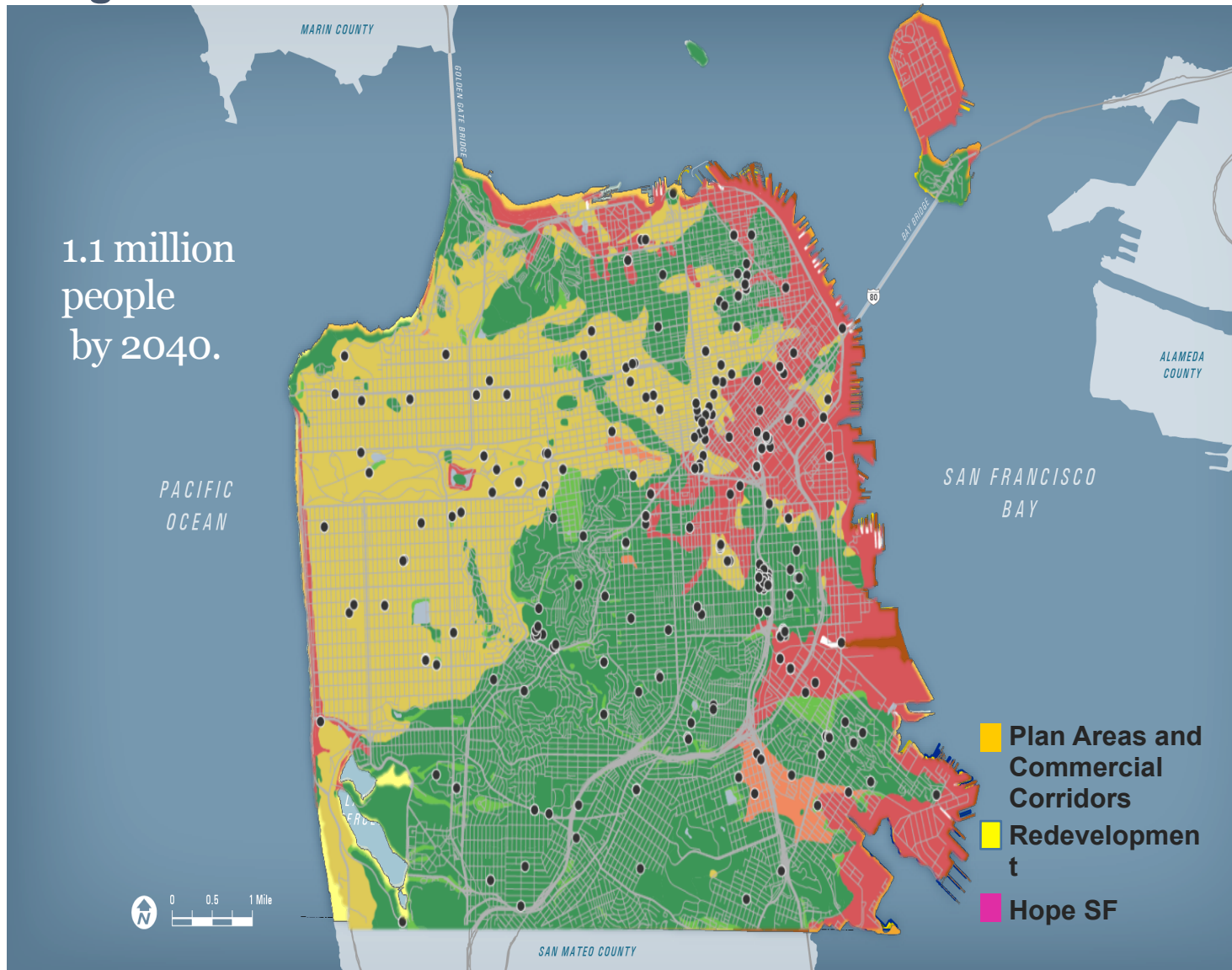
Brian Strong, Chief Resilience Officer and  
Director  
Office of Resilience and Capital Planning  
City and County of San Francisco



# Context



# Resilience Challenges



# Resilience Challenges

- ❑ Creating a sense of urgency
- ❑ Requires tools to develop and implement long term solutions in a political environment
- ❑ Problems and solutions go beyond jurisdictional boundaries
- ❑ Focus on life-safety rather than recovery
- ❑ Issues of equity, displacement, housing, demographics, and population growth
- ❑ Encouraging the private sector to act
- ❑ Lack of funding for mitigation and upfront planning
- ❑ Changes at the federal level
- ❑ Hard to communicate what it means and how its measured
- ❑ **Public Confidence**



# RESILIENT SAN FRANCISCO

STRONGER TODAY, STRONGER TOMORROW.



We face several interconnected challenges:



## EARTHQUAKES

The Bay Area will experience a 7.0 magnitude earthquake in the next 30 years. Even the relatively moderate and distant 1989 Loma Prieta Earthquake (6.9) caused substantial damage to our city. It is imperative to the survival of San Francisco that we continue working to prepare and recover from the "big one."



## INFRASTRUCTURE

Our daily lives—from the roads and pipes we use every day, to the larger systems, like food and social networks and housing that we rely on as lifelines. Sometimes these systems continue to operate past their intended life span and sometimes they are inadequate all together to meet the needs of a growing and vibrant city.



## CLIMATE CHANGE

Change are already being felt in the form of drought and increasingly severe storm events. We must secure our city's future through mitigation, while recognizing the likely impacts of climate change by beginning to adapt today rather than when it is too late.



## SOCIAL INEQUITY

Equality and equity in all policies but this work is never done. Social equity and inclusiveness needs to be at the core of what makes a city thrive.



## SEA LEVEL RISE

of sea level rise to impact our shores by 2100. As we plan for the growth of our city, we need to adapt to this challenge that threatens not only our waterfront but also our way of life in San Francisco and regionally.



## UNAFFORDABILITY

In San Francisco pay more than 30% of their household income in rent. Median home prices are continuing to rise, making it a challenge for first time home buyers. San Francisco is becoming out of reach for many of the people who made the city what it is today.

# 10-Year Capital Plan



 THE CITY AND COUNTY OF SAN FRANCISCO  
CAPITAL PLAN

**ONESF**  
Building Our Future

Fiscal Years 2018-2027



# San Francisco's Historic Waterfront

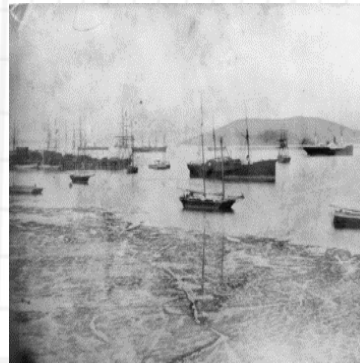
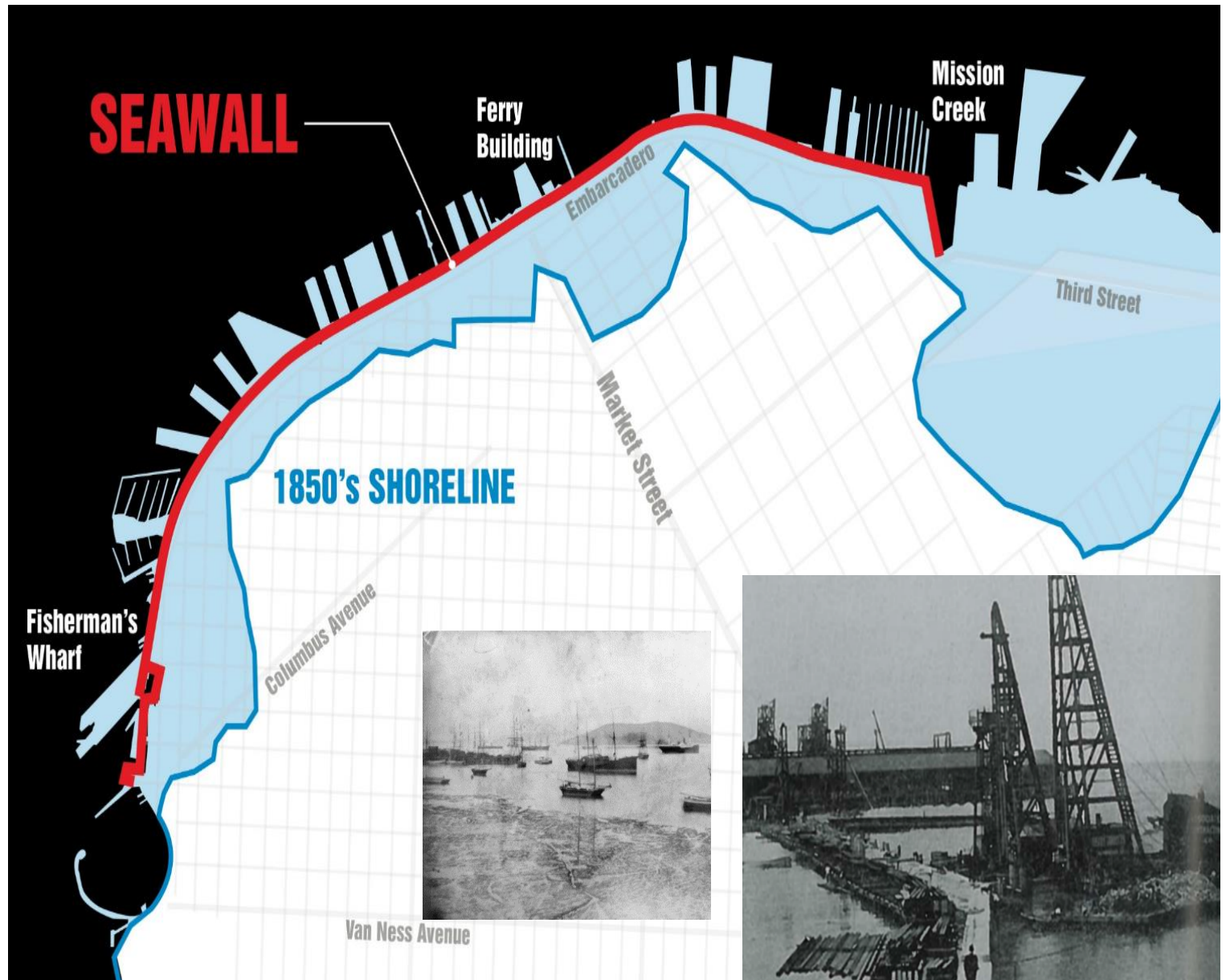




Photo | Michael Macor

## San Francisco's Waterfront

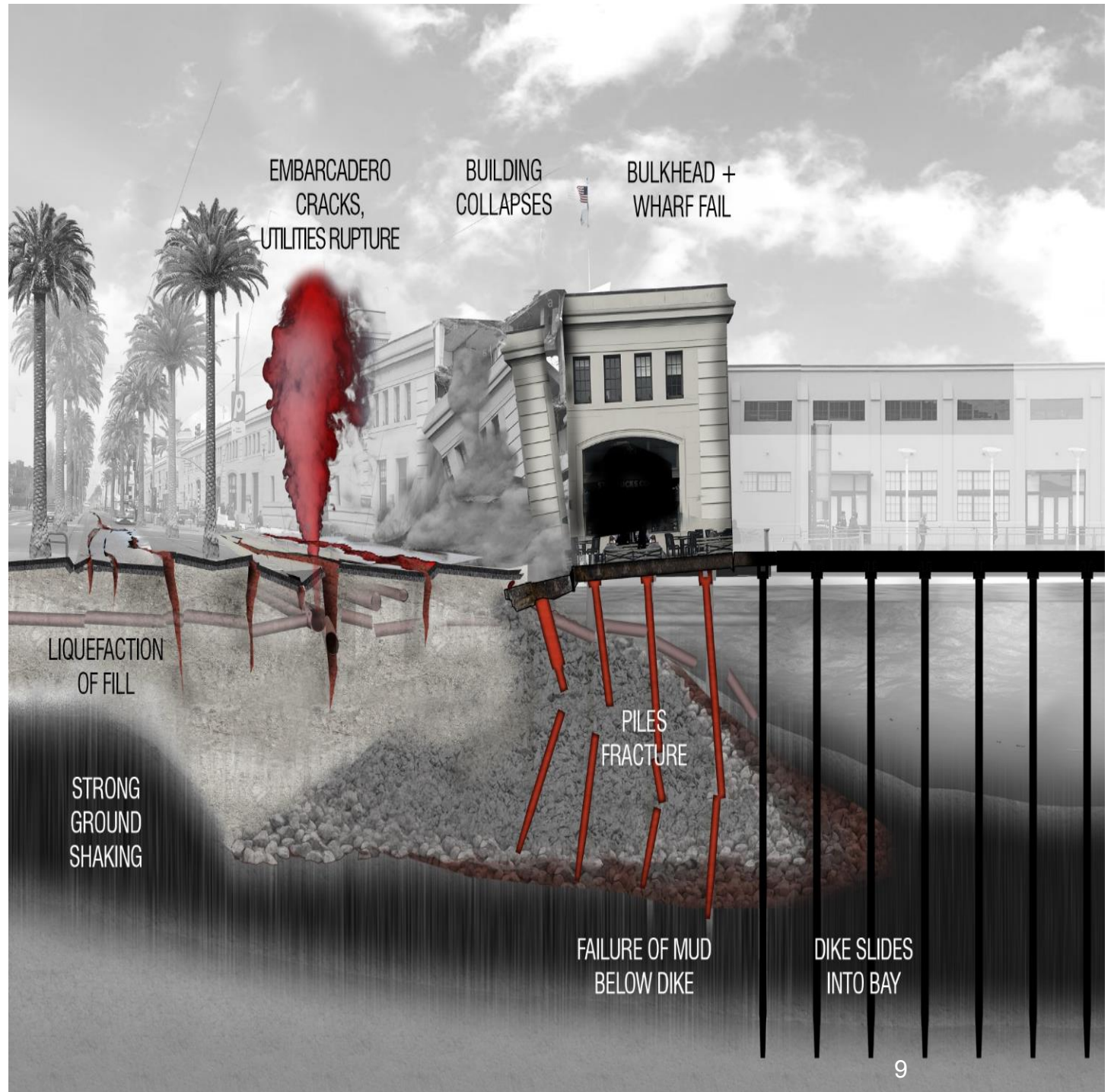
### At Risk

- \$100 billion in assets and activities
- Historic district
- Maritime facilities
- Bart/Muni railway
- **Utilities**
- Emergency response

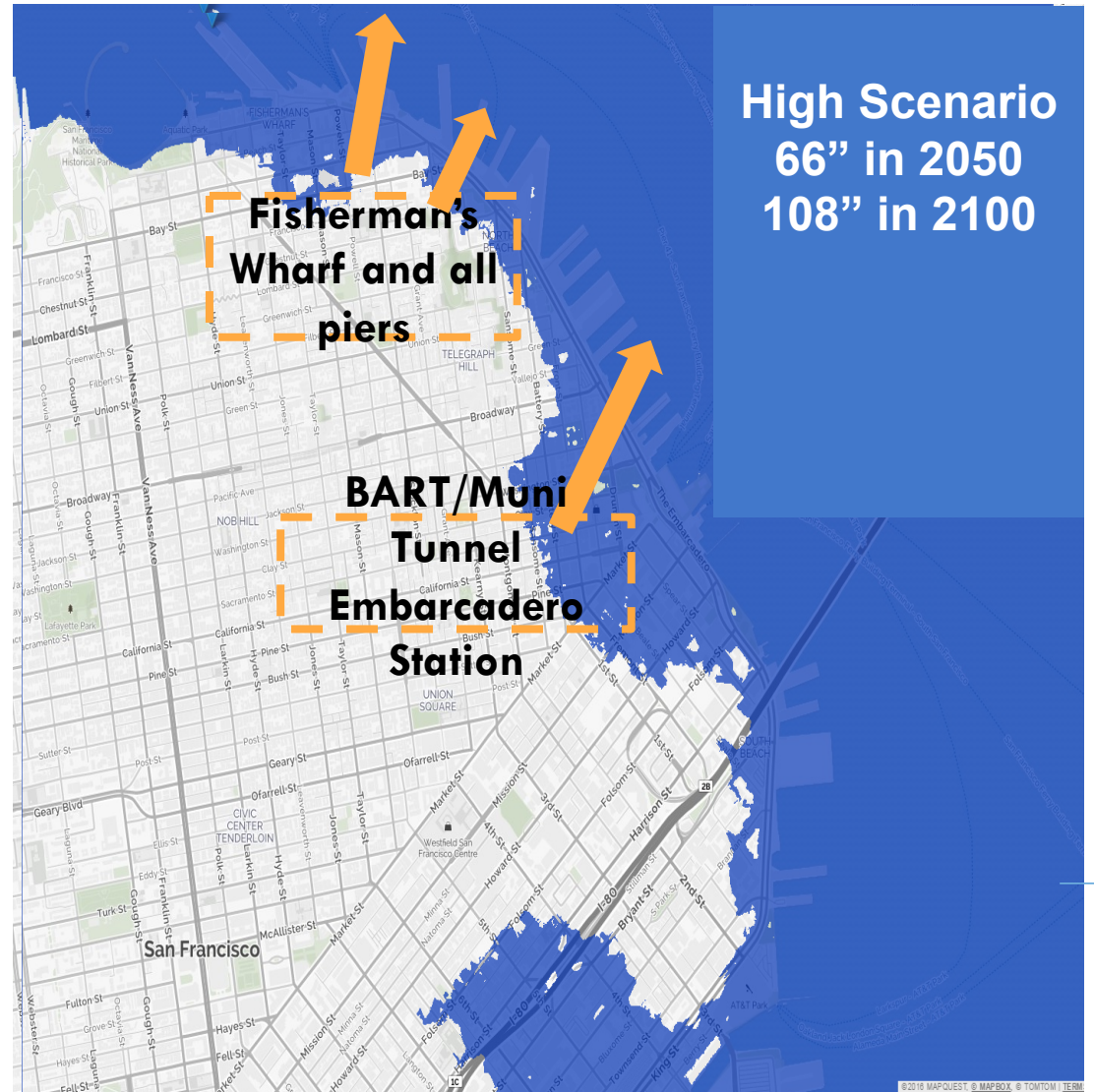
### Estimated Needs

- \$500M for immediate life safety
- \$2-5B for full seismic improvements and to address sea level rise

# Sea Wall Earthquake Safety Bond



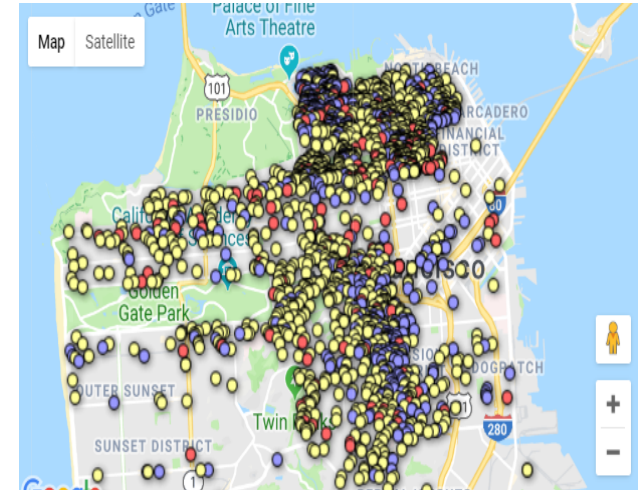
# Sea Level Rise



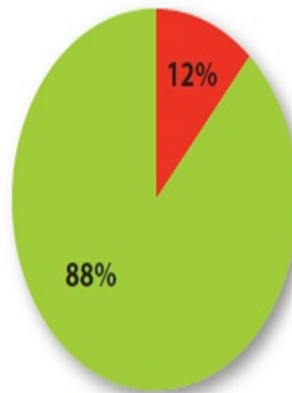
YEAR 2100	PRIVATE PROPERTY	PUBLIC PROPERTY	TOTAL EXPOSURE
66" (SLR)	\$19 Billion	\$35 Billion	\$54 Billion
108" (SLR + storm surge)	\$38 Billion	\$37 Billion	\$75 Billion

Note: Dollar amounts indicate asset replacement cost only. Numbers are in 2016 dollars and reflect upper range, end-of-century projections without adaptation or action.

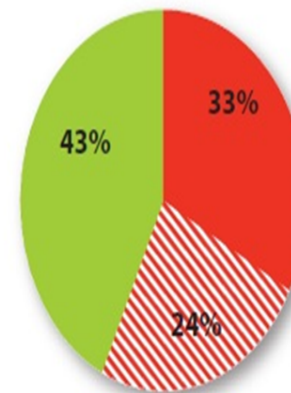
# Earthquake Safety Private Structures



San Francisco  
Public Schools



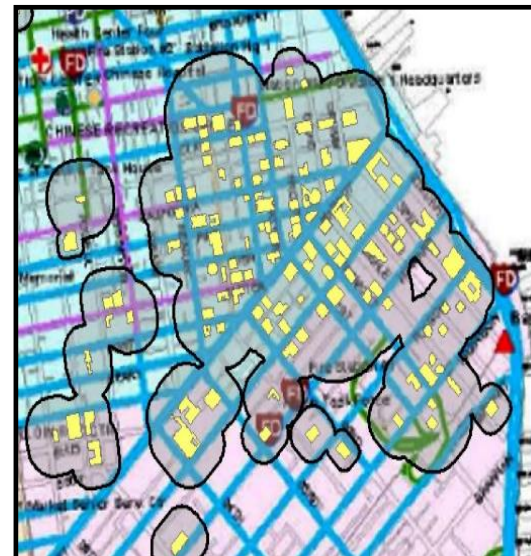
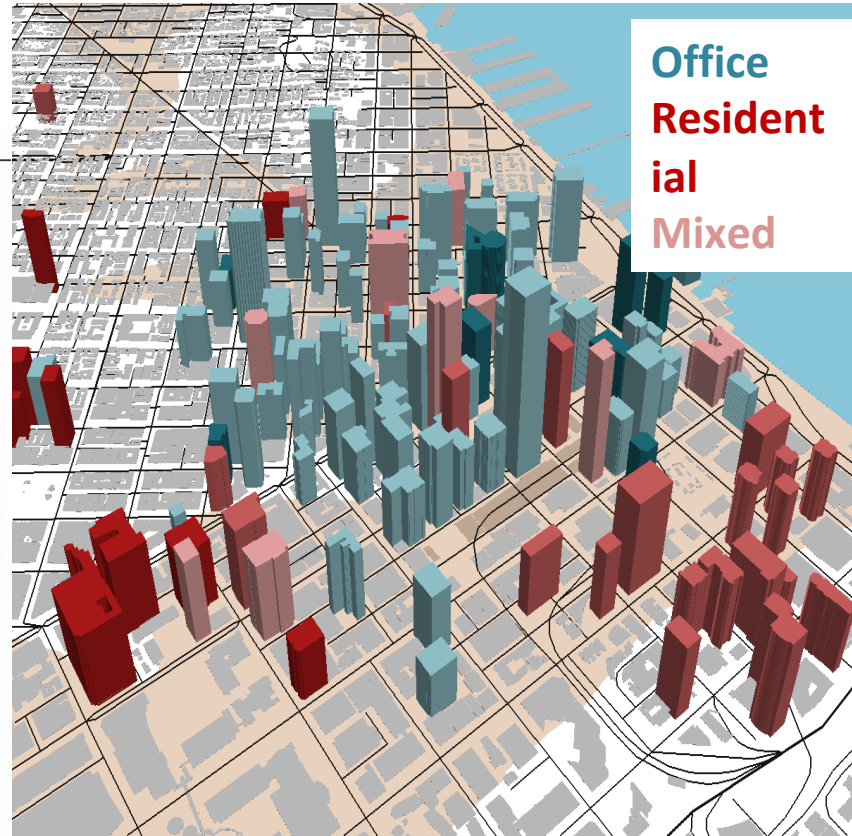
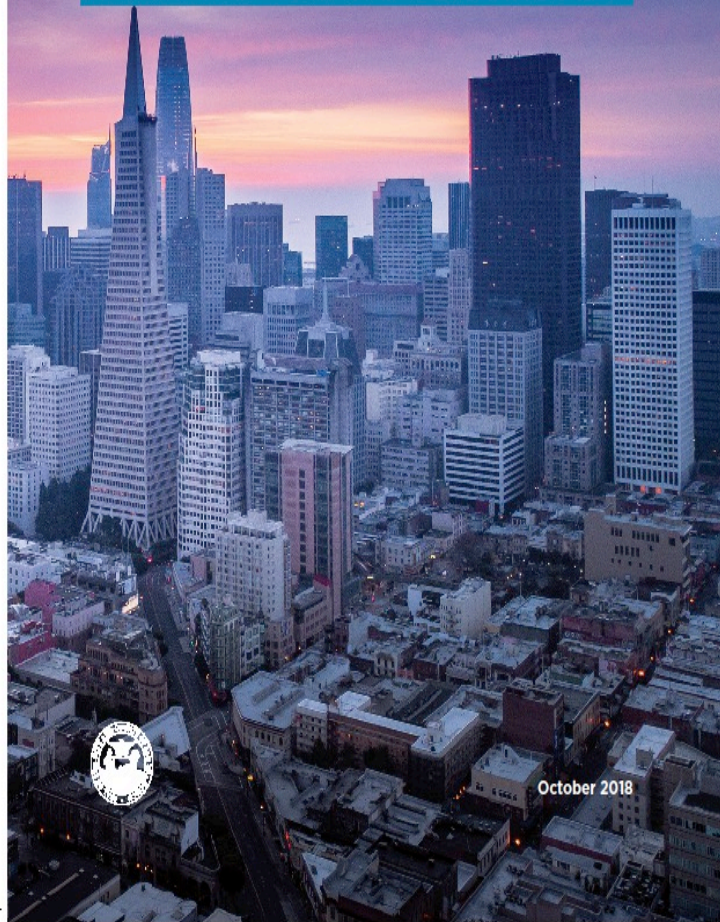
San Francisco  
Private Schools



- Buildings whose characteristics indicate they **might perform poorly** in future earthquakes
- Buildings whose characteristics indicate they are **likely to perform well** in future earthquakes
- Buildings for which there is **not enough information** to determine likely seismic performance

# Tall Buildings

## TALL BUILDINGS SAFETY STRATEGY

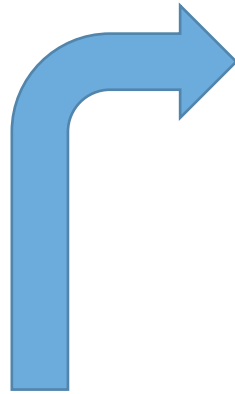


# Lifelines Council

Sector	Agency
Water & Wastewater	SFPUC
Electric Power & Natural Gas	PG&E
Highways & Roads	Caltrans
	SF Public Works
	Golden Gate Bridge HTD
Transit	BART
	SF MTA
Airports	SFO
Ports & Waterways	SF Port
Fuel	Kinder Morgan
Telecommunications	AT&T
	Comcast
	Verizon Wireless
	SF Dept of Technology
AWSS (Firefighting Water)	SFPUC

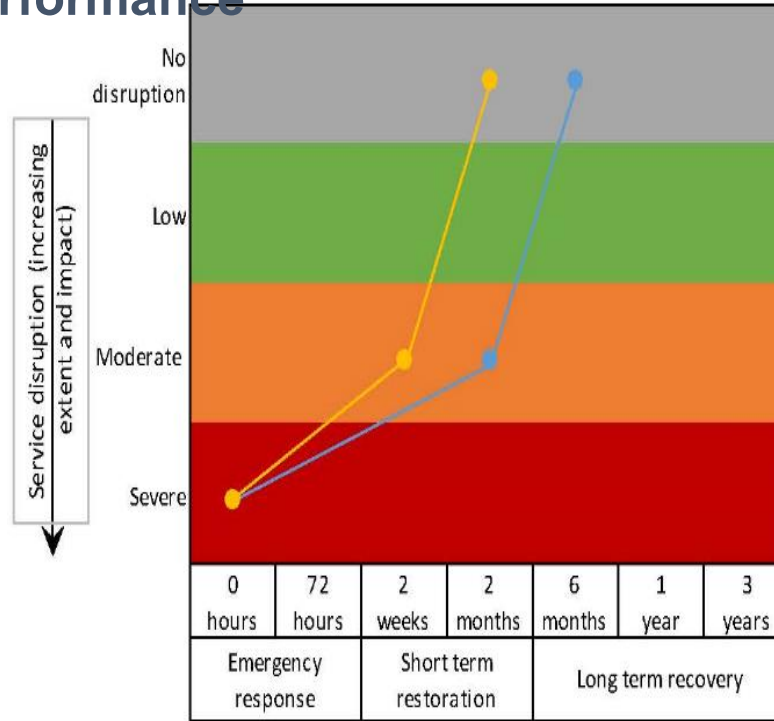


# Lifeline Restoration Performance Project

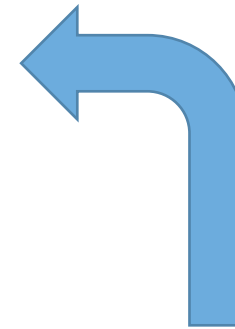


## Sector interviews

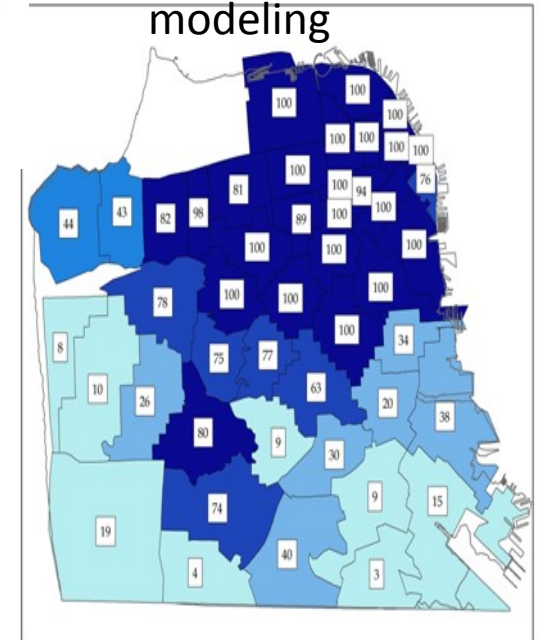
Expected Service Disruptions to Your System (Nature and Extent)						
M7.9 San Andreas Fault						
0 hours	72 hours	2 weeks	2 months	6 months	1 year	3 years
<input type="checkbox"/> No loss	<input type="checkbox"/> No loss	<input type="checkbox"/> No loss	<input type="checkbox"/> No loss	<input type="checkbox"/> No loss	<input type="checkbox"/> No loss	<input type="checkbox"/> No loss
<input type="checkbox"/> Slight disruption	<input type="checkbox"/> Slight disruption	<input type="checkbox"/> Slight disruption	<input type="checkbox"/> Slight disruption	<input type="checkbox"/> Slight disruption	<input type="checkbox"/> Slight disruption	<input type="checkbox"/> Slight disruption
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Description:	Description:	Description:	Description:	Description:	Description:	Description:



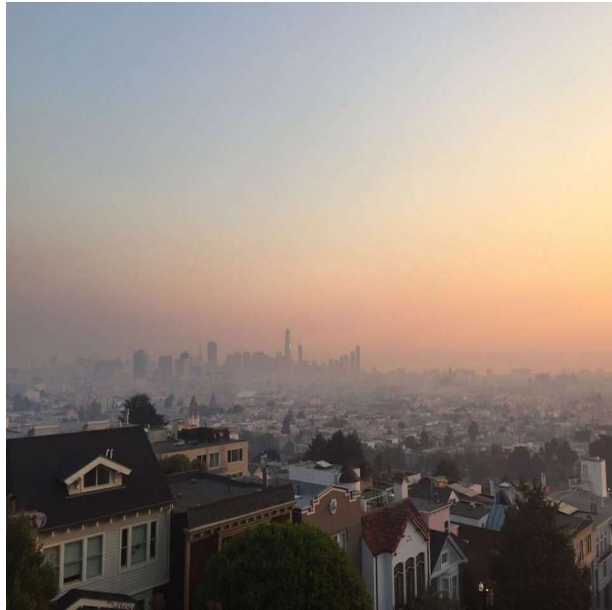
- Current, existing performance
- Goal



## Sector modeling



# Hazard and Climate Resilience Plan



## Increasing Temperatures



More **extreme heat** days, making heatwaves more frequent and longer-lasting

**Drought** and **wildland-urban-interface fires** will become more frequent and severe

## Rising Sea Levels



More frequent, extensive and longer-lasting **coastal flooding** especially during storm events.

**Stormwater flooding** will increase as high bay levels can impede drainage of stormwater runoff.

Higher groundwater table will **increase the susceptibility of some soils to liquefaction** during an earthquake.

## Changing Precipitation Patterns



Concentrated precipitation in discrete storm events can increase **stormwater flooding**.

California could be subject to frequent and severe **droughts**.

A reduced snowpack in the Sierras can exacerbate **drought**.

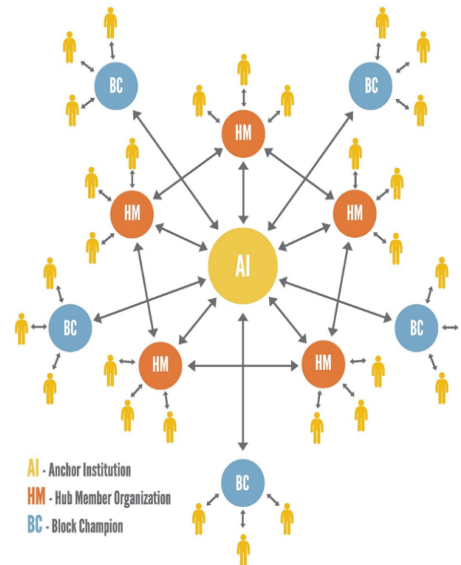
# Community Orientation

Neighborhood Empowerment

Network

- Effective disaster response cannot be driven by government alone
- Community-based partners expand government's reach (Resilient Hubs)
- Neighborfest Block Parties
- Community leadership academy

## HUB Pre-Event

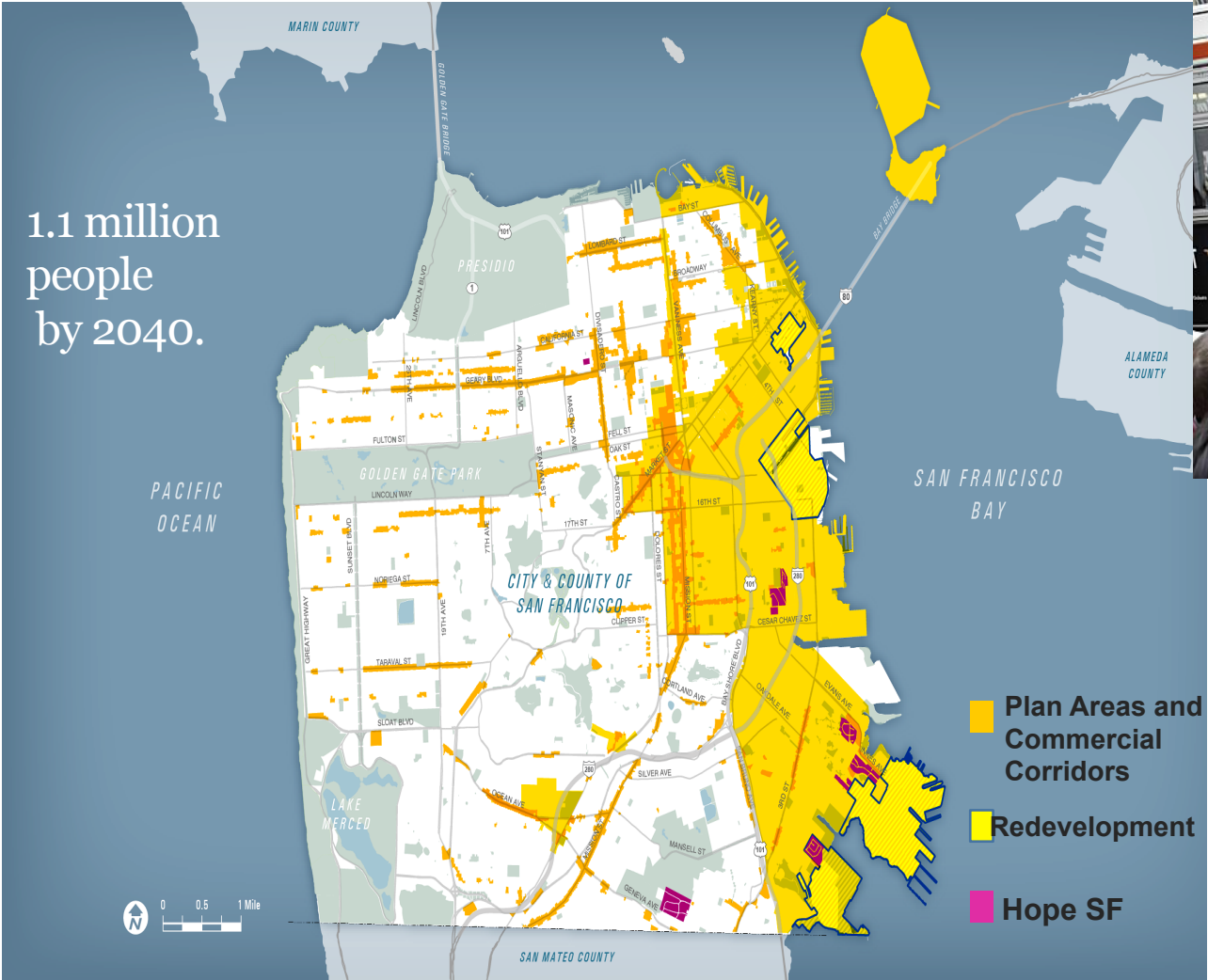




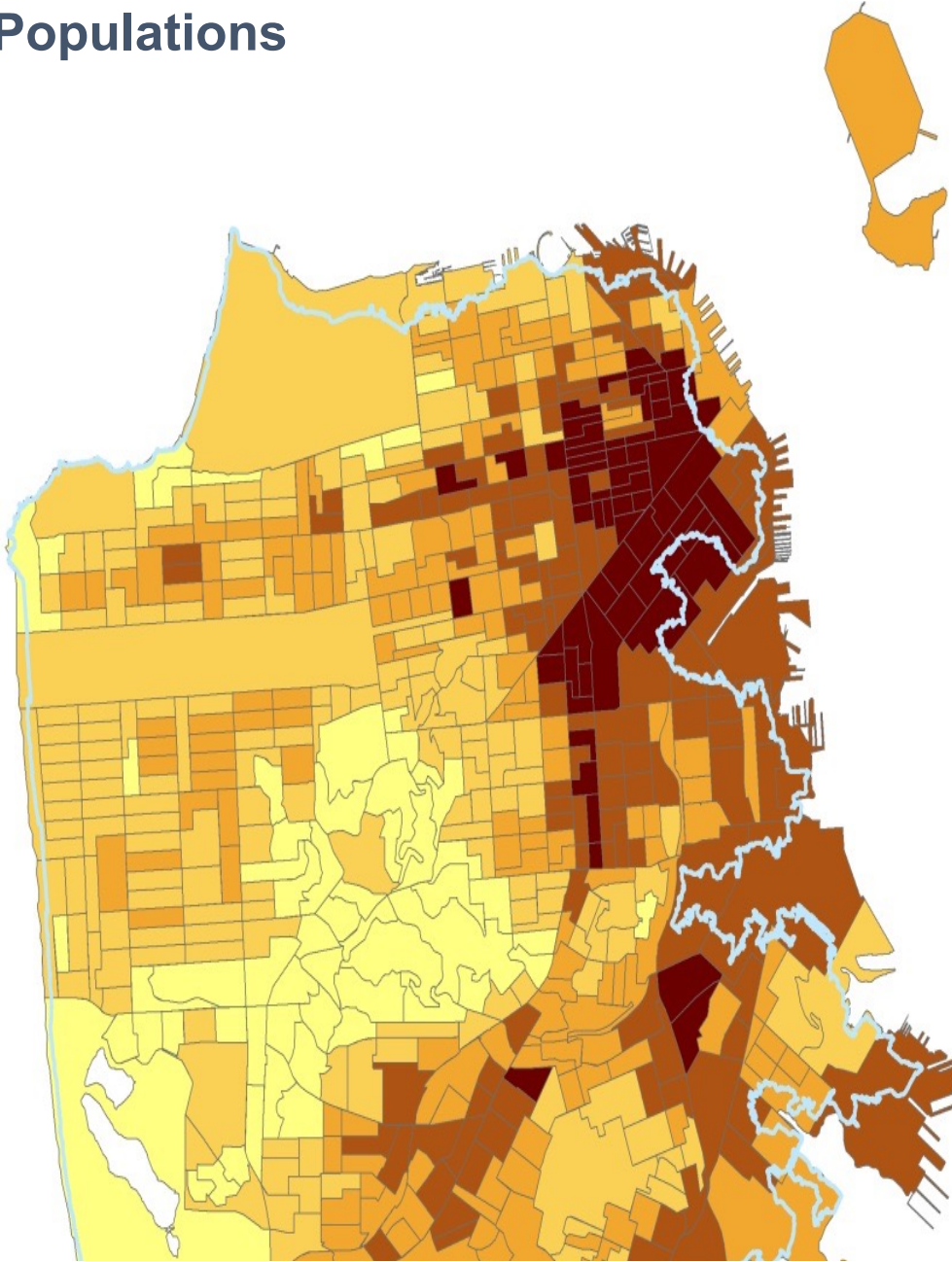
THANK YOU

**ONESF**  
Building Our Future

# Social Resilience Challenges



## Vulnerable Populations



**Climate Change Social Vulnerability Indicators by Census Block**  
Vulnerability scores combine demographic information including:

- Age
- Race and ethnicity
- Poverty
- Educational attainment
- Linguistic isolation
- Health status

# Social Resilience Challenges

