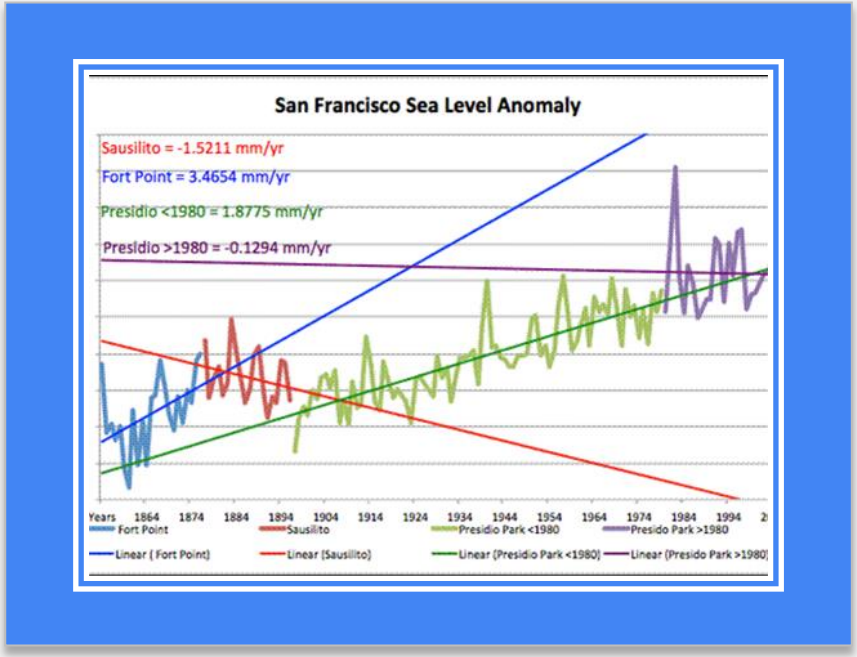
Marin Sea Level Rise Adaptation Strategies

By Kenji Ma

Statistics

¼ of Marin County properties are threatened by sea level rise

By 2100, sea level could rise by around 70 cm



History - 1982 Storm

Up to 40 dead in the Bay Area

$300 million in property damage

Marin affected worst by landslides and floods

Downtown San Anselmo 1982

Asset Adaptation

- the goal is to identify a wide range of reasonable and effective alternatives for threatened areas

Construction Type	Existing Foundation	Measure	Retrofit	Relative Cost
Frame, Masonry Veneer, or Masonry	Crawlspace or Basement	Wet Floodproofing 	Wet floodproof crawlspace to a height of 4 feet above lowest adjacent grade or wet floodproof unfinished basement to a height of 8 feet above basement floor	Lowest
Masonry Veneer or Masonry	Slab-on-Grade or Crawlspace	Dry Floodproofing 	Dry floodproof to a maximum height of 3 feet above lowest adjacent grade	
Frame, Masonry Veneer, or Masonry	Basement, Crawlspace, or Open Foundation	Barrier Systems 	Levee constructed to 6 feet above grade or floodwall constructed to 4 feet above grade	
Frame, Masonry Veneer, or Masonry	Basement, Crawlspace, or Open Foundation	Elevation 	Elevate on continuous foundation walls or open foundation	
Frame, Masonry Veneer, or Masonry	Basement, Crawlspace, or Open Foundation	Relocation 	Elevate on continuous foundation walls or open foundation	
Frame, Masonry Veneer, or Masonry	Slab-on-Grade	Elevation 	Elevate on continuous foundation walls or open foundation	
Frame, Masonry Veneer, or Masonry	Slab-on-Grade	Relocation 	Elevate on continuous foundation walls or open foundation	Highest
Frame, Masonry Veneer, or Masonry	Slab-on-Grade, Crawlspace, Base-ment, or Open Foundation	Demolition 	Demolish existing building and buy or build a home elsewhere	Varies

Three Types of Adaptation

1. Protect
2. Accommodate
3. Retreat

Protect

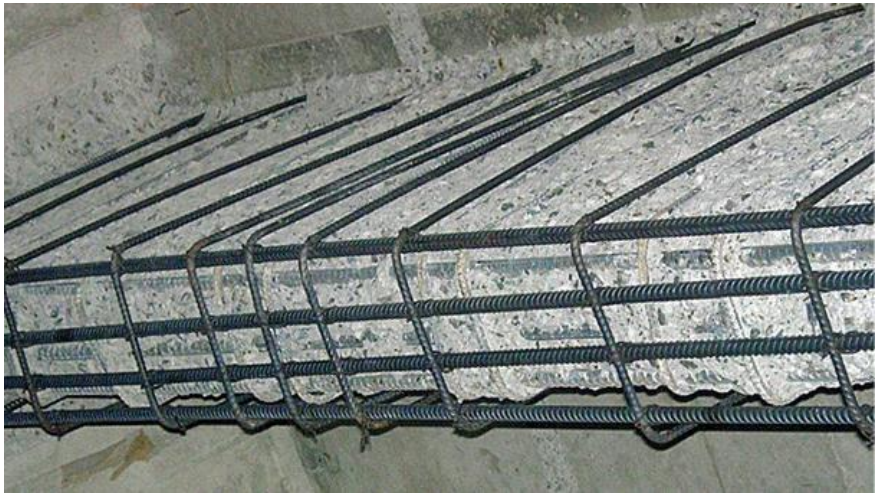
"Hard" protection: seawalls, revetments, and bulkheads

"Soft" protection: nature based solutions, horizontal levees, wetland restoration, and dune restoration

Dune Restoration

Currently happening at Tomales Dunes, Lawson’s Landing, and many other beaches

Involves rehabilitating native plant species and adding more sand



Accommodate

Elevating, retrofitting, strengthening

Designation and zoning

Retreat

Managed retreat: establishing thresholds to trigger demolition or relocation of structures that are threatened

Should only happen in areas where it is cost effective and has long term benefits

Problems With Managed Retreat

Uncertainty about who pays for what

Sometimes there is insufficient space for structures to be located

Nonprofit organizations, city, state, and federal government can all help with retreat projects

Example: Pacifica State Beach

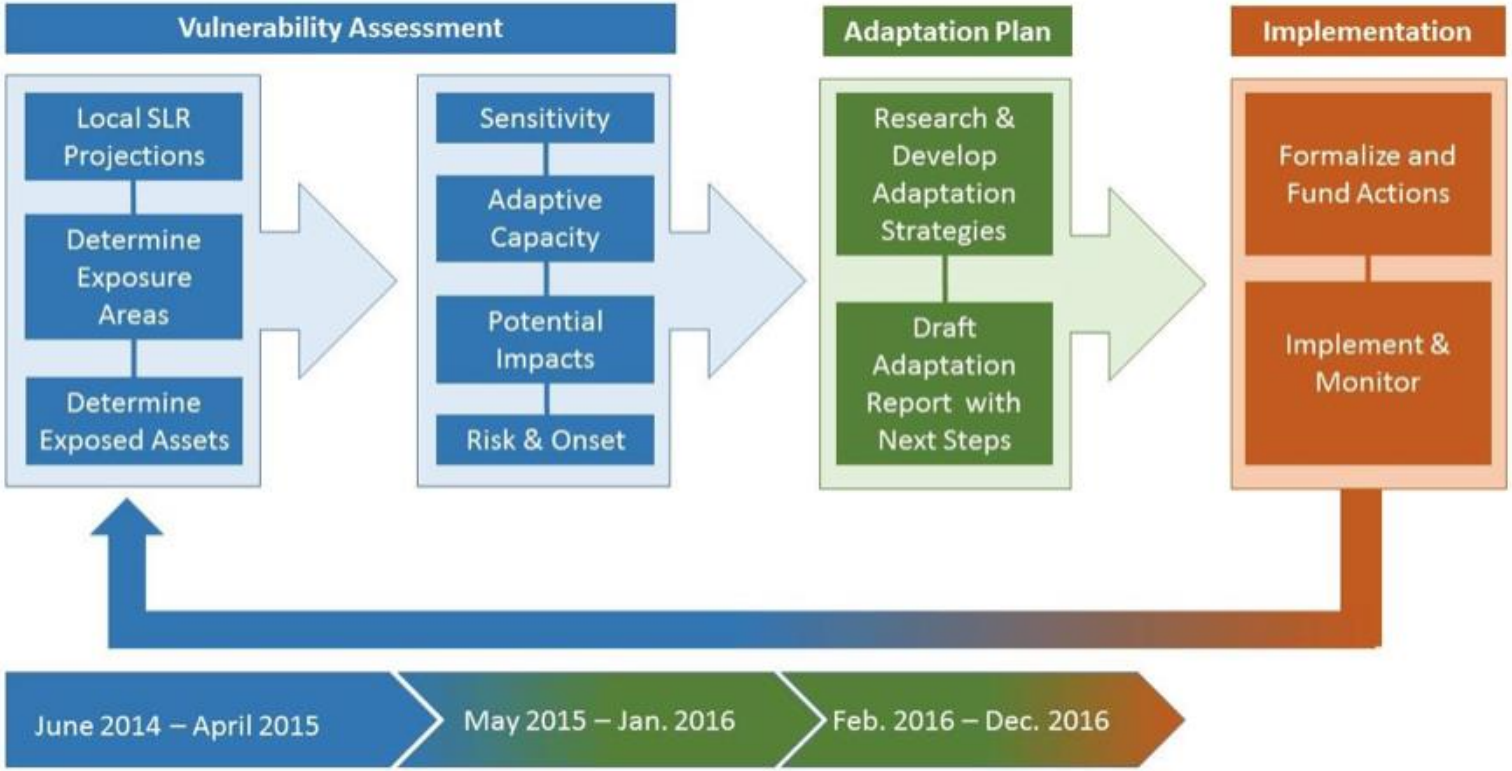
Partnered with state, fed, scientists, engineers, and non-profit organizations to retreat and protect coast

Restored wetlands as well

C-SMART

- C-SMART = Collaboration: Sea-level Marin Adaptation Response Team
- Began in July 2014
- Working to amend the Local Coastal Program
- LCP working to ensure adaptation
- Assess vulnerability of areas
- Identify adaptation strategies

Figure 3. C-SMART Process



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