



# The Land-Sea Interface

Julia Chunn-Heer

Natural coastal environments  
have been adjusting to  
sea-level fluctuations of  
hundreds of feet for millions  
of years and will continue to  
do so in the future.



Mangroves



Seagrass



Coral Reefs

Cities, however, don't adjust well to sea-level rise.  
About 150 million people today live within a meter of sea level..



San Diego

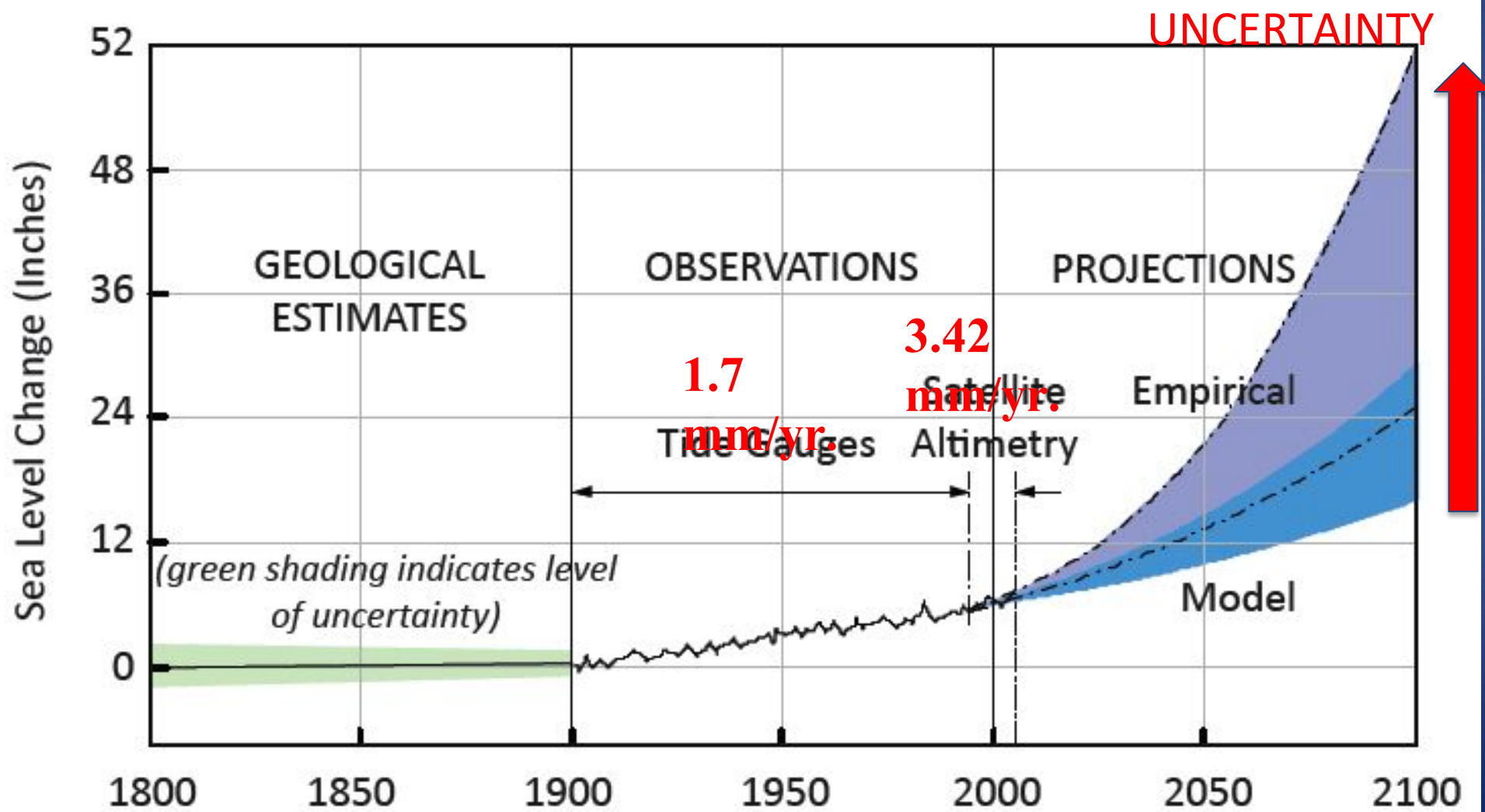


Singapore



Hong Kong

Global sea-level rise was measured from tide gages historically and satellites since 1993.



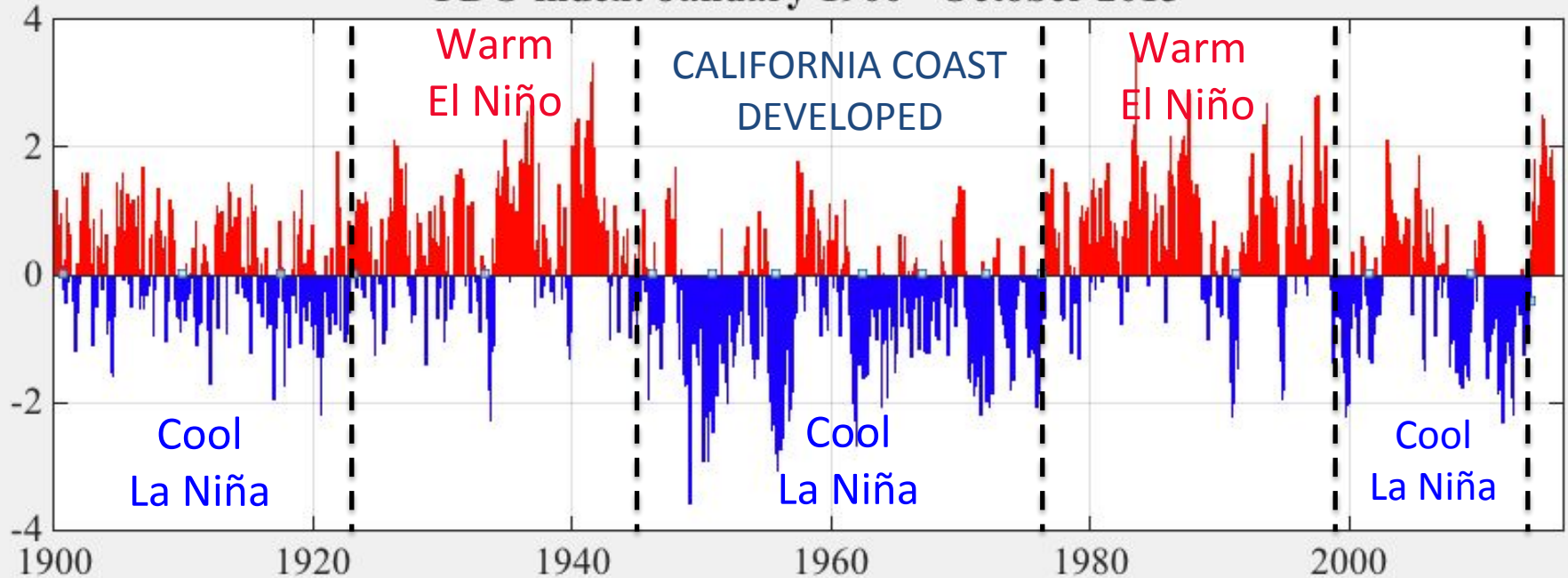
# FUTURE SEA-LEVEL RISE PROJECTIONS

(c) La Jolla

<i>Feet above 1991-2009 mean</i>	<b>MEDIAN</b>	<b>LIKELY RANGE</b>	<b>1-IN-20 CHANCE</b>	<b>1-IN-200 CHANCE</b>
<b>Year / Percentile</b>	<i>50% probability SLR meets or exceeds...</i>	<i>67% probability SLR is between...</i>	<i>5% probability SLR meets or exceeds...</i>	<i>0.5% probability SLR meets or exceeds...</i>
2030	0.5	0.4 – 0.6	0.7	0.9
2050	0.9	0.7 – 1.2	1.4	2.0
2100 (RCP 2.6)	1.7	1.1 – 2.5	3.3	5.8
2100 (RCP 4.5)	2.0	1.3 – 2.8	3.6	6.0
2100 (RCP 8.5)	2.6	1.8 – 3.6	4.6	7.1
2100 (H++)	10			
2150 (RCP 2.6)	2.5	1.5 – 3.9	5.7	11.1
2150 (RCP 4.5)	3.1	1.9 – 4.8	6.5	11.8
2150 (RCP 8.5)	4.3	3.0 – 6.1	7.9	13.3
2150 (H++)	22			

# SHORT-TERM COMPLICATIONS PACIFIC DECADEAL OSCILLATION

PDO index: January 1900 - October 2015



# Short-Term Impacts of High Tides and Large Storm Waves Mission Beach, San Diego- 1988

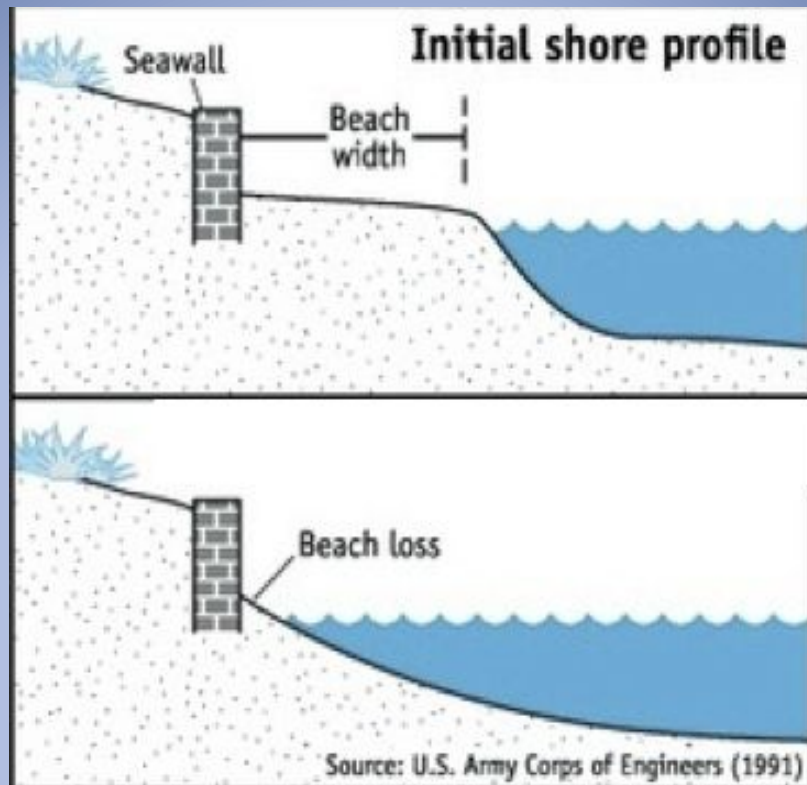


BUILD BARRIERS  
SEAWALLS/REVTMEN  
TS









Source: U.S. Army Corps of Engineers (1991)

**Beach loss eventually occurs in front of a seawall where there is chronic erosion.**

# Surfing Impact from Sea Level Rise

## Stanford Research Concludes:

- 1/3 of surf-spots vulnerable to SLR
- Of the 179 CA spots in Surflin's database, **46% impacted**
- **40%** “best conditions” experienced today will disappear by 2100
- **16.2%** breaks are **Endangered** (drown and cease to exist)
- **18.1%** of surf-spots are **Threatened** (could adapt, but may still drown).



# Challenges



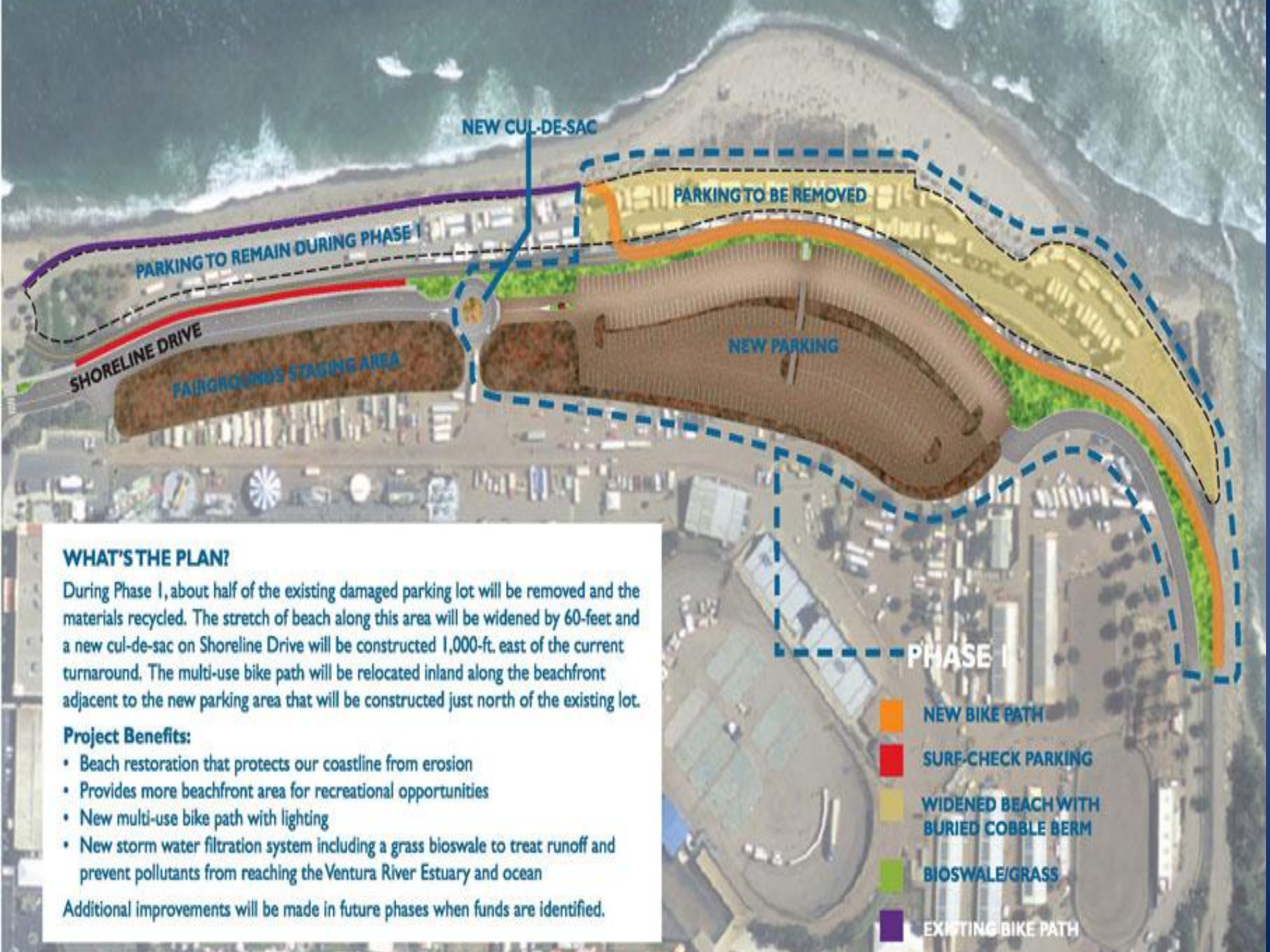
# Resilient Retreat

**Inevitable!** “Managed retreat—the only true option for adapting to sea level rise .”

Gary Griggs

- Nearly **40 % of Americans** live near the coast.
- **Cost effective.**
  - City of Imperial Beach: managed retreat vs armoring. By 2100, City will *spend five times* more on armoring compared to managed retreat.
  - National Institute of Building Sciences, every dollar invested in preparedness and resiliency **saves us four dollars** in costs down the road.





### WHAT'S THE PLAN?

During Phase I, about half of the existing damaged parking lot will be removed and the materials recycled. The stretch of beach along this area will be widened by 60-feet and a new cul-de-sac on Shoreline Drive will be constructed 1,000-ft. east of the current turnaround. The multi-use bike path will be relocated inland along the beachfront adjacent to the new parking area that will be constructed just north of the existing lot.

### Project Benefits:

- Beach restoration that protects our coastline from erosion
- Provides more beachfront area for recreational opportunities
- New multi-use bike path with lighting
- New storm water filtration system including a grass bioswale to treat runoff and prevent pollutants from reaching the Ventura River Estuary and ocean

Additional improvements will be made in future phases when funds are identified.

### PHASE I

- NEW BIKE PATH
- SURF-CHECK PARKING
- WIDENED BEACH WITH BURIED COBBLE BERM
- BIOSWALE/GRASS
- EXISTING BIKE PATH







# Coastal Act

30210,30220, 30221, 30213 + All protect public access

30235. Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or ***to protect existing structures*** or public beaches in danger from erosion and ***when designed to eliminate or mitigate adverse impacts on local shoreline sand supply.***

Mike Keefe THE DENVER POST 11.21.10



# Ways to Engage

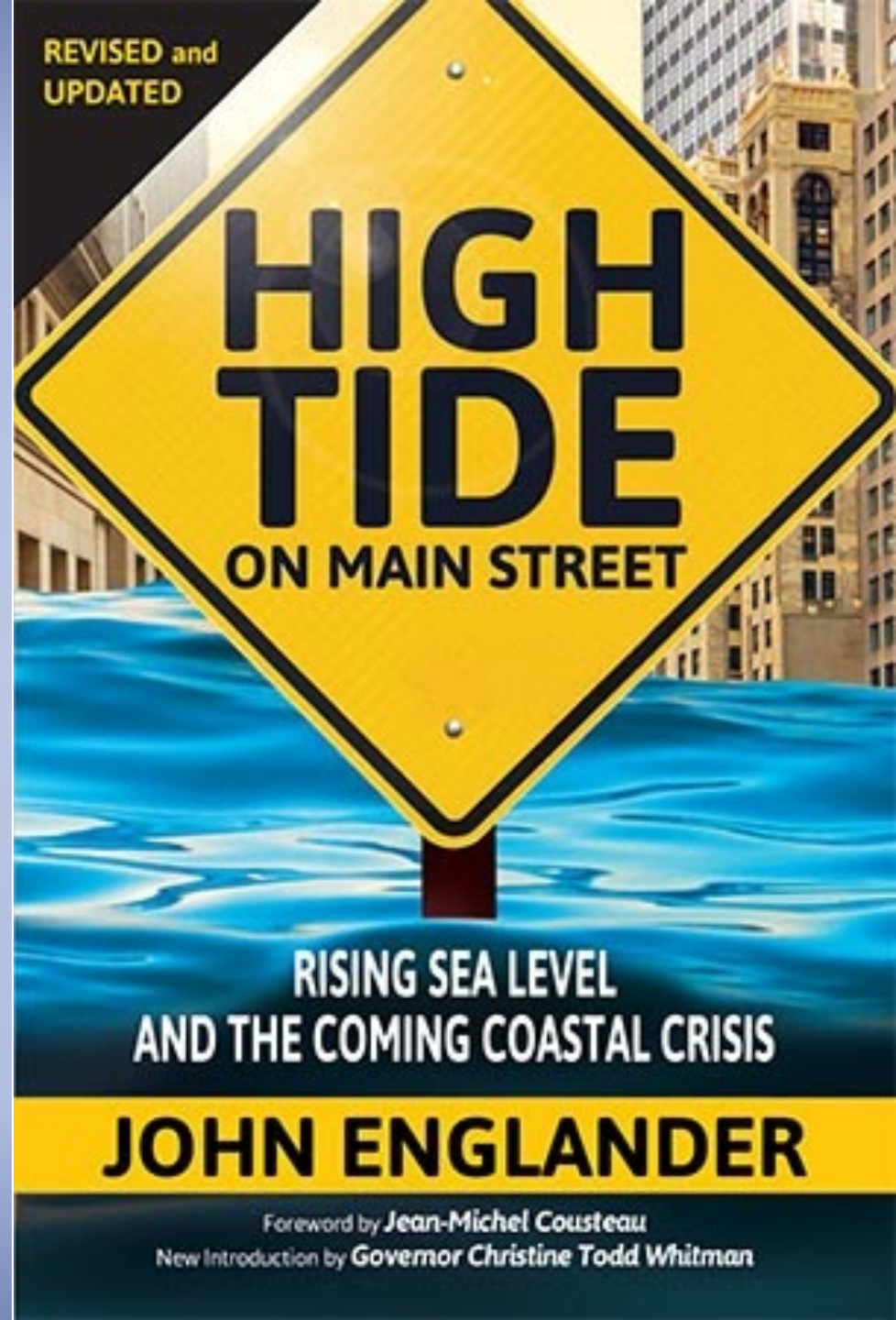
- Coastal Commission meeting in San Diego October 16-18  
[www.coastal.ca.gov](http://www.coastal.ca.gov)
- Surfrider Beach Preservation meetings Oct 7, Nov 4, Dec 2  
<https://sandiego.surfrider.org>
- Local cities regarding LCP update and SLR workshops
- Draft Residential Adaptation Policy Guidance (Coastal Commission)
- Read: Legal Risk Analysis for Sea Level Rise Adaptation Strategies in San Diego, by the Environmental Law Institute June 2017

A scenic coastal landscape featuring a rainbow arching over the ocean. In the background, there is a dark, forested cliffside. The sky is filled with large, dramatic clouds, and the water shows gentle waves washing onto a sandy beach in the foreground.

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It's real.  
It's bad.  
It's us.  
Scientists agree.  
There's hope  
(In California).

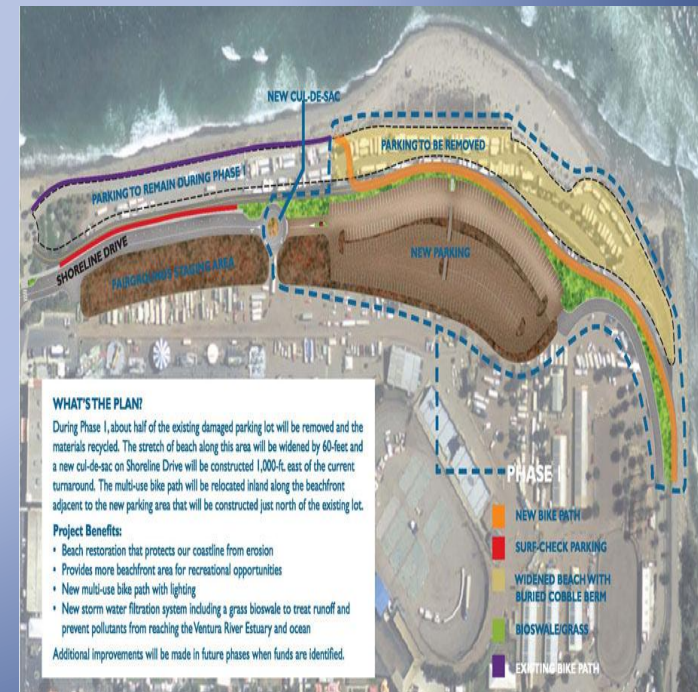


- 30007.5. The Legislature further finds and recognizes that conflicts may occur between one or more policies of the division. The Legislature therefore declares that in carrying out the provisions of this division such ***conflicts be resolved in a manner which on balance is the most protective of significant coastal resources.***

- 30235. Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or *to protect existing structures* or public beaches in danger from erosion **and *when designed to eliminate or mitigate adverse impacts on local shoreline sand supply.***

# Managed Retreat Efforts

- Oregon—home relocation
- Surfer's Point—parking lot/bike path
- Cayucos WWTP—denied permit in favor of relocation
- Sloat—multi levels
- Goleta Beach—hardscape removal, relocation path & utilities
- Montauk lighthouse





# Sea-Level Rise: NOAA La Jolla Tide Gauge

Long-term sea-level rise vs.  
short-term extreme events (El Niño)

La Jolla: 2.17 mm/yr. (8.5"/100 years)

