Partnering Transportation and Coastal Zone Management Agencies: The California Example of Success

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Presenters:
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California's Federally-certified Coastal Zone Management Act (CMZA) Program
Local Coastal Program Projects

Ventura Highway 101 HOV Project
Collaboration between the California Coastal Commission, Caltrans, and local governments resulted in a significant multi-modal project
Caltrans and Federal Highway Administration

California Department of Transportation
Caltrans & California Coastal Commission

History of Coordination & Partnership
Devil's Slide, San Mateo County

Two new tunnels at "Devil’s Slide" on State Route 1 in San Mateo County, completed in 2014 to bypass an unstable segment vulnerable to erosion and rockslides.
History of Collaboration

Devil's Slide, San Mateo County
State Route 1 at "Devil’s Slide" repurposed as new part of the California Coastal Trail
Along North Coast San Diego, the Interstate 5 HOV project incorporated lengthened bridges to promote lagoon restoration; construction initiated in 2017.
Pedestrian Bridge, San Elijo Lagoon, San Diego County

A new north-south suspended bike and pedestrian bridge west of the highway and above the San Elijo Lagoon as part of the I-5 San Elijo Highway project.
Climate Change in California: Wildfires

Waddell Creek at State Route 1
Santa Cruz County
CZU Complex Fire, August 2020

North of Meyers Grade Rd, State Route 1
Sonoma County
LNU Complex Fire, August 2020
Transportation System in the Coastal Zone

San Francisco Bay Bridge Approach
Winter high tide
California State Guidance on Sea Level Rise

State of California Sea-Level Rise Guidance

2018 UPDATE

CALIFORNIA COASTAL COMMISSION
SEA LEVEL RISE POLICY GUIDANCE

Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits

Original Guidance unanimously adopted – August 12, 2015
Science Update unanimously adopted – November 7, 2018

Policy guidance for consideration of SLR in repairing and building critical infrastructure, including the transportation system
The Coastal Commission's draft guidance (left), released for public review in August 2021, focuses on water and transportation infrastructure. Similarly, Caltrans is updating Department guidance (right) on sea level rise.
Caltrans District Vulnerability Assessments (2019) show vulnerability to sea level rise, storm surge, and cliff erosion; highways are already exposed to flooding and erosion—and as seas rise, the number of vulnerable roadway segments will increase.
Many changes due to past and future greenhouse gas emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets and global sea level.
5 Key Insights from California
Key Insight 1: Corridor Approach is Essential

Portions of the Eureka Arcata Highway 101 Corridor during high tide January 2021
North Bracut (left) and Jacoby Creek (right)
Case Study: Eureka Arcata Highway 101 Corridor
Storm damage to the Pacific Coast Highway shoulder at Sycamore Cove day use beach at Point Mugu State Park in the Santa Monica Mountains
Case Study: Pacific Coast Highway
Oxnard – Santa Monica Corridor

Pacific Coast Highway along Sycamore Cove, Ventura County
Case Study: Pacific Coast Highway
Oxnard – Santa Monica Corridor Plan
Key Insight 2: Avoid Coastal Squeeze
Key Insight 2: Avoid Coastal Squeeze

Shoreline with seawall
- The seawall disrupts the natural replenishment of sand.
- The barrier helps dissipate wave energy and fend off surging water.

Gradual loss of beach
- The seawall limits sand replenishment and locks the shoreline in place.
- The sea continues to rise, squeezing out the beach.

Shoreline without seawall
- Waves move sand on and off the beach, and erosion from the cliffs helps replenish what's lost.
Case Study: Gleason Beach
Highway Realignment

Along State Route 1 in Sonoma County, bluff erosion has destroyed houses west of the highway and now threatens the road.
Case Study: Gleason Beach
Highway Realignment

Houses were built west of the highway (above), which have been destroyed by bluff erosion (below).
Case Study: Gleason Beach Highway Realignment

Proposed Gleason Beach Realignment (approximate)

Project level bluff erosion and sea level rise risk assessment
Case Study: Gleason Beach Highway Realignment

Rendering of the approved $40 million project shows the realigned highway and improved coastal access.
Local officials are ramping up awareness of the danger of eroding cliffs at the beach in Del Mar, shown in August 2019.
The Army Corps of Engineers and Santa Cruz County constructed full-bluff seawalls to protect development, including public access mitigations to and along a popular beach.
Past their useful lifespans, the bridge and the Highway 1 corridor in Santa Cruz County are vulnerable to coastal erosion and increasingly threatened by projected impacts from sea level rise.
With initial designs for the lagoon restoration completed, the effort is now shifting to the initiation of a highway resiliency project to reorient the bridge and highway approaches and prepare for anticipated sea level rise, which has been included as a priority project in the current federal infrastructure bill.

Case Study: Scott Creek Bridge
Case Study: Piedras Blancas, San Luis Obispo County

Highway 1 north of the Piedras Blancas Lighthouse in San Luis Obispo County was heavily armored and vulnerable to wave runup before $74 million highway realignment project completed in 2017
Case Study: Piedras Blancas Highway Realignment
Case Study: Piedras Blancas Highway Realignment

Removing temporary rock slope protections has allowed the beach near Piedras Blancas to return.
The open areas are now a popular stop for elephant seals, who return each year to mate and care for their pups.
Key Insight 5: Nature Based Strategies

Case Study: Cardiff State Beach
Highway 101 in San Diego near Cardiff Beach before project during high- (left) and low-tide (right) conditions, August 2010
Case Study: Cardiff State Beach

Post-construction of the Cardiff State Beach Living Shoreline Project
Engineered hummocks across the fore-slope rise to the dune crest to facilitate planting and recruitment of native dune vegetation, ~April 2021
Ventura's Surfer's Point was heavily damaged by coastal erosion and was restored using managed retreat and nature-based solutions.
Grand Challenges and Conclusions

First Takeaway:
Need Federal Support for SLR Adaptation

- For California, Caltrans estimates the rough order of magnitude in construction costs for adaptation to be $9 – 11 billion by 2030 and $45 billion by 2100 (Source: Draft 2021 State Highway System Management Plan)
- Additional right-of-way, maintenance, mitigation costs, and other related requirements will increase estimates substantially
- Within the state’s broader economic context, $150 billion in property is at risk of flooding from SLR by 2100, and it could cost the San Francisco Bay $450 billion to be resilient to 6.6 ft of SLR (Source: L.A. Times (2019) / USGS (2019))
- The 2018 National Climate Assessment concluded that $1 trillion in real estate is threatened by SLR (Source: 2018 National Climate Assessment)
Rat Creek Slide, Monterey County

Total cost of repairs and clean up was $11.5 million, April 2021
Second Takeaway: Opportunities for Reimagining Communities

- Long-term solutions provide social, environmental, and economic benefits

Hagemann Gulch Bridge connects the Arana Gulch Trail to Broadway in Santa Cruz County, expanding multi-modal educational opportunities and community connections.
Surfers Beach, San Mateo County
King Tide, November 2020
Beaches are the state’s pride and joy; many could vanish by the end of the century, depending on how Californians choose to adapt to sea level rise.
Thank You

Additional Information:

Caltrans Coastal Program: https://dot.ca.gov/programs/environmental-analysis/coastal-program

California Coastal Commission website: https://www.coastal.ca.gov/

Presentation Materials: https://bit.ly/3mUMOys