

Orange County Regional SLR & Coastal Impacts Planning Workshop

“Adaptive” Adaptation Process & Assessing Vulnerabilities to Sea Level Rise

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Plan for today

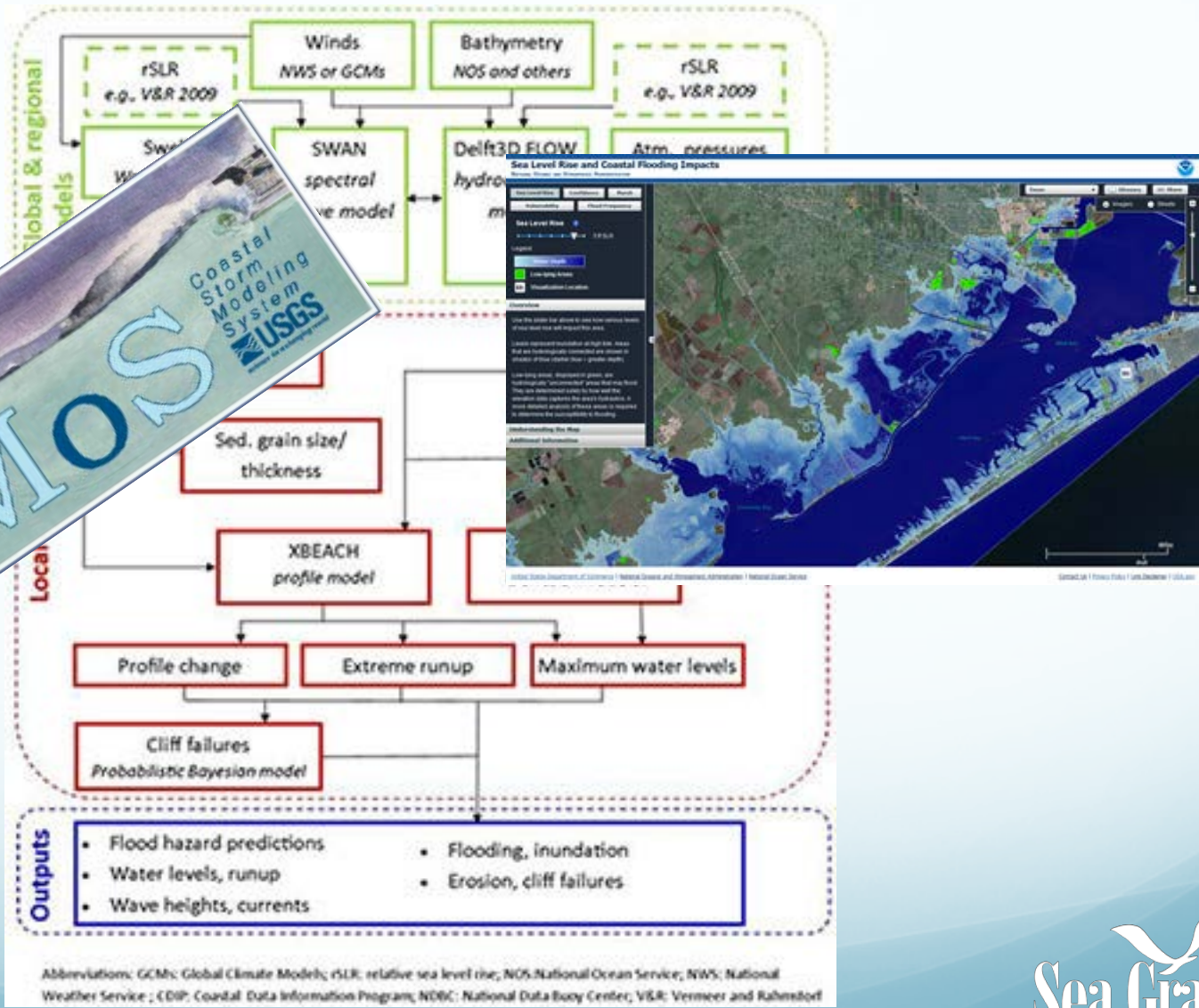
- “Adaptive” Adaptation – initiating planning with evolving information
- Conducting Vulnerability Assessments – a process
- Adaptation Strategies – quick overview
- Lessons Learned from our work in L.A.

The Challenge

“Responding to climate-related risks involves decision making in a changing world, with continuing uncertainty about the severity and timing of climate-change impacts”

- *IPCC 5th Assessment, 2014*

Without this to guide our planning?



Abbreviations: GCMs: Global Climate Models; rSLR: relative sea level rise; NOS: National Ocean Service; NWS: National Weather Service; CDIP: Coastal Data Information Program; NDBC: National Data Buoy Center; V&R: Vermeer and Rahmstorf

Uncertainty and waiting for perfect science...

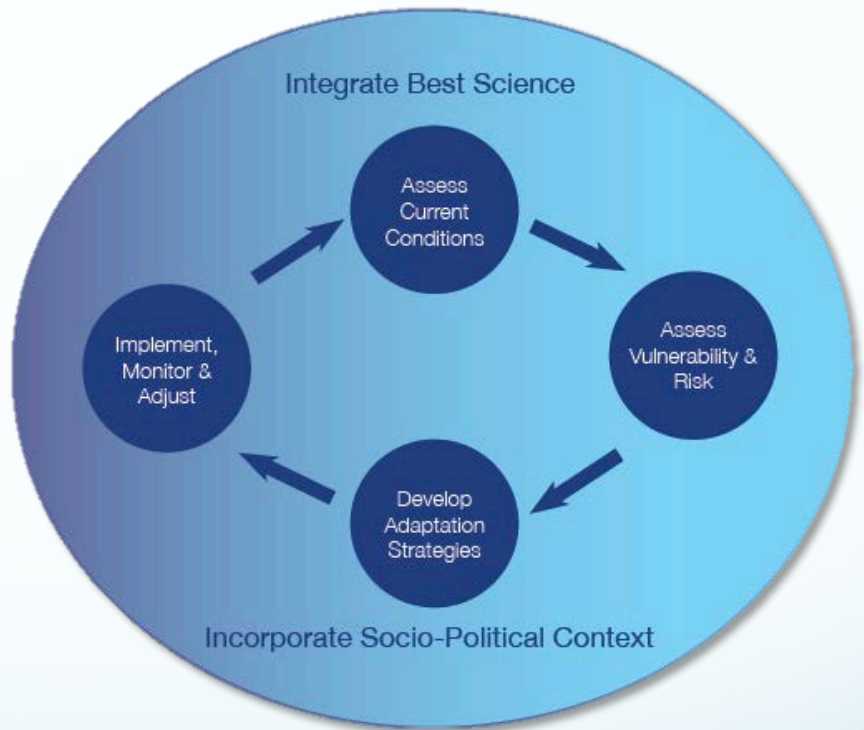
I THOUGHT I WAS
INTERESTED IN UNCERTAINTY
BUT NOW I'M NOT SO SURE



JUSTID

“Adaptive” adaptation planning

- Science is ever-evolving
- Adaptation planning is iterative
- Plan for range of scenarios
 - Scenario-planning
 - Robust decision-making
 - Adaptive management



Approach involves rethinking how we use uncertain and evolving information in our planning

“Adaptive” adaptation planning

“When the future proves hard to predict, plans ought to be flexible and robust.”

J. Rosenhead, 1989

Adaptive plans are “designed to respond over time to new information and perform well over a wide range of future scenarios”

R. Lempert, 2003

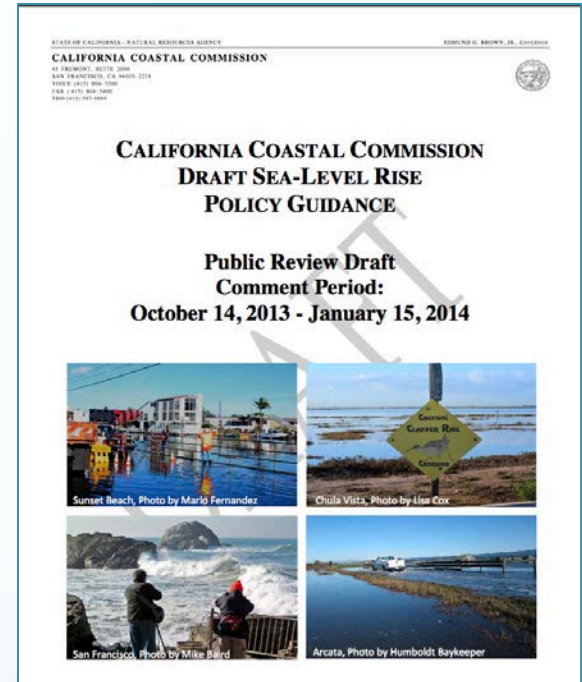
How can this work in practice?

- Productive relationships between scientists and decision-makers
- Iterative assessments of vulnerability and risk, incorporating the best available science
- Embracing uncertainty by developing a range of possible outcomes
- Planned re-evaluation of policies and monitoring
- A systematic process for acquiring new information
- Flexible language in planning documents

Precedence for Adaptive Adaptation

Draft *Sea Level Rise Policy Guidance*,
California Coastal Commission, 2013

“If the likelihood of impacts is expected to increase with rising sea level, it may be necessary to design for some amount of sea level rise and include design flexibility that will allow future project changes or modifications to prevent impacts if the amount of sea level rise used in the design is not sufficient.”



http://www.coastal.ca.gov/climate/slr/guidance/CCC_Draft_SLR_Guidance_PR_10142013.pdf

Precedence for Adaptive Adaptation

Draft *Sea Level Rise Policy Guidance*, California Coastal Commission, 2013

“include design flexibility that will allow future project changes or modifications”

“Flexible monitoring with various triggers or change points”

Washington State

- Washington State Law (Growth Management Act) requires counties and cities to use the best available science in planning

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[36.70A.171](#) << [36.70A.172](#) >> [36.70A.175](#)

RCW 36.70A.172

Critical areas — Designation and protection — Best available science to be used.

(1) In designating and protecting critical areas under this chapter, counties and cities shall include the best available science in developing policies and development regulations to protect the functions and values of critical areas. In addition, counties and cities shall give special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries.

Washington State

- Washington State Law (Growth Management Act) requires counties and cities to use the best available science in planning

“counties and cities shall include the best available science in developing policies and development regulations to protect the functions and values of critical areas” which includes frequently flooded areas

WASHINGTON
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King County, Washington

- The Environment Chapter of the King County Comprehensive Plan in Climate Change & Biodiversity section:

“King County should evaluate a range of projected future climate scenarios based on best available science to help ensure that conservation efforts are able to meet their objectives in a changing climate.”

- Language on *how* and *when* the Comprehensive plan, even outside of the 4-year Comprehensive Plan update cycle.

“Every year the Comprehensive Plan may be amended... Technical amendments to policy, text, maps or shoreline designations”

Solana Beach Local Coastal Program

LCP adopted Feb 2013, amended June 2014

- Prioritize monitoring of SLR – both short-term for permitting and long-term to respond to potential development policies
- Inventory of available studies on coastal processes to help fill information gaps
- Re-evaluate erosion rate every 10 years or more often if physical condition warrant – e.g. climate change / SLR

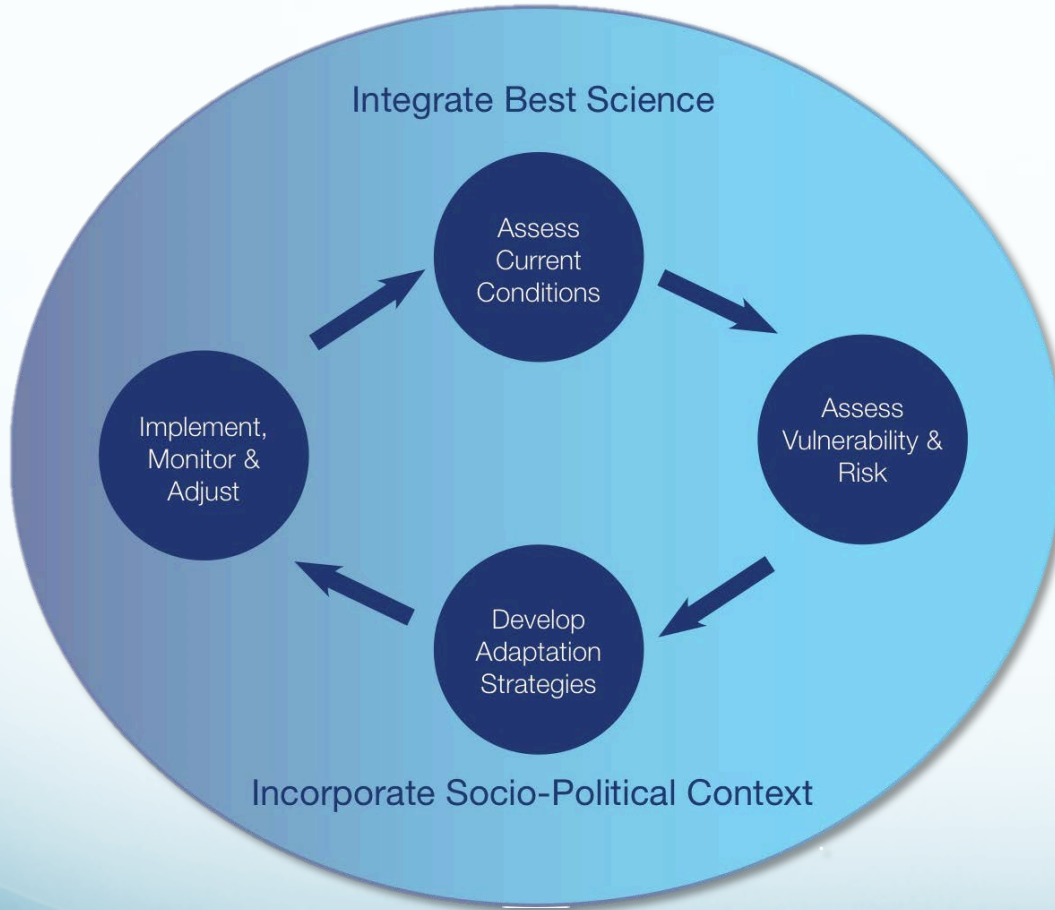


City of Imperial Beach

- SLR Vulnerability Assessment & Adaptation Planning
- “Adaptive approach” for study and planning
 - Use best available science for vulnerability assessment
 - Use CoSMoS 3.0 for adaptation strategy development (or earlier if available)



Assessing Vulnerability



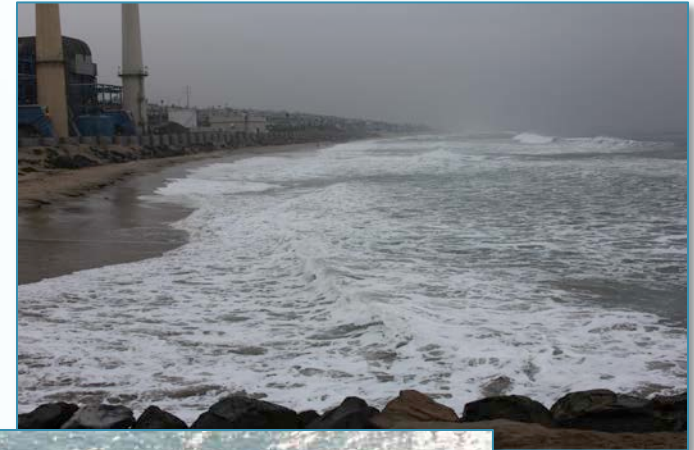
Process drawn from many sources and firsthand experience:

- ICLEI – Local Governments for Sustainability
- NOAA Coastal Services Center
- San Diego Bay SLR Plan, San Francisco Bay SLR Planning, AdaptLA – City of Los Angeles SLR Study

Assessing Current Conditions

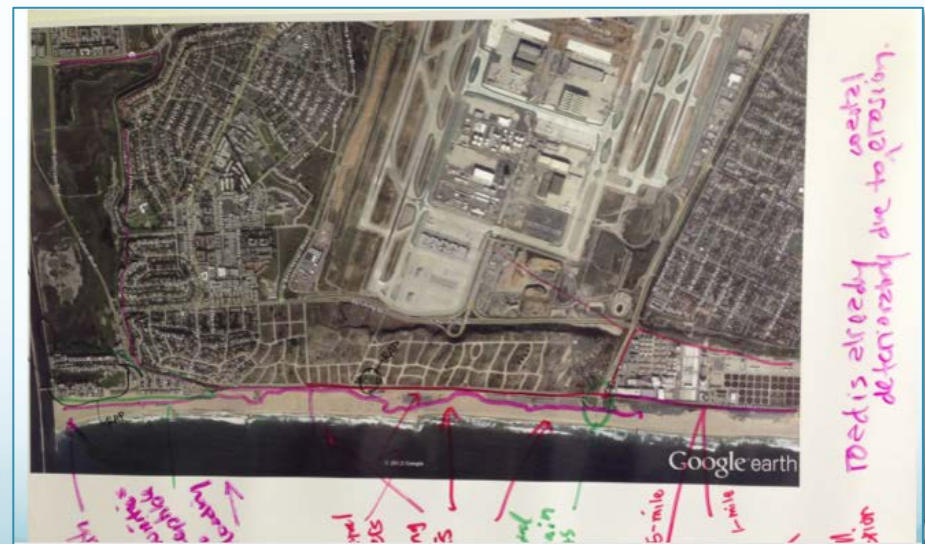
“Today’s storm is tomorrow’s high tide”

- What we experience today are indicators of what we will experience with SLR & coastal change in the future
- Understanding current vulnerabilities help prioritize where to focus first



Assessing Current Conditions

- Important for engaging key stakeholders
- Draws on internal knowledge; can be done in-house
- Great tool for political will; getting buy-in



Stakeholder Engagement



Political Leaders
City Councils
Sustainability Depts
Wastewater Treatment
Emergency Managers
Private Industry
Consultants
Public Utilities
Public Works
Harbor Depts
Planning Depts
Park Managers

NGOs
Academia
Educators
State Agencies
Federal Agencies
MPOs, JPAs, COGs
Museums, Aquariums
Community Organizations
Professional Associations
Regional Organizations
Neighborhood Councils
Social Justice Organizations

Climate Change Vulnerability

The degree to which a system is exposed to, susceptible to, and unable to cope with, the adverse effects of climate change.



Physical
Vulnerability



Social
Vulnerability

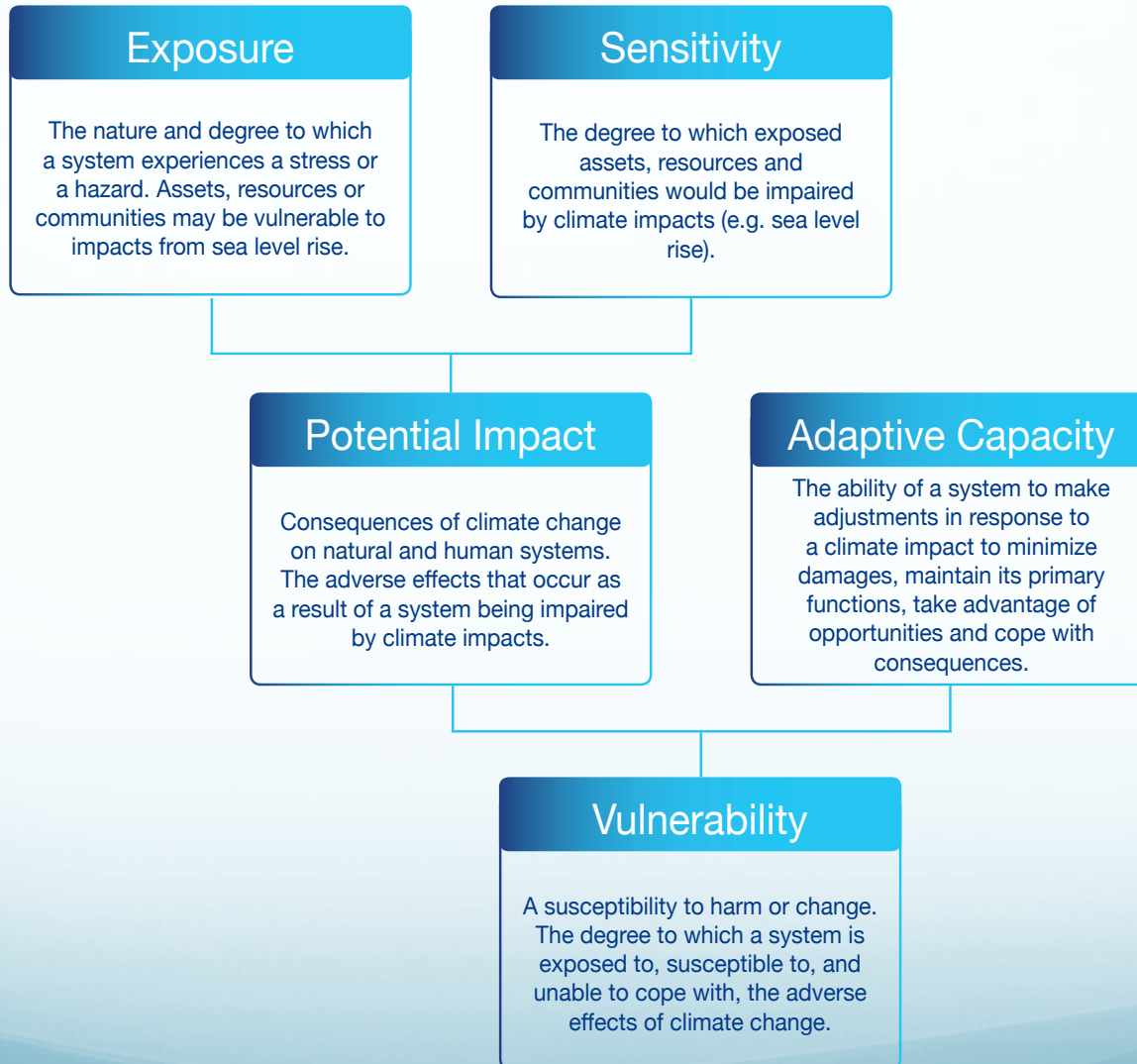


Economic
Vulnerability



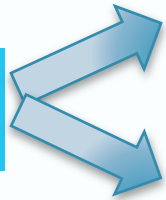
Ecological
Vulnerability

How Do You Assess Vulnerability?



Considerations for Assessing Vulnerability

Exposure



- Impacts – What climate impacts will the asset come in contact with?
- Location – Where is the asset located with respect to the impact?

Sensitivity



- Degree of Impact – How much will the asset be affected if/when it comes in contact with the impact?
- Level of Stress – Is the asset already under stress?

Adaptive Capacity



- Ability to Anticipate – Can the asset anticipate the impact and respond accordingly?
- Capacity to Adjust/Move– Does the asset have the ability/means/knowledge to move away from the impact?

Exposure

The nature and degree to which a system experiences a stress or a hazard.

- Is your asset in the blue, red or yellow area?
 - Yes = exposed
 - No = not exposed
- With good information, exposure most straightforward to determine



Sensitivity

The degree to which exposed assets, resources and communities would be impaired by climate impacts (e.g. sea level rise)

Cabrillo Aquarium & Beach



- Degree of impact & Level of Stress
- Beach, Aquarium & Rec Center have high sensitivity to:
 - Storm-related flooding
 - Daily tidal flooding
 - Erosion
 - Interaction w/groundwater

Adaptive Capacity

The ability of a system to make adjustments in response to a climate impact to minimize damages, maintain its primary functions, take advantage of opportunities and cope with consequences.



- Ability to Anticipate; Capacity to Adjust or Move
- Beach MEDIUM adaptive capacity
 - Could function if partially impaired
 - If floods at high tides, can use at low tides
- Aquarium LOW adaptive capacity
 - Could NOT function if partially impaired
 - Parking lot/road would limit visitor access

Hyperion Wastewater Treatment Plant (HTP)
 12000 Vista Del Mar Blvd
 Playa Del Rey, CA 90293

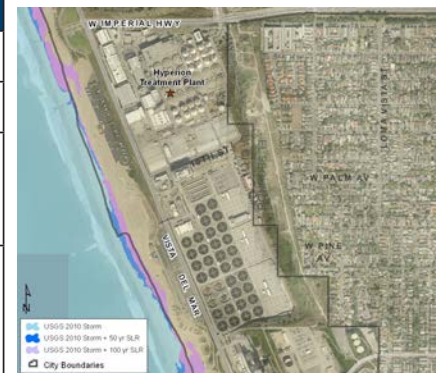
Asset Overview Based on Existing Conditions Inventory

Owner:
 City of Los Angeles

City Department and Point of Contact:
 Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
 Regional Water Quality Control Board
 State Water Resources Control Board
 Environmental Protection Agency
 South Coast Air Quality Management District

Summary of Asset:
 HTP is located next to Dockweiler State Beach at approximately 32 feet above sea level. The major treatment processes at this plant include screening, grit removal, primary sedimentation, and secondary treatment. After secondary treatment, the wastewater is discharged into Santa Monica Bay through the five-mile submerged outfall.



Summary of Current Conditions and Physical Vulnerability Assessment

Current Known Vulnerabilities Identified in Existing Conditions Inventory

Localized flooding and damage to equipment and structure of facility is possible due to extreme wet weather, if there are failure(s) to critical individual unit processes (facilities), failure of effluent pumping, or failure of influent bypass pumping of influent sewer flow. Damage to process control operations (secondary treatment) is possible from extreme wet weather washout.

Structural damage possible from seismic or tsunami, combined with extreme wet weather, could result in failure of critical plant process equipment and/or inability to transport biosolids to reuse sites, due to restricted local road and interstate highway access.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
<p>HTP is sensitive to storm-related flooding which could cause equipment and operations failures due to damage of electrical pumps and panels from exposure to water. A dramatic increase in sea level could reduce the plant's efficiency in the discharge of effluent, because the pumped flow would be met with more water pressure. While erosion could result in some loss of the beach in front of the plant, the plant itself is not very sensitive to erosion or interaction with the groundwater because it is built on top of a large cement catacomb.</p>	<p>The plant's ability to continue to function if it is partially disabled depends on the severity of the impact. The plant maintains additional flow capacity, so if one part of it becomes impaired, the plant will continue to treat and handle the quantity of wastewater entering the plant. The plant is equipped with pumps that could remove water relatively quickly and has a redundant 1-mile outfall. Emergency generators have been placed at all critical facilities. The Bureau of Sanitation is securing an on-site renewable energy power source to maintain service in case of grid failure.</p>	<p>The primary economic consequences would be repairing the plant. Impacts to individual pieces of equipment would cost significantly less than the loss of the entire facility. The primary environmental consequence would be the discharge of partially treated wastewater into the Santa Monica Bay which would be temporary in nature and there may be impacts habitat and wildlife.</p>

Replacement value (i.e., cost of inaction): \$3 billion

Adaptation Measures - Teaser

Adaptation Strategy Matrix

Avoid Hazards

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Land Acquisition	Fee Simple Acquisition	One or more lots	Short/Long-term	Yes	Government, Non-Governmental Organization, Homeowner Association, Geologic Hazard Abatement District	High	Provides greatest control over land use and hazard response. Land can be purchased from willing sellers or by governments using eminent domain.
	Conservation Easements	One or more lots	Short/Long-term – lessen with time	Yes	Government, Non-Governmental Organization, Homeowner Association, Geologic Hazard Abatement District	Low to Moderate	Provides less control than fee simple acquisition. Can be part of a permit action. Land can be purchased from willing sellers.
	Transfer Development Credit	Jurisdiction, Region	Moderate/Long-term	Yes	Government, Geologic Hazard Abatement District	Low to Moderate	Provides fee simple acquisition of high hazard lots. Takes time to set up TDC Program and develop criteria for hazardous lot acquisitions. Costs to administer are low. Acquisition costs paid by developers. Cost of coastal land may make program infeasible.

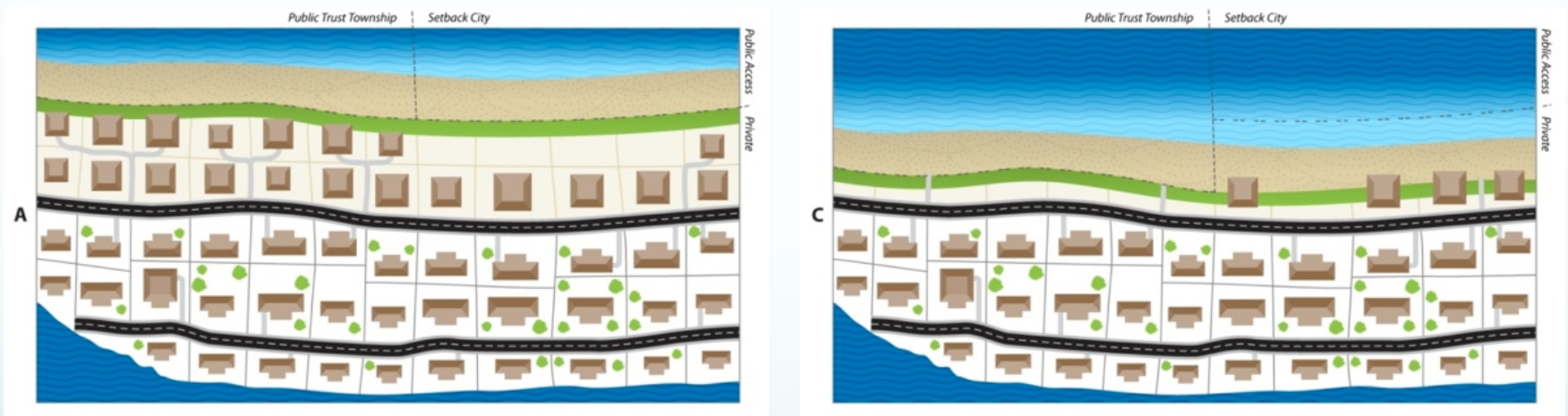
Adaptation Measures - Teaser

- Move Hazards Away from Development
 - E.g. maintain/restore natural sand supply



Adaptation Measures - Teaser

- Move Development Away from Hazards
 - E.g., Setbacks, managed retreat, rolling easements



<http://papers.risingsea.net/rolling-easements-7-1.html>

Adaptation Measures - Teaser

- Barriers between Hazards & Development
 - E.g., Revetments, seawalls, living shorelines



Adaptation Measures - Teaser

- Avoid Hazards
 - Land acquisition (conservation easements, fee simple acquisition)
- Flood Protection
 - Elevate structures or equipment, storm shutters, flood covers

How do you choose?

- Strong understanding of vulnerabilities
- Further analysis (e.g. cost/benefit; affordability; legal implications; geographic fit)
- Community values
 - What kind of future do you and your stakeholders envision for your community?
 - Political feasibility

Much more information in webinars and subsequent training!

In summary...

- “Adaptive management” approach
 - Systematic use of best available science & trigger points for monitoring
 - Allows for flexibility and reduces analysis paralysis
- Current Conditions Inventories
 - Today’s storm is tomorrow’s high tide
 - Helpful communication tool
- Vulnerability assessments
 - Identify exposure, sensitivity, adaptive capacity
 - Address physical, ecological, economic and social vulnerability
- Selection of adaptation strategies based on
 - Based on careful vulnerability analysis
 - Community values, costs, and politics
- Stakeholders, stakeholders, stakeholders...

Lessons Learned

- Challenges with figuring out where to “draw the line”
 - Possible Solution: In future planning, emphasize adaptive management approach. The line doesn’t become as important.
- Some important assets needed to be considered in a regional context
 - Inter- and intra-jurisdictional considerations (e.g. beaches; PCH)
 - Possible Solution: Engage broader stakeholder group to get interjurisdictional information, support and collaboration

Lessons Learned

- Getting information at the right level, while also having top level departmental support
 - Possible solution: Communicate early and often!
 - Consistent and continued communication across all levels within a department, from the outset!
- Critical to have leadership buy-in, identify strong advocates early on, and engage stakeholders; they provide valuable information
 - Solution: Meetings like today!

Thank you! Questions?

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