



**Congressman Alan Lowenthal**  
47<sup>th</sup> Congressional District  
Chair, Safe Climate Caucus

Invites you to a forum  
hosted in conjunction with the

**Aquarium of the Pacific**  
**“CLIMATE CHANGE**  
**IMPACTS AND ACTIONS”**

September 2, 2015  
9 a.m. - 12 p.m.  
Aquarium of the Pacific  
Watershed Classroom



Congressman Lowenthal will present a legislative update on climate change legislation. A multi-disciplinary group of experts and community leaders will educate participants on their work to address climate change locally, statewide, and nationally.

RSVP TO: Helene Ansel, Office of Congressman Alan Lowenthal,  
via email [Helene.Ansel@mail.house.gov](mailto:Helene.Ansel@mail.house.gov).

For questions or additional information, call 562.436.3828.

**Parking:** Attendees and participants may park in the City Owned Parking structure across from the Aquarium. Please bring parking tickets inside to be stamped at a station near the Aquarium front desk, for the **Aquarium Guest Rate of \$8**. Alternative transit: Long Beach Transit Red Passport Bus.

ALAN LOWENTHAL  
47TH DISTRICT, CALIFORNIA

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SUBCOMMITTEE ON ASIA AND THE PACIFIC  
SUBCOMMITTEE ON THE WESTERN HEMISPHERE

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Congress of the United States  
House of Representatives  
Washington, DC 20515

108 CANNON HOUSE OFFICE BUILDING  
WASHINGTON, DC 20515  
PHONE (202) 225-7924  
FAX (202) 225-7926

100 WEST BROADWAY STREET  
WEST TOWER, SUITE 600  
LONG BEACH, CA 90802  
PHONE (562) 436-3828  
FAX (562) 437-6434

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August 18, 2015

Congressman Alan Lowenthal is pleased to invite you to a forum on climate change impacts and resiliency on a local and national level. This interactive forum brings together a unique, multi-disciplinary group of local environmental professionals and community leaders who are working on climate change issues in Southern California.

Wednesday, September 2, 2015 from 9 a.m. - 12 p.m. in the Aquarium of the Pacific Watershed Classroom.

Attendees will have exclusive access to the forum's insights and discussion.

RSVP via email to [Helene.Ansel@mail.house.gov](mailto:Helene.Ansel@mail.house.gov). Seating is limited and subject to confirmation. Please call 562.436.3828 with questions or if you need additional information.

Thank you for your consideration.



Alan Lowenthal  
Member of Congress

ALAN LOWENTHAL  
47TH DISTRICT, CALIFORNIA

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Congress of the United States  
House of Representatives  
Washington, DC 20515

108 Cannon House Office Building  
Washington, DC 20515  
Phone (202) 225-7924  
Fax (202) 225-7926

100 WEST BROADWAY STREET  
WEST TOWER, SUITE 600  
LONG BEACH, CA 90802  
Phone (562) 436-3826  
Fax (562) 437-6434

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CLIMATE CHANGE FORUM  
Aquarium of the Pacific, Watershed Classroom  
September 2, 2015

AGENDA

9:00 A.M. *U.S. Representative Alan Lowenthal, CA-47<sup>th</sup> District*

*Dr. Jerry Schubel, President/CEO, Aquarium of the Pacific*

9:20 A.M. Presentations

*Hector De La Torre, Member, Air Resources Board*

*Jack Ainsworth, Senior Deputy Director, California Coastal Commission*

*Krista Kline, Managing Director, Los Angeles Regional Collaborative*

*Roberta Marinelli, Director, USC Wrigley Institute*

10:00 A.M. Questions and Discussion

10:20 A.M. Break

10:40 A.M. Presentations

*Kevin Wattier, General Manager, Long Beach Water Department*

*Rick Cameron, Managing Director of Planning & Environmental Compliance, Port of Long Beach*

*Krista Kamer, Director, CSU Council on Ocean Affairs, Science and Technology*

*Juliette Hart, Climate Science Specialist, USC Sea Grant*

11:20 A.M. Questions and Discussion

11:45 A.M. Closing Remarks

# Climate Change – Impacts and Actions Forum

*Forum Summary by Jennifer Lentz, Ph.D., Aquarium of the Pacific*

## FORUM OVERVIEW

On September 2, 2015, California's 47<sup>th</sup> District Representative, Congressman Alan Lowenthal, in collaboration with the Aquarium of the Pacific, hosted a public forum on the impacts and actions related to climate change. This forum is intended to bring together a unique, multi-disciplinary group of local stakeholders, environmental professionals, scientists, and community leaders to share how they are working on climate change issues in Southern California, statewide, and at the national level.

The following is a brief summary of the information presented during this forum.

## OPENING REMARKS

US Representative Alan Lowenthal, from the CA-47<sup>th</sup> District started the forum by saying how delighted he was that people in and around our community are working on issues surrounding the climate; particularly issues regarding sea level rise, drought, ecosystem impacts, air quality and carbon dioxide reductions. He explained that these issues are very important to him and he has been working to use his position to move forward on climate issues. The Congressman currently serves as the Chair of the "Safe Climate Caucus" which is a group of 47 active members of Congress who are all working to make action on climate change a priority. Members of the Caucus often give floor speeches, write opinion articles, record videos, and generally take advantage of any opportunity they can to talk about climate change and the need for congressional action. The Congressman is also a ranking member on the Natural Resources Committee: Energy and Mineral Resources, which works mostly on defense of our shared natural resources. He uses his position on this committee to bring up issues like renewable energy development, coastal zone management, adaptation to sea level rise, fracking, and offshore drilling. He explained that we need to start by understanding who we are, where we come from, where we are, and where we are going in order to fully understand the issues we are facing with regard to Climate Change.

The Congressman then turned the microphone over to Long Beach City (LBC) Council Representative Roberto Uranga. In addition to representing LBC's Council District 7, Uranga also serves on the California Coastal Commission as the South Coast Representative appointed by the State Senate Rules Committee. The Coastal Commission's mission is to "protect, conserve, restore, and enhance environmental and human-based resources of the California coast and ocean for environmentally sustainable and prudent use by current and future generations" (<http://www.coastal.ca.gov>). As part of this mission, Uranga explained that the Commission has been working hard issues related to Sea Level Rise (SLR); the "Sea Level Rise Policy Guidance" report represents the culmination of this work and just unanimously adopted by the Commission on August 12, 2015. This 293 page report "provides an overview of the best available science on sea level rise for California and recommended methodology for addressing sea level rise in Coastal Commission planning and regulatory actions. It is intended to serve as a multi-purpose resource for a variety of audiences and includes a high level of detail on many subjects" (<http://www.coastal.ca.gov/climate/slrguidance.html>).

Congressman Lowenthal continued his introduction by talking about how he understands how important it is to start acting on climate change-related issues, and is working hard to bring about the changes needed to make this happen. Explaining that while many members on the other side of the aisle may not agree on the science behind the causes of climate change, the President and the executive agencies understand the critical nature of climate-related issues and are doing a lot of good work in this area. While there may be little progress being made with regard to national climate change policies, the following areas of concern are becoming increasingly apparent to representatives from both parties: mitigation, adaptation strategies, and planning.

Mitigation strategies includes policies that reduce our greenhouse gas emissions and get at the root causes of climate change, sadly there has been no movement in Congress on this front. Adaptation plans include policies that help communities adapt to the certain changes. This is an area that both Republicans and Democrats are worried about. While members of the Republican Party may not agree on the causes of climate change the fact that some are willing to discuss adaptation strategies needed for climate related issues, is a very positive first step and provides a much needed opening for bipartisan dialogue. Specifically, there's a growing concern about how the most vulnerable members of our communities will be (and are already) impacted by climate change.

The Congressman is working on a broader framework for his work in this area that includes bipartisan discussions and partnerships. He explained that our community is in an excellent spot to be national leaders in these issues. We're already leading in many ways. Some examples we will hear about today:

- The Port of Long Beach.
- Coastal neighborhoods and sea level rise.
- Area universities—research, helping communities figure out how to adapt.
- The local water departments are leading the state in efficient water use and recycling.
- Local, state, and federal teams are also hard at work in our area, providing assistance to communities looking to build a more resilient and sustainable future.

Lowenthal explained that this Forum is designed to provide more information on climate change related issues, with an emphasis on issues that will impact the 47<sup>th</sup> District and larger southern California region. Presentations from representatives working for organizations within this community on climate change-related issues, their talks should provide an overview of their work and hopefully address the following questions:

- How is our community moving forward on climate change?
- What things are we doing well?
- What partnerships can be strengthened?
- Who is missing from this group—who else should we be talking to?
- Who are the most vulnerable communities?
- How do we prioritize amongst communities?
- With limited funding, how do we balance mitigation and adaptation?
- How can I better represent you in Congress and on the Safe Climate Caucus?

Congressman Lowenthal introduced Dr. Jerry Schubel, CEO of the Aquarium of the Pacific, who's Key Note presentation would set the stage for the rest of the forum.

## KEY NOTE PRESENTATION

### “Making the 47<sup>th</sup> Congressional District More Resilient to Climate Change”

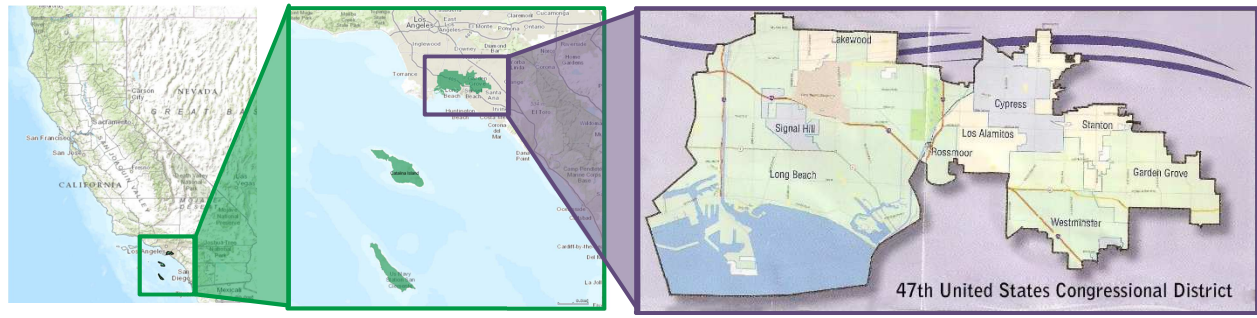
by Dr. Jerry Schubel, President/CEO, Aquarium of the Pacific

Dr. Schubel began with an overview of the questions this forum would address:

- What are the areas of our community (geographic and economic) most vulnerable to climate change?
- What are the current projects and initiatives underway in our community to reduce Green House Gas (GHG) emissions and/or to increase resiliency?
- What are the strengths of our community, where can we lead?
- What specific partnerships can be strengthened?
- In what areas can Representative Lowenthal make a difference right now in Congress?

Climate Change is Real — 2014 was warmest year on record, and 2015 is on track to be even warmer. Sea level is rising; glaciers are melting; the Arctic sea ice is melting; the reported “pause in warming” was an artifact. Manifestations of Climate Change in the 47<sup>th</sup> Congressional District (**Figure 1**) will likely include the following:

- Drought will be ubiquitous and in all probability will get worse as we move deeper into the 21st Century.
- The number of Hot Days (>95°F) will increase, by 2100 the number of hot days will be 2-3 times greater than the present number.
- Air quality (AQ) will get worse particularly near ports as temperature increases.
- Within the 47<sup>th</sup> District, the impacts of sea level rise (SLR) and coastal flooding will be confined to the Long Beach area, and the degree of inundation within this area will get worse.

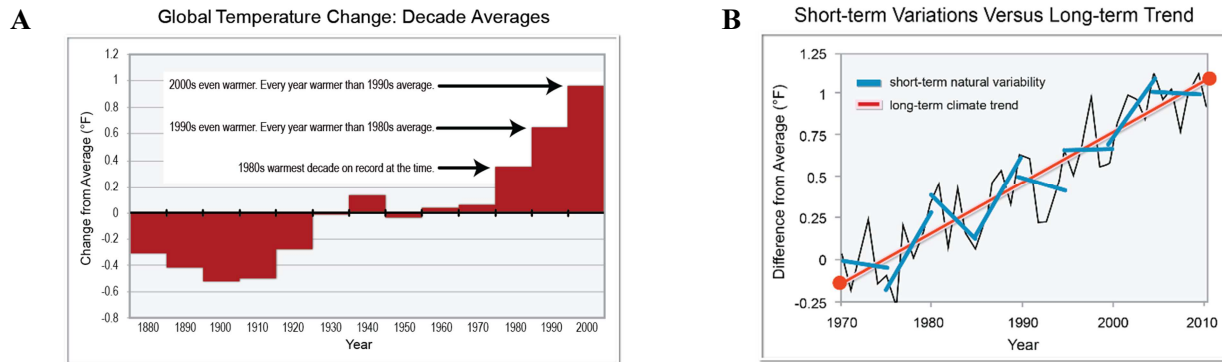


**Figure 1.** The 47<sup>th</sup> Congressional District of the United States

Worldwide, the primary manifestations of climate change will include the following:

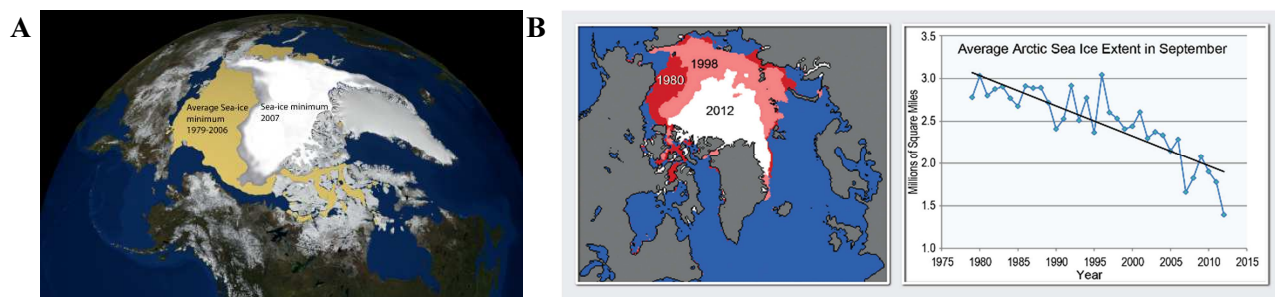
1. Increased air temperature near the surface (troposphere)
2. Increased air temperature over the land
3. Increased amounts of water vapor
4. Increased air temperature over the oceans
5. Increased sea surface temperature (SST)
6. Increased sea level
7. Increased ocean heat content
8. Decreased sea ice
9. Decreased glaciers
10. Decreased snow cover

Global Temperature Change as decadal averages, every decade has been warmer than the previous decade (**Figure 2A**). Short-term vs long-term variations, there is a lot of noise but there is a clear trend towards increasing temperature (**Figure 2B**).



**Figure 2.** Global changes in air temperature, represented as decadal averages between 1880 and 2000 (**2A**, above left), and comparing the short-term natural variability in temperature to the long-term warming trend indicative of climate change (**2B**, above right).

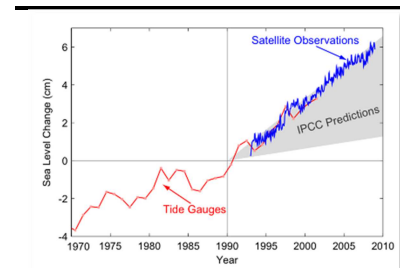
The minimum amount of Arctic sea-ice in 2007 is dramatically less than the average sea-ice minimum for the same region between 1979 and 2006 (see **Figure 3A**), with the area showing a steep decline in the average extent of Arctic sea ice during the month of September over the last 40 years (see **Figure 3B**).



**Figure 3.** Arctic Sea Ice Declines. Minimum Arctic sea-ice extent from 1979 to 2007 (**3A**, above left). Average Arctic sea ice extent during the month of September from 1975 to 2015 (**3B**, above right).

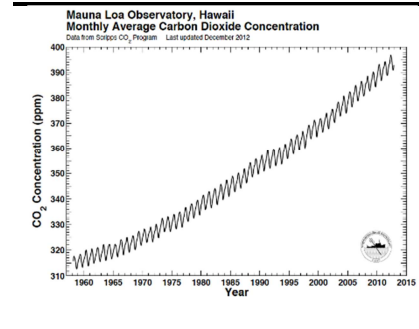
NOAA studies show that Sea Level Rise (SLR) over the last 40 years is greater than the International Panel on Climate Change's (IPCC's) reports indicate (see **Figure 4**). These increases in SLR are primarily the result of increased amounts of Carbon Dioxide ( $\text{CO}_2$ ) in the atmosphere.

Dr. Charles D. Keeling (1928-2005), developed a technique for quantifying the amount of  $\text{CO}_2$  in the air, and used this technique to measure  $\text{CO}_2$  concentrations at a number of locations around the world, including the Mauna Loa Observatory in Hawaii. Data from the Mauna Loa Observatory show a dramatic increase in monthly averages of  $\text{CO}_2$  concentrations over the last 50+ years (see **Figure 5**).

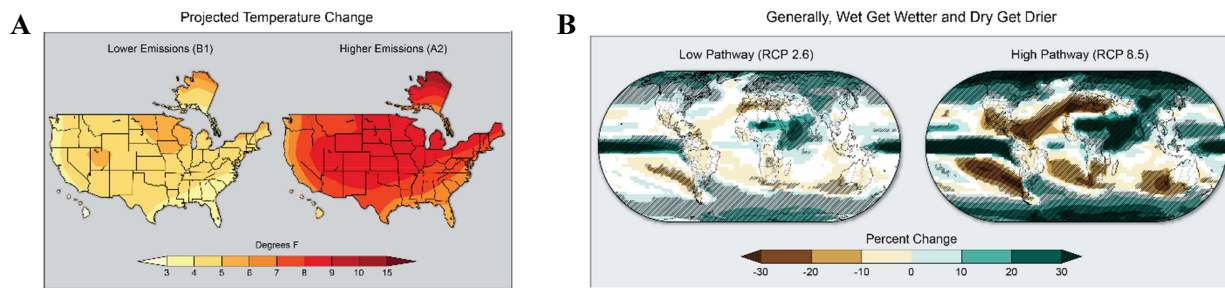


**Figure 4.** Sea-Level changes between 1970 and 2010

This continued increase in CO<sub>2</sub> concentrations, along with increased amounts of other GHGs, will result in a 3-15°F increase in air temperatures by 2100 (see **Figure 6A**), resulting in increased droughts and flooding events worldwide (see **Figure 6B**). Climate Change will also cause increases in the occurrence and severity of extreme weather events, and these events are expensive to deal with. In 2014, the United States experienced eight \$1 Billion weather and climate disasters, including: the yearlong western drought (which reached historic levels in California); Winter Storms in the Midwest/Southeast/Northeast (January 5-8); Tornadoes and Flooding in the Midwest/Southeast/Northwest (April 27-May 1); Flooding in Michigan and the Northeast (August 11-13); and Severe Weather events in the South/Plains (April 2-3), Rockies/Midwest/Eastern states (May 18-23), Plains (June 3-5), and Rockies/Plains(September 29-October 2)



**Figure 5.** Carbon Dioxide (CO<sub>2</sub>) concentrations represented as monthly averages from 1960 to 2015 at the Mauna Loa Observatory in Hawaii.

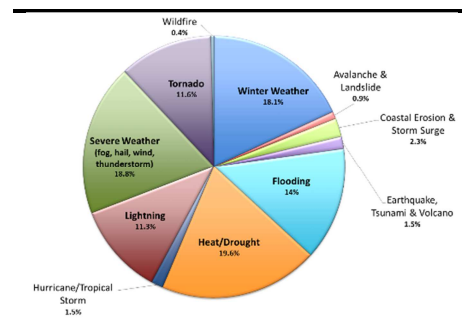


**Figure 6.** Low and High estimates of projected climate changes by the year 2100, with air temperature on the above left (**6A**) and droughts and precipitation on the above right (**6B**).

To withstand these current and projected changes, the 47<sup>th</sup> district must focus on Climate Resiliency. A “Climate Resilient” city or region is an area that is able to continue to function in the face of challenging circumstances due to climate change, and to recover quickly from disruptions. There are four main dimensions of climate resilience:

1. **Health & Well-Being:** everyone living and working in the city has access to what they need to survive and thrive.
2. **Economy and Society:** the social and financial systems that enable urban populations to live peacefully, and act collectively are in place.
3. **Leadership and Strategy:** the processes that promote effective leadership, inclusive decision-making, empowered stakeholders, and integrated planning are in place.
4. **Infrastructure and Environment:** the man-made and natural systems that provide critical services, protect, and connect urban assets enabling the flow of goods, services, and knowledge are in place.

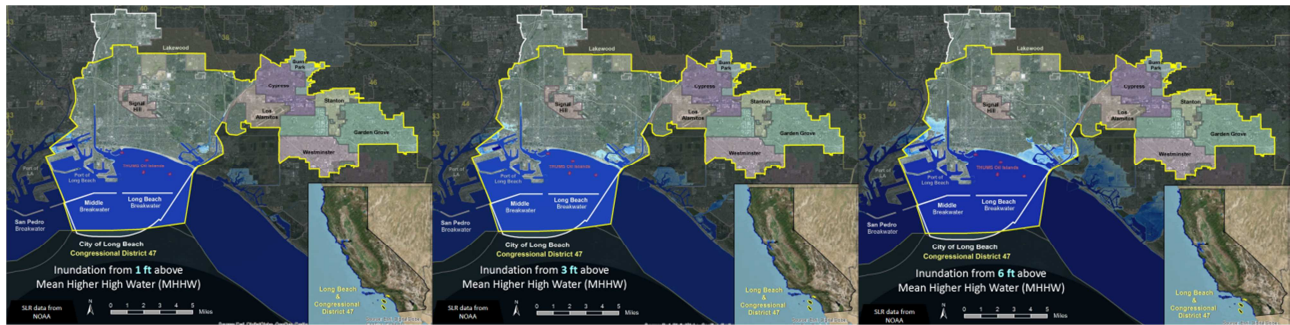
Regional Priority Vulnerabilities Associated with Climate Change will change over time. On a short time scale (present day out to 2030 and 2050), priorities should focus on those areas most vulnerable to: increases in hot spells, drought, degraded air quality, and coastal flooding. Over a longer time scale (present day out to 2075 and 2100), in addition to the areas previously mentioned, priorities should begin to focus on those areas most vulnerable to sea level rise and coastal inundation. Of all extreme weather events, the one that takes the greatest toll on humans is heat (see **Figure 7**).



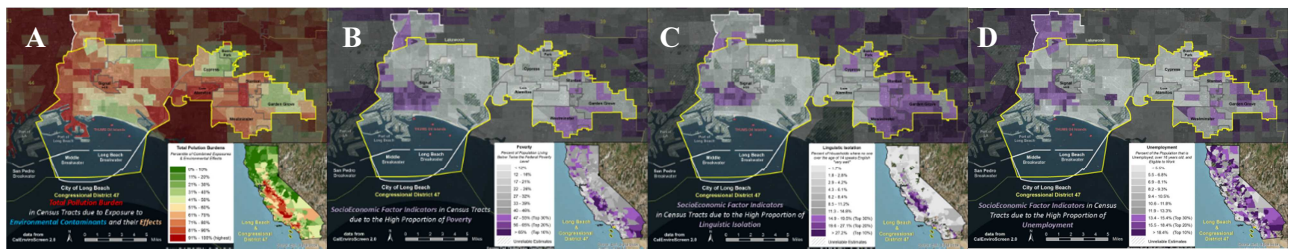
**Figure 7.** Hazard-Related Deaths in the US



In addition to heat, portions of the 47<sup>th</sup> district are at risk of inundation from sea level rise (see **Figure 8**), along with various environmental stressors (see **Figure 9A**) which are made worse in the presence of certain socioeconomic factors (see **Figure 9B-D**).



**Figure 8.** Areas of the 47<sup>th</sup> Congressional District expected to be inundated from 1ft (above left), 3ft (above center), and 6ft (above right) of sea level rise (SLR) above mean higher high water (MHHW).



**Figure 9.** CalEnviroScreen 2.0’s relative ranking of communities that are disproportionately burdened by pollution in census tracts due to their exposure to environmental contaminants and their effects (9A). The impact of pollution is compounded by the presence of sensitive populations and certain socioeconomic indicators, such as poverty (9B), linguistic isolation (9C), and unemployment (9D).

Some of the current projects underway to make this area more climate resilient include the following:

- Mayor Robert Garcia’s initiative to make Long Beach a “climate resilient city”
- LARC initiatives particularly “A Greater LA: The Framework for Regional Climate Action”
- AdaptLA’s partnership of LA, USC Sea Grant, UCLA, and others
- USC SeaGrant sea level rise (SLR) and Flooding Initiatives
- USGS’s CoSMOS (Coastal Storms Modeling System)
- NOAA’s Portfolio of Climate Change Programs
- Governor’s Initiatives regarding drought and greenhouse gas (GHG) emission reductions

The question is “where will the payoffs come?” They will come from **integration** and **application** of existing tools and programs to the 47<sup>th</sup> District with the emphasis on **Adaptation**. California has the resources, intellectual, and fiscal, greater range of environments and climates than any other state. We have both the problems and the opportunities. As John W. Gardner once said, “we are all faced with a series of great opportunities – brilliantly disguised as insoluble problems.” Dr. Schubel, closed with the following quote by Alison Lurie, “As one went to Europe to see the living past, so one must visit Southern California to observe the future.”

## BRIEF MESSAGE FROM SHARON WEISSMAN (from the Mayor's office)

Weissman, on behalf of Mayor Garcia, expressed how fortunate the City of Long Beach is to have Congressman Lowenthal as our representation. He took on covering coal piles to improve our air quality. Long Beach is a progressive city with a progressive council, who work hard to deal with issues like air quality, drought, etc. Long Beach established a Sustainable City Commission in 2007, housed under the Office of Sustainability, which reports to the City Manager. In 2010, the City Council adopted the "Long Beach Sustainable City Action Plan," which is intended to "guide operational, policy and financial decisions to create a more sustainable Long Beach" (for more information and a copy of the plan see: [www.longbeach.gov/sustainability/nature-initiatives/action-plan/](http://www.longbeach.gov/sustainability/nature-initiatives/action-plan/)). In closing, the Mayor has asked her to congratulate the congressman on his leadership and all the amazing things he is doing for our city.

## PRESENTATIONS

### **"Climate Change Forum"**

*by Hector De La Torre, Member of the EPA's Air Resources Board (ARB)*

We are at a critical time right now in California, there are a number of bills in congress that deal with safeguarding California against risks associated with climate change. Such as SB32 (which is similar to AB 32), which sets targets for 2020, 2030, 2040, etc. No one else in this country are doing as much as California is, and if this bill gets passed we will be the leaders in acting change.

With climate change, we are realizing that Californians are most vulnerable precisely where we're most fortunate. Rising seas and gathering storms threaten our coastlands, home to most of our population. Heat waves and droughts pressure farms and ranches that are among the most productive in the world. And our magnificent forests are at greater risk from wildfires that worsen in warmer weather. Knowing what is at stake, California has become a global leader in responding to the growing climate threat. Our innovative policies are reducing greenhouse gas emissions and accelerating the transition to a clean-energy economy. At the same time, we are planning and preparing for the unavoidable risks of climate change. Our efforts fit within an integrated, three-R's strategy: reducing emissions, readiness, and research.

Currently California's Climate Strategy is based on AB32, which has a vision of reducing GHG emissions to 40% below 1990 levels by 2030, and includes the following goals: 50% renewable electricity; 50% reduction in petroleum use in vehicles; double energy efficient savings at existing buildings; carbon sequestration in the land base; reduce short-lived climate pollutants; and safeguard California. Governor Brown's inaugural address on January 2015, discussed what are being referred to as the "five pillars," which identifies several key strategies for addressing the "first R" - reducing carbon emissions in California:

1. Reducing today's petroleum use in cars and trucks by up to 50 percent
2. Increasing from one-third to 50 percent our electricity derived from renewable resources
3. Doubling the efficiency savings achieved at existing buildings and making heating fuels cleaner
4. Reducing the release of methane, black carbon and other short lived climate pollutants
5. Managing farm and rangelands, forests and wetlands, so they can store carbon

In addition, the Air Resources Board (ARB) is developing a plan to reduce emissions of short-lived climate pollutants. The California Natural Resources Agency, in coordination with other state agencies, has updated the 2009 California Climate Adaptation Strategy, which is known as the "Safeguarding California Plan." For more information on what CA is doing see the National Resources Agency's 2014 report. ([http://resources.ca.gov/docs/climate/Final\\_Safeguarding\\_CA\\_Plan\\_July\\_31\\_2014.pdf](http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf)).

Local Government Actions for Climate Change, as detailed in the “Scoping Plan Update,” many local governments have initiated efforts to reduce GHG emissions by: upgrading vehicle fleets; retrofitting government buildings and streetlights; purchasing greener products; implementing waste-reduction policies; adopting more sustainable codes, standards, and general plan improvements to reduce GHG emissions; and implementing SB 375 (Sustainable Communities Strategy).

Some of the Government Tools include, [CoolCalifornia.org](http://CoolCalifornia.org), which is designed to provide all Californians with the tools they need to take action to protect the climate and keep California cool.

Further opportunities exist for local and regional entities to take action, in areas like:

- *Transportation*: clean vehicle incentives and infrastructure, biofuel incentives, and sustainable communities.
- *Energy*: local building codes, energy efficiency programs, water conservation efficiency, renewable energy incentives, and fuel cell deployment.
- *Commercial Refrigeration*: incentivize adoption of low-GWP refrigerant systems.
- *Recycling and Waste*: capture waste methane for renewable fuel.

Some of the other actions the State is taking include “California Climate Investments” program, which uses the proceeds from cap and trade auctions to pay for the following programs:

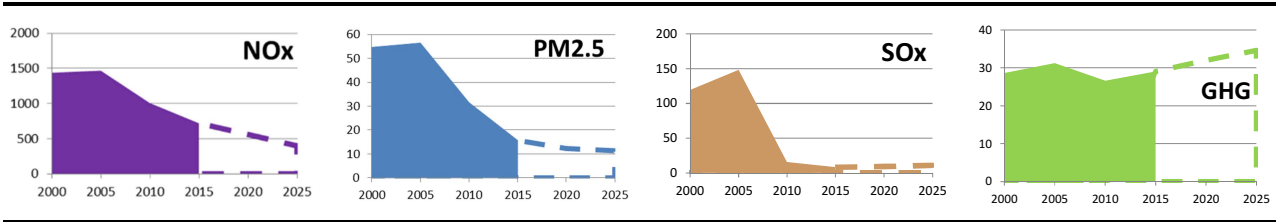
- Conducting low income weatherization projects
- Funding and promoting zero emission transportation and port equipment
- Encouraging and supporting greater use of transit, walking, and biking
- Urban forestry programs

*Local Success example*: Reducing truck idling we were able to reduce the amounts of diesel soot and black carbon. A partnership between the City of Commerce, the California Air Resources Board (CARB), the Department of Toxic and Substance Control (DTSC) and East Yard Communities for Environmental Justice has focused on enforcing the no idling rule to ensure that trucks do not idle in our communities. Idling (a parked truck with the motor on, consistently releasing diesel emissions) consistently happens in specific corridors in the City of Commerce. Every day, approximately 47,000 diesel trucks drive on the I-710 freeway. Truck movements and activities exposes the communities of Commerce to large amounts of diesel exhaust, increasing the rate of cancer, asthma and other respiratory illnesses.

*Climate Mitigation and Adaptation Initiatives*: A number of things are going on at the State, regional, and local level. The following are examples of efforts happening at the State level:

- Climate change investments
- Climate change research
- Climate Change assessments
- State Implementation Plans for air quality
- AB 32 Climate Change Scoping Plan (2008)
- Our Changing Climate (2012)
- Safeguarding California: Reducing Climate Risk Plan (2014)
- Short-Lived Climate Pollutant Plan

Progress in Reducing Freight Emissions in California: we’ve already reduced NO<sub>x</sub> and PM<sub>2.5</sub>, but SO<sub>x</sub> and GHG are still going up (see **Figure 10**). We need to work to change this. Industry has already demonstrated leadership and made investments in response to actions taken by ARB and federal and local government partners, which have resulted in progress towards reducing statewide freight emissions. For example, these combined actions have cut emissions of toxic diesel particulate matter at the state’s largest seaports by 80 percent over the last decade. In the long term, freight emissions from nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), and particulate matter (PM<sub>2.5</sub>) are projected to continue decreasing. However, greenhouse gas emissions (GHG) are expected to rise as trade continues to grow, and as existing control strategies in this sector have primarily focused on reducing toxic and criteria air pollutants. Despite all the progress made to date, California’s freight transport system still accounts for about half of the toxic diesel particulate matter statewide, 45 percent of the NO<sub>x</sub> emissions and 6 percent of the greenhouse gas emissions. Black carbon is a component of diesel particulate matter – it has both climate and direct health impacts.



**Figure 10:** Reductions in California freight emissions between 2000 and 2015, with projected emissions through 2025. In the above graphs, nitrogen oxides (NOx), particulate matter  $\leq 2.5 \mu\text{g}/\text{m}^3$  (PM2.5), and sulfur oxides (SOx) are depicted in Tons per day, while the greenhouse gases (GHG) are depicted in million metric tons CO<sub>2</sub>-e per year. (Sources: EMFAC 2014, Off-Road Emission Inventory Model, and ARB’s GHG emission inventories)

On July 17, 2015 Governor Brown issued executive order B-32-15, enacting the “California Sustainable Freight Action Plan,” which is a multi-agency effort that works towards improving freight efficiency, transition to zero-emission technologies, and increase competitiveness of California’s freight system. This integrated action plan, also identify State policies, programs, and investments to achieve these targets. The plan will be informed by existing State agency strategies, including California Freight Mobility Plan, Sustainable Freight Pathways to Zero and Near-Zero Emissions Discussion Document, and Integrated Energy Policy Report, as well as broad stakeholder input. The Sustainable Freight Pathways document included a number of discrete actions to reduce emissions from the following: trucks; ocean-going vessels; locomotives; freight hubs; delivery vans and small trucks; cargo handling equipment (like forklifts); transit buses and airport shuttles (both of which further support market development of zero emission technologies in the heavy-duty sector); and transportation refrigeration units.

Congress and the Federal Government can make a difference by doing the following: increasing vehicle efficiency standards (for the first time since the Clean Air Act was passed, CA was on the same page with the federal government on emission standards. Previously CA was more strict than the nation, but Obama changed this. The EPA’s proposed Phase 2 GHG standards for trucks stipulates that by 2027 fuel consumption and CO<sub>2</sub> emissions will be lowered by at least 16-24%, depending on truck type); requiring cleaner ships and trains; bringing low carbon power plants on-line; and being a climate action leader at the international level (Gov. Jerry Brown was asked to speak in Paris, he is the only US governor asked to speak because CA is the leader in Climate action within the US).

The following partnerships and initiatives are important for success and can be further strengthened: communities; ports and cargo owners; shipping, rail, trucking, and warehousing industries and labor; business leaders and venture capitalists; technology developers; government; and other stakeholders.



For more information see: Cool California (<http://www.coolcalifornia.org/>), Climate Change Portal (<http://www.climatechange.ca.gov/>), ARB’s website (<http://www.arb.ca.gov/>), California Sustainable Freight Initiative (<http://www.arb.ca.gov/gmp/sfti/sfti.htm>), and the San Pedro Bay Ports Clean Air Action Plan (<http://www.cleanairactionplan.org/>).

## “CA Coastal Commission: Sea Level Rise and Climate Change”

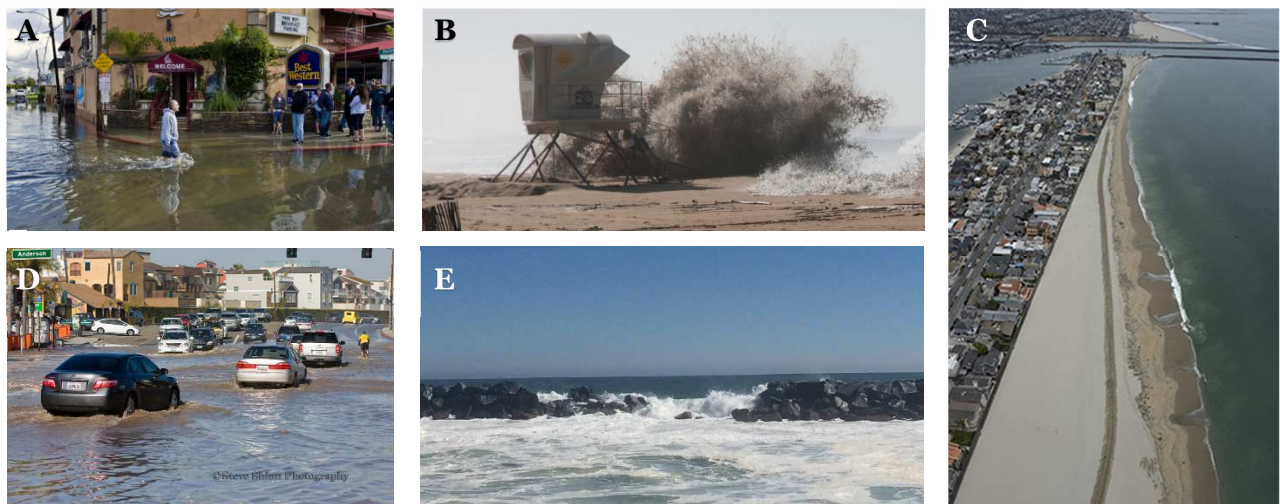
by Jack Ainsworth, Senior Deputy Director, California Coastal Commission

Climate Change, more specifically sea level rise (SLR) is the most challenging issue facing our community. Identifying areas that are vulnerable to and at risk of SLR is critical in having communities that will be resilient in the future. They are working to develop Local Climate Plans (LCP) with each of their jurisdictions. They are working to ensure that they have really good inter-agency collaboration in climate change issues, and working to improve public education on these issues, because in order to have public support, the public must understand the issues.

The CA Coastal Commission is a state agency that was started in 1976 by the California Coastal Act. Most Development in the Coastal Zone must get a permit from the Commission or local government, and be consistent with the Coastal Act and Local Coastal Programs (LCPs). Local governments must prepare Local Coastal Programs to be approved by the Commission, that identify the kinds, locations, and intensities of development, and policies and regulations to implement the Coastal Act. The Commission has a long history of addressing shoreline change—including hazards from sea level rise—through these planning and regulatory actions, and for that reason, climate change is not a new issue.

**Coastal Hazards Management:** Two policies in particular give the Coastal Commission authority to address flooding and erosion hazards from sea level rise: *Coastal Act section 30253*, which states that new development shall minimize risks from flood and fire and not require construction of shoreline structures, or sea walls; and *section 30235*, which gives the Commission the authority to approve shoreline structures in certain circumstances for existing development. Since LCPs must contain equivalent hazard policies, and because those LCP policies are then reflected in local Coastal Development Permits, LCPs are a key tool for implementing adaptation strategies throughout California to address coastal hazards such as those presented by sea level rise.

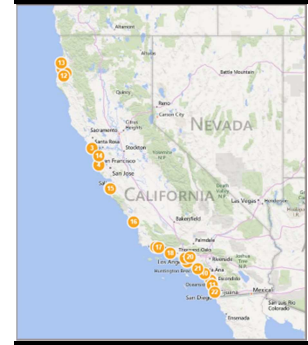
We are already facing issues of coastal flooding, beach hazard, reduced beach width, flood risk in residential areas, Transportation impacts along PCH, and impacts to critical infrastructure like the breach in the breakwater caused by Hurricane Marie (see **Figure 11**).



**Figure 11:** Examples of some of the coastal flooding problems already being experienced in the Long Beach area, including: (A) post-Hurricane Andre flooding of the Long Beach Peninsula<sup>1</sup>; (B) beach erosion in the Bolsa Chica area of North Huntington Beach<sup>2</sup>; (C) reduced beach width along the Long Beach Peninsula; (D) flooding along the Pacific Coast Highway; and (E) reaches in the Long Beach Breakwater caused by Hurricane Marie. (Sources: <sup>1</sup><http://www.ocregister.com/articles/tides-382947-high-water.html>, <sup>2</sup><http://www.nbclosangeles.com/news/local/High-Surf-Warnings-and-Amazing-Photographs-85773857.html>)

**Regulatory process: Project Example** — Naples sea wall: project development included an analysis on SLR using the best available science and a contingency plan for SLR with design for increased height. **Planning Example** — Southeast Area Specific Plan (SEADIP): includes provisions to address climate change and SLR adaptation; and the Los Cerritos wetland restoration and SLR analysis project, which builds in transitional space allowing the wetlands to migrate as SLR.

**Grants for LCP updates:** Because LCPs are such crucial planning tools, the Commission received funding to provide grants to local governments to update their LCPs. On January 8th, 2014 the Commission awarded \$1 million in grants to 11 local governments, and is in the process of reviewing applications for the 2nd round of grant funding. The vast majority of the funded projects include work to address sea level rise. The OPC and State Conservancy are also administering grant programs to support LCP planning for climate change. To date, about \$5 million has been awarded for LCP planning through the Coastal Commission, Conservancy, and Ocean Protection Council. The Legislature was crucial in making this funding available for this important work, so we wanted to take this opportunity to thank legislators present for your role in that. A total of 5 years of funding will be available through 2017. **Figure 12** shows the locations of all the grants that have currently been awarded.



**Figure 12.** Locations of the 22 awarded LCP grants

**Sea Level Rise Policy Guidance** document (adopted in August 2015). Intended to be a one-stop-shop for information and resources to help local governments update their LCPs. The document includes a menu of adaptation strategies that can be applied in various situations across the state depending on the characteristics of each particular area. The Guidance also includes a similar step-by-step process aimed at incorporating sea level rise into individual projects in the coastal zone through the Coastal Development Permit application process. (for more information see <http://www.coastal.ca.gov/climate/slrguidance.html>)

Ainsworth concluded with a few pictures of what is motivating all of this (see **Figure 13**), including pictures of bluff erosion and examples critical infrastructure is at risk (such as power plants, wastewater treatment plants, and transportation corridor). CA has seven wastewater treatment plants located in areas at risk from 1.5 m of sea level rise and a 100-year storm, as well as a number of power plants and other critical infrastructure). However, it is not all bad news, there have also been adaptation successes (see **Figure 14**).



**Figure 13:** Examples of some nearby locations already experiencing some of the hazards associate with sea level rise, such as: (A) bluff erosion in Isla Vista (photo by Phyllis Griffman); (B) vulnerability of the Mandalay Generating Station in Oxnard, CA; (C) the wastewater ocean outfall at Ocean Beach, SF; and (D) Surfer's Beach in Half Moon Bay, showing how Highway 1 is at risk from both erosion and flooding in many areas throughout CA.



**Figure 14** (left): Examples of some adaptation success stories, such as: Hwy 1 Piedras Blancas Realignment (A); and preventing further coastal erosion by removing Fort Ord (B-before removal, C-after removal).

## “Los Angeles Regional Collaborative (LARC) for Climate Action & Sustainability”

by Krista Kline, Managing Director of the Los Angeles Regional Collaborative (LARC)

LARC is a membership organization whose members include government, academia, environmental groups, community groups, business community, labor, students, and individual citizens (see **Figure 15**). LARC’s sole purpose is to coordinate across and within these groups close the loop between research and policy. They also work to make their data available to policy makers. LARC engages the public by holding quarterly public forums (every 3 months).



**Figure 15.** LARC Members

One of LARC’s big projects right now is “A Greater Los Angeles: The Framework for Climate Action and Sustainability” which focuses on the following sectors: Energy; Transportation and Land use; Water; Public Health; Ocean and Coastal Resources; Emergency Services; forestry, biodiversity, and habitat, and waste management.

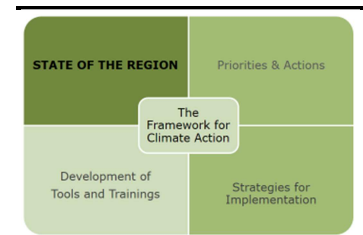
**The Framework**, funded by the SGC, the framework is a 3 year process, designed to bring the region together to identify areas where the region (and local governments) can be most successful in implementing climate action. The State has ambitious goals, and the local governments are responsible for implementing many of them, but what is the best way to go about it, especially with limited resources? The Framework is a one-stop place for information about climate change in LA County. What’s projected, what’s legally required? What’s the best way to spend limited resources?

**What:** a practical and place-based resource to support effective climate action planning in Los Angeles.

**Why:** to minimize the burden of legal mandates, while maximizing the effectiveness of action.

**Who:** engaging practitioners for practitioners.

**The Framework Process** (see **Figure 16**): A State of the Region guidebook to climate science for local government practitioners, with particular emphasis on how climate change will impact Los Angeles. A summary of the Federal, State and Local policy mandates that clearly outlines what local actors are required to do, and what they are not required to do. An analysis of current greenhouse gas emissions should include: where they come from, who’s producing how much and a list of priority actions to reduce emissions based on level of impact, cost effectiveness and local benefit. A Compendium should include: identification of regionally specific priorities to maximize resilience, assessment of target actions to achieve these priorities and description and analysis of the best strategies for implementing these actions.



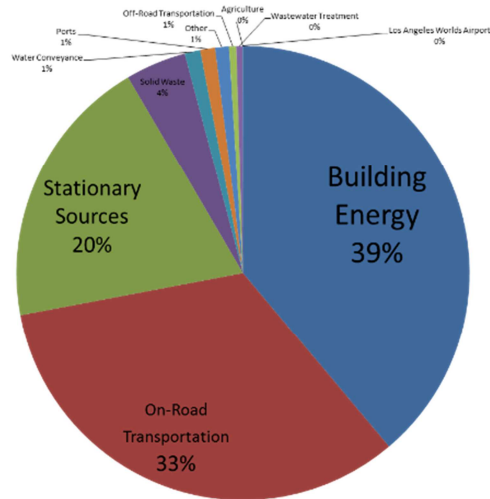
**Figure 16.** The Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC) Framework Process

**The State of the Region (SOR) Report:** SOR is useful to decision makers because it presents the latest climate science in the context of specific Los Angeles regional concerns; compiles and summarizes LA specific climate change research and policies; and identifies the mismatches between projected impact timelines and decision making timelines. Ultimately, the State of the Region exists to serve the needs of decision-makers and thus presents climate research and data as a means to improve regional action.

**What Every Decision Maker Needs to Know About Climate Change:** SOR starts with key findings/takeaways for decision makers, such as the following: climate change is happening now; even with GHG reductions, climate change will continue through mid-century; GHG reductions are critical to mitigating the most severe impacts predicted to occur; adaptation must be place-based, as climate impacts will vary across the region down to the neighborhood scale; impacts span political boundaries so collaboration is key; broad sustainability goals increase resilience; and climate change will increase temperatures, reduce water predictability, raise sea levels, and lengthen the wildfire season.

**LA County's Emissions Profile:** The following graphics depict where LA's GHG emissions come from.

Los Angeles County GHG Emissions Inventory		
GHG Emissions Source	MTCO <sub>2</sub> e	
Building Energy	38,900,762	39%
On-Road Transportation	33,226,317	33%
Stationary Sources	19,516,169	20%
Solid Waste	4,327,123	4%
Water Conveyance	1,117,283	1%
Ports	1,059,131	1%
Other	987,741	1%
Off-Road Transportation	515,044	0.5%
Wastewater Treatment	443,832	0.4%
Agriculture	26,105	0.03%
Los Angeles Worlds Airport	2,760	0.0%
<b>Total</b>	<b>100,122,267</b>	<b>100.0%</b>



**State of the Region's Summary of Findings:** The highest social and health vulnerability appears to be from heat, wildfire, and associated air quality impacts. Some, but less social vulnerability from sea level rise. High economic costs associated with 10 and 100 year coastal flooding events. Climate Change impacts on water supply are unclear. Conservation is the first and most important element of adaptation. Flood and earthquake pose greatest threat to supply. Electricity supply and transportation cause majority of emissions and likely hold the greatest opportunities for reductions. Need more information on economic and infrastructure impacts. Unpredictability of future demographics make predicting future vulnerability less certain.

**Identifying Priorities:** Priorities are **specific** goals that increase Los Angeles' climate resiliency. Regional Priorities must: reduce GHG emissions, and/or increase adaptation efforts. Priorities set the foundation for sustainable transformation in the region.

**Priority Sectors:** While LARC was drafting priorities, the State was also muddling through their climate actions. This directly applies to local/regional governments, as they are often the ones shouldered with the responsibility to implement these targets. Notably, Governor Brown's **Executive Order B-30-15**, helped identify key priorities and stressed that actions should reduce emissions AND increase adaptation. It is designed to: identify vulnerabilities to climate change by sector and regions; outline primary risks to residents, property, communities and natural systems from these vulnerabilities, and identify priority actions needed to reduce these risks (LARC SOR); and identify a lead agency or group of agencies to lead adaptation efforts in each sector (LARC Implementation). Priority should be given to actions that both build climate preparedness and reduce greenhouse gas emissions. State Bill (SB) 350, sets forth the "Golden State Standards" of 50% reduction in petroleum use; 50% utility power coming from renewable energy; and 50% increase in energy efficiency in existing buildings. Through the Framework, LARC staff is identifying areas where the region can step in to support these standards.

**Selection Criteria for Targeted Actions:** Targeted Actions. There are a lot of actions. The goal is to be specific, and transformative. For example: the action must have the capacity to catalyze systemic change; the action must lead to greater sustainability and resilience over the long-term and not create further path dependence on fossil fuels; mitigation actions must have the capacity to create significant emissions reductions by 2035; and the action must not create adverse equity impacts.

In closing, LARC is part of the "Alliance for Regional Collaboratives on Climate Action" (ARCCA), which includes the Bay Area Climate & Energy Resilience Project; the Capital Region Climate Readiness Collaborative; the San Diego Regional Climate Collaborative; and of course, the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC).



## “Ocean Acidification and Southern California”

by Roberta L. Marinelli, Director of the USC Wrigley Institute for Environmental Studies

She was invited to this forum because she wrote to Congressman Lowenthal’s office about how important climate change issues are.

**Ocean Acidification – What is it?** Ocean acidification (OA) is a change in the chemistry of seawater that occurs when atmospheric carbon dioxide enters the ocean (see **Figure 17**). It affects the ocean’s acidity, and it affects the availability of the building blocks for shells.

**Is that a problem?** YES! CO<sub>2</sub> has increased dramatically over the last century. The ocean has absorbed ~90% of the heat created by anthropogenic CO<sub>2</sub>, and 30% of the CO<sub>2</sub> attributed to industrial activity.

**Is this a global phenomenon?** Yes, but it is not uniformly impactful. The polar waters are at high risk, along with upwelling regions, and coastal areas.

**California Coastal Upwelling:** The California Coastal Upwelling is a combination of forces that cause cool seawater that is naturally rich in nutrients and CO<sub>2</sub> to come to the surface (upwelling). Because we have more CO<sub>2</sub> in our surface waters, we have more risk of ocean acidification. Fundamentally, if our coastal waters experience water that comes from offshore upwelling, our coastal organisms might already be able to cope with ocean acidification; however, it is also possible that important organisms such as corals, bivalves, and other shell-bearing forms, may already be at their limit.

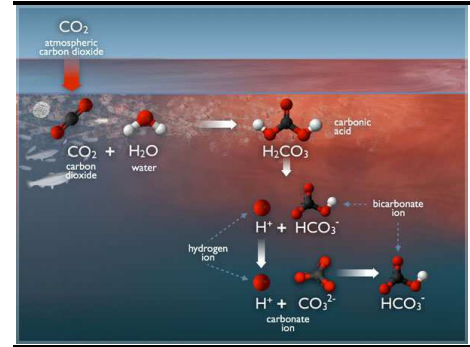
**Coastal Nutrient Runoff:** An additional component is Coastal Nutrient Runoff. Coastal nutrients enter the ocean through runoff or sewage outfalls. Nutrients that enter the coastal zone may enhance the growth of plants in the coastal ocean, which can actually lower carbon dioxide, because plants take up CO<sub>2</sub>.

**What are we doing about it?** Research. Dr. David Hutchins and Dr. Feixue Fu (both from USC) are studying how ocean acidification will affect phytoplankton and nutrient cycling. Dr. Dennis Hedgecock and Dr. Donal Manahan are studying how ocean acidification affect shellfish growth and physiology, and whether or not it is possible that species are resilient (their work is based out of USC at the Wrigley Marine Science Center on Catalina Island). Drs. Will Berelson (USC) and Dr. Jess Adkins (Cal Tech) are studying the chemistry of shell formation. Dr. Ann Russell (UC Davis) and Dr. Baerbel Hoenisch (Columbia University) are studying what we can learn about the future of ocean acidification through the geologic past.

**Networking:** Marine Laboratories along the west coast are forming a network to measure OA in their local coastal zones. Scientists are combining forces to measure and understand how OA will affect ecosystems and resources broadly. Scientists are also reaching out to inform the public.

**What can you do?:** Recognize that our ecosystems are at risk and that isn’t just the systems we enjoy but the systems that we rely on. Oceans contribute 17% of the world’s protein consumption – therefore we can help by supporting sustainable fisheries research, supporting sustainable aquaculture research, and consuming sustainable fish and shellfish. It’s also important to acknowledge that good science doesn’t have an agenda; therefore we can help by learning about the science of our local ocean, and by supporting ocean science research.

We must recognize that the human footprint is evident everywhere. Our science and policy must guide us toward a sustainable future that reconciles human prosperity, economic progress, and environmental security.



**Figure 17.** The process of Ocean Acidification

## “Climate Change Forum”

by Kevin Wattier, General Manager, Long Beach Water Department

Congressman Lowenthal introduced Kevin as being one of the most well respected authorizes in the country when it comes to water.

### *Water 101: Where Southern California Gets its Water*

Southern California gets its water from many sources (see **Figure 18**). The key to planning has been to diversify the supply pool and to create a balance between imported and local resources, backed up by prudent and timely investments. Recent state legislation now requires water agencies to detail water supply availability and to provide forecasts that are used to decide if development can move forward.



Figure 18. Southern California’s Water Sources

### *So what does that mean for the future of CA’s water, based on current Climate Predictions?*

- This year we had 75% of the normal precipitation in the Lake Orval Watershed
- The same watershed had 5% of normal snowpack
- This is not a high elevation watershed, 90% of it is below 1000ft
- So why is it important that we had less rain and almost no snow? Because we rely on the slow melting of the snow to replenish our watershed slowly throughout the year.
- We simply cannot continue to rely on water moving forward because it is rapidly disappearing.

### *The future of Water in southern California does NOT look good. So what are we doing about it?*

Recommendations:

- Support the water replenishment district’s GRIP Project.
- Support upcoming efforts to further utilize recycled water to reduce dependence on imported water.
- Support Long Beach’s approach to turf replacement: “The Beautiful Long Beach Program.” This is something that all of southern California should be doing. A core element in So Cal moving forward needs to be a permanent reduction in water consumption, and there’s only one way to do that and it’s through turf replacement.

The question is, Are we going to work together to proactively make California a beautiful, sustainable, and resilient place? Or are we going to be forced to when it becomes an emergency?

## “Port of Long Beach Climate Adaptation & Resiliency”

by Rick Cameron, Managing Director of Planning & Environmental Compliance, at the Port of Long Beach

**POLB – Economic Engine & Environmental Leader:** The Port of Long Beach (POLB) is a vital economic engine for the region, state, and nation. POLB is a major gateway for trade between the US and Asia. More than 6.7 million 20-foot container units (TEUs), 2,000 vessel calls, cargo valued at \$180 billion. POLB is the 2nd busiest port in the U.S., 21st largest in the world, and if combined with neighboring Port of Los Angeles (POLA), 9th busiest in the world. Nearly 1 in 5 loaded containers entering the U.S. come through POLB—63.1 million metric tons of cargo. Trade passing through the Port supports about 30,000 jobs in the Long Beach area, 316,000 jobs in Southern California, and 1.4 million jobs nationwide. More than \$5 billion a year in U.S. Customs revenues from the Long Beach/Los Angeles ports; about \$4.9 billion a year in local, state, and general federal taxes from Port-related trade; more than \$47 billion in direct and indirect business sales yearly; and nearly \$14.5 billion in annual trade-related wages.

**Green Port Policy:** The Port’s “Green Port Policy” facilitated a change from being reactive to being proactive, with regard to climate and environmental issues, specifically focusing on: Air, Water and Sediments, Wildlife, Soil, Sustainability, and Community Engagement. Today, the Port of Long Beach is known throughout the world as an environmental leader. Ten year anniversary of the Green Port Policy: protect the community from negative Port impacts; distinguish Port as environmental leader; promote sustainability; employ best available technology; engage and educate the community about the Port. Clean Air Action Plan (CAAP), Water Resources Action Plan (WRAP), and other environmental initiatives have been extremely successful. Air emissions are significantly down, habitat and wildlife are strong and improving, and the community is more engaged than ever. The port’s mission statement includes the Triple Bottom Line, or the three legs of the sustainability stool. For efforts to be sustainable they must balance economics, social aspects, and the environment. Where those three aspects meet sustainability can be achieved, which occurs when you are financially solvent, have a thriving community, and have a healthy environment. The most recent emissions inventory, which covers calendar year 2013, shows significant reductions. POLB is exceeding their clean air goals for 2023 for diesel particulate and nitrogen oxides and we are well on our way to meeting our sulfur oxide goal. Greenhouse Gases are also down 20%. All of these reductions have been achieved while TEUs throughput is essentially the same, meaning these reductions are not a result of reduced throughput. These reductions have been achieved while we have been able to move the same amount of cargo, which shows that the investments that the port and industry has made to implement these strategies, is working.

**2013 Air Emissions vs 2005:** The Port’s 2013 Air Emissions Inventory (compared to 2005): 90% decrease in Sulfur Oxides, 82% decrease in Particulate Matter emissions, 54% decrease in Nitrogen oxides, 20% decrease in Greenhouse gases, but TEU’s up 0.3%.

**Moving forward — CAAP Update 3 (zero & near-Zero emissions, GHGs, Efficiencies, and Energy):** POLB has had tremendous success over the past 10 years, but there’s still a lot of work left to do. They are continuing to work with their partners at the Port of Los Angeles, EPA, ARB, and AQMD, POLB is embarking on a second update to the CAAP. CAAP 3 will be an opportunity for POLB to share their accomplishments from the past decade and to develop new strategies for maintaining our emission reductions and reducing further their impacts on air quality. They anticipate this new CAAP also will reference and incorporate to the extent feasible efforts related to energy and supply chain optimization.

These gains allow POLB to envision a future with zero- and near-zero emission technologies, such as: electrification of all terminals, as leases come up for renewal; shore power or AMECS emission controls for all vessels; increasing on-dock rail with near-zero locomotives; and overhead catenary systems for drayage trucks. POLB’s Climate Change Green House Gas Mitigation Plan is working on capturing GHGs through community-based projects like wide scale tree planting. Investing in the Port of the future through Business Continuity with a focus on modern, electrified, and resilient infrastructure. One challenge POLB is facing is the need to ensure our infrastructure is modern and efficient and can accommodate the future demand for goods movement. They are working to make investments that will allow the port to continue to grow, while

also ensuring that it is grown in a way that ensures resilient, green growth. The Port is in the middle of a significant capital improvement program, spending \$4 Billion to construct the Port of the Future, with modern facilities and infrastructure that can accommodate the largest ships and allow for efficient movement of goods. Major projects are underway, including: the Gerald Desmond Bridge; rail improvements, including on-dock rail facilities; and, the Middle Harbor Redevelopment Project. The Middle Harbor project is nearing completion of Phase 1. When complete, this 305-acre facility will be one of the cleanest and most technologically advanced container terminals in the world, with significant amounts of electrification. The modern facilities and operational efficiencies will allow it to operate with half the air emissions of a typical terminal of its size.

Climate Change Adaptation and Resilience Planning by assessing, developing mitigation and implementation of these plans. There are many aspects to Climate Change, from mitigating its causes to developing adaptive measures to counter act its effects. POLB is developing a Climate Change Adaptation and Coastal Resiliency Strategic Plan (CRS Plan). The intent of the Plan is to prepare the port for the effects of climate by assessing their vulnerability's, developing mitigation measures to address those vulnerabilities, and then of course, implementing those measures. At this point they have just completed their initial assessment which included numerous technical studies such as, Climate science, Breakwater Assessment, Asset Vulnerability Assessments, and Inundation Mapping. Next they will begin the true planning phase where they develop the mitigation strategies to address the vulnerabilities that have been identified. Once that is complete, they will move into implementation.

***CRS Plan Components:*** Phase 1 – Climate Impacts Study: focuses on 4 climate stressors: sea level rise, storm surge, increased precipitation, and extreme temperatures. Phase 2 – Development of Adaptation Strategies: includes an initial list included over 50 potential strategies; levels of detail (vulnerability, point of intervention, partners, timeframe, high-level cost); and organization of strategies (Policy, Initiative, or Infrastructure).

***POLB Energy Policy:*** Electrification expected to quadruple the Port's electricity use by 2030. POLB is continuing to electrify our operations for both business and environmental benefits. They estimate their current Port wide energy costs range between 30 and 40 million dollars per year. As they continue to electrify their operations, we could see a quadrupling energy use of the next couple of decades, that could translate into collective Port of Long Beach energy costs exceeding \$100 million/year by the year 2030. Also, the grid is old. Over 100 years old in some places around the Port. Energy reliability as it relates to business continuity is a huge concern for the port. Given that the general demand for power is rising everywhere and the demand could be rising faster than the utilities' capacity to deliver. All of this will have an impact on the port's operations, business continuity, and the Port's bottom line. The port is now launching a comprehensive energy program with the goals of: clean, distributed power generation; energy security, operational resiliency; grid-connected, emergency grid-independent; long-term energy cost stability; clean fuels for mobile, stationary uses.

In closing, the Port of Long Beach plans to have a Sustainable and Resilient Future.

## “CSU’s Council on Ocean Affairs, Science and Technology (COAST)”

by Krista Kamer, Director, CSU’s Council on Ocean Affairs, Science and Technology (COAST)

California State University (CSU) is one of the largest, most diverse public university systems in the U.S. (tied with New York’s SUNY system), with over 460,000 students currently enrolled, over 100,000 graduates during the 2013-2014 calendar year, and over 3 million alumni. CSU’s Council on Ocean Affairs, Science, and Technology (COAST) consists of a “network of hundreds of CSU faculty members and students actively working to advance our knowledge of marine, coastal and coastal watershed resources and the processes that affect them” (see **Figure 19**).

Our ocean and coastal waters have intrinsic value, as well as economic value. Areas of particular interest to COAST are California’s Fisheries (such as the California Spiny Lobster, Grass Rockfish, the Pacific Oyster, Lingcod, etc.); invasive species (such as the Chinese mitten crab, *Caulerpa taxifolia*, *Watersipora subtorquata*, etc.); water quality; coastal hazards; the intrinsic value of the ocean and coastal waters; and the economic value of these waters, as well as the economic benefits they convey to the surrounding region.



**Figure 19.** CSU’s participating COAST locations

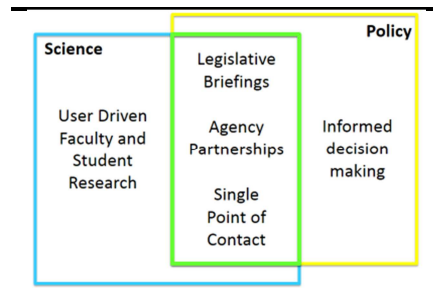
Climate Change will cause sea level rise and storms, which will cause thermal shifts, and changes in seawater chemistry ( $\uparrow\text{CO}_2 \rightarrow \downarrow\text{PH} \rightarrow \downarrow\text{Carbonate}$ ).

Areas where Faculty and Staff are Working:

- **Multiple Stressors:** CSU has numerous ecophysiologicalists who focus on seawater chemistry, thermal stress, pollution and contaminants, and prey and habitat availability.
- **Marine Protected Area (MPA) Baseline Characterization,** focusing on MPAs near CSU locations in Humboldt, Sonoma, Monterey Bay, Fullerton, Pomona, and San Diego. By studying MPAs near these CSU locations, COAST researchers are able to monitor species as they move northward.
- **Desalination** in theory has huge potential, but it does have problems. CSU has faculty working on technical solutions to these problems so that desalination will someday be a responsible and eco-friendly option.
- **Sustainable Aquaculture,** could be the solution to providing protein to growing population (if done responsibly). Aquaculture produces far less carbon per unit protein than terrestrial practices (beef, chicken, pork). Has the ability to reduce dependence in imported seafood (90% of US seafood is imported).

COAST sees itself as being very effective in serving as a “Science-Policy Nexus” (see **Figure 20**).

In closing, Kramer thanked the Congressman for his environmental leadership through opposing drilling for oil and gas in the Arctic and raising awareness about climate change. Ultimately, the US needs to reduce our CO<sub>2</sub> Emissions, and CA can lead by example.



**Figure 20.** COAST’s Science-Policy Nexus

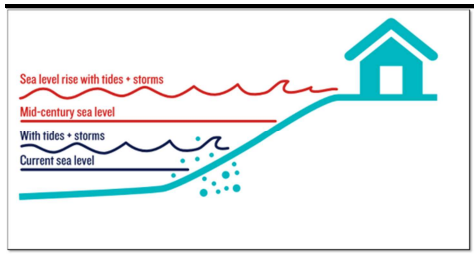
# “AdaptLA: Coastal Impacts Modeling and Planning for the LA Region”

by Dr. Juliette Hart, Climate Science Specialist, USC Sea Grant

Sea Grant is funded by NOAA, California has two Sea Grant programs. The USC Sea Grant office focuses on the “Urban Ocean Program.” USC Sea Grant provides funds for research, community outreach and education, technical assistance to local/regional government, climate change science and planning, coastal ecosystem science, coastal management, and maritime affairs.

Sea Level Rise (SLR) Projects for the US West Coast are summarized in the 2012 report “Sea-Level Rise for the Coast of California, Oregon, and Washington: Past, Present, and Future” (available at: [http://www.nap.edu/catalog.php?record\\_id=13389](http://www.nap.edu/catalog.php?record_id=13389)). SLR projections for the LA region are provided in **Figure 21**.

Time Period	LA Region
2000 – 2030	2 – 12 inches
2000 – 2050	5 – 24 inches
2000 – 2100	17 – 66 inches



**Figure 22.** Beyond “just” sea level rise (source: San Diego, 2050 Is Calling. How Will We Answer? (2014) The San Diego Foundation; Climate Education Partners)

But it’s not just a matter on increased sea levels, you also have to account for tides and storms (see **Figure 22**).

**Figure 21.** Sea Level Rise (SLR) projections for the Los Angeles area

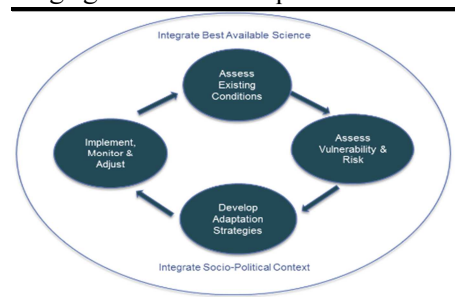
USGS’s *Coastal Storms Modeling System (CoSMoS)*, began with a pilot study between USGS and Dr. Patrick Barnard, doing a hindcast of a January 2010 ten year storm, and then used this model to forecast a 10yr storm combined with 0.5m and 1.4m SLR. The results of CoSMoS 1.0 were used by AdaptLA to Assess SLR Vulnerability Assessment for the City of LA (available online at: <http://dornsife.usc.edu/uscseagrant/la-slr/>). This report included assessments of the physical, economic, social, and ecologic vulnerabilities. *CoSMoS 2.0*, expanded beyond just a single storm

event to incorporated global climate models (GCMs) to drive global and regional wave models, scaled down to local hazard projections focused on a specific region (the San Francisco area). *CoSMoS 3.0* is based on So.Cal area (from Point Conception to the US-Mexico border), and expands on 2.0 by incorporating shoreline change modeling, model outputs will include 100year storms combined with multiple SLR scenarios (available September 2015), and a full suite of storms/SLR scenarios (available June 2016). Funding for CoSMoS 3.0 came from the California Coastal Conservancy and the Ocean Protection Council.

**Regional AdaptLA:** The Ocean Protection Council, in partnership with the Coastal Commission and the Coastal Conservancy, funded the L.A. Region to broaden their initial City of LA study and implement some of the recommendations from that study. That particular grant is funding the science. The grant is led by the City of Santa Monica, but it includes the 11 coastal jurisdictions and L.A. County. USC Sea Grant received additional funding from the Coastal Conservancy to provide technical assistance and outreach of model results and also build capacity within the coastal jurisdictions to use this information in their planning.

**AdaptLA — Science:** the TerraCosta Consulting group was used to get data on short-term wave driven beach change, and long-term sea level rise driven beach change. ESA was used for Backshore characterization, shoreline change, and high-level vulnerability assessments. These consulting agencies teamed up with USGS to “push the science forward.” **Capacity-Building:** Capacity Building through Stakeholder Engagement (using initial process workshops, webinar series, and technical outreach workshops).

**“Adaptive” Adaptation Planning:** Science is always evolving, which means we need “Adaptive Adaptation Planning” that uses an iterative process to plan for a range of scenarios (see **Figure 23**). This process incorporates the best available science as well as socio-political context at every step. This is an iterative and flexible process, that involves planning for a range of scenarios. There are a number of different approaches to doing this, but essentially all involve



**Figure 22.** “Adaptive” Adaptation Planning

rethinking how we use information in our planning. The solution involves rethinking how we use uncertain and evolving information in our planning!

***What are we Doing Well?:*** science and capacity building; strong partnerships; and great work in the Port of Long Beach (POLB).

***What Partnerships do we need to Strengthen?*** Federal-State-Local partnerships; Private/Public partnerships; and regional collaborative' partnerships with LARC.

***Who we Missing?*** Broad stakeholder engagement, and the socially vulnerable

***Who are the Most Vulnerable?*** See the city of LA's social vulnerability study, and the Aquarium of the Pacific's social vulnerability work. We need to build capacity for communities to do their own analyses.

***How do you balance Mitigation and Adaptation?*** Mitigation IS the best Adaptation.

## QUESTIONS AND DISCUSSION

***Doug Otto:*** I think at the end of this what is most important is that all this material is translated into specific action plans that are put into place.

***Congressman Lowenthal:*** I agree and I think the Aquarium can plan a very important role in this by continuing to bring us together to talk about these issues, and bringing these organizations and stakeholders together and helping them to form collaborations. The key is that we must figure out how to translate this scientific knowledge into specific actions within communities

***Guest Question:*** Who is responsible for housing all this information?

Answer: Larry Rich, the Sustainability Coordinator in the Long Beach Office of Sustainability.

## CLOSING REMARKS

Congressman Lowenthal: we can use climate change as a way to improve the quality of our lives...we need to do more outreach to better understand and get to the bottom of what concrete steps need to be taken in order become resilient to the current and future changes resulting from Climate Change.

“I personally believe that we have a story to tell, but we need to work to make sure that we tell the story right”