

# A CITIZENS' GUIDE TO BUILDING A CLIMATE-RESILIENT LONG BEACH

**Summary of the City of Long Beach Climate Resiliency Assessment Report  
Created by the Aquarium of the Pacific at the request of Long Beach Mayor Robert Garcia**

Tom Bowman  
Bowman Change, Inc.  
February 2017



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In his January 2015 State of the City address, Mayor Robert Garcia announced that he wanted to make Long Beach a model of a climate resilient city.<sup>1</sup> The Mayor asked the Aquarium of the Pacific to take the lead in assessing the primary threats posed by climate change, identify the most vulnerable neighborhoods and segments of the Long Beach population, and provide a preliminary assessment of options to reduce these vulnerabilities.

The Aquarium worked with experts from Southern California universities and regional and city government agencies to publish the City of Long Beach Climate Resiliency Assessment Report in December 2015. The following pages offer a summary of the conclusions found in the Assessment. While this summary does not go beyond the conclusions reached by the experts, some additional information has been added to provide helpful context.

For more information, please see the Assessment:  
[http://www.aquariumofpacific.org/conservation/2015\\_city\\_of\\_long\\_beach\\_report\\_on\\_resiliency](http://www.aquariumofpacific.org/conservation/2015_city_of_long_beach_report_on_resiliency)

1. "What is Long Beach doing about Climate Change?" Office of the Mayor, Official website of Long Beach California, posted 11/10/2015. <http://www.longbeach.gov/mayor/news/compact/>

## Executive Summary

Long Beach is in an excellent position to build upon its natural advantages and past efforts to become more resilient to the changing climate and to recover more quickly from disruptive events.

For example, longer and more frequent droughts will affect all Californians. Long Beach is in a better position than many other cities to withstand long droughts, but more can still be done. The most effective action is to convert more lawns to California-friendly greenscapes. Expanding water recycling and capturing stormwater, and possibly investing in desalination might be financially attractive actions farther into the future.

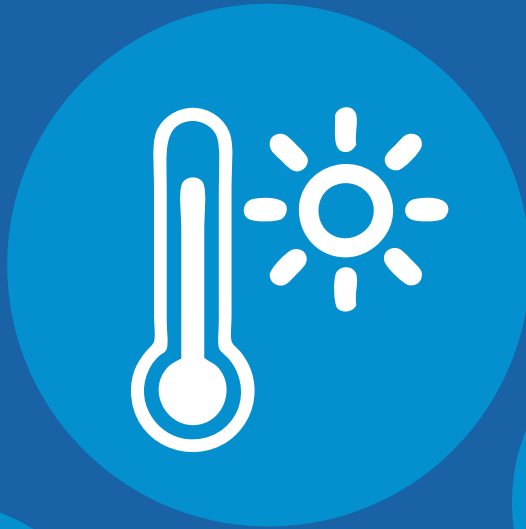
Higher summer and autumn temperatures will be a burden, especially the northern parts of the city. While Long Beach will not be as hard hit as inland communities, higher temperatures and more exceptionally hot days will be harmful to elderly people, people without air conditioning, infants and young children, the homeless, and those who work outdoors. Making people aware of the City's designated "cooling centers," planting drought-tolerant shade trees, and encouraging people to adopt energy-efficient cooling options for their homes and businesses will help.

Air pollution is expected to get worse, especially near the 405 and 710 Freeways and around the Port complex. Unusually high asthma rates among children in Long Beach are already a top public health concern. Efforts to reduce pollution from the Port, encouraging people to use alternative transportation, and continuing the City's tree planting campaign can help reduce these risks.

In the coming decades, the Port of Long Beach, the Peninsula, and adjacent areas will face a greater risk of flooding during major storms. Later in the century, as sea levels rise, the entire waterfront might be permanently under water. The City should review historical storm data and make new surveys to identify the infrastructure that faces the greatest risks. Retreating inland will probably be necessary in some areas in the long term.

The most vulnerable members of our community include the poor, elderly, homeless, young children, people with compromised immune systems, and those who are active or work outdoors. Long Beach has a higher-than-average poverty level, and poor people are concentrated in the west-central and northern parts of the city. The City should focus resilience efforts on these vulnerable people and neighborhoods. The City's ongoing campaigns to plant trees and expand recreational green space in western and northern Long Beach are helpful. Establishing comprehensive health and communication plans to support these groups will be increasingly important as heat waves and air pollution become more intense.

The City can become more climate-resilient by using planning processes that are open to the diverse voices in our community and responsive to their interests and needs.



## Introduction

Climate change is not a single event, nor does it affect just one part of our lives. Climate change is about a broader group of challenges to our community.

“Climate” refers to the prevailing weather patterns that we experience over a long period of time. Located on the Southern California coast, Long Beach has a climate that features warm, relatively mild summers and cool, relatively mild winters. Most of our rain falls in the winter and spring, leaving the summer and autumn months dry. The seasonal low clouds along the coast known as “May gray” and “June gloom” are also part of the Long Beach climate, as are the swings between El Niño and La Niña conditions and other natural cycles that influence temperatures and precipitation all over the world.

“Climate change” refers to long-lasting shifts in these familiar weather patterns. Any of us might experience unusual weather on any given day, but it is the long-lasting changes in weather patterns that require our attention.

Changes in climate patterns create new risks that residents and businesses have not had to account for in the past. If we understand what is changing and the risks that these changes create, members of our community will be in a better position to keep Long Beach safe and prosperous.

The Assessment identifies five main threats to Long Beach that are caused by the changing climate:

- Drought and the resulting water shortages,
- Extreme heat with higher temperatures and more exceptionally hot days,
- Deteriorating air quality,
- Rising sea levels and coastal flooding during storms, and
- Public health and social vulnerability challenges.

While the consequences of drought are the same throughout Long Beach, the other four threats will be felt more harshly in some neighborhood than in others.

People experience the consequences of climate change in many different aspects of their lives. As a result, it helps to understand other changes that are also happening at the same time. For example, the size of Long Beach’s population is growing relatively slowly, but the population of Los Angeles County is growing more quickly. Government agencies expect the population of Los Angeles County to grow about 14% by the year 2050, from roughly 10.2 million people today to 11.5 million people.<sup>2</sup> This could create more traffic on roads and freeways, more air pollution, and a greater need for electricity and water. Making Long Beach a climate-resilient city means taking these factors into account too.

“Climate resilient cities” can continue functioning day-to-day as the climate changes. They can also recover quickly from disruptive events. For those who make decisions about public policy, the Assessment concludes that building resilience depends on four characteristics:

2. California Department of Finance: P-1\_Total\_CAProj\_2010-2060\_5-Year.xls

- Effective leadership, decision-making that includes many different voices, stakeholders who can make well-informed decisions, and planning processes that bring all of these threads together;
- Man-made infrastructure and natural systems that protect and connect important assets and promote the flow of goods, services, and knowledge;
- Social and financial systems that enable people to live peacefully and act collectively on their own behalf; and
- Access for everyone to the things they need to survive and thrive.

Keeping these factors in mind, the Assessment explores the most important climate change threats and suggests ways to make Long Beach less vulnerable.

## **Drought and Water Shortages**

When we have long periods with below average precipitation, water supplies in surface and underground reservoirs run low. These droughts can have devastating effects on natural vegetation, wildlife and agriculture, and they also mean less water for the people of Long Beach.

Southern California's water supply relies heavily on snow that falls in the distant watersheds of the Colorado River and the Sierra Nevada. Snow collects in the high mountains, storing its water until the snow slowly melts slowly in the spring and early summer.

Average temperatures in the Western States that contain these vast watersheds are expected to rise 2°–4.5°F by the year 2050. As a result, there will be more rain but less snow in the mountains. The smaller snowpack that does form will melt earlier too, leaving longer dry periods in the summer and autumn.

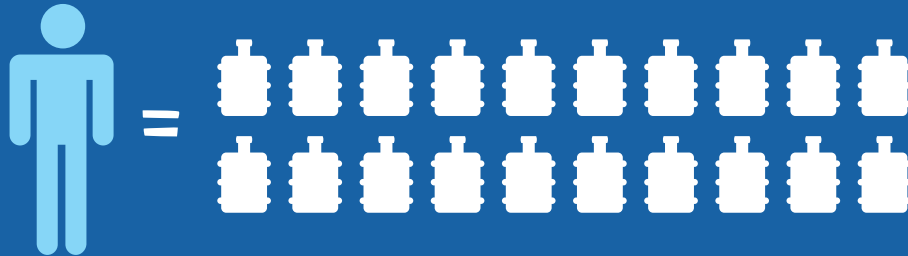
These changes mean that the amount of water Southern California cities can import from these mountain sources will decline in the coming decades. At the same time, our landscapes will need more water to cope with the dryer, warmer summers.

### **Where Does Long Beach Stand?**

The Long Beach Water Department imports about 40% of the city's water supply from the California Water Project and the Colorado River Aqueduct. Another 53% comes from groundwater, which is partially recharged using runoff from the San Gabriel Mountains. Just 7% comes from recycled water. This means that rising temperatures in the mountains will make a large portion of our water supply less reliable.

Fortunately, Long Beach has been a leader in water conservation, achieving a 31% reduction in daily use per person since the 1980s. Today, the average Long Beach resident uses about 100 gallons of water per day. This is the minimum amount that Southern California's water wholesaler guarantees to deliver, assuming there is enough water available. Long Beach is not expected to need more water in the future than it does today, but the imported supplies might become less stable.

The average Long Beach resident uses about 100 gallons of water per day.



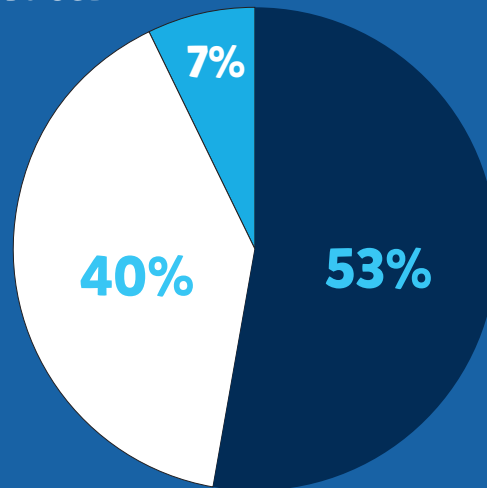
## Sources of Long Beach's Water

In an Average Year

53% - Groundwater (partially recharged by runoff from San Gabriel Mountains)

40% - California Water Project and the Colorado River Aqueduct

7% - Recycled water



Conserve/  
Reduce Usage



Stormwater  
Capture



Drought-tolerant  
landscaping



Increase use of  
recycled water

### **What Is Long Beach Doing to Meet its Water Needs?**

- Long-term investments have earned Long Beach a “preferential right” to water from the Colorado River Aqueduct, assuming there is enough water available.
- Compared to the year 2010, the amount of recycled water Long Beach uses is expected to increase 112% by 2035.
- Projects that could make groundwater supplies more resilient in a changing climate are under consideration or already underway.
- Long Beach has one of the County’s first Low Impact Development ordinances, which focuses on water capture, reuse, and sustainability.
- The State of California continues to enact water conservation measures, such as requiring water-wise construction and highly efficient toilets, faucets, and other fixtures.
- Long Beach is developing a stormwater capture and reuse facility to help meet State and Federal requirements.

### **What Else Can Long Beach Do?**

- Continue replacing thirsty lawns with California-friendly greenscapes that thrive in our semi-arid climate, and replace sprinklers with drip irrigation that puts water only where it is needed.
- Enforce a 2010 ordinance that “requires new landscapes to include drought-tolerant plants, effective irrigation systems, and other important measures” (ORD-10-0031).
- Consider expanding the use of residential and commercial stormwater capture techniques such as large-scale cisterns, green infrastructure, and replacing pavement with permeable surfaces.

## **Higher Temperatures and More Extremely Hot Days**

Long Beach and the surrounding region will grow warmer throughout this century. Hot spells will also become more frequent, intense, and will last longer.

Average temperatures in the Greater Los Angeles region are expected to rise about 3°F by the year 2050. If global carbon emissions peak around 2050 and then start to decline temperatures should not rise beyond this level. This possibility is called a “mitigation scenario.”

On the other hand, if carbon emissions continue rising throughout the century (a “business as usual” scenario), average temperatures will increase more than 7°F by the end of the century. People will experience the most significant warming in the late summer and fall, when temperatures are already at their highest.

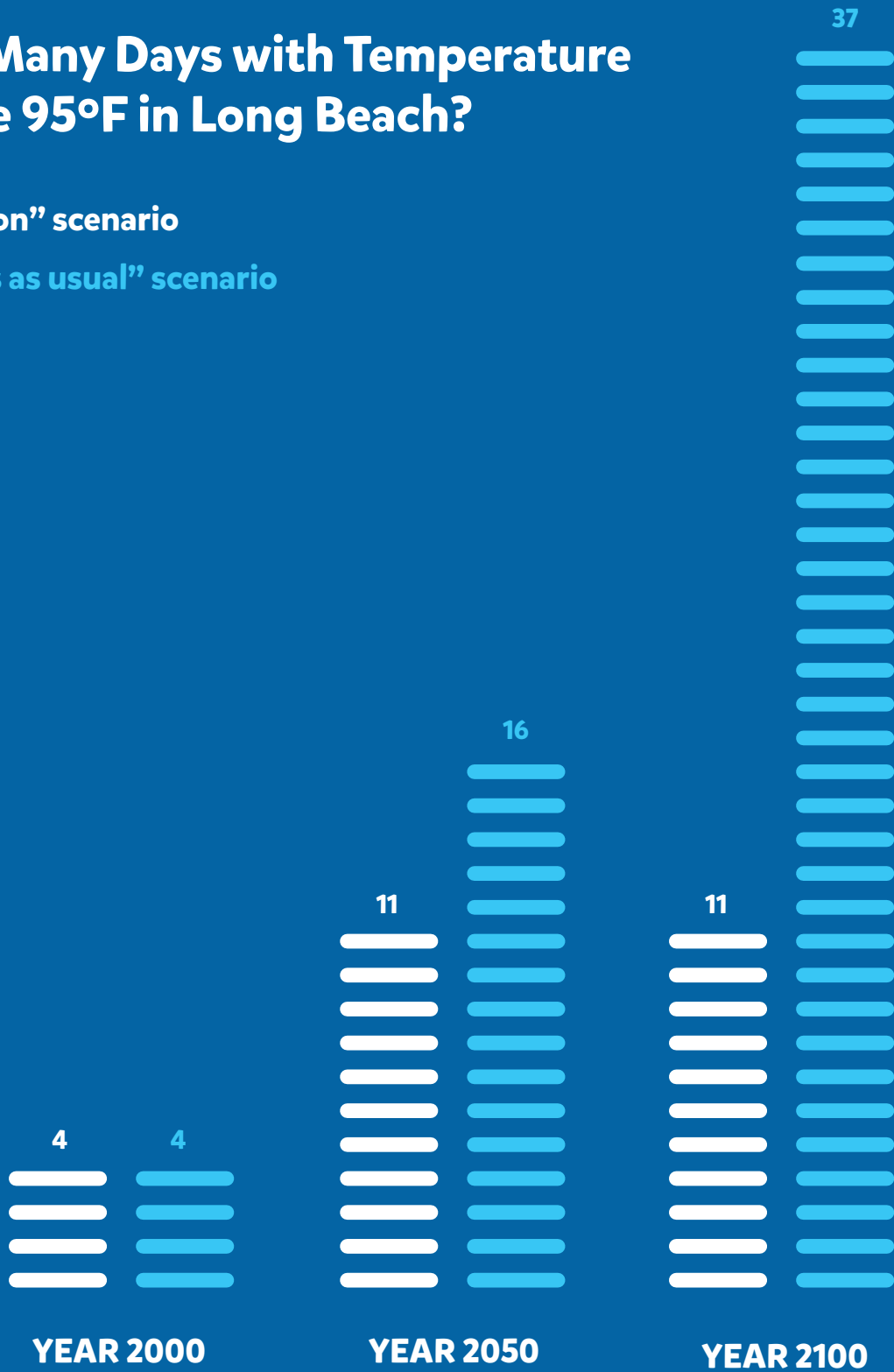
The number of extremely hot days, when temperatures climb above 95°F, will also increase. About twenty years ago, Long Beach experienced an average of just 4 exceptionally hot days each year. Our future will include more of these very hot days.



# How Many Days with Temperature Above 95°F in Long Beach?

“Mitigation” scenario

“Business as usual” scenario



With its coastal location, Long Beach will still have fewer hot days than inland communities in the San Gabriel Valley, Inland Empire, and desert areas. Even so, people will face a greater need for electricity to run air conditioners to keep their homes and businesses cool.

### **What Is Long Beach Doing to Cope with Higher Temperatures?**

- The City keeps a list on its website of buildings that serve as “cooling centers” during heat waves. Public Libraries also serve as air-conditioned cooling centers.
- The Department of Health and Human Services opens cooling centers for longer hours and makes additional buildings available during heat waves.
- Ongoing efforts to plant 10,000 drought-tolerant trees by 2020 and expand recreational green space, especially in the western and northern parts of Long Beach, can help reduce temperatures. One study found that trees can cool cities down by 0.5 – 1.8°F at 2:00 pm.

### **What Else Can Long Beach Do?**

Reducing carbon emissions is a global challenge, so the City, its residents, and businesses need to plan for higher average temperatures and more exceptionally hot days.

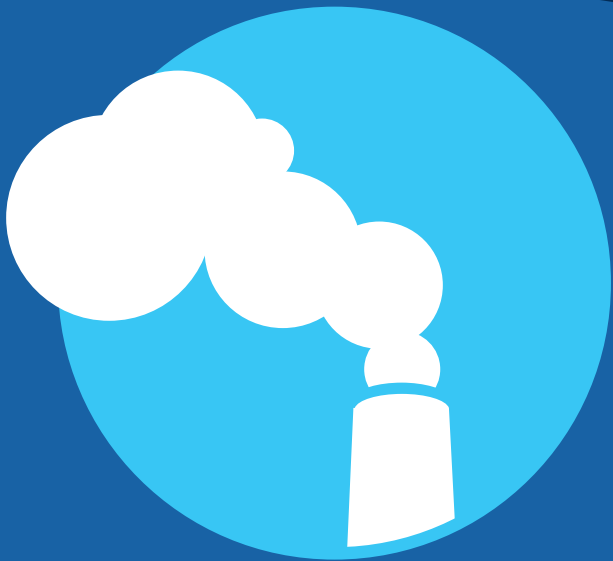
- Planting trees around homes and commercial buildings, and taking steps to reduce indoor heat in energy efficient ways will help keep people safe and comfortable during heat waves. One study found that planting shade trees around buildings can reduce the need for artificial cooling by up to 30%.
- Electric utility companies can show residents and businesses how keep their homes and businesses cooler in cost-effective and energy-efficient ways.

## **More Air Pollution**

Californians live with some of the worst air pollution in the country. Over 90% of us live in places that violate air quality standards for two major pollutants: ground-level ozone, that we call “photochemical smog,” and the fine particles that come primarily from diesel and industrial exhaust.

Photochemical smog causes many health problems including respiratory, cardiovascular, central nervous system, and reproductive and developmental harm, plus early death. Although the number of smoggy days will increase because of rising temperatures, ozone pollution is less of a concern in Long Beach than it is for inland communities.

In 2014, for example, Long Beach never violated the federal ozone standard because ocean breezes usually blow pollutants inland while the smog was forming. That being said, measurements of ozone



pollution in Long Beach are not detailed enough to identify which neighborhoods might still be at risk. The health consequences of fine particle pollution are similar to the harm that ozone causes. Fine particles can also cause cancer. Fine particles are about ten times smaller than dust, pollen and mold, and can pass through the lungs and into the blood stream. The Union of Concerned Scientists estimates that this type of pollution causes more than \$1 billion in health care costs and 8,800 deaths in California every year.

Fine particle pollution is a serious challenge for Long Beach because most of it comes directly from vehicles, power plants, and factories. In addition to hosting two busy freeways, Long Beach is also adjacent to two of the nation's busiest container seaports—the Port of Los Angeles and the Port of Long Beach. More than 80% of all U.S. imports from Asia come through these facilities, and diesel trucks transport about 40% of the freight on local roads and freeways.

In a warming climate, with higher temperatures and dryer conditions, the smoke from wildfires is also expected to add air pollution to the Los Angeles region.

### **What Does this Mean for Long Beach?**

Thanks to the prevailing ocean winds, Long Beach has some of the best air quality in the Los Angeles basin. Even so, fine particle pollution is a significant public health problem.

Despite a 40% decrease in fine particle pollution in parts of the Long Beach over the ten years, the annual average still exceeds California's health standard. As economic activity increases in the coming years, Long Beach will experience more particle pollution unless steps are taken.

Unlike smog, fine particles can occur at anytime, day or night. This type of pollution peaks during rush hour and at night when the cooler, denser air lets the particles linger. Particle pollution is also high during the winter for the same reasons, and because people use wood stoves and fireplaces more often.

The major sources of air pollution in Long Beach are concentrated in the western and southwestern parts of the city. They include the 710 and 103 freeways on the west side, the Port complex in the southwest, oil refineries to the west, major industrial complexes mainly in the south, and the 405 freeway that cuts through the city. Pollution from trucks is especially high within 1,000 feet of the freeways.

### **What Is Long Beach Doing to Reduce Air Pollution?**

- The Port of Long Beach has made great strides in cutting pollution from ships and diesel trucks. Their efforts led to reductions in particulate matter (85%), sulfur oxides (97%), nitrogen oxides (50%) and carbon pollution (21%) between 2005 and 2014.
- Under the Clean Air Action Plan, which also involves the Port of Los Angeles, new pollution reduction goals have been set for the year 2023.
- The Port of Long Beach provides a Port Community Mitigation Grant program, which had already awarded \$2.6 million to schools, parks, and clinics by 2013. The program supports health education for families with asthma, mobile medical clinics, and air filtering systems for classrooms.

- Trees help clean the air, so the City's 10,000 trees initiative will help. More than 30% of the trees have already been planted.
- The City has added 19.6 acres of additional open space since 2011. The City's goal is to add another 1,100 acres, mainly in the northern and western parts of Long Beach where air pollution and summer heat are especially challenging.
- The City's General Plan provides a 20-year guide for future decision-making to improve quality of life, reduce air pollution and improve the city's transportation network. Among other things, this involves expanding bicycle paths and facilities, plus pedestrian infrastructure downtown and between Metro Blue Line stations.
- Like other California cities, Long Beach must reduce carbon emissions to 1990 levels by 2020, plus another 40% by 2030. Cutting carbon emissions will also improve air quality by reducing air pollution.

### **What Else Can Long Beach Do?**

- Since there have been very few studies of air pollution in Long Beach alone, the City needs to create a more detailed picture of air pollution hazards. Adding more monitoring stations will help identify and track vulnerable neighborhoods. New sites would probably include schools, hospitals, and transportation corridors.
- The City might comply with the South Coast Air Quality Management District's "Vision for Clean Air," which provides a framework for air quality and climate planning to meet air quality standards that have been set for 2023 and 2032.
- The public can be engaged and informed about progress, ongoing concerns, and the actions that should be taken to protect people's health.
- The City would benefit from a comprehensive communications plan to alert vulnerable people such as children, the elderly, and those who work outdoors when health risks are high.
- Since 70% of air pollution in our region comes from vehicles, more efforts could be made to get people out of their cars and into alternative modes of transportation.

## Coastal Flooding and Rising Sea Levels

Sea levels are rising around the world because ocean water is expanding as it warms and because melting glaciers are adding more water to the ocean. The California coast north of Cape Mendocino, is being gradually lifted by tectonic forces, so sea level is rising more slowly north of Cape Mendocino than south of Cape Mendocino.

Temporary rise of sea level, however, are a more immediate concern in Southern California. Strong El Niño conditions can raise sea levels along the coast by nearly one foot for several winter months at a time. Large storm waves and high tides during strong El Niños can cause tremendous damage.

For example, California suffered 36 casualties and \$1.2 billion in damage during the 1982-83 El Niño. Locally, two THUMS Oil Islands were damaged. In 2014, Hurricane Marie caused 20-foot swells and massive flooding in southeastern Long Beach. This storm caused \$10 million in damage to the Long Beach Middle Breakwater alone.

While major storms during strong El Niños are rare, they are part of life along the Southern California coast. As the century unfolds, climate change will lift the base sea levels that El Niños, high tides, and storm waves are built upon. Therefore, the risks to homes, businesses, the beach, and coastal infrastructure will increase.

Sea level in the Long Beach-Los Angeles area is expected to rise nearly one foot by 2030, up to two feet by 2050, and as much as 5.5 feet by 2100. A note of caution is important. Future sea level rise will depend on how much Earth's temperature rises and how much of Greenland and Antarctica ice melts.

### Where Does Long Beach Stand?

Nicknamed the "Aquatic Capital of America," Long Beach is heavily invested in ocean-related activities including the Port; numerous off shore oil wells; and famous attractions such as the RMS Queen Mary, Aquarium of the Pacific, the Long Beach waterfront, two active marinas, and Rosie's Dog Beach. A 5.5-foot increase in sea levels will put all of these investments at risk.

In the near term, temporary flooding and storm damage are the main concerns. Later in this century, parts of Long Beach are expected to be permanently underwater.

CoSMoS 3.0, a sea level rise model that was created by the U.S. Geological Survey, has been used to study portions of the California coast. While the model is not perfect, it does show which parts of Long Beach are most vulnerable.

The CoSMoS 3.0 model was used to study a major storm with today's sea level, plus future sea levels that are 20 inches, 39 inches, and 6 feet higher than today.

In every case, there will be significant flooding in the southeastern and southwestern corners of Long Beach where more than 22,000 people live. In the worst-case scenario, more than 37,000 people will be affected.

The most vulnerable areas in the southeast include the Peninsula, Alamitos Bay, Belmont Shore and the lot just north of the Alamitos Bay Marina. As sea level rises, major storms will also affect the marina and the Lagoon. The worst-case scenario would also affect parts of Belmont Heights and College Estates.



In Southwestern Long Beach, the Port is most vulnerable on Piers A, A West, D, E and S, along with parts of the Long Beach Shore Marina. In the worst-case scenario, flooding will spread throughout the Port and cover most of the beach from downtown to the Peninsula.

The breakwater and THUM Oil islands will suffer significant damage in these scenarios too. Today, the entire eastern half of the Long Beach Breakwater and much of the Middle and San Pedro Breakwaters could be compromised during an extreme storm. Since the THUM Oil islands were not designed to withstand ocean waves, all of Chaffee and most of Freeman Island would be flooded. Grissom and White would begin flooding in the higher scenarios.

### **What Is Long Beach Doing to Reduce Coastal Flooding?**

- Beach sand naturally moves from the Peninsula toward downtown. For decades the City has trucked sand back to the Peninsula and built berms to protect homes. This practice requires an almost constant convoy of trucks that disturb residents. In the future, with rising sea level and more severe storms, trucking sand and building berms may not be sufficient.
- Seawalls, additional breakwaters, and riprap (rock used to armor shorelines) could be used to protect parts of the shoreline. Unfortunately, this type of armoring can lead to erosion and loss of the beach. Over time, retreat inland will be the only viable option.
- The Port of Long Beach is developing a Coastal Resiliency Strategic Plan that integrates climate change into planning and environmental policies, design and construction practices, and community outreach. This effort is limited to the Port and its key transportation corridors.
- The City recently launched an “Alert Long Beach” emergency notification system that uses text messages, voice mails, and emails to issue emergency storm alerts to the community.
- The City is collaborating with Moffatt and Nichol on a detailed hydrodynamic model for Alamitos Bay and plans to incorporate the results of CoSMoS 3.0 into their effort in order to get a more detailed picture of the risks.

### **What Else Can Long Beach Do?**

- An appropriate first step is to make a comprehensive review of information about past storms and identify where most of the damage occurred.
- Sea walls and drainage infrastructure could be resurveyed to account for any changes that may have occurred since past surveys were done, especially in areas that were damaged in past storms. The Assessment’s authors encourage the City to consult with their colleagues at Scripps Institution of Oceanography on data collection techniques to ensure that the survey results will be useful for hazard modeling. Hazard modelers would also benefit from data on near shore bathymetry, wave behavior and beach changes.
- A review of all infrastructure and assets that are at risk of flooding would be invaluable. This would include roads, power lines and outlets, sewer and water lines, storm drains, railways, wastewater treatment facilities, power plants, airports, hospitals and so forth.



The authors stress that data gathering is necessary in order to identify vulnerable people and property and evaluate steps that can be taken to make the community more resilient.

## **Health and Social Vulnerability**

The effects of a warming climate can be harmful and even deadly. Threats come directly from injuries during floods, storms and heat waves; and less directly from exposure to poor air, water and food quality. The risks fall heavily on the most vulnerable members of our community including poor people, the elderly (especially people who are socially isolated), the very young, homeless people, and people whose health is already compromised.

A greater percentage of Long Beach residents (19.1%) live in poverty than in Los Angeles County (15.7%) or the State of California (13.7%). The 2015 census identified 2,345 homeless people, 926 chronically homeless, and 255 homeless children in Long Beach. These people should be included in outreach about adapting to changing conditions.

Vulnerable residents are concentrated in the west-central and northern parts of Long Beach, near downtown and the Port complex, and farther inland along the 710 Freeway. While these communities are especially at risk from pollution and extreme heat, the surveys used to identify vulnerable residents are far from perfect. The Assessment authors recommend gathering more environmental, health, and socio-economic information to strengthen these benchmarks.

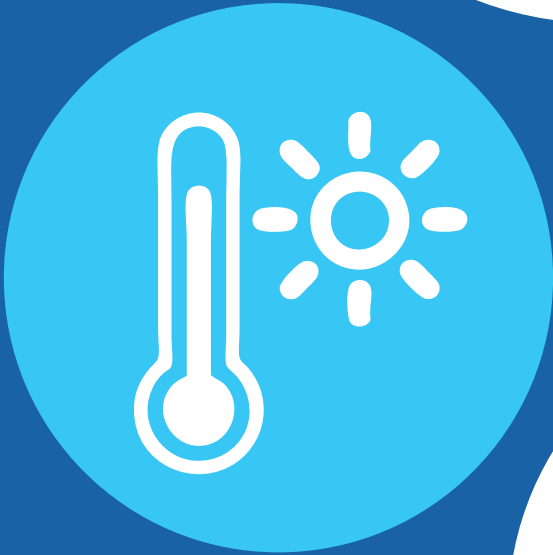
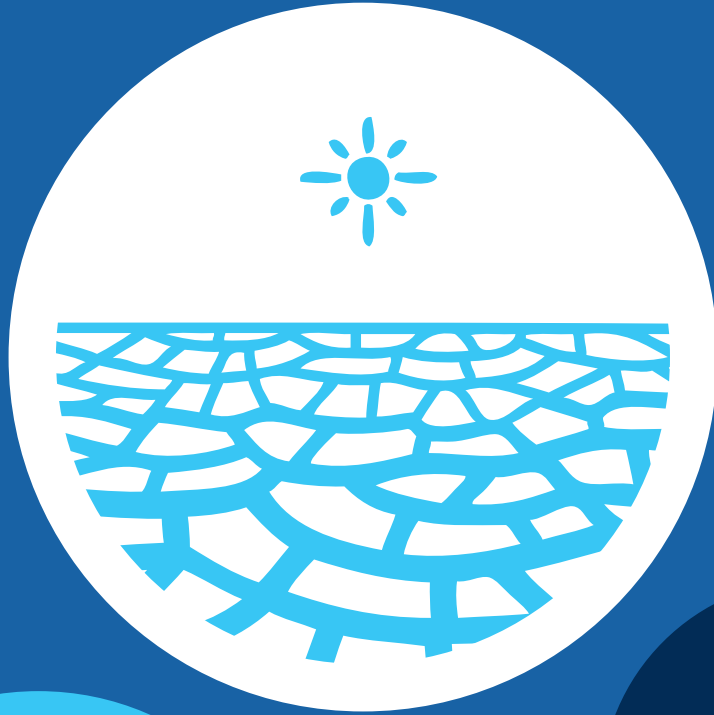
### **Urban Heat Island**

Over the past 30 years, heat claimed more American lives than natural disasters such as earthquakes, floods, and blizzards. Because our overall temperatures and the number of exceptionally hot days are expected to rise, heat is at or near the top of public health issues associated with climate change for the Long Beach-Los Angeles area.

With so many paved surfaces, downtown areas have much higher temperatures than residential or natural landscapes. Called the “urban heat island effect,” this creates greater health risks in urban centers. The Los Angeles area has the strongest urban heat island effect of any city in California, but heat-related deaths do not have to increase if efforts are made to reduce the effect.

### **Air Pollution**

As noted earlier, air pollution is linked to long-term respiratory and cardiovascular harm, cancer, and premature death. In addition, Long Beach already has much higher childhood asthma rates than the national average (15% of children in Long Beach versus 9% nationwide). Children who live near free-ways have twice the risk of asthma, and teens growing up in Southern California’s highly polluted communities have five times the risk of reduced lung function. Asthma was already the leading cause of



missed school days, plus 1,254 hospital emergency room visits and 879 hospitalization days in the year 2000. Each hospitalization for a child with asthma costs \$12,395 under Medi-Cal insurance.

## **Drought**

Recent, persistent drought conditions have already led to higher food prices and water rationing in Long Beach.

### **What Is Long Beach Doing to Protect People's Health?**

- The City's Department of Health and Human Services advises people to seek air conditioning and utilize the City's cooling centers during heat waves.
- Long Beach is enforcing measures to reduce the urban heat island effect by installing alternative landscapes, providing more shade, using materials that reflect rather than absorb heat, and building green roofs and cool roofs.
- The city's tree planting initiative is progressing toward its goal for 2020, especially in the most vulnerable neighborhoods.
- Access to local parks and green spaces depends on a person's zip code. Eastern and southeastern neighborhoods have many more protected acres per person than in northern and western Long Beach. By acquiring another 1,100 acres of green space in northern and western Long Beach, the City can achieve eight acres of recreational open space for every 1,000 residents.
- The City's HEAL Zone initiative encourages residents of North Long Beach to walk, bike, and make healthier choices to prevent chronic health conditions such as diabetes and heart disease. Meanwhile, the Livable West Long Beach plan is gathering input about health concerns from community members in order to fund top priority projects.

### **What Else Can Long Beach Do?**

The Assessment recommends that the City implement the California Department of Public Health's "Checklist for Integrating Health into Climate Action Planning" as a way of bringing public health in planning decisions.

## **Building a Climate Resilient Community**

With its coastal location and forward-looking actions, Long Beach faces the changing climate with some advantages. Yet high poverty rates, deteriorating air quality near freeways and the Port complex, frequent and persistent drought, and storm waves combined with continued sea level rise pose significant challenges to the community.

In 2015, Mayor Garcia signed the international Compact of Mayors and committed the City to a three-year effort to assess carbon emissions, create plans to reduce emissions, and adapt to the changing climate.

Meanwhile, the Aquarium of the Pacific is engaging the diverse communities that call Long Beach home through an extensive outreach and education effort, and is working with CSULB. Together with efforts by other stakeholders, these initiatives can help Long Beach achieve greater resilience, wellbeing and prosperity in the changing future.

## **Key Takeaways**

The Assessment's authors recommend that the City of Long Beach...

### **Gather Key Information**

- Install additional air pollution monitoring stations near hospitals and schools and along the 710 and 405 freeway corridors.
- Review historic storm damage reports, conduct new surveys and work with scientists to develop and apply dynamic coastal flooding models to plan for higher storm waves and rising sea levels.
- Gather more environmental, health, and socio-economic information about the most vulnerable members of our community.

### **Take Key Actions**

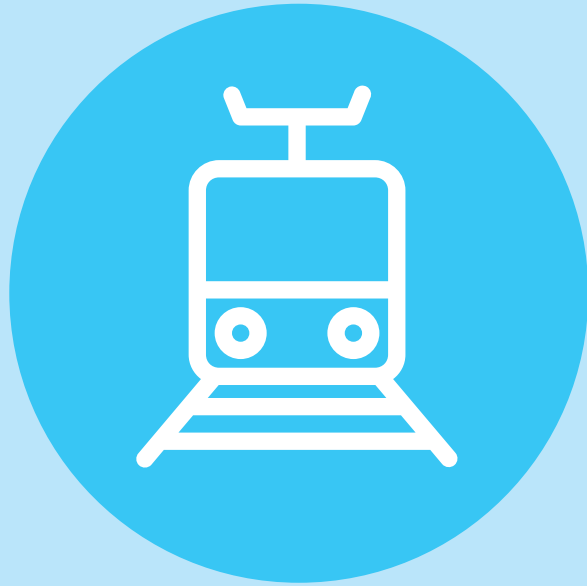
- Focus efforts on the most vulnerable people and neighborhoods, especially in west-central and northern Long Beach.
- Encourage lawn-to-California-friendly greenscape conversions at homes and commercial properties.
- Continue efforts to reduce air pollution in and around the Port complex.
- Continue the City's tree planting and greenspace expansion campaigns, especially in the western and northern parts of the city.

- Encourage adoption of energy efficient cooling strategies, such as shading and fans at homes and commercial properties
- Encourage use of public and alternative transportation within the city.

**Engage with the Public**

- Adopt planning processes that include diverse stakeholders and address their concerns.
- Begin planning for more capital-intensive adaption measures that might be necessary later in the century, such as developing new sources of water, armoring selected coastal infrastructure, and retreating inland.







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