Geography & Demographics:
Where are our Risks?

Global Energy Network Institute

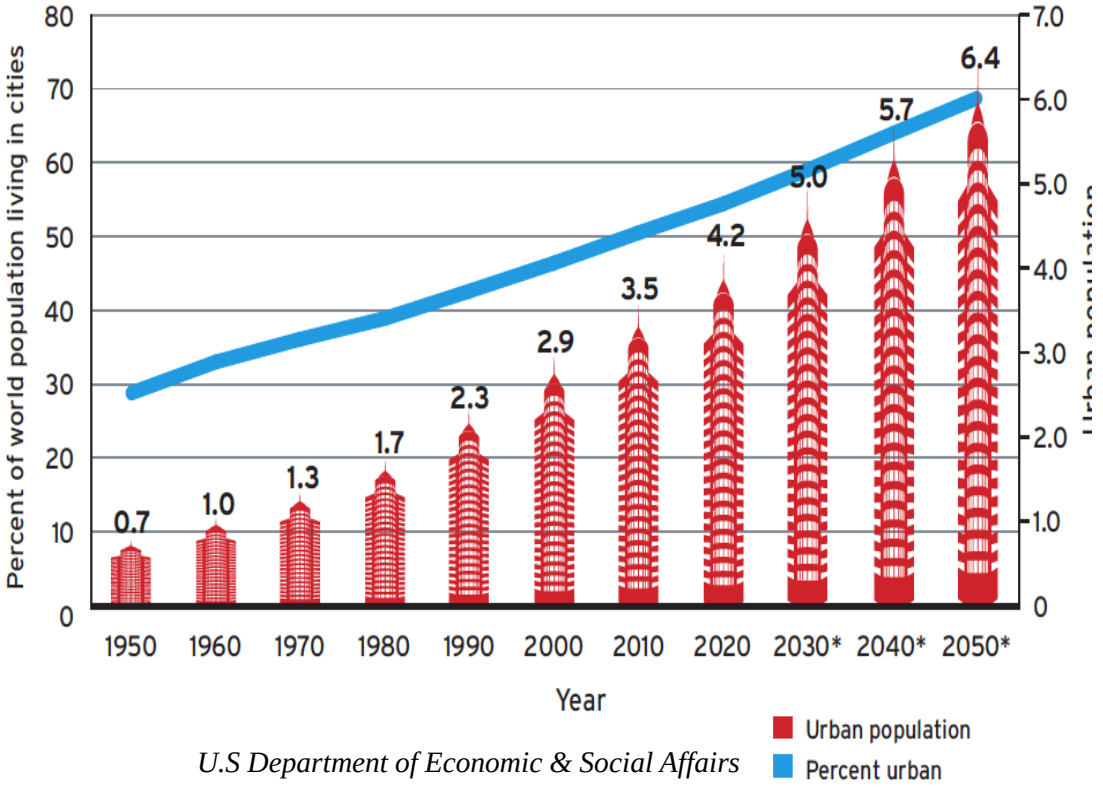
Different Cities Have Different Climate Related Problems

	Rio de Janeiro	Bangkok	Tel Aviv
Sea Level Rise	✓	✓	✓
Tornados			
Thunder Storms		✓	
Hurricanes			
Mass Movements (Mudslides, Bluff Erosion)	✓	✓	
Drought		✓	✓
Flood	✓	✓	✓
Wildifire	✓		✓
Extreme temperature	✓		✓
Earthquake		✓	
Tsunami		✓	

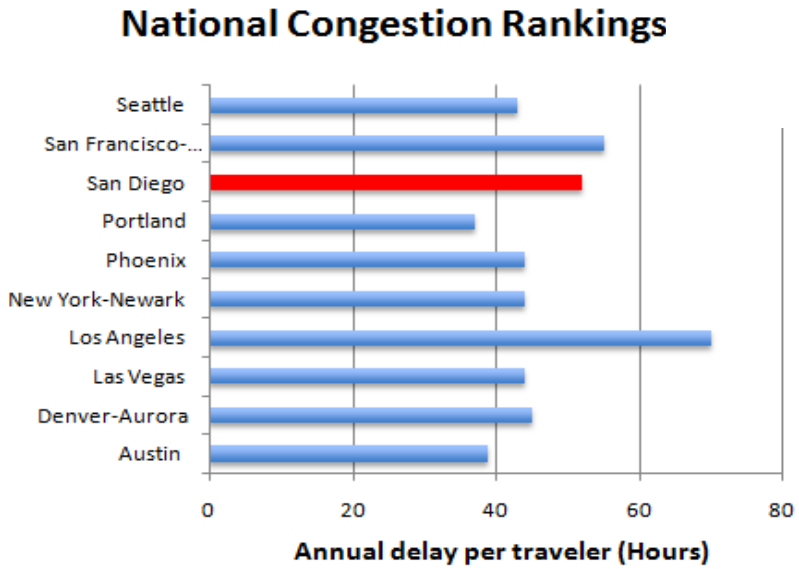
"Israel is a pioneer for water management, areas such as drip irrigation, recycling, purifying sewage water and water desalination."

University of Pennsylvania

World Urban Population Increase



U.S Department of Economic & Social Affairs



Source: Texas Transportation Institute, 2009; Equinox Center, 2009

"West Coast cities fared worst in a study of traffic patterns in North America." *NY Times*

Where Are We Located ???

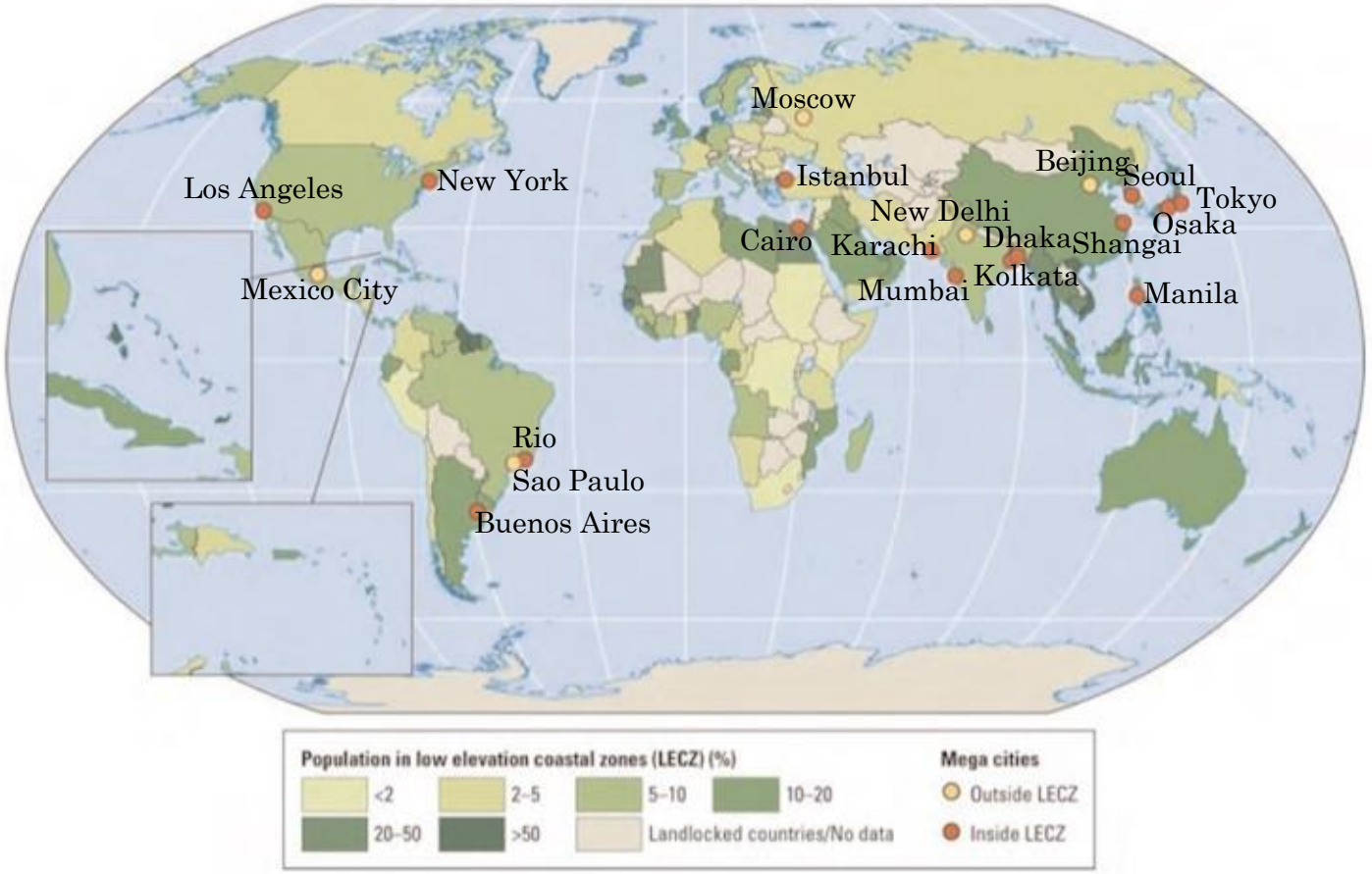


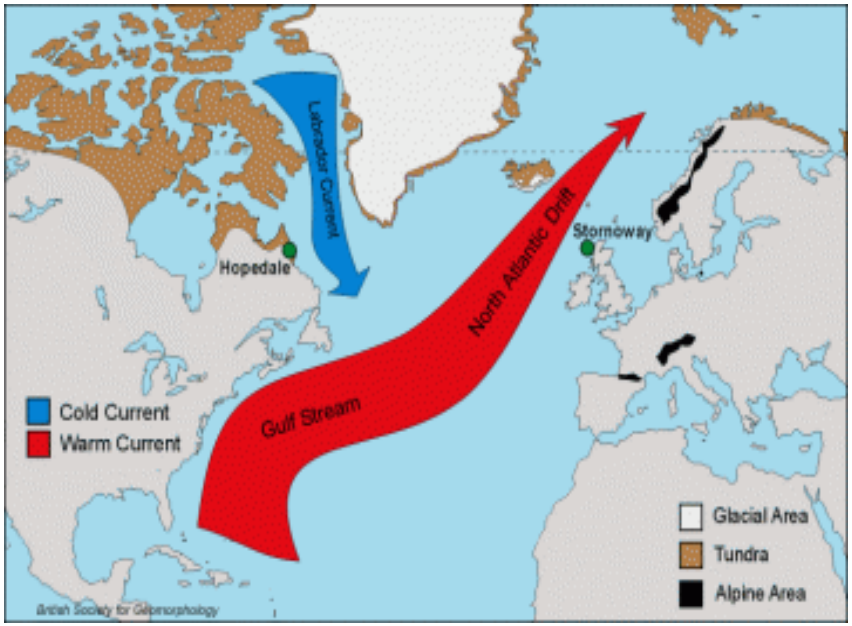
Figure 4a
At Risk: Population and Megacities Concentrated in Low-elevation Coastal Zones (LECZ) Threatened by Sea-level Rise and Storm Surges

Source: World Bank 2009b.

"Coastal counties, home to 40 percent of the nation's population, will take especially large hits from the rise of the sea, which could swallow more than $370 billion worth of property in Florida and Louisiana." *NY Times*

"It only takes a small change in the Climate to create a big change in the weather"

M. Fischetti, Senior Editor Scientific American



Inside Climate News Article: **How Arctic Warming Could Chill Western Europe**

- For Instance: Paris 48.8 N and Montreal 45.5 N in latitude.
- January temperatures, however, average 41°F in Paris and 14°F in Montreal (Atlanta is 43°F)

Environment Canada & Meteo France

U.S. Climate Risks

Vulnerability to Sea Level Rise, based on the Coastal Vulnerability Index. Intensified by extreme weather like hurricanes.

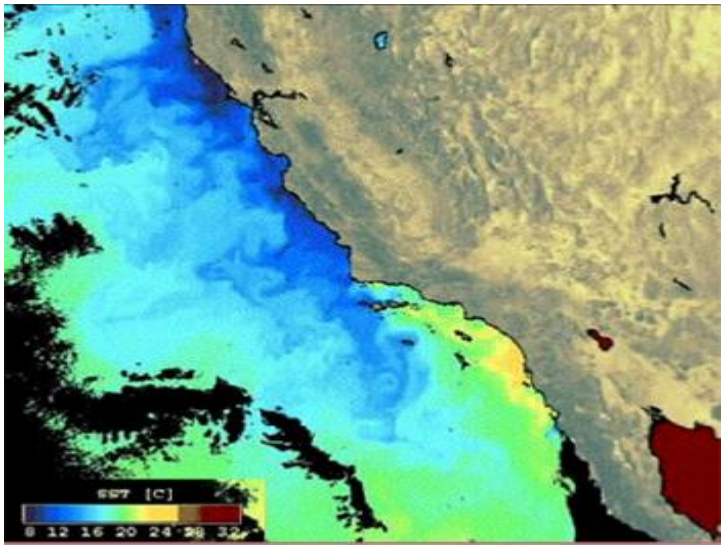
Source: The Wire

South Beach – Miami FL

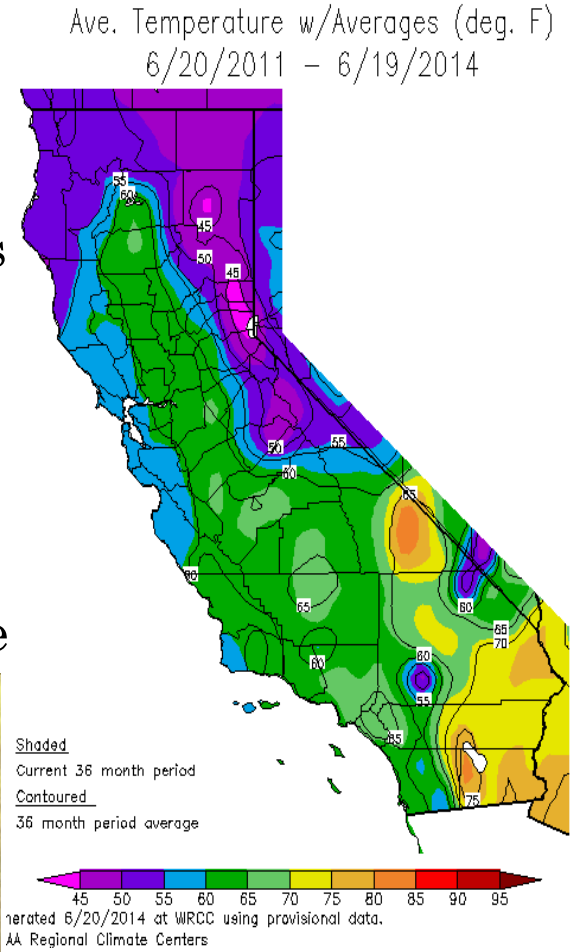
It's Not Mars, It's San Diego!

California's Climate

- Moderate coastal climate: California's Polar Current
- Temperature gradient can reach as high as 1°F/mile between coastlines and inland valleys
- San Francisco for instance is considerably cooler than Central Valley cities like Sacramento and Fresno.
- San Diego County is no Exception: In July, average highs in La Jolla and other coastal regions are 75°F compared to the 90°F average high in El Cajon.



Source: NASA

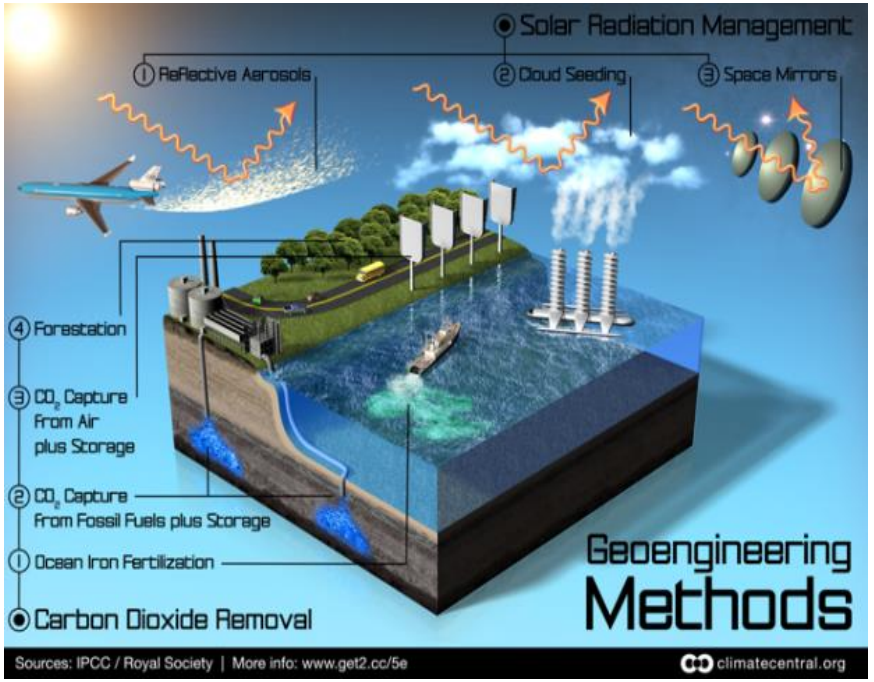


Source: California Climate Data Archive

KOOL-AID SOLUTIONS

OUT Fluffy!
Carbon Paw Print

Intermittence?
Storage?



Geo-Engineer Climate Change
Creating international-level policies ?

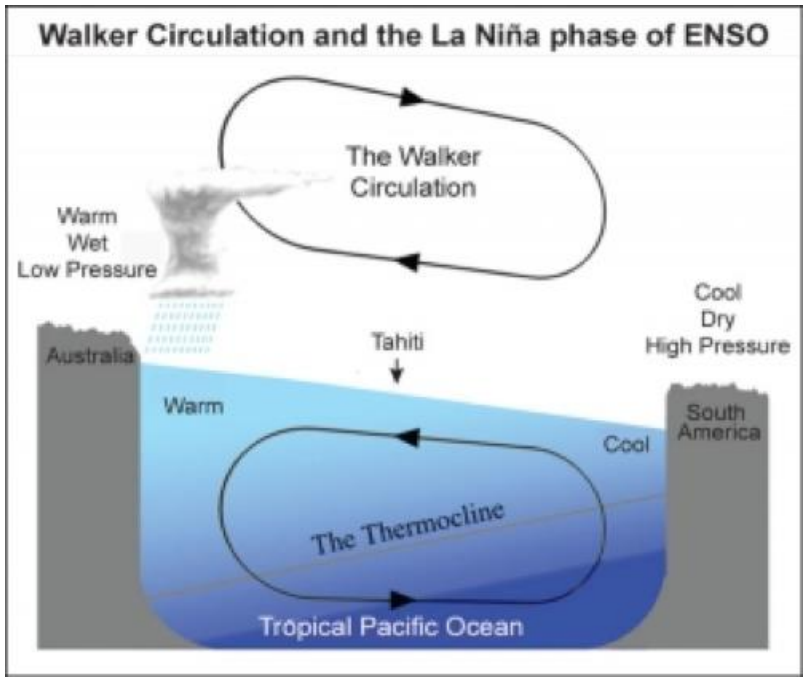
Bottom-line: The is no ONE solution that will solve our problems

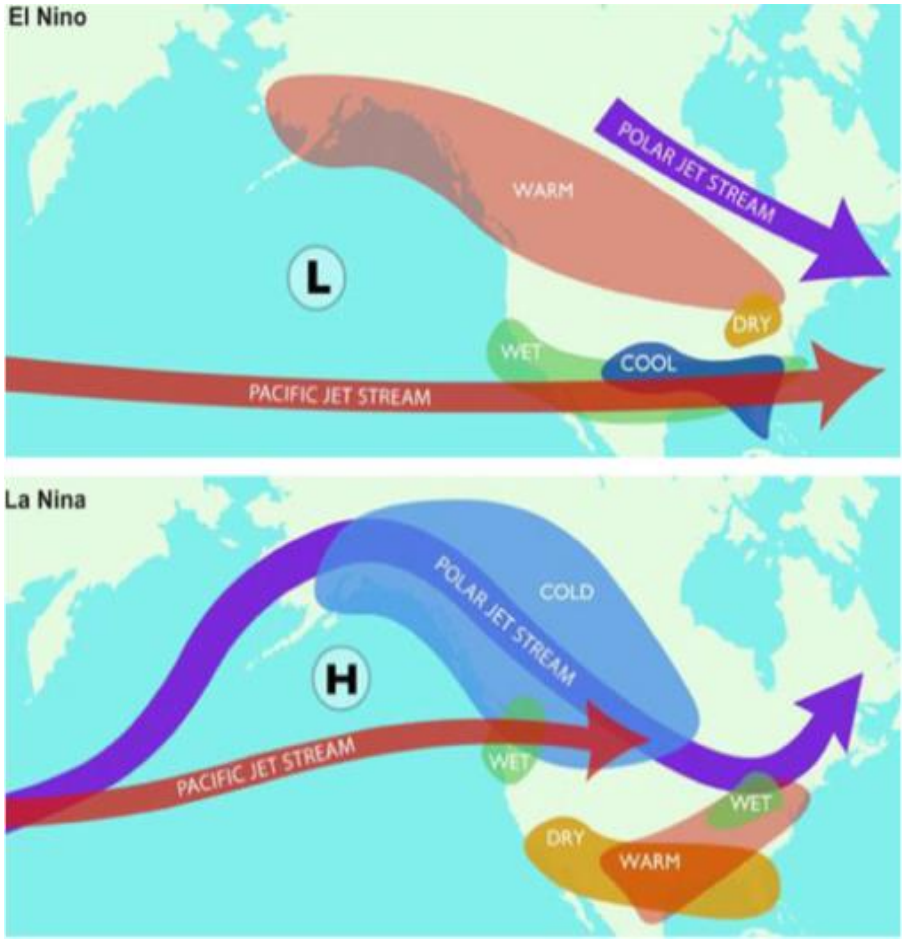
El Niño–Southern Oscillation (ENSO)

El Niño is a climate pattern that describes the unusual warming of surface waters along the tropical Pacific ocean.

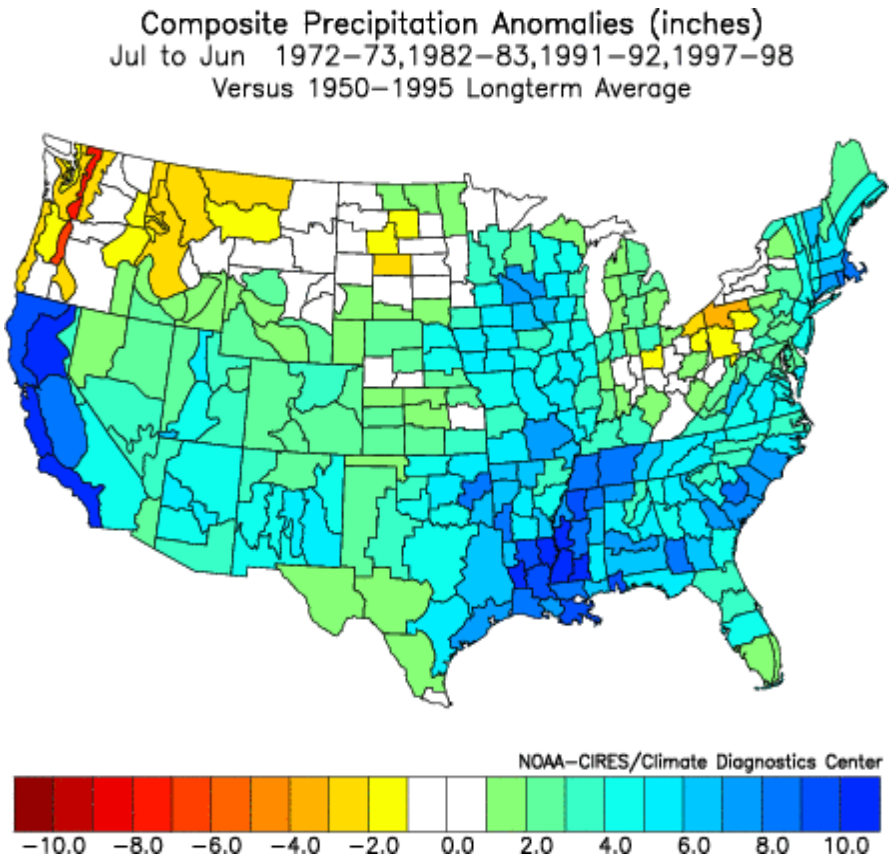
National Geographic

- Low pressure shifts from west to east during El Niño
- In the southwest, wet conditions during El Niño and dry during La Niña

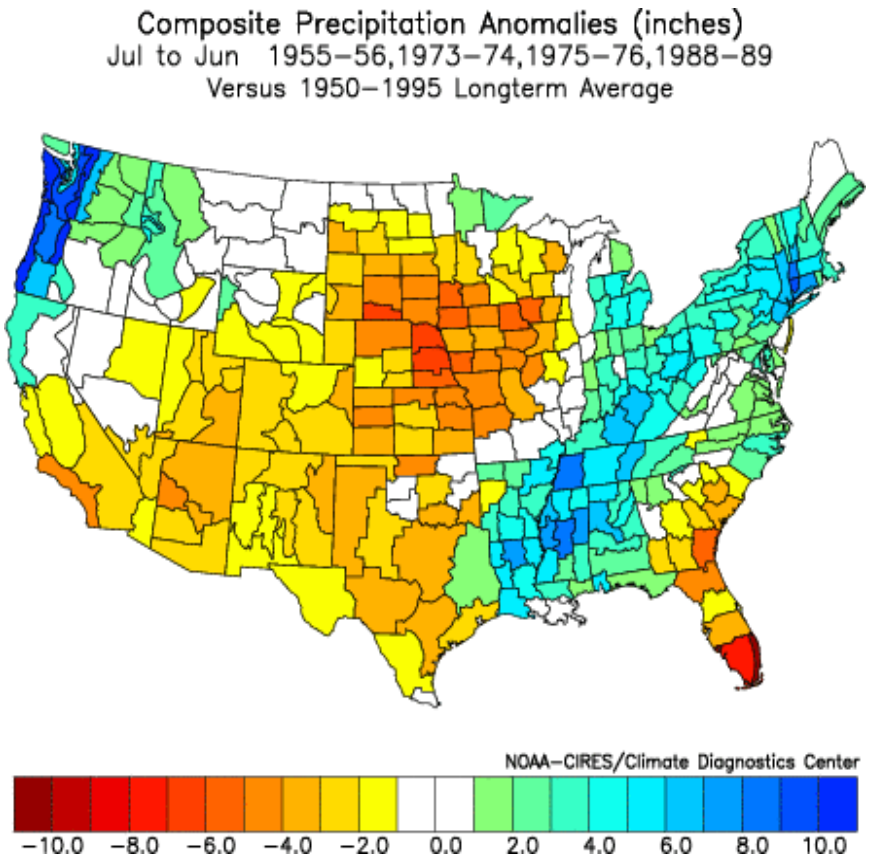




El Niño



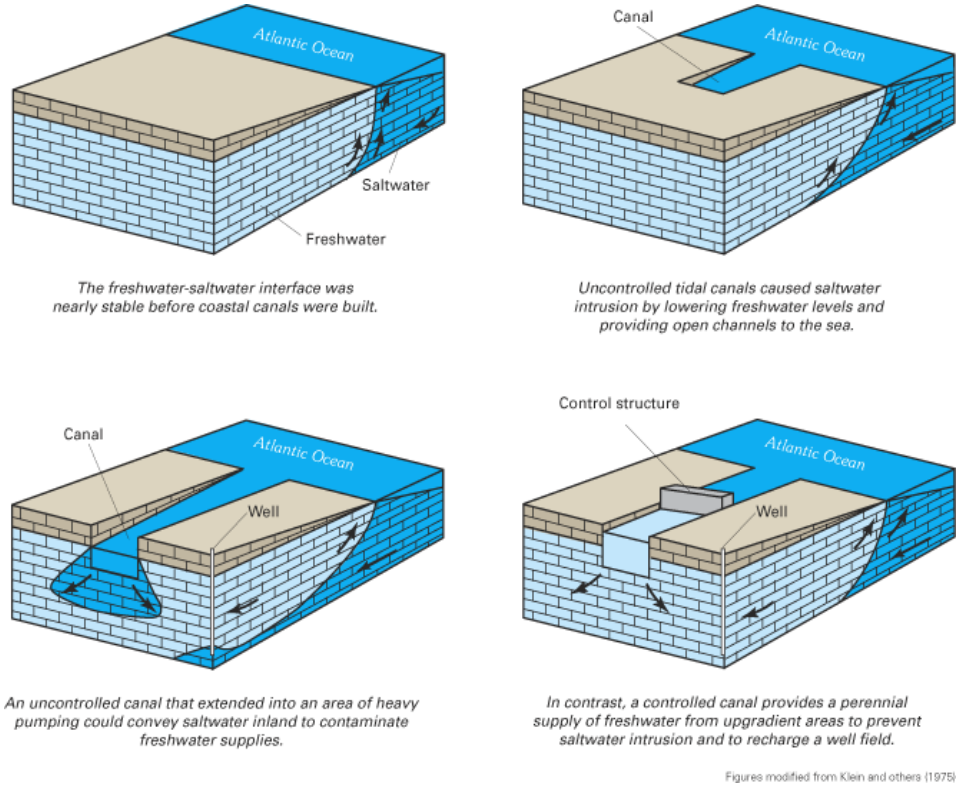
La Niña



Rainfall variation in El Niño and La Niña

Water Resources: Saltwater Intrusion

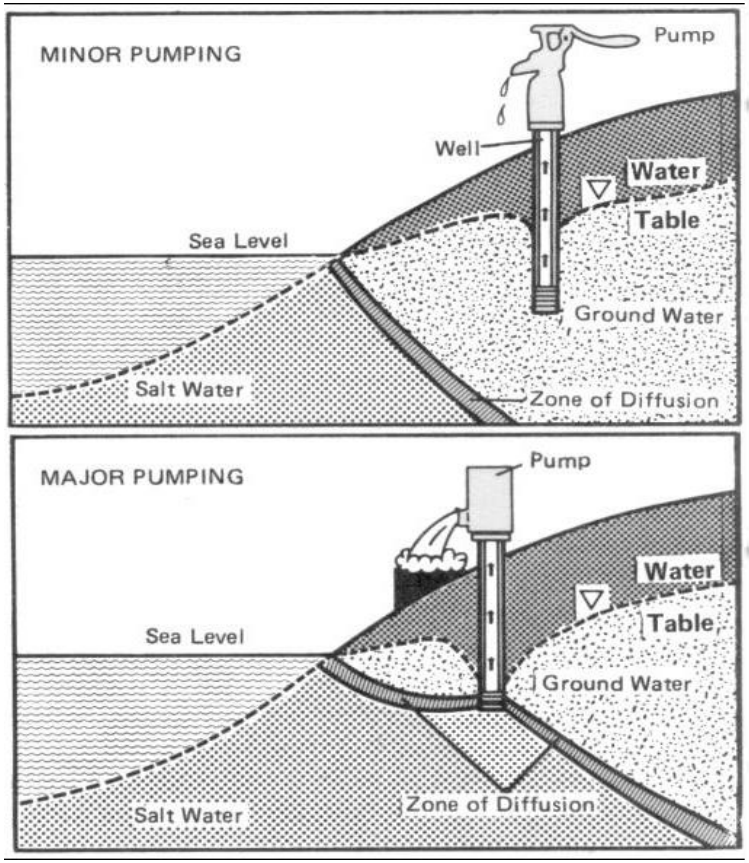
- The movement of saline water into freshwater aquifers.
- When freshwater is extracted, it lowers the pressure column allowing the denser saltwater to intrude laterally through underground pores.
- Underground water overdraft is the primary cause of saltwater intrusion.
- Uncontrolled tidal canals also contribute to saltwater intrusions.



Barlow, Paul M. (2003). Ground Water in Freshwater-Saltwater Environments of the Atlantic Coast

"USING WATER WITH HIGH SALINITY REQUIRES IRRIGATION TO BE MORE FREQUENT AND OF GREATER AMOUNTS THAN WHEN GOOD QUALITY WATER IS USED"

B. J. Boman and E. W. Stover: Managing Salinity in Florida Citrus -University of Florida



"Nearly 90% of all water withdrawals in South Florida come from the Biscayne Aquifer."

Florida Department of Environmental Protection

Water in the Southwest

Do We Even Have A Water Problem ???

Water From The Colorado

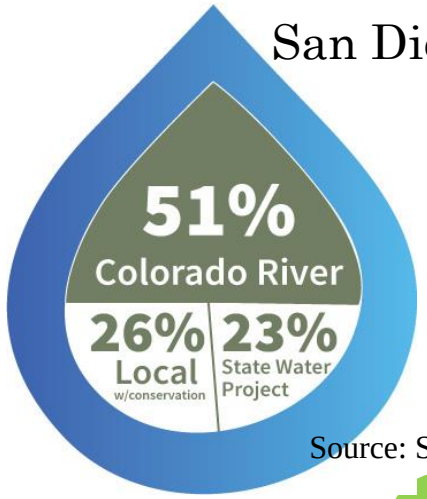
- Water is most critical in Lower basin states.
- Colorado River Compact (1922):
- Agreement which allocates water rights to the seven states (and Mexico) that border the Colorado River Basin
- Upper and Lower Basin each with 7.5 million acre ft/year apportionment.

Water in California

- 4.4 million acre feet/year apportionment (enough to cover the state of New Jersey with one foot of water).
- Has benefited from other states (like Arizona) not using their full apportionment.
- Imperial, Coachella and Yuma: Why does America grow its vegetables in the desert?

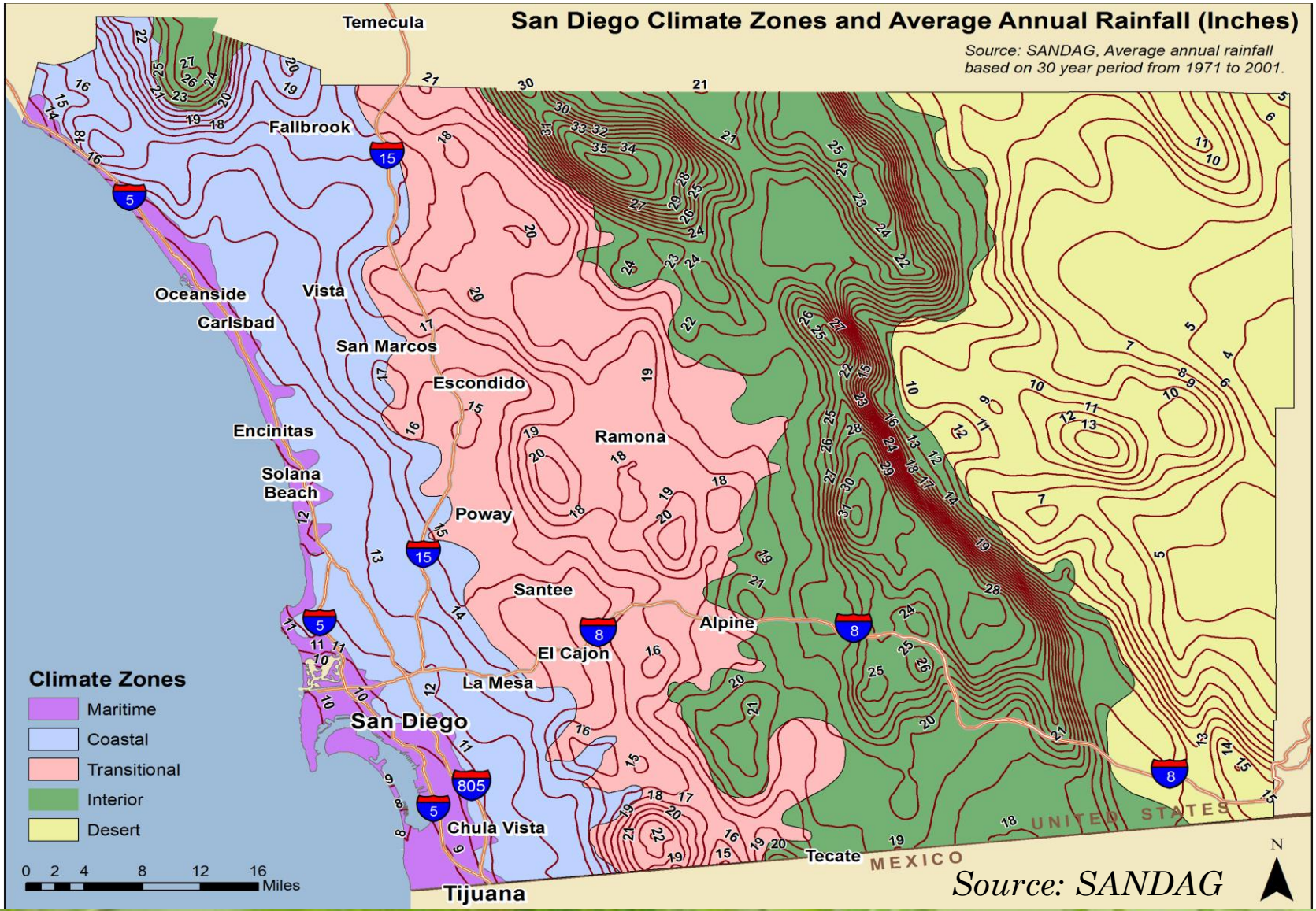
Fiscal Year 2013

San Diego



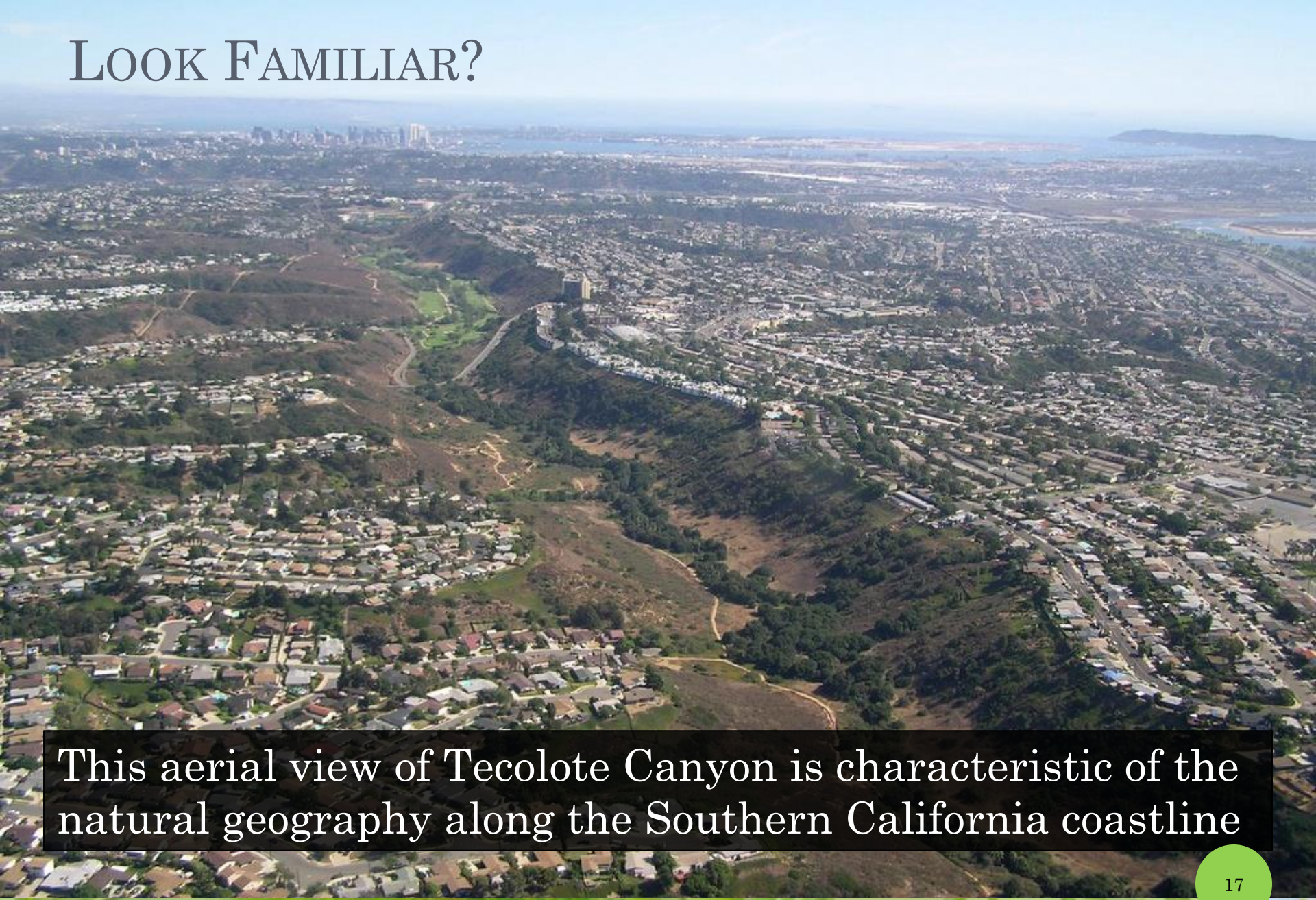
Source: SANDAG

The Climate Zones of San Diego



Source: SANDAG

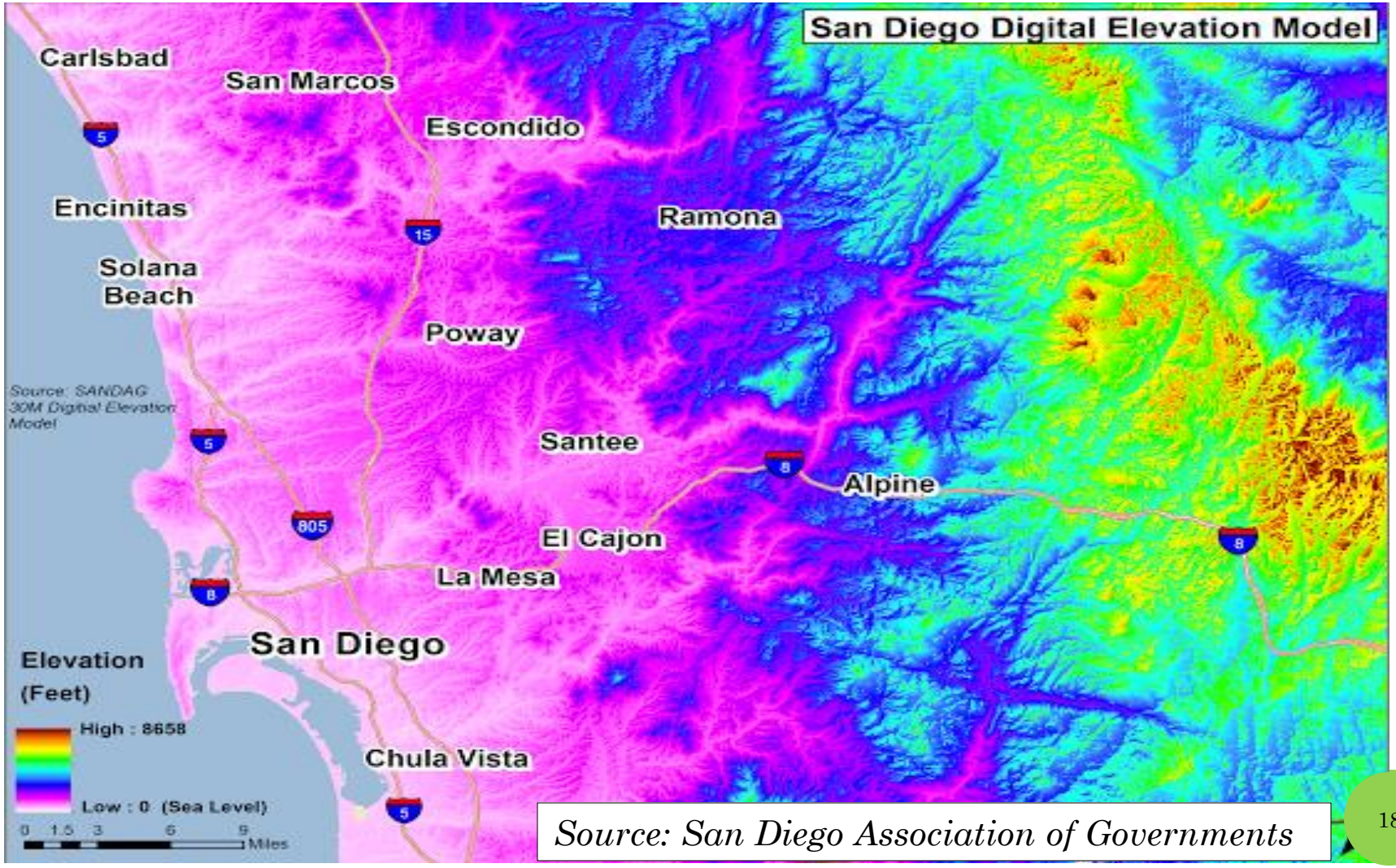
Look Familiar?



This aerial view of Tecolote Canyon is characteristic of the natural geography along the Southern California coastline

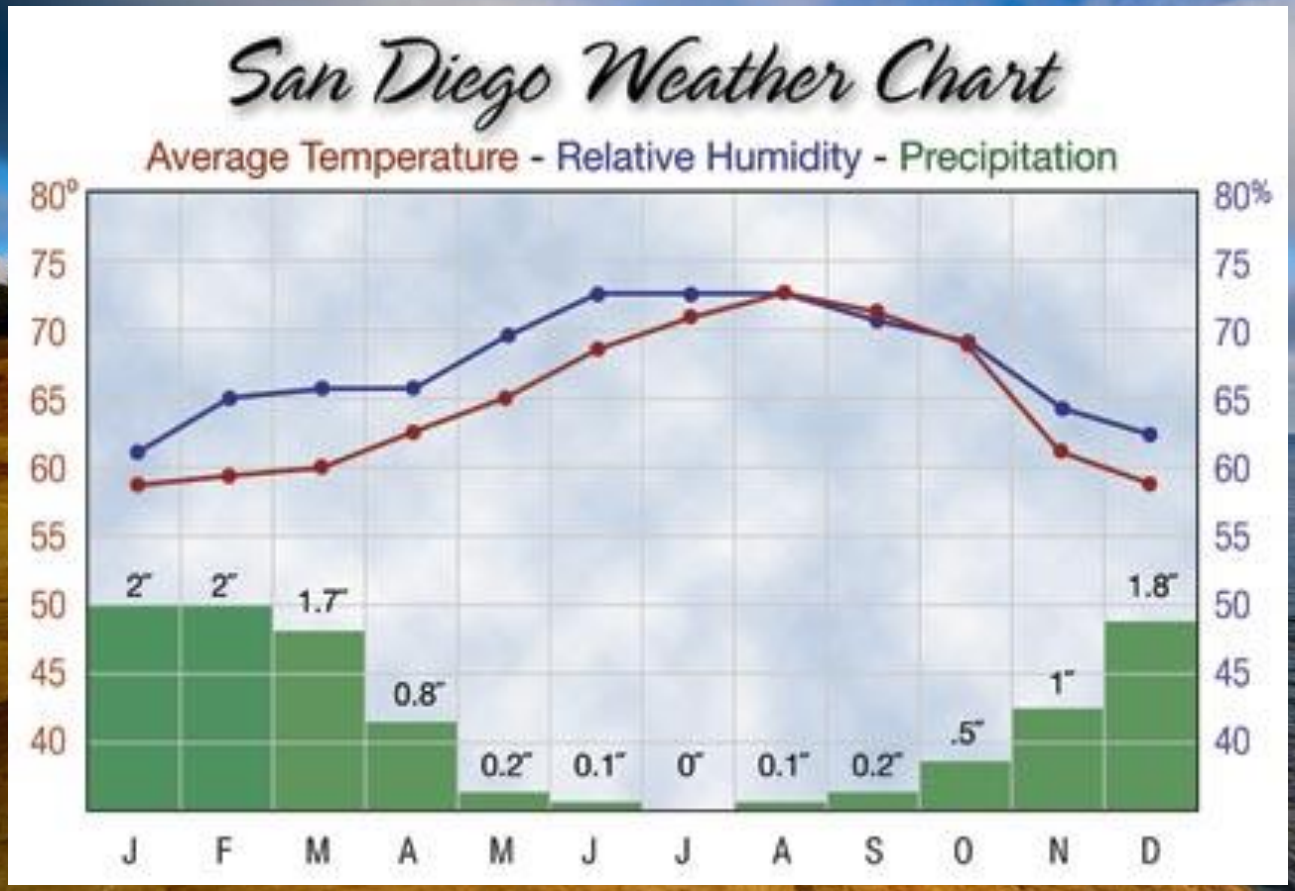
San Diego Elevation Map

These canyons are critical in understanding the interactions between human development and wildlife, and preparing against potential environmental risks



Source: San Diego Association of Governments

"America's Finest City"



If there is a single word that describes the San Diego region, it is "paradise." And this paradise is our home.

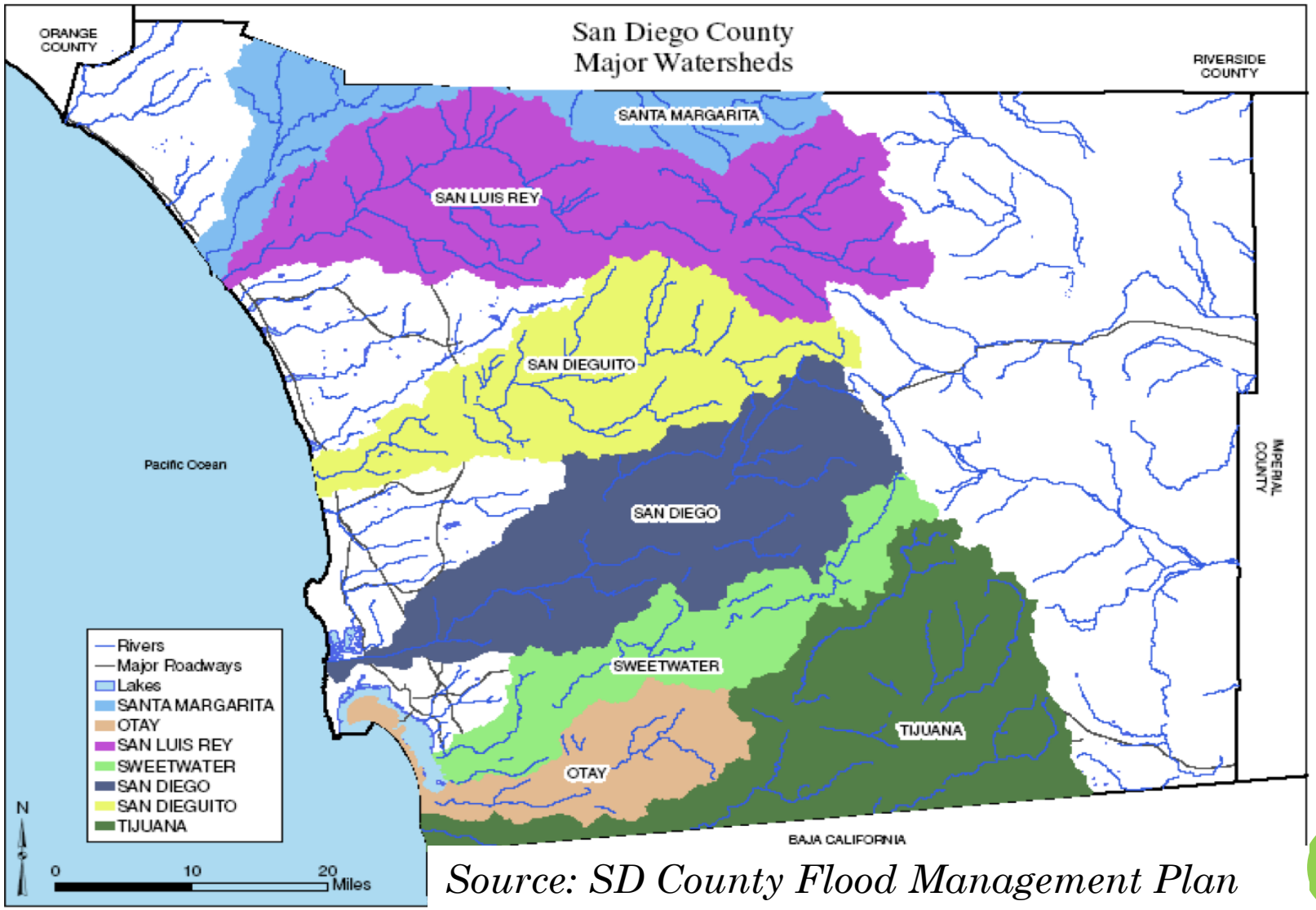
– Our Greater San Diego Vision 2012

So… why should we be concerned with climate change?

Environmental Risks

- The frequency of flooding, extreme temperatures, drought, fires, and the probability of sea level rise will all increase

River Sources & Water Basins



Source: SD County Flood Management Plan

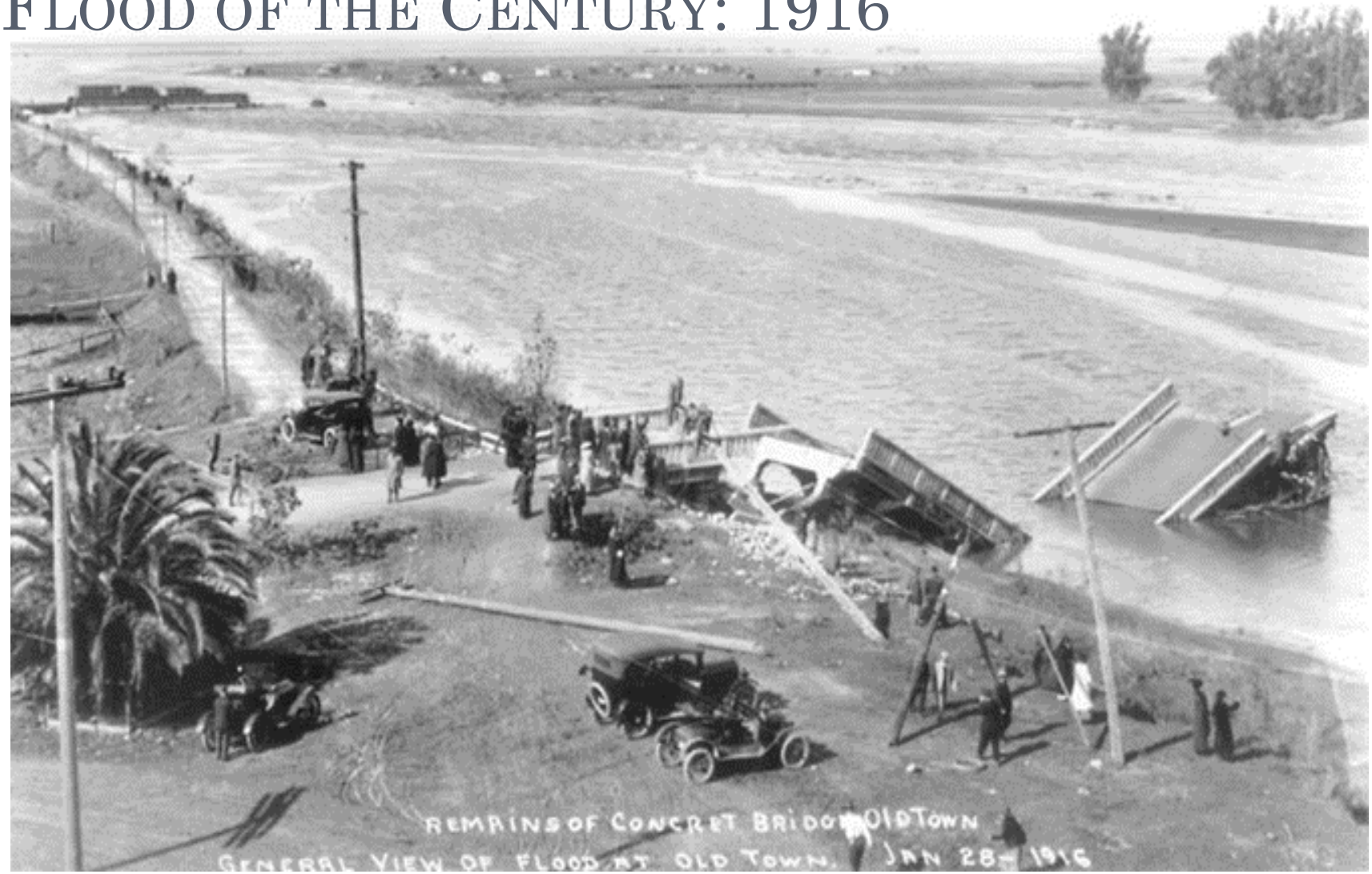
A History of Floods

- In 2010, 1.5” - 3.5” of rain fell in 2 days
- Major areas affected were along the San Diego River, Santa Margarita River, and the San Luis Rey River

Fashion Valley Flooding

An “inside look” at Qualcomm Stadium 2 days before the Poinsettia Bowl

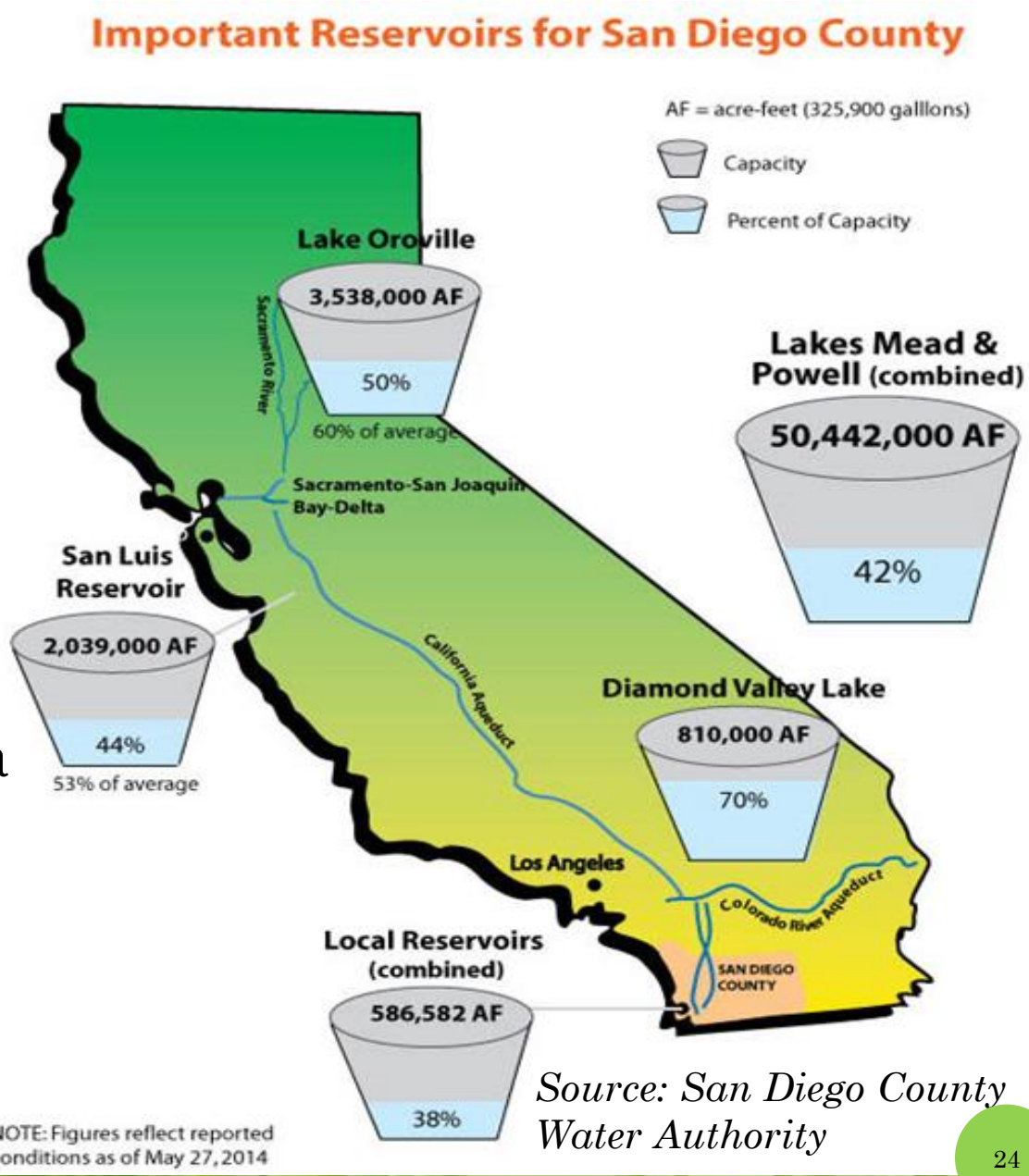
Flood of the Century: 1916



All bridges along the San Diego River were wiped out, isolating San Diego from Los Angeles for days

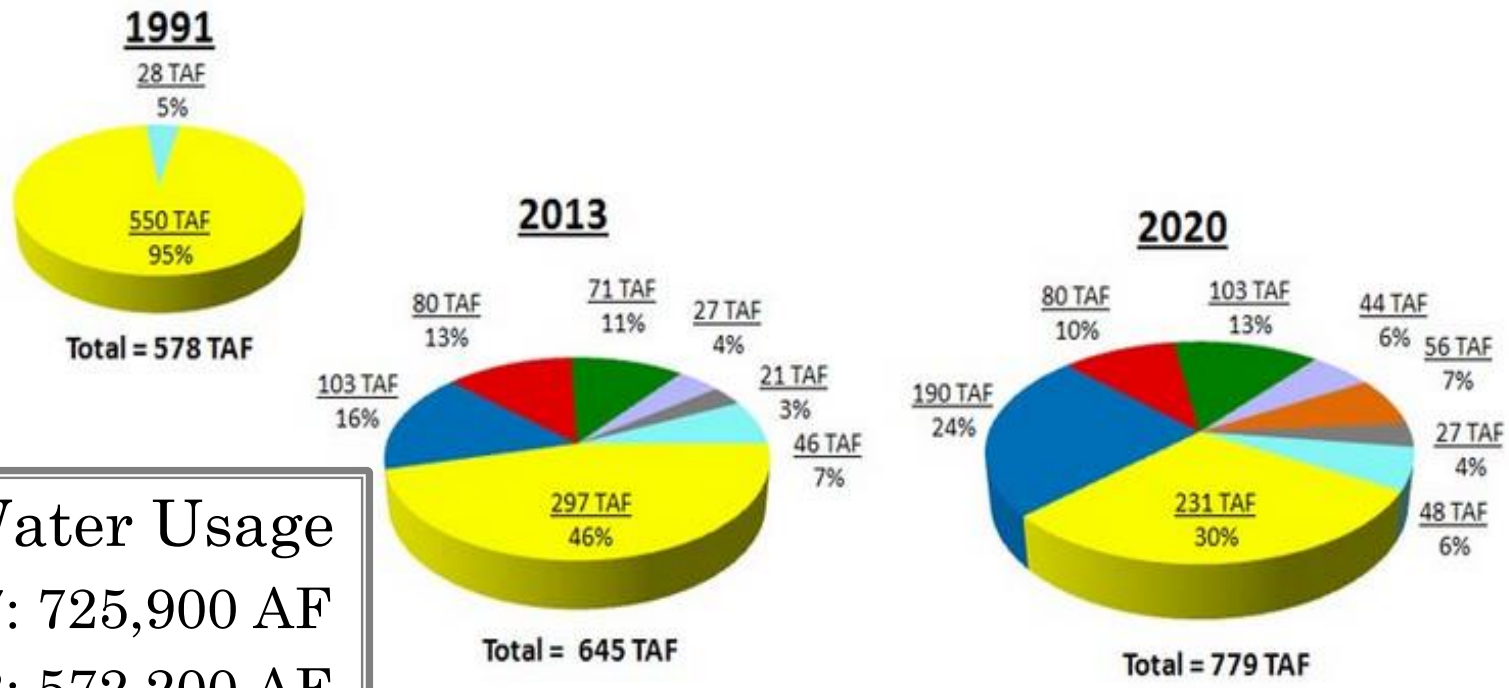
Drought

- 75-95% of San Diego water comes from Colorado River and Northern California
- Droughts in Northern California and along the Colorado River have profound impacts on San Diego water supply



Source: San Diego County Water Authority

Increasing the Region's Water Diversity & Conservation



Total Water Usage

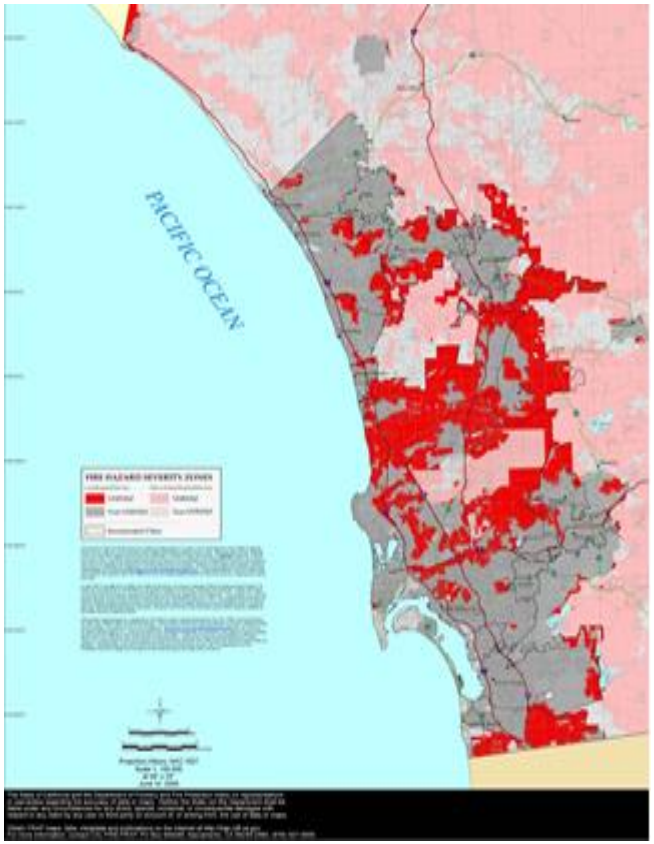
- 2007: 725,900 AF
- 2013: 572,200 AF

Source: San Diego County Water Authority

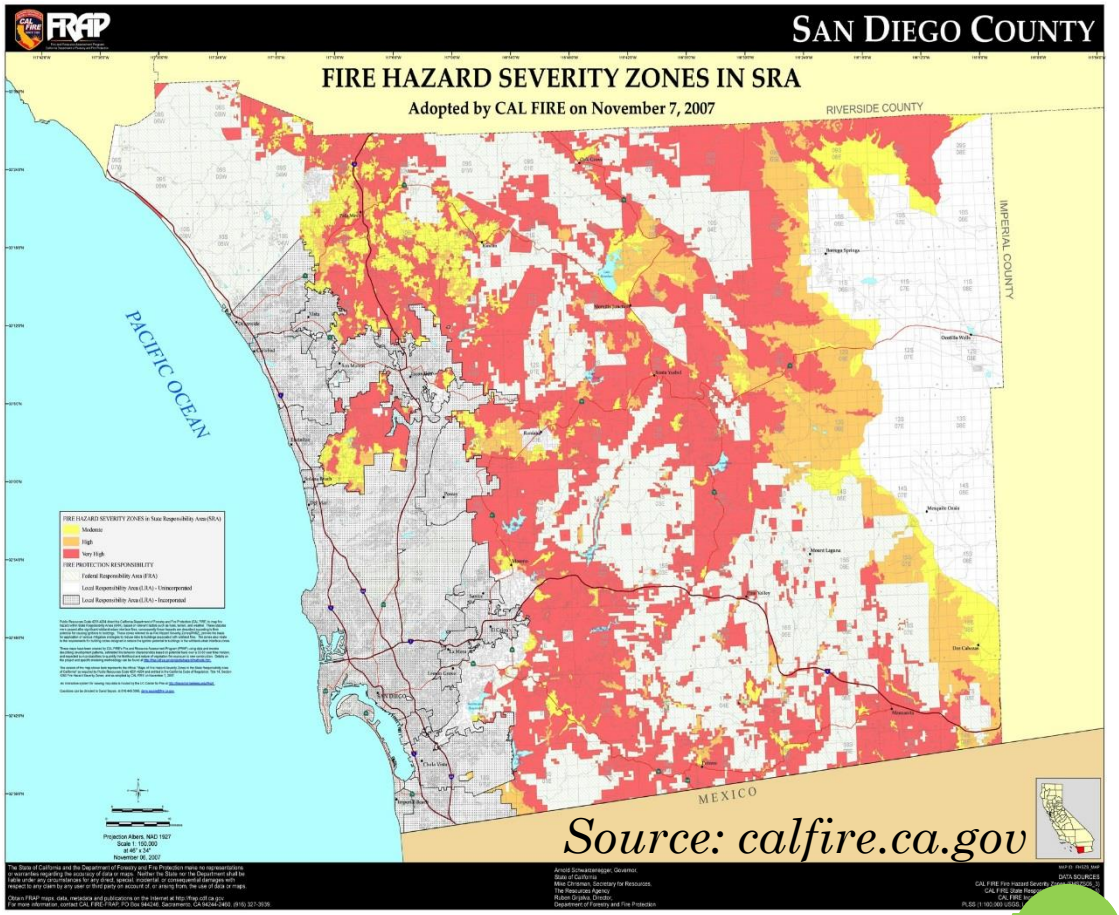
TAF=Thousand Acre-Feet

Fire Hazard Zones

- Fire is also a potential risk near developed areas of San Diego county



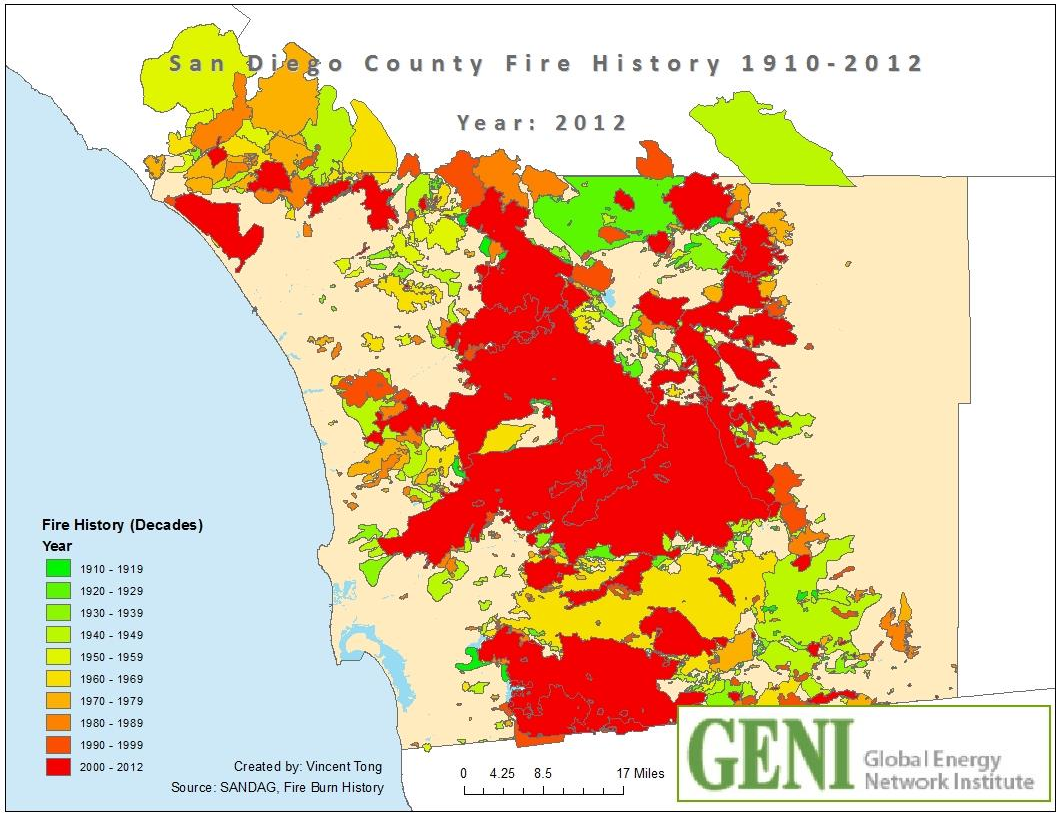
Local Responsibility Area



State Responsibility Area

A History of Fires

- Fire severity and frequency has increased since 1910
- Cedar Fire (2003) and Witch Creek Fire (2007) were among top 10 most costly fires in U.S. history – both occurred within last decade



The Cost of Fires

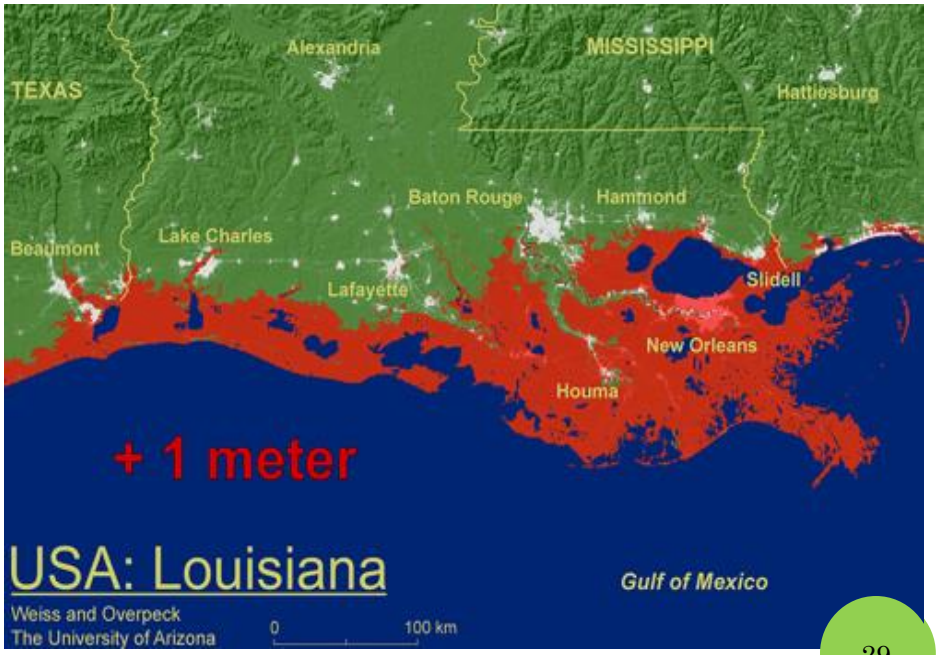
- May 2014 Fires:
  - $28.5 million in response
  - $29.8 million in loss
  - Are we ready for the "dry" season?
- October 2007 Fires:
  - $1.6 billion
- October 2003 Fires:
  - $2.03 billion
- In perspective, the budget for San Diego County for the new fiscal year is $5.08 billion

Southern California Wildfires 2003
Source: Satellite image provided byNASA

Sea Level Rise: The National Numbers

…By 2050

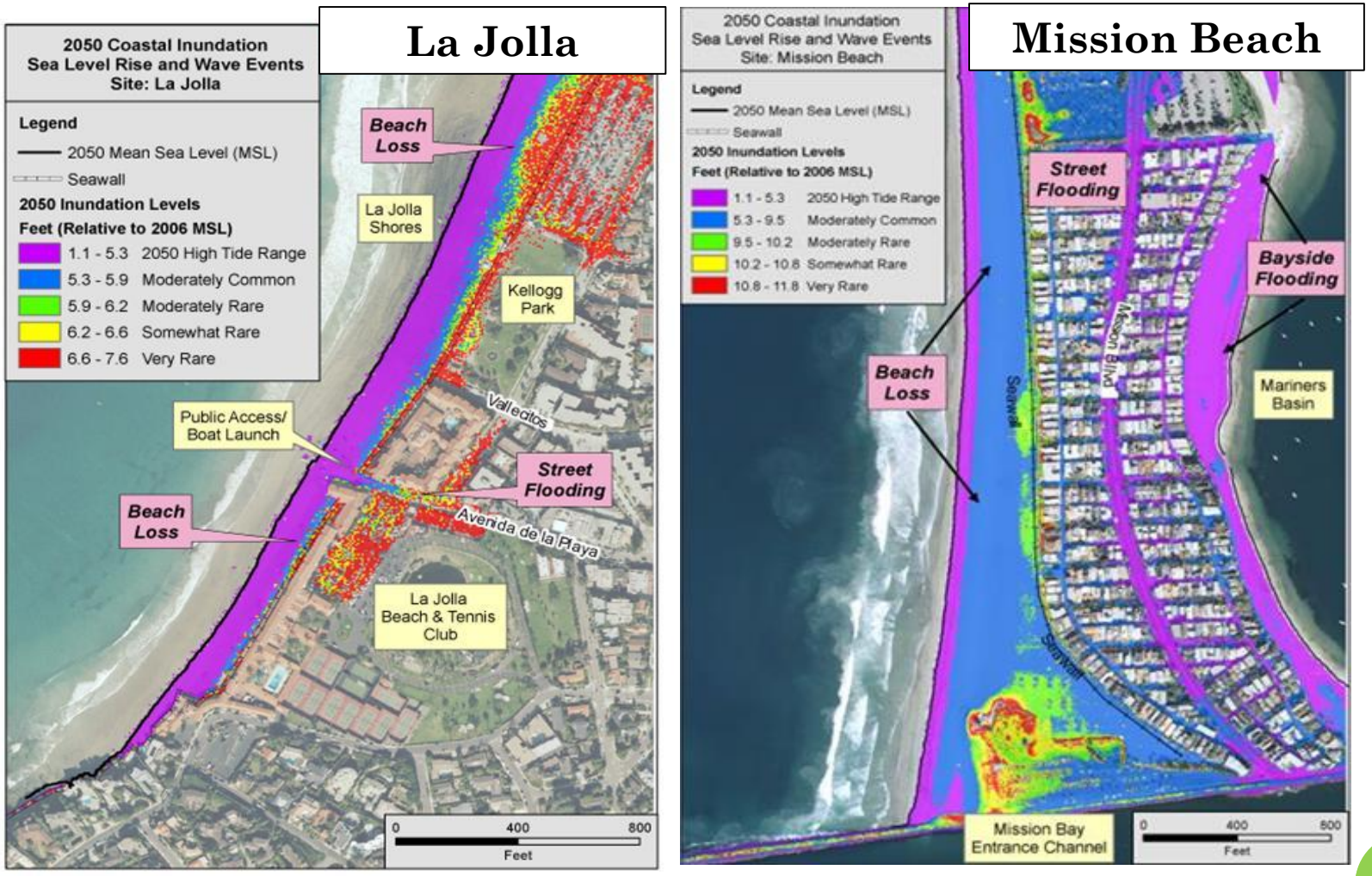
- Louisiana: $33 billion of existing property will be underwater
  - 4.1% to 5.5% of all insurable property will be below mean sea level by 2050
- Florida: $15 billion of existing property will be underwater



Source: riskybusiness.org as published in the NY Times

Sea Level Rise in San Diego

- Sea Level projected to rise by 12-18” by 2050



Source: The San Diego Foundation

San Diego County: A Hotspot for Biodiversity

- Most biologically rich county in the nation
- Invasive species and habitat loss due to human development are pressing issues
- Also has most endangered species of any county


Bobcat


Kangaroo rat


Coyote

Loss of Endemic Chaparral

- Coastal Sage Shrub reduced to 15% of expanse since when California became a state

Landscape dominated by invasive species
Trabuco Ranger District of the Cleveland National Forest

Impact of Excessive Fire
East of Interstate 8 near Alpine

The Importance of Understanding San Diego's Geography

- Awareness of regional geography allows us to identify and address potential risks
- Adaptation (**Resilience**) is key

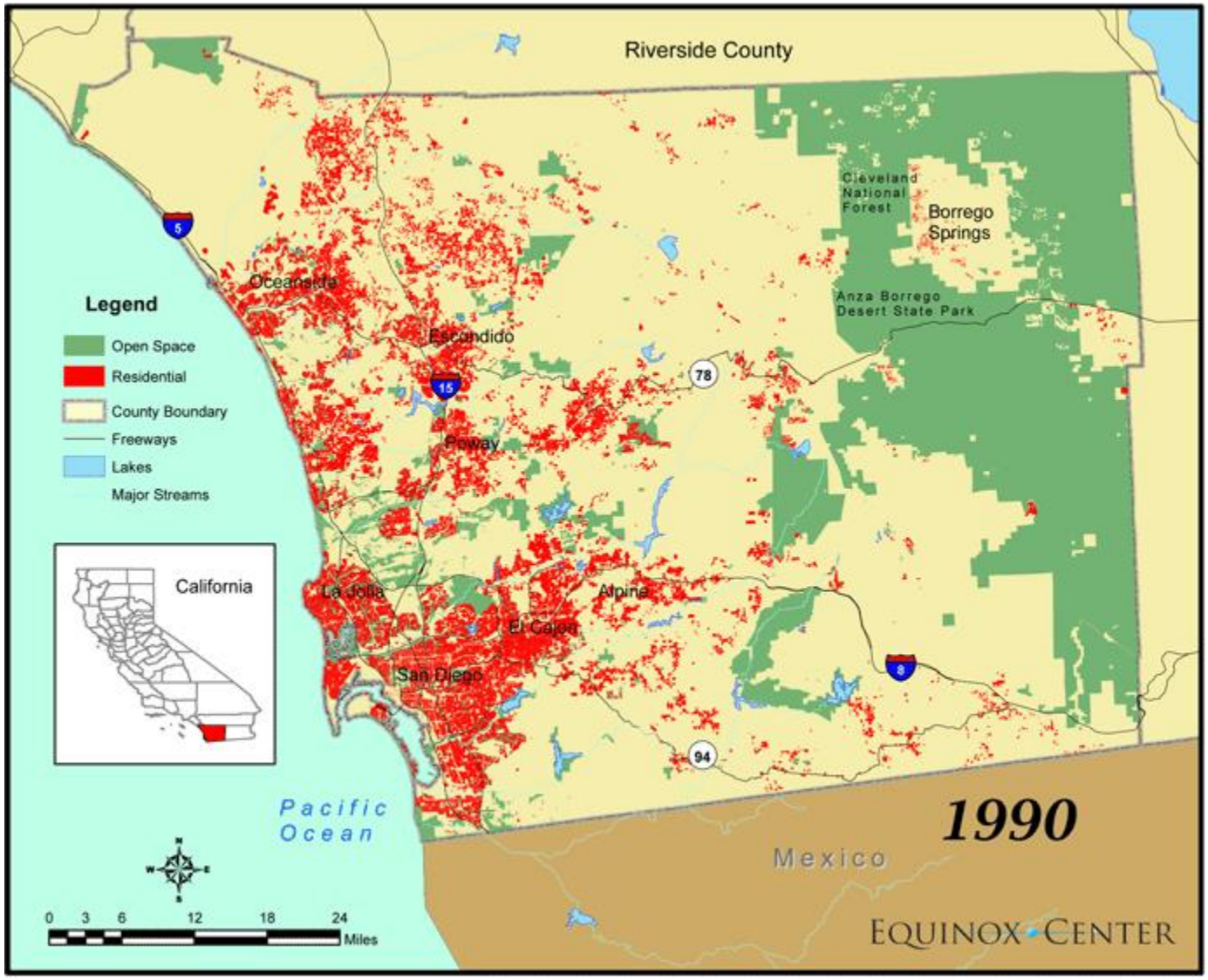
INTRO: DEMOGRAPHICS

"How do we slow down what matters the most and speed up what benefits change and progress? We don't want to impede progress, but we are seeking reconnection to ourselves, to each other, and with the world."

John Maeda, *President, Rhode Island School of Design*

It is crucial for policy makers to understand the demographic trends and factor them into their decision making process.

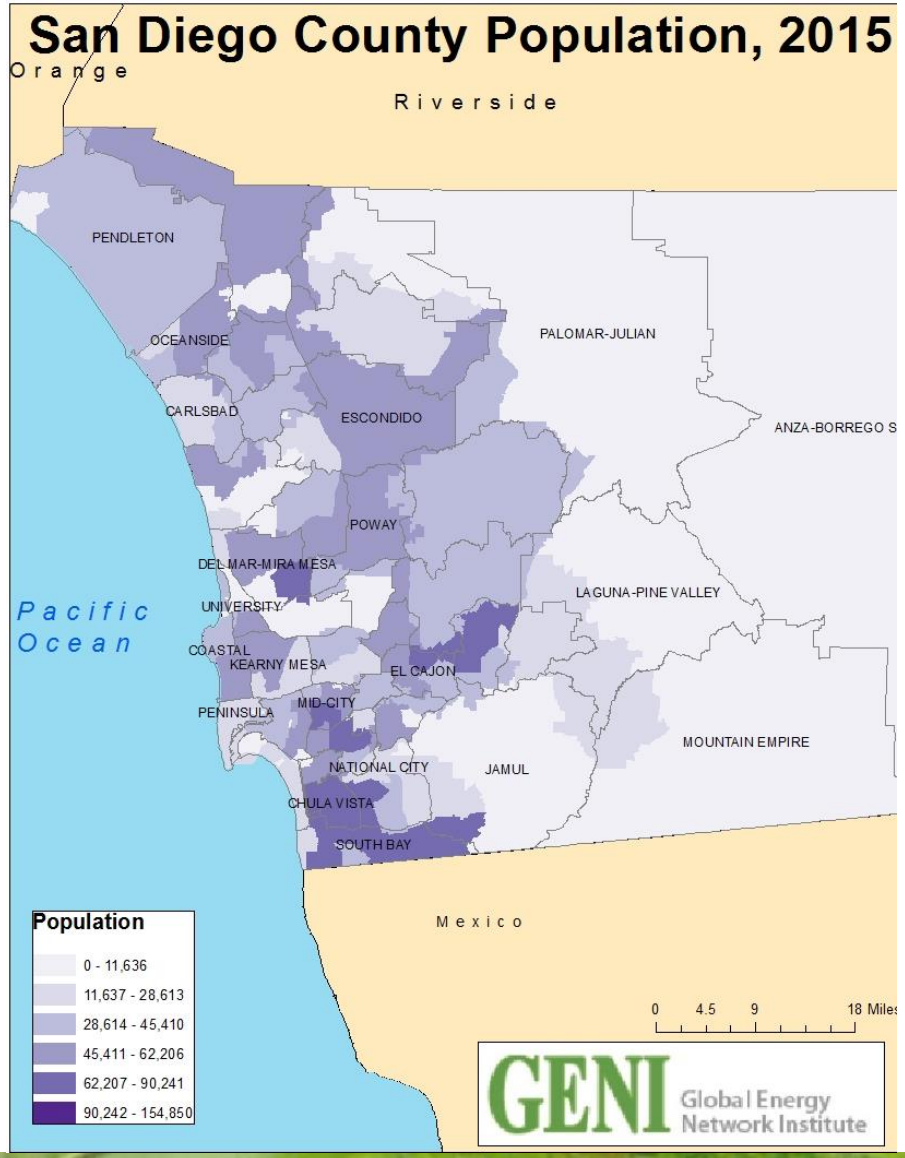
Where are we?

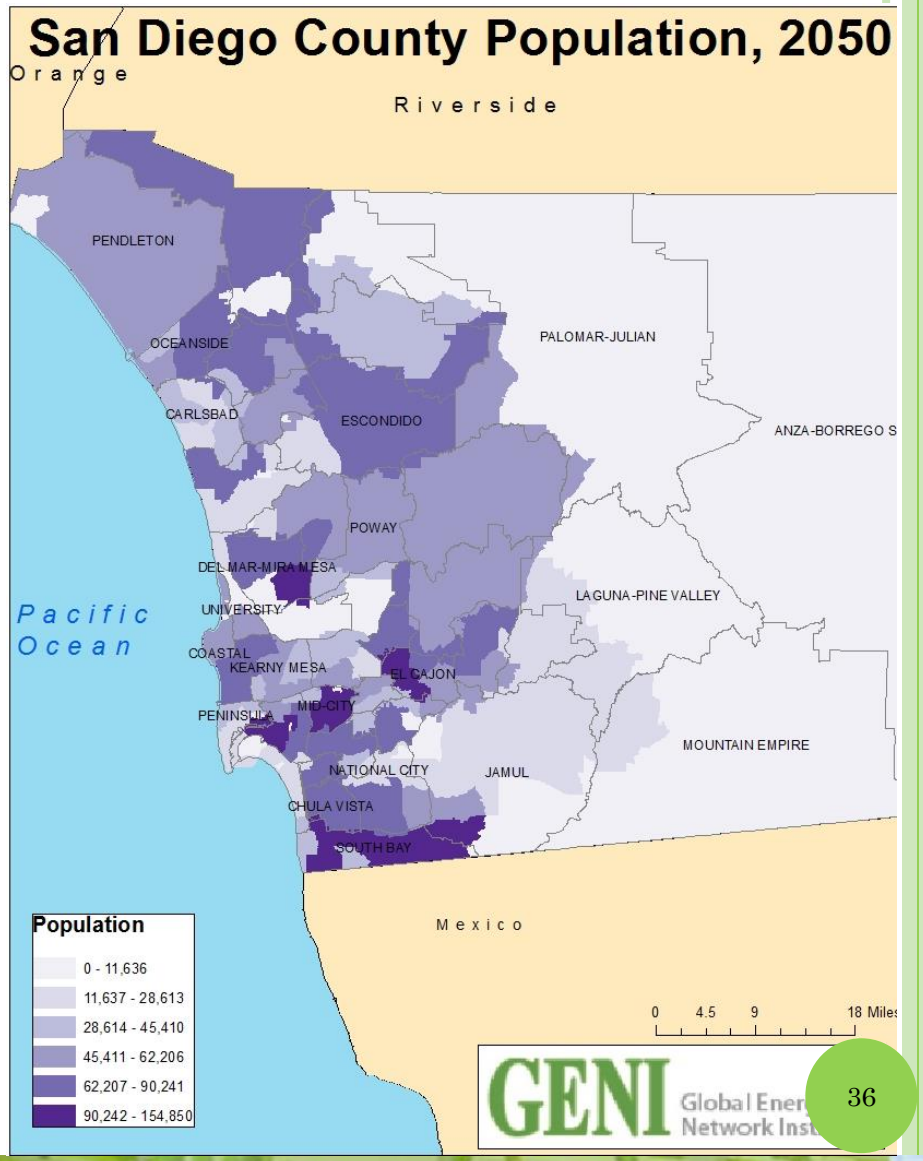


San Diego residential development over the past 15 years.

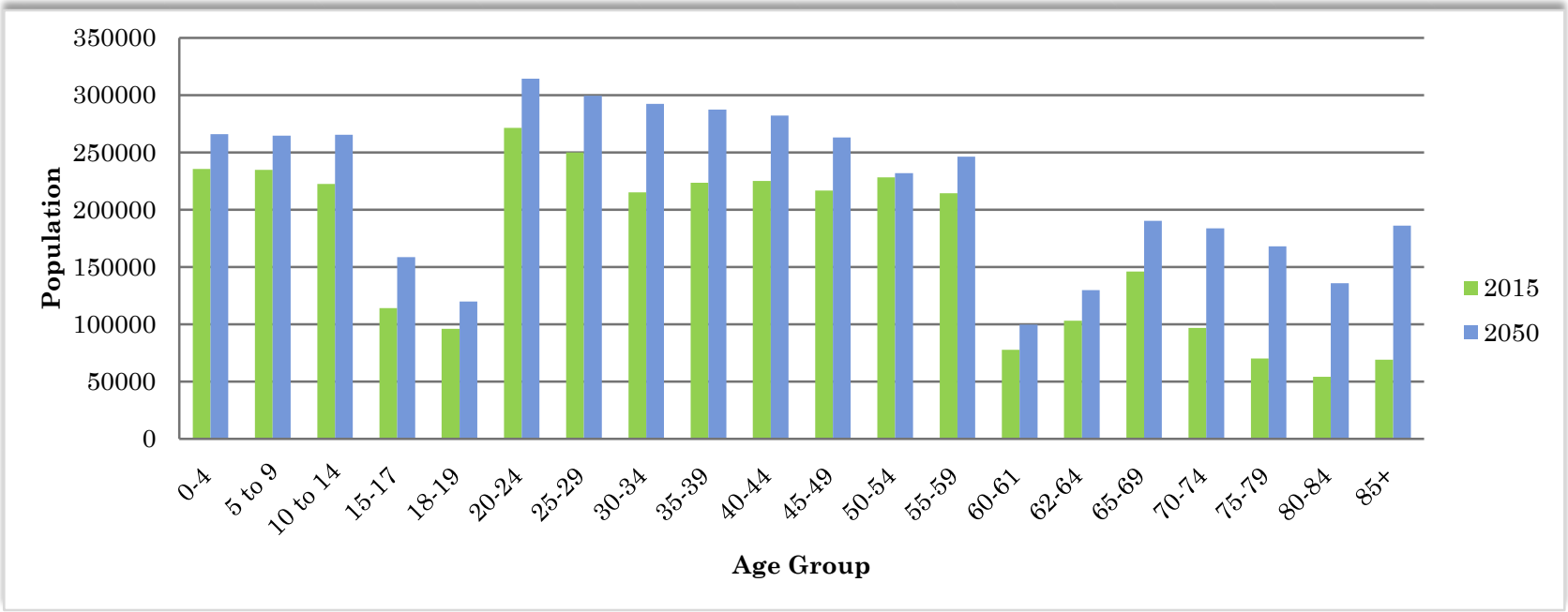
Population Density

Source: SANDAG
Created by: Vincent Tong





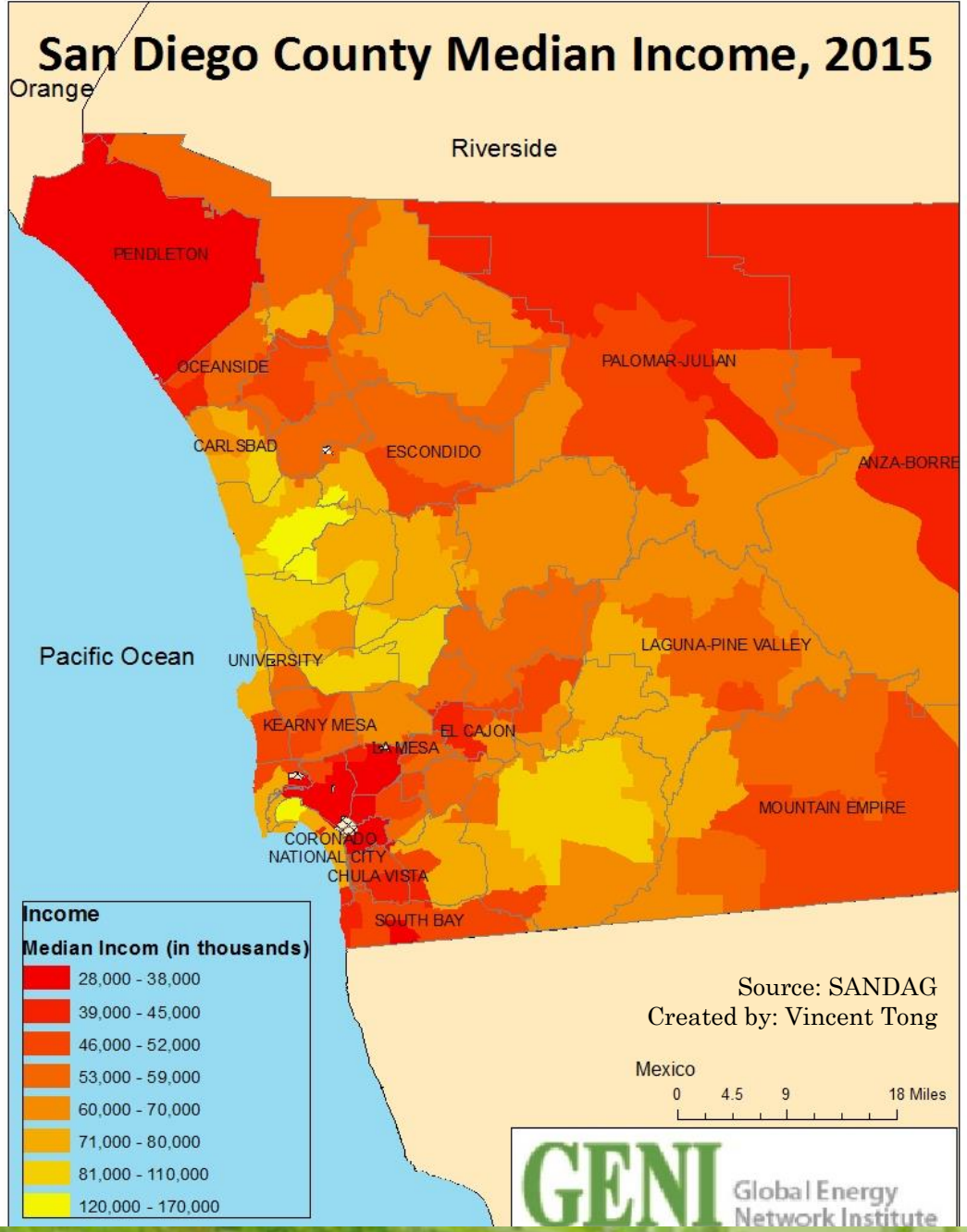
Age Demographics



Age Group	0-4	5-9	65-69	70-74	75-79	80-84	85+
2015	235,659	234,637	145,997	96,774	70,125	54,090	69,131
2050	266,027	264,675	190,340	183,685	167,985	135,903	185,952
% Change	+12.89%	+12.80%	+30.37%	+89.81%	+139.55%	+151.25%	+168.98%

Trends suggest that people in San Diego are having less children while elderly population is growing exponentially

INCOME


San Diego County Median Income, 2015
Orange
Riverside
PENDLETON
OCEANSIDE
CARLSBAD
ESCONDIDO
PALOMAR-JULIAN
ANZA-BORRE
Pacific Ocean
UNIVERSITY
LAGUNA-PINE VALLEY
KEARNY MESA
EL CAJON
LA MESA
MOUNTAIN EMPIRE
CORONADO
NATIONAL CITY
CHULA VISTA
SOUTH BAY
Income
Median Incom (in thousands)
28,000 - 38,000
39,000 - 45,000
46,000 - 52,000
53,000 - 59,000
60,000 - 70,000
71,000 - 80,000
81,000 - 110,000
120,000 - 170,000
Source: SANDAG
Created by: Vincent Tong
Mexico
0 4.5 9 18 Miles
GENI Global Energy Network Institute

Affordable Housing

The U.S. Department of Housing and Urban Development (HUD) defines "affordable" as housing costing no more than 30% of a household's monthly income.

Median house in San Diego County is more than $500,000 while median family income is only $63,400.

Los Vecinos Affordable Housing Development

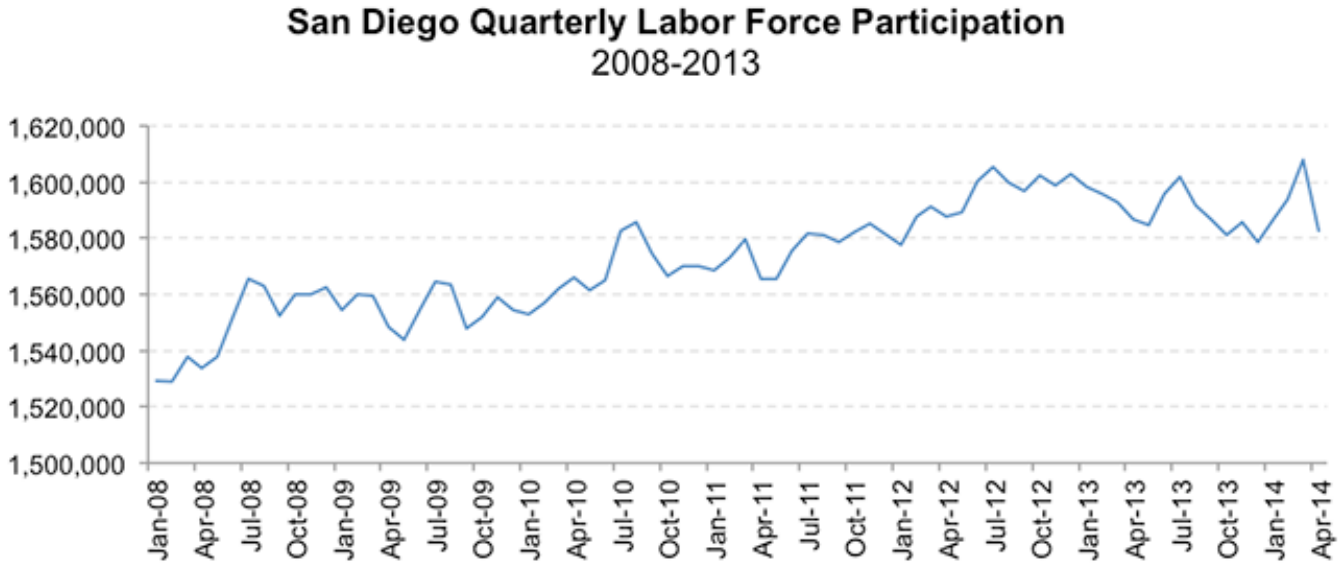
Source: http://www.treehugger.com/sustainable-product-design/los-vecinos-first-platinum-leed-certified-100-solar-powered-affordable-housing-in-san-diego.html

EMPLOYMENT: LABOR MARKET RESILIENCE

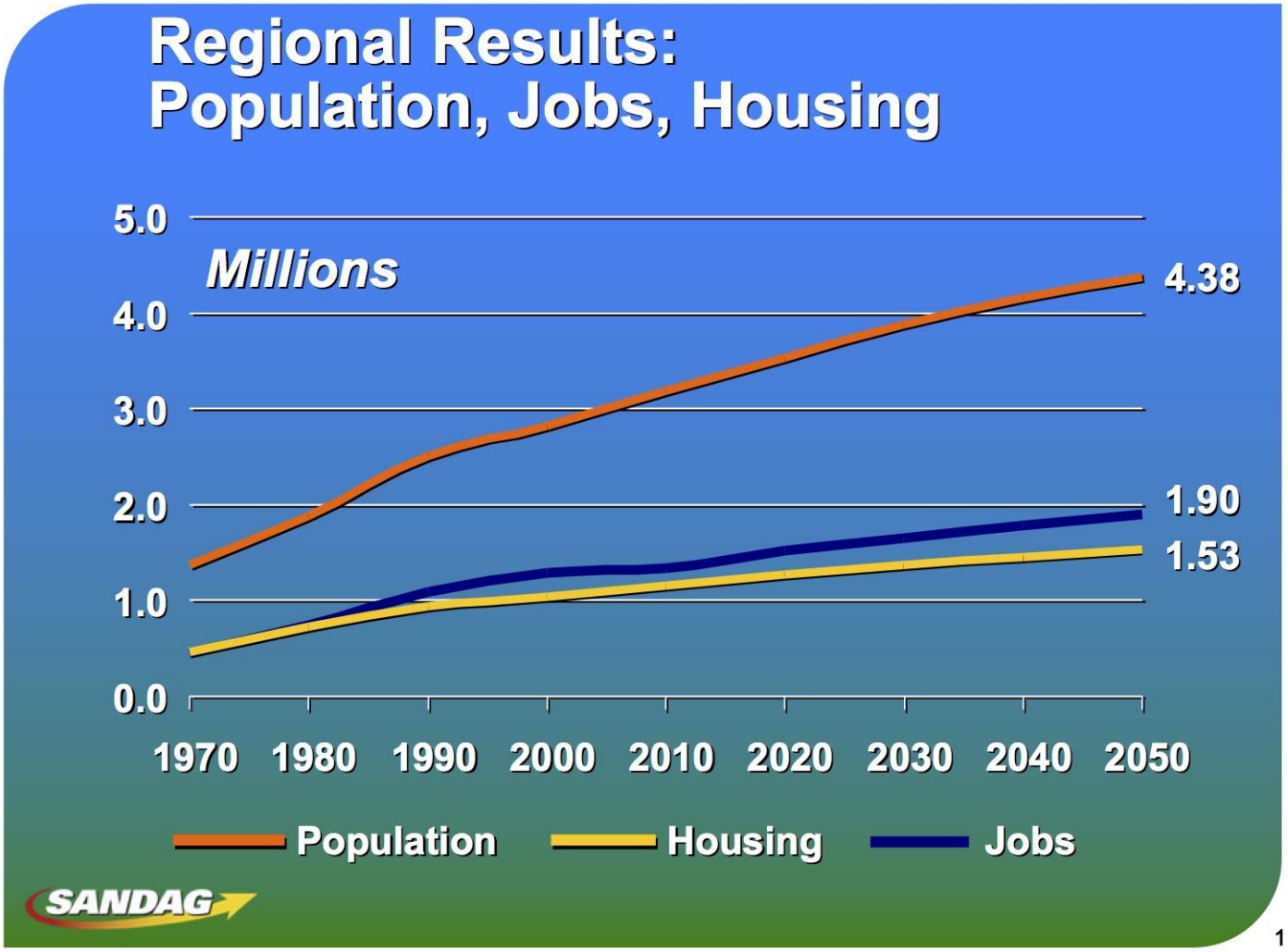
Resilient labour markets are "..labour markets that weather economic downturns with limited
social costs or, more formally, limited losses in worker welfare" (OECD, 2012b: 57)

San Diego:	Apr 13	Feb 14	Mar 14 (Revised)	Apr 14 (Prelim)	Percentage Change Month	Year
Civilian Labor Force	1,586,700	1,594,000	1,607,800	1,582,800	-1.6%	-0.2%
Civilian Employment	1,742,200	1,482,600	1,496,500	1,487,500	-0.6%	1.0%
Civilian Unemployment	114,400	111,500	111,300	95,300	-14.4%	-16.7%
Civilian Unemployment Rate	7.2%	7.0%	6.9%	6.0%		
CA Unemployment Rate	8.7%	8.5%	8.4%	7.3%		
U.S. Unemployment Rate	7.1%	7.0%	6.8%	5.9%		

State of California. EDD. Labor Market Information Division. San Diego-Carlsbad-San Marcos MSA. 16 May 2014. Data Not Seasonally Adjusted



Where we are headed



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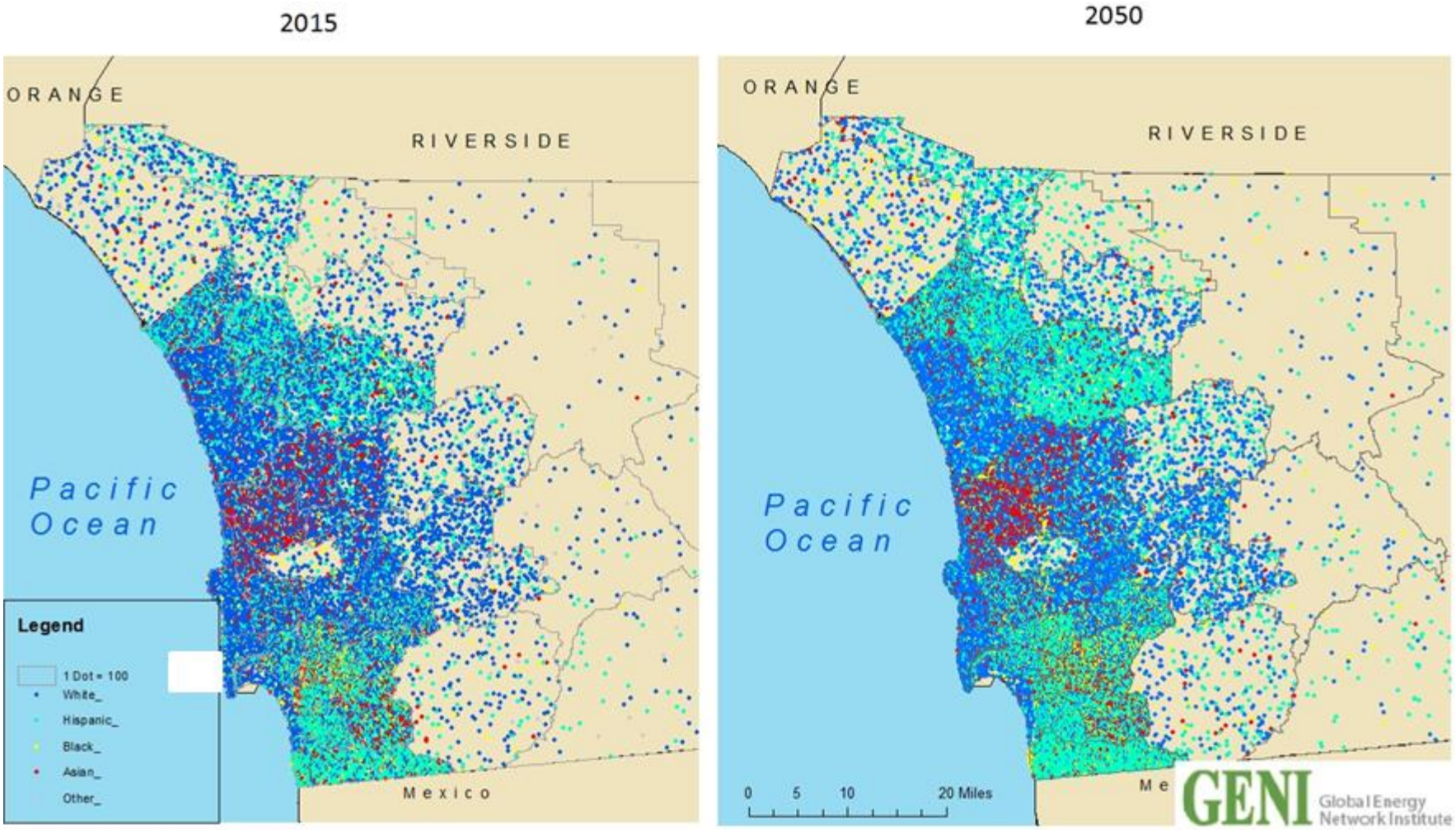
Do these trends suggest resilience?

ETHNICITY



Source: SANDAG
Created by: Vincent Tong

Side by side comparison of ethnic density in San Diego county in 2015 & 2050.

Ethnicity

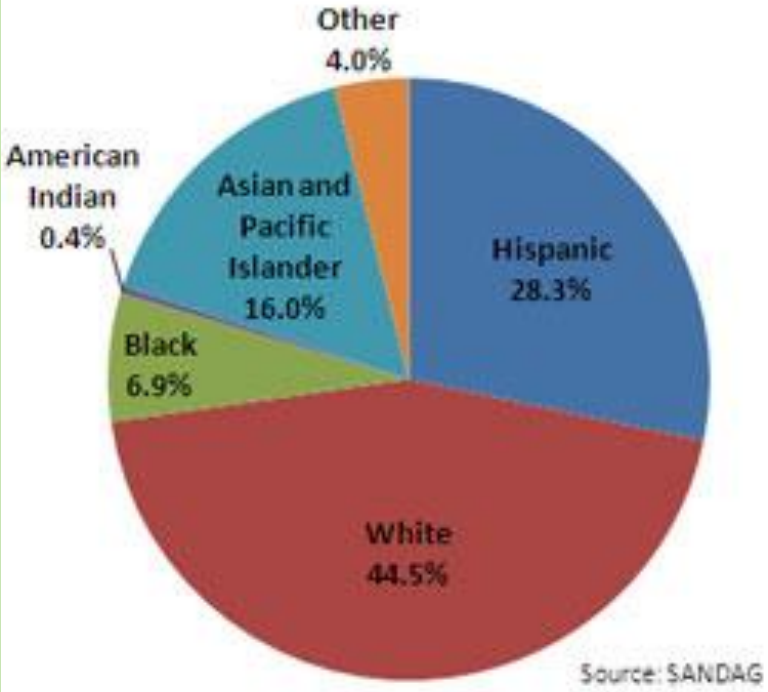
Demographic Forecast (2011-2050)			
	2011	2050	% Change
White	1,495,582	1,549,069	+3.6%
Hispanic	1,010,784	1,881,719	+86%
Black	142,905	229,860	+60.8%
Asian	348,724	502,492	+44%
Other	117,815	197,210	+67.4%
Total	3,115,810	4,360,350	+39.9%

Non-White households make up most of the population changes.

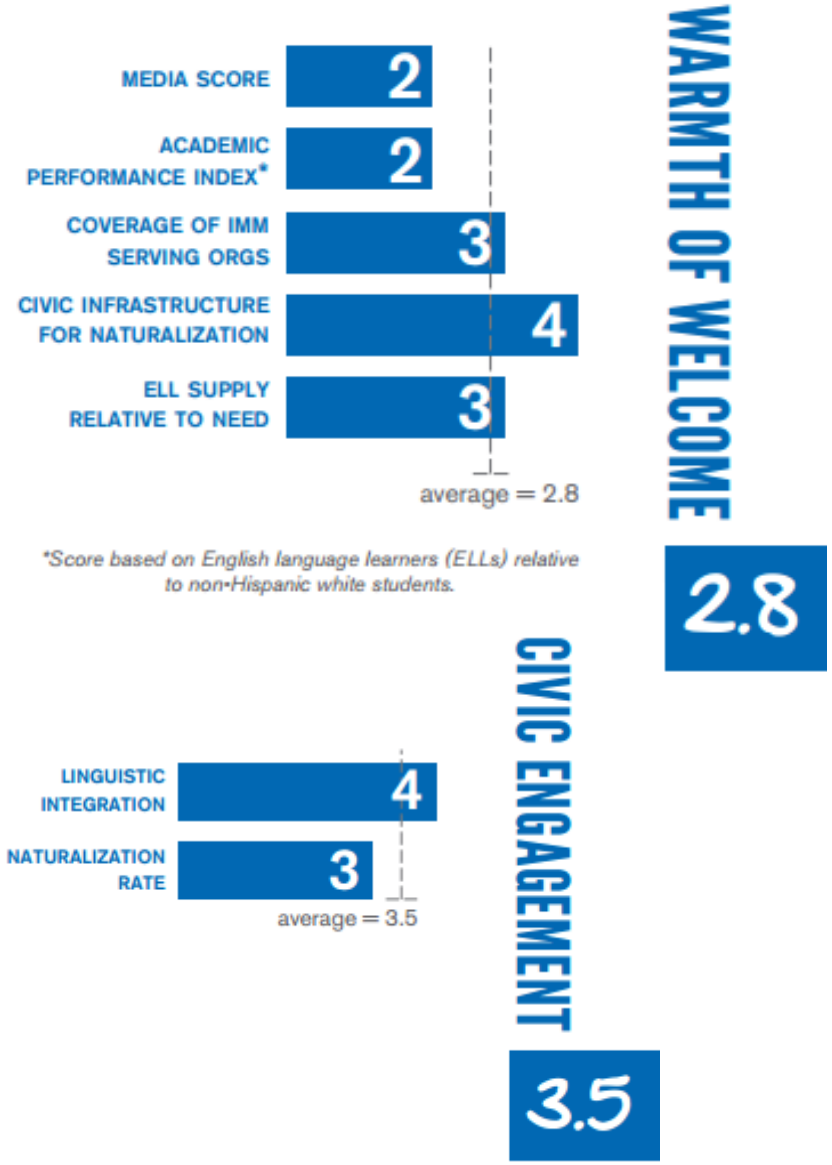
Source: SANDAG

ETHNICITY

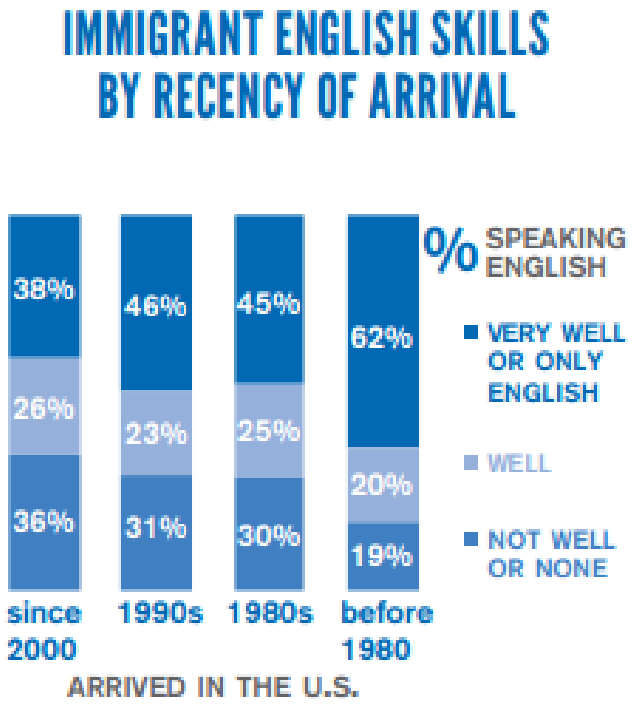
San Diego County borders Tijuana which forms the largest bi-national metropolitan region in the US with over 5 million people.



Programs for Immigrants

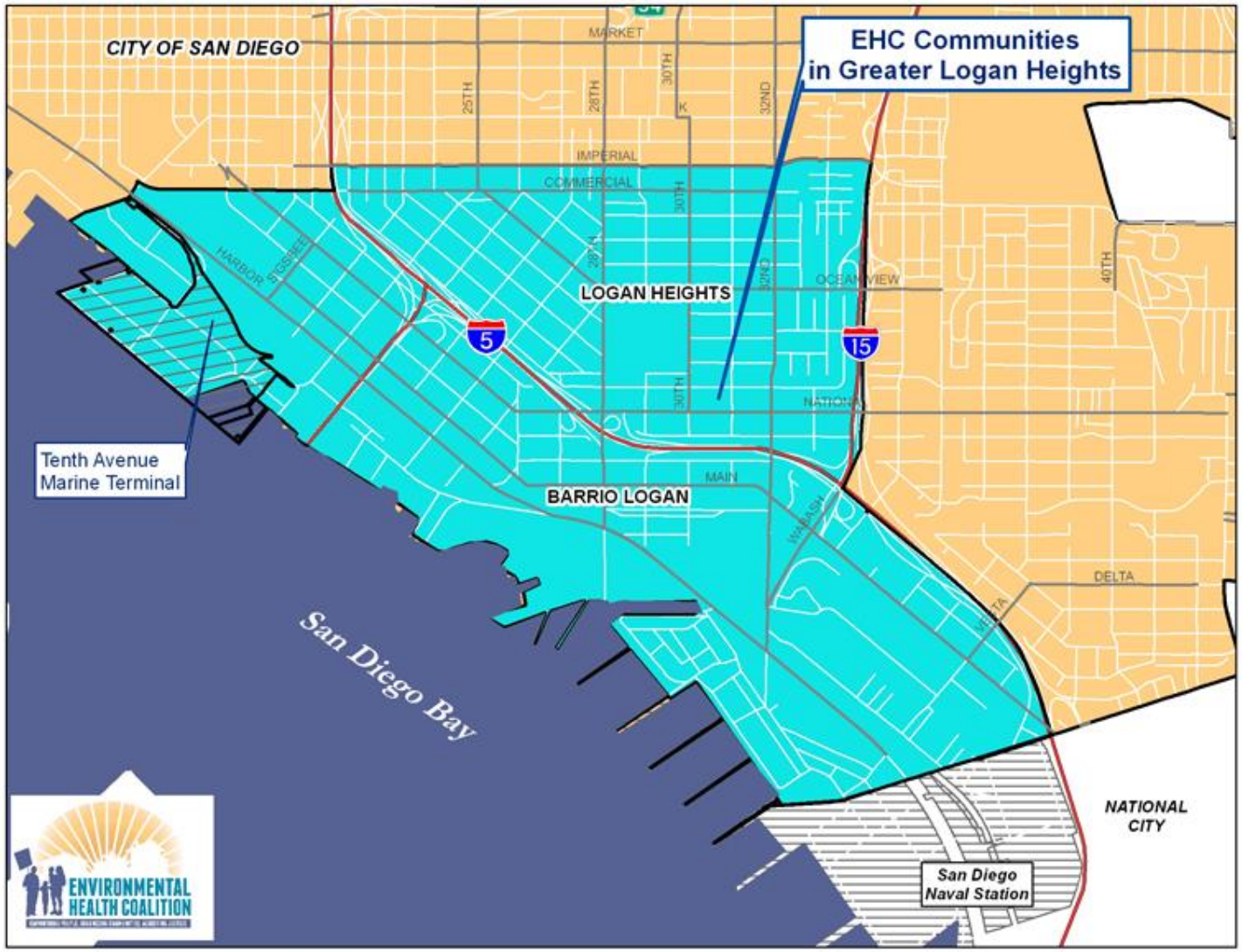


Since immigrants play such a vital part of the present and future of San Diego, it is imperative that programs be implemented that encourage civic engagement.



Source: http://csii.usc.edu/documents/SANDIEGO_web.pdf

Case Study: Barrio Logan



Case Study: Barrio Logan

Environmental Racism
~90% Non-white community created by racially discriminatory real estate covenants
Overcrowding
Encroachment of Industry on residential areas
Destructive Effects of highways and bridges
Once vibrant → junkyards, poverty, and substandard housing

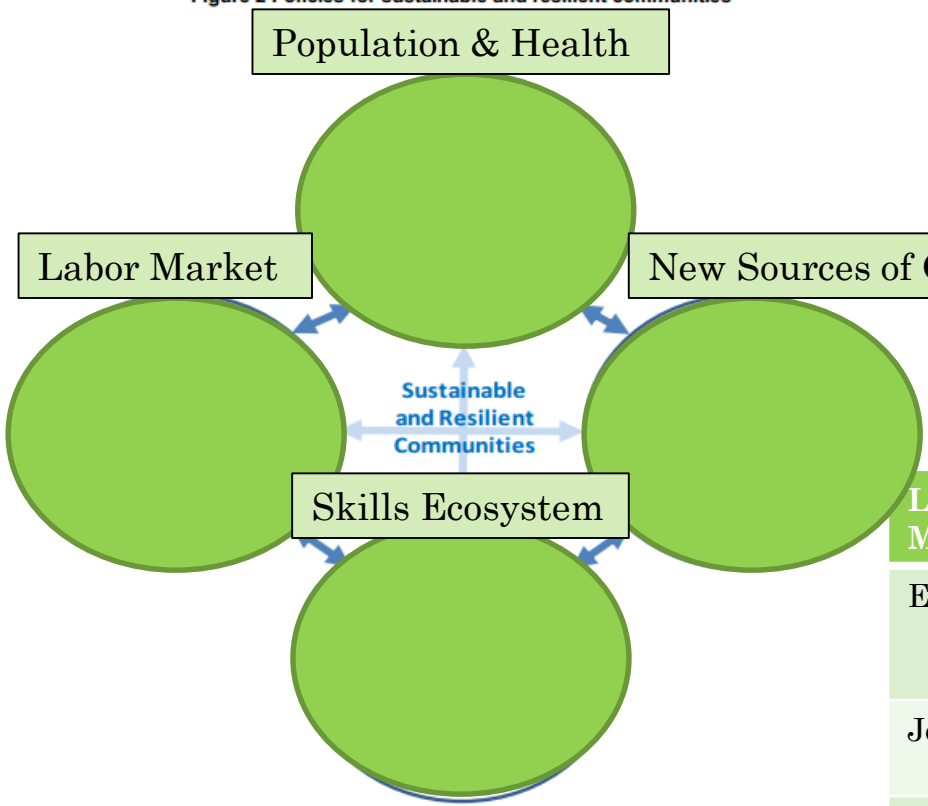
Health Risks
Highest at Risk community in San Diego. Top 5% in state.
Three times the asthma rate as the rest of San Diego

Creating Healthy Neighborhoods

- https://www.youtube.com/watch?v=_pe3v9HPbXo

Resilient Demographics

Figure 2 Policies for sustainable and resilient communities



Source: Based on OECD, 2012

Labor Market	Population & Health	New Sources of Growth	Skills Ecosystem
Employability	Eroded tax-base	Work ecologies approach	Skill supply
Job inequality	Fertility	Silver/White economy	Skill utilisation
Aging Workforce	Longevity	Innovation	Skill development
Retention	Mortality	Green growth	Skill demand
Attraction	Aging		Education and Training
Skills mismatch	Migration		

Moving Forward

Date:Thursday	Topics
June 12	How Global Climate Trends Affect Local Communities
June 19	Sustainability and Resiliency = Mitigate + Adaption
June 26	Geography and Demographics: Where are our Risks?
July 3	Building Resilient Water Systems
July 10	Building Resilient Energy Systems
July 17	Building Resilient Transportation and Transit
July 24	Planning Resilient Agriculture and Food Systems
July 31	Designing Resilient Waste Systems
August 7	Planning for Public Health Stresses
August 14	The Economics of Resiliency. Is it Affordable?
August 21	Resilient Polices and Regulations: Getting Rules Right
August 28	Resilient San Diego and a Platform for other Cities

Image: http://climate-resilient-cities.org/

	San Diego
Sea Level Rise	✓
Tornados	
Thunder Storms	
Hurricanes	
Mass Movements (Mudslides, Bluff Erosion)	✓
Drought	✓
Flood	✓
Wildfire	✓
Extreme temperature	✓
Earthquake	✓
Tsunami	

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Department of Geography

SAN DIEGO STATE UNIVERSITY

Further Information

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Thank you for your time!