

# Session 1: Planning For Our Future



# Who are we?



# What is Geodesign?



Shannon McElvaney - ESRI

**Geodesign** is a methodology that promotes **designing with geography** instead of designing around geography. Geodesign integrates science, social, and aesthetic values into landscape planning with geospatial tools that enable rapid, iterative evaluation of design alternatives against their probable outcomes.

# Design Science

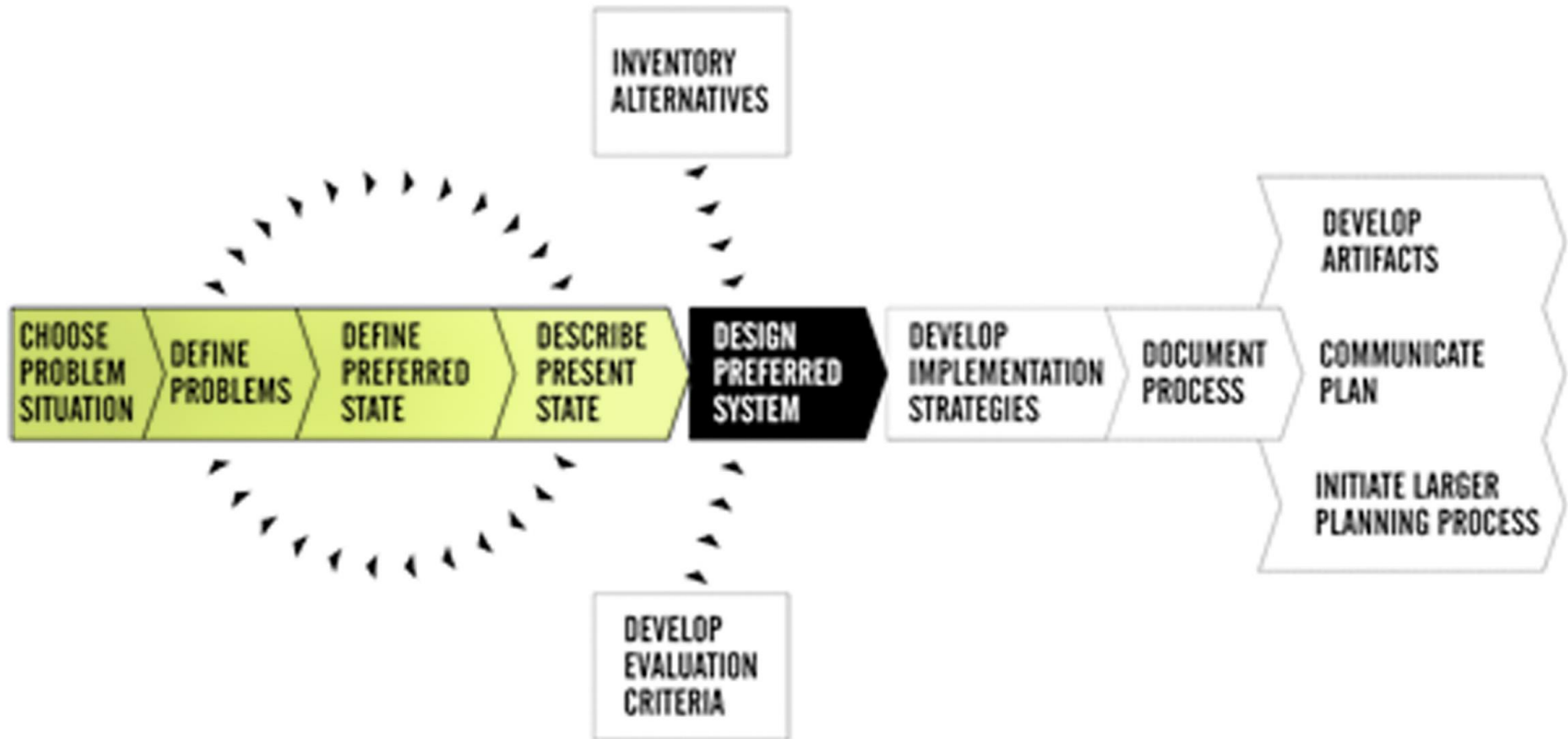


R Buckminster Fuller

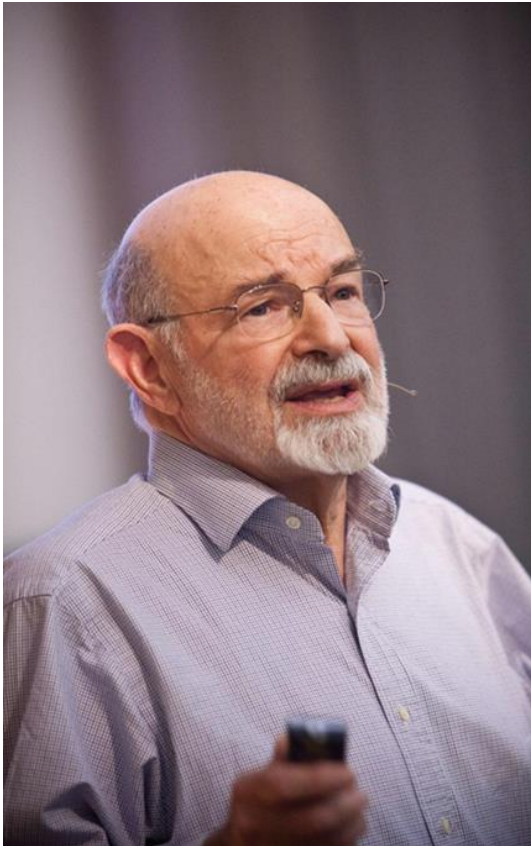
**Design Science** is the effective application of the principles of science to the conscious design of our total environment in order to help make the Earth's finite resources meet the needs of of all humanity without disrupting the ecological processes of the planet



# Design Science

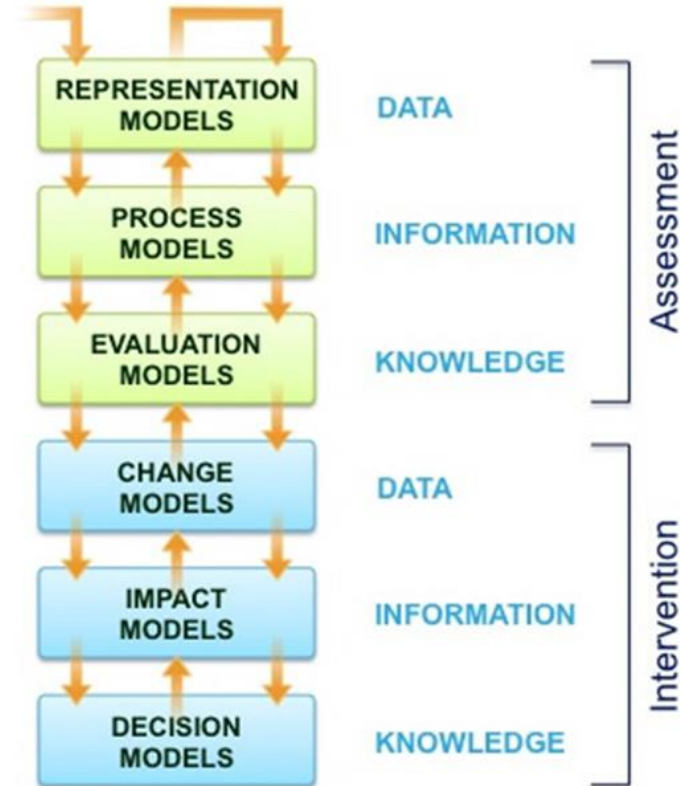


# Design Science



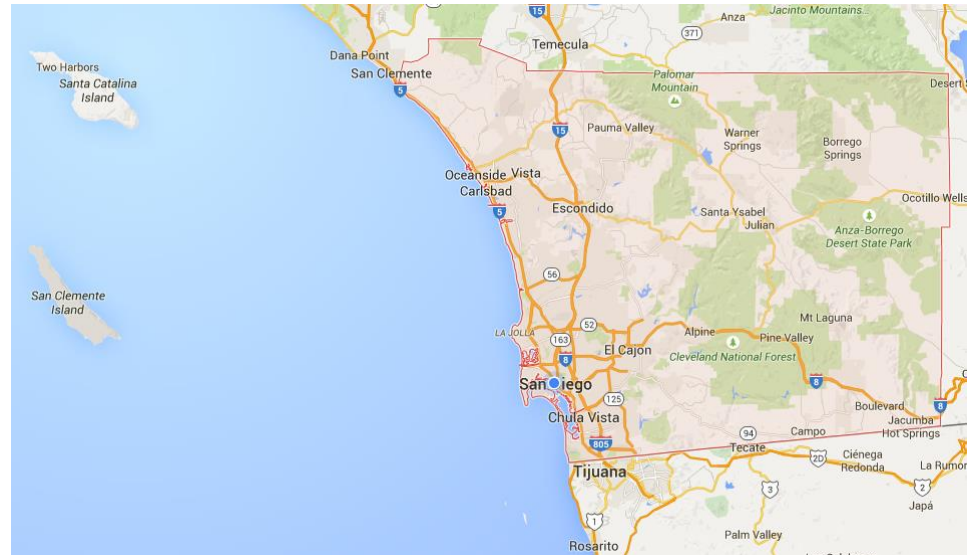
Carl Steinitz – Retired from Harvard School of Design.

- 1** How should the landscape be described?
- 2** How does the landscape operate?
- 3** Is the landscape working well?
- 4** How might the landscape be altered?
- 5** What differences might the changes cause?
- 6** Should the landscape be changed?

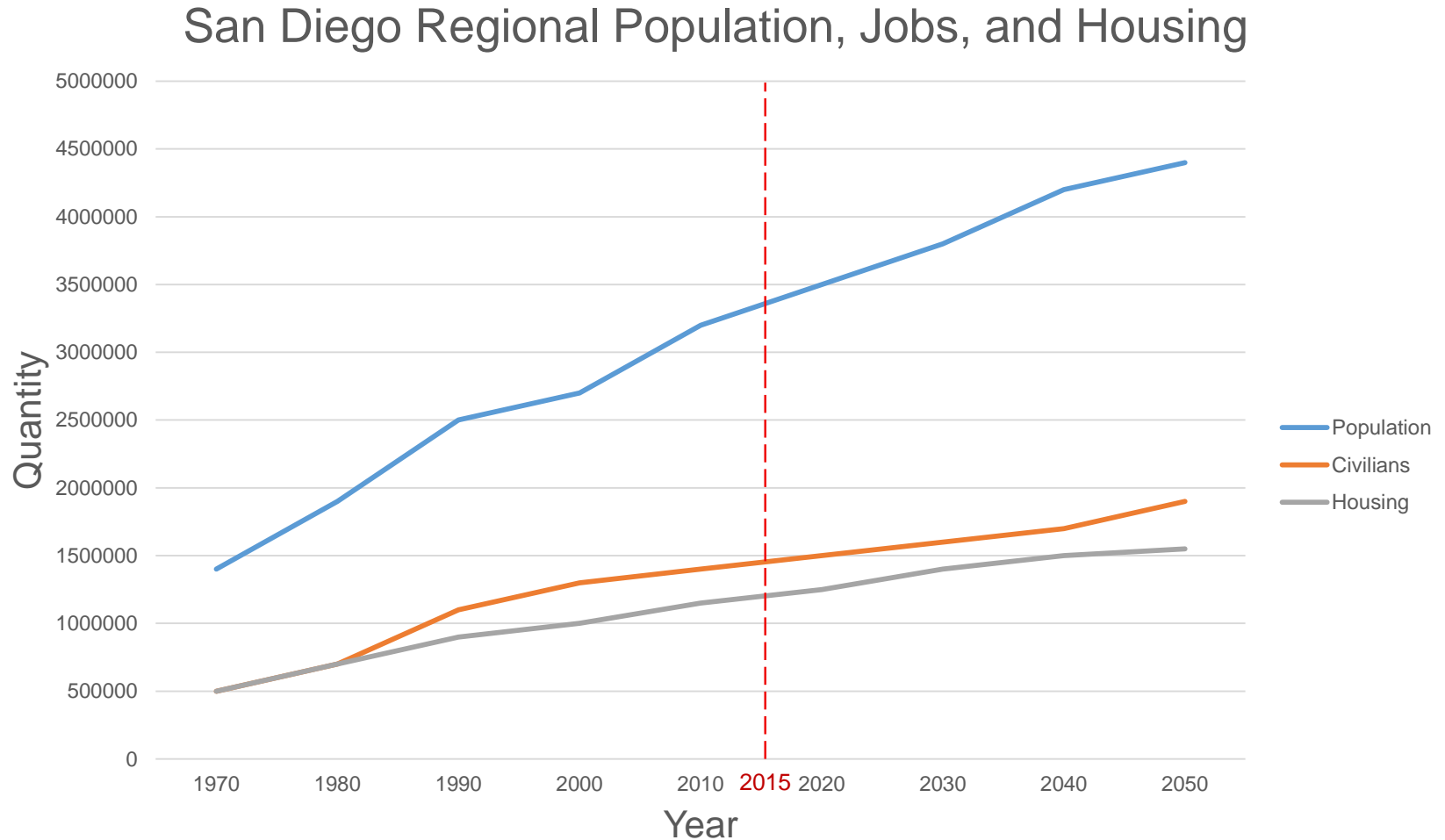


# San Diego

The current state



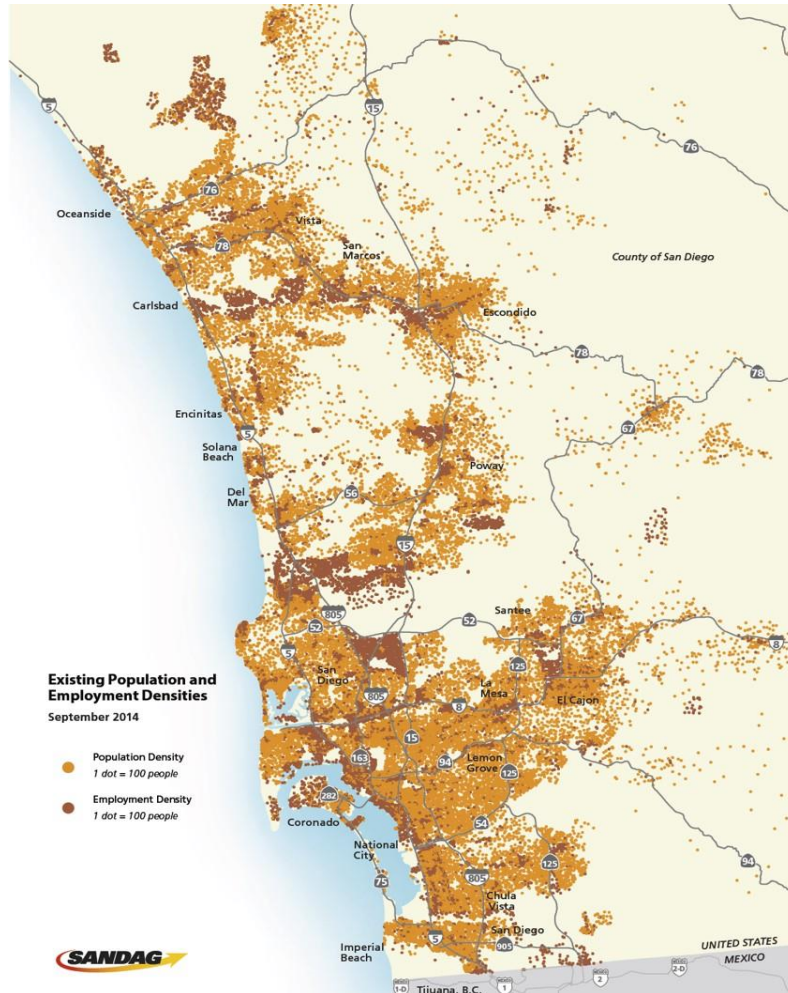
# San Diego Demographic forecast



Source: SANDAG regional growth forecast



# San Diego Demographics



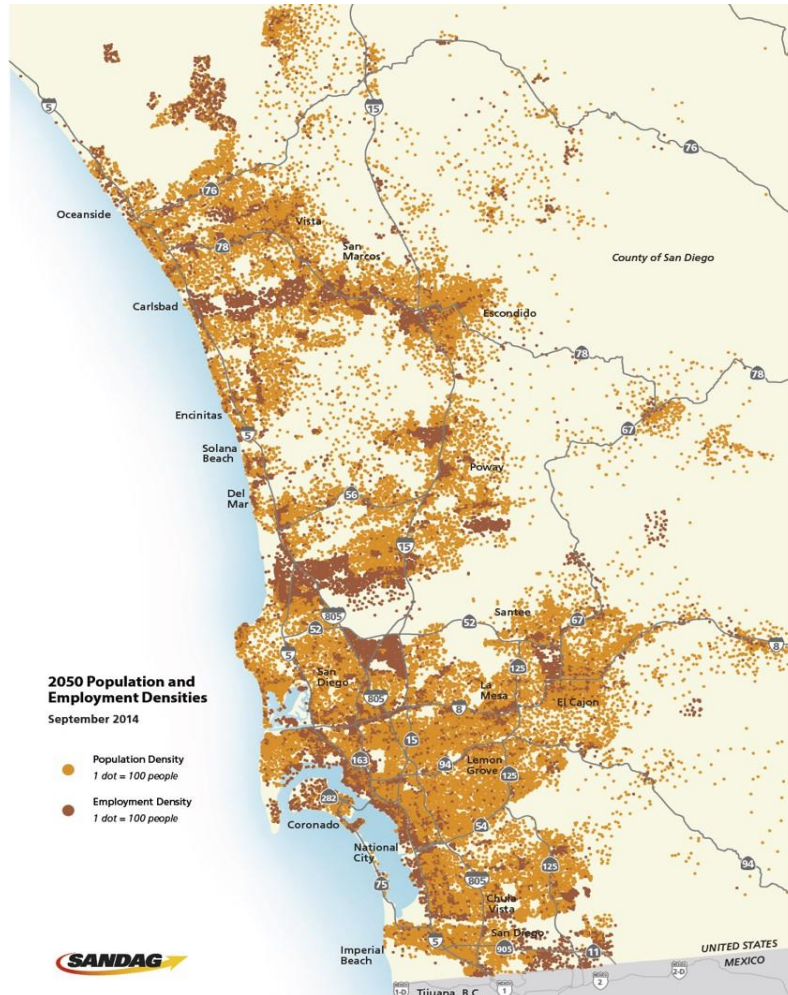
## Existing Population and Employment

- 3.1 million people
- 1.5 million jobs
- 1.2 million homes

- Population Density  
1 dot = 100 people
- Employment Density  
1 dot = 100 people

Source: SANDAG

# Projected San Diego Demographics



## 2050 Population and Employment

- 4.1 million people
  - Projected 1 million increase
- 1.9 million jobs
  - Projected 400,000 increase
- 1.5 million homes
  - Projected 300,000 new homes

Population Density  
1 dot = 100 people

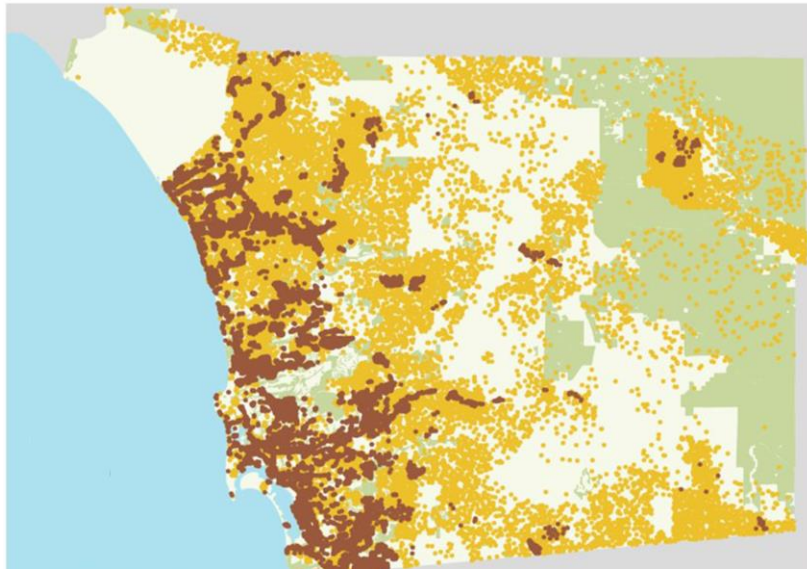
Employment Density  
1 dot = 100 people

Source: SANDAG

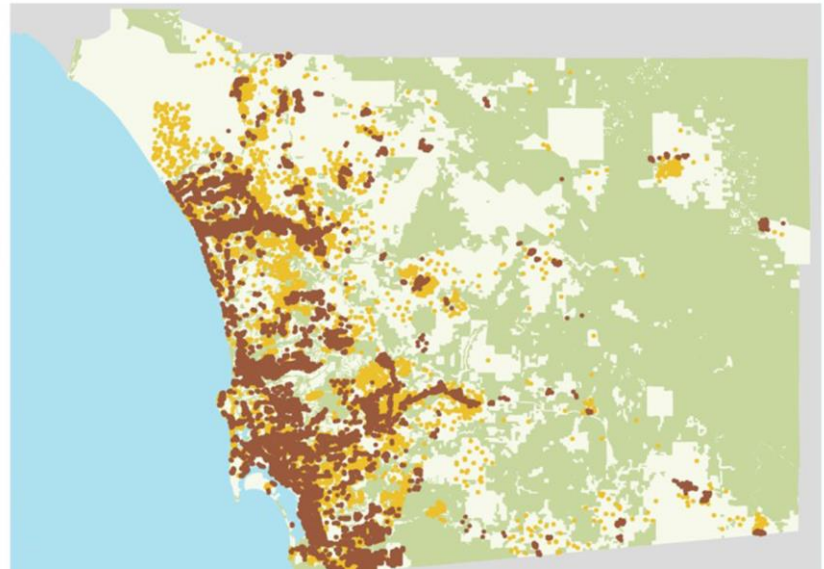
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# San Diego Land Use

1999 Planned Land Use



2015 Planned Land Use



- Population Density  
1 dot = 1 person
- Employment Density  
1 dot = 1 person

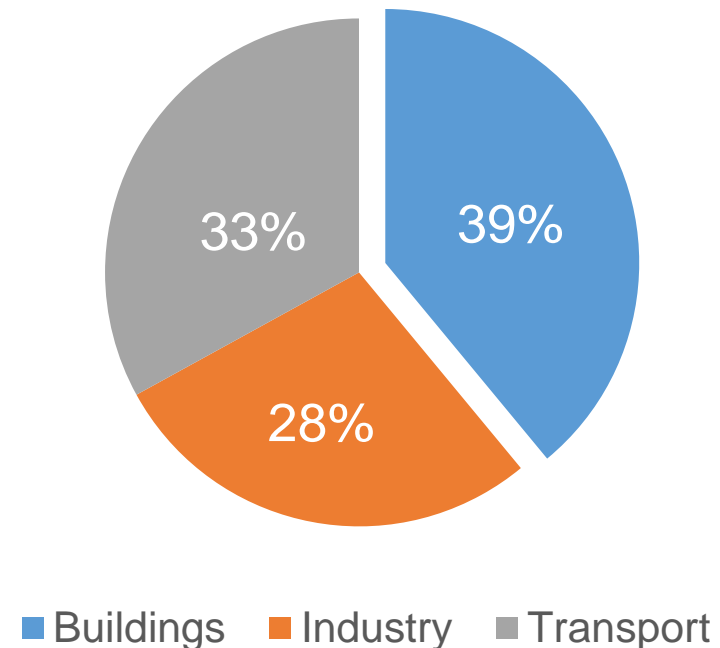
Source: SANDAG/ San Diego Forward



# San Diego Built Environment

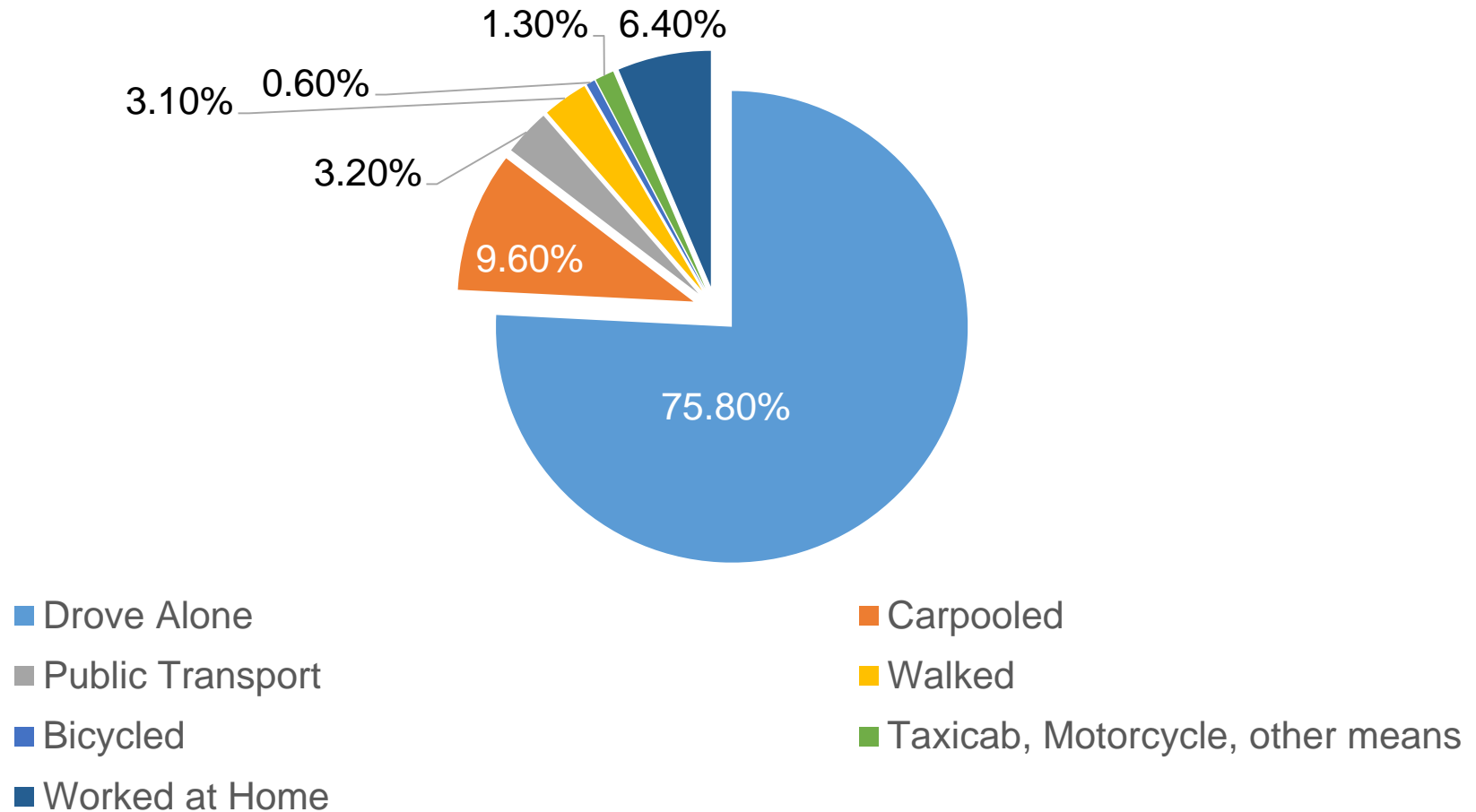
- Within the next 25 years, emissions from commercial buildings **will grow the fastest at a rate of 1.8%** through to 2030.
- Buildings **consume 70%** of the electricity load in the U.S.

CO2 Emissions from Fossil Fuels





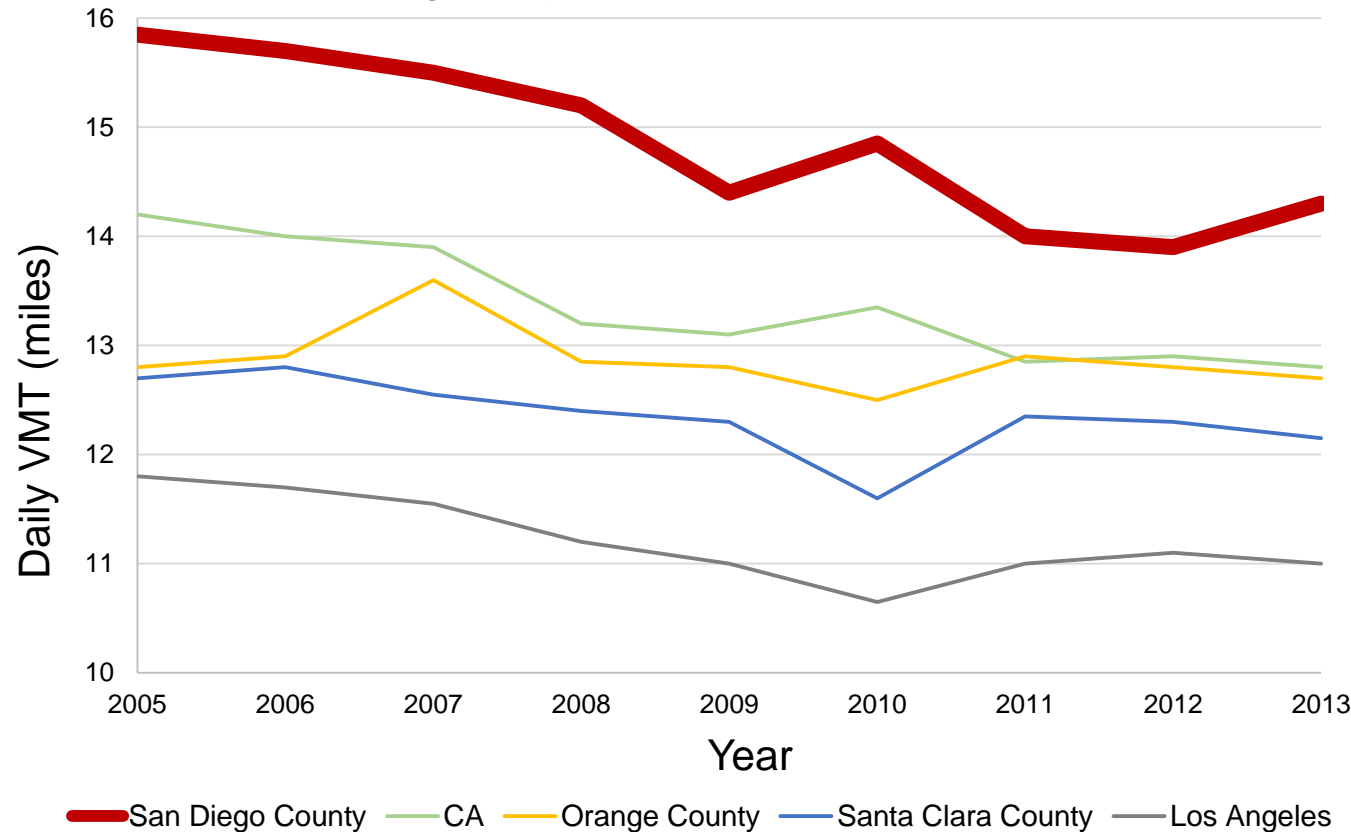
# San Diego Transport and Transit to Work



Source: SANDAG/ San Diego Forward

# San Diego Transport

## CA Highway Transportation Breakdown

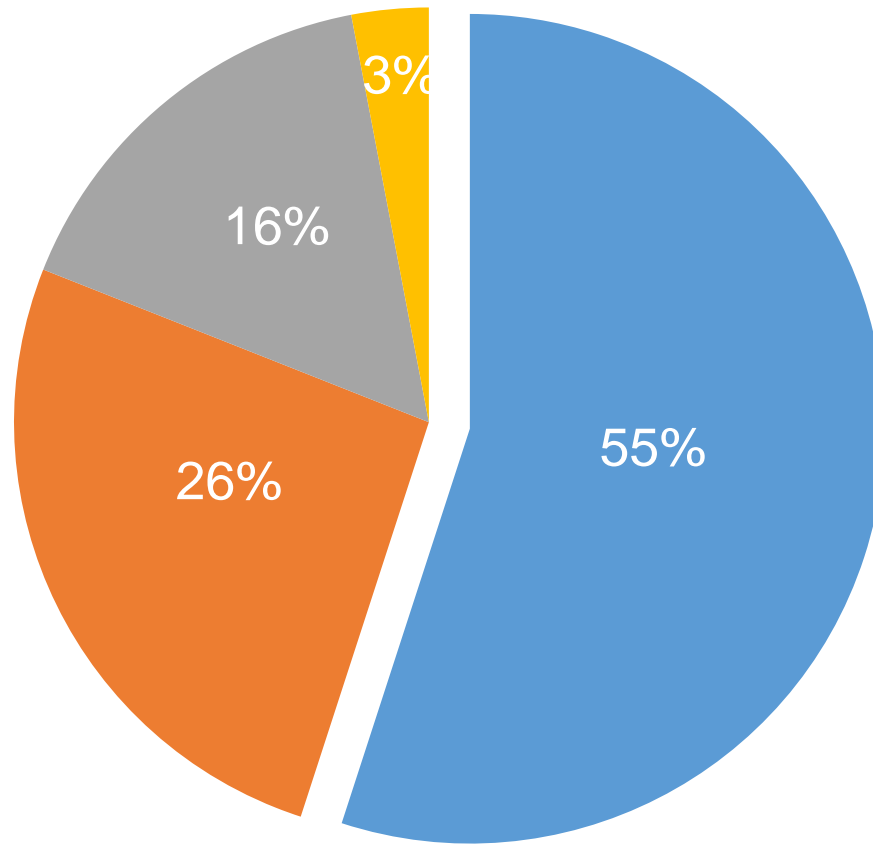


### A Closer look

- Downtown Metric
  - **6.3 VMT** per capita per day
- Suburban Metric
  - **19.8 VMT** per capita per day

Source: Equinox Center 2015

# San Diego Carbon Emission Breakdown



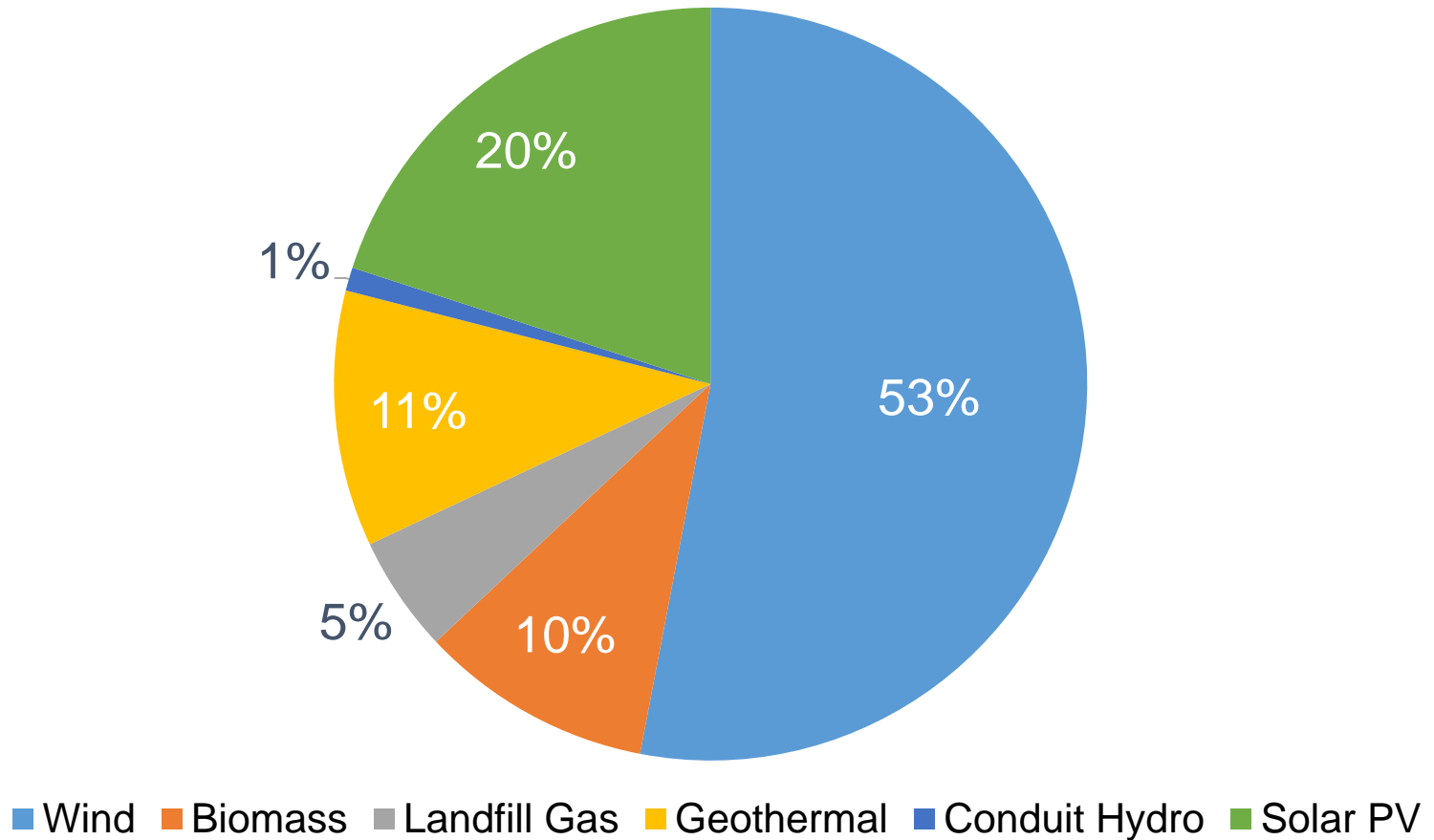
- CO<sub>2</sub> emissions in San Diego county are **caused mainly by transportation.**
- San Diegans simply use their cars too much.

■ transportation ■ electric ■ natural gas ■ solid waste/waste water

Source: SANDAG/ San Diego Forward

# San Diego Renewable Energy Mix

SDG&E Renewable Energy Mix 2013

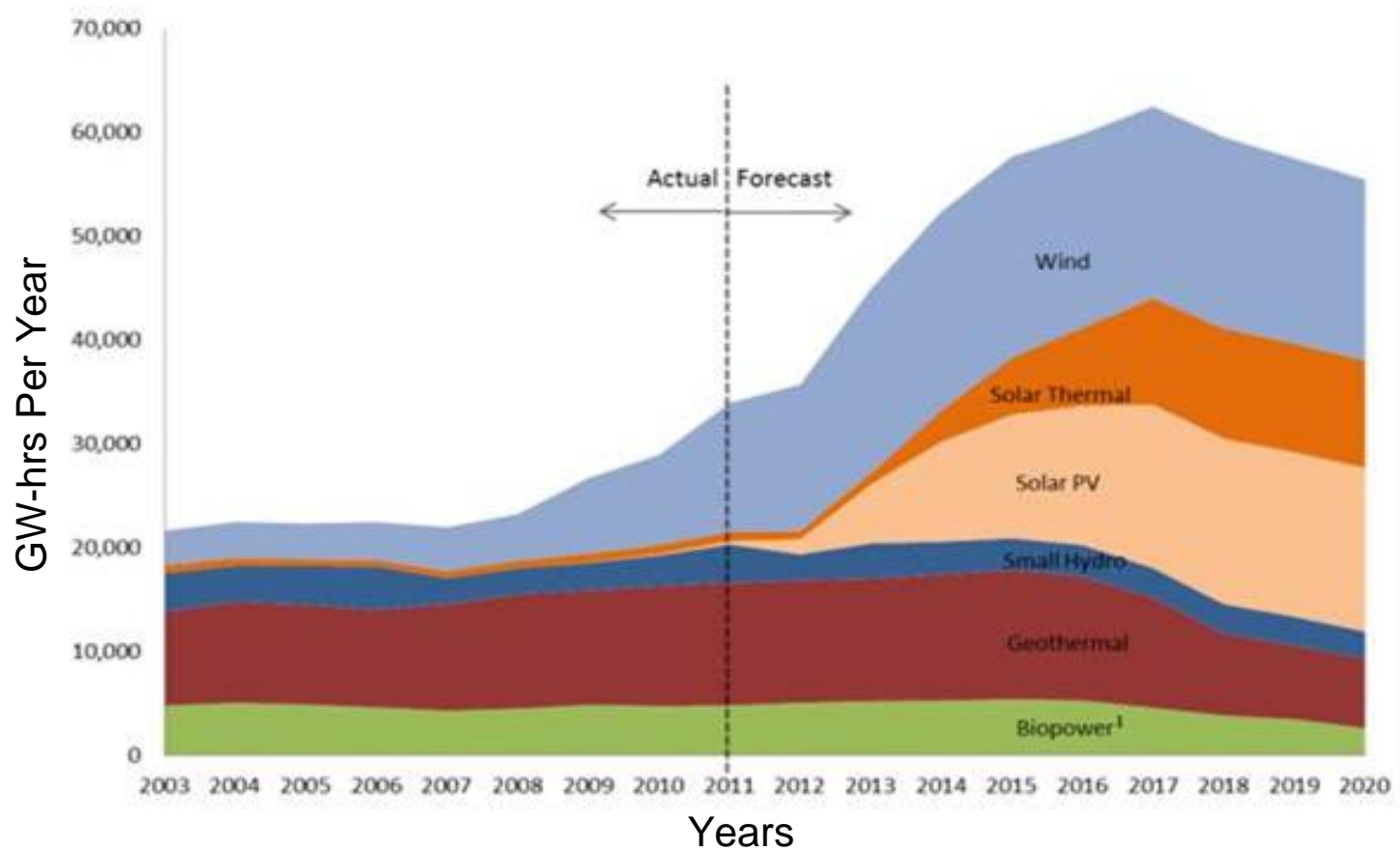


Source: SANDAG/ San Diego Forward



# San Diego Renewable Energy Mix

Renewable Resource Mix, Actual and Forecasted



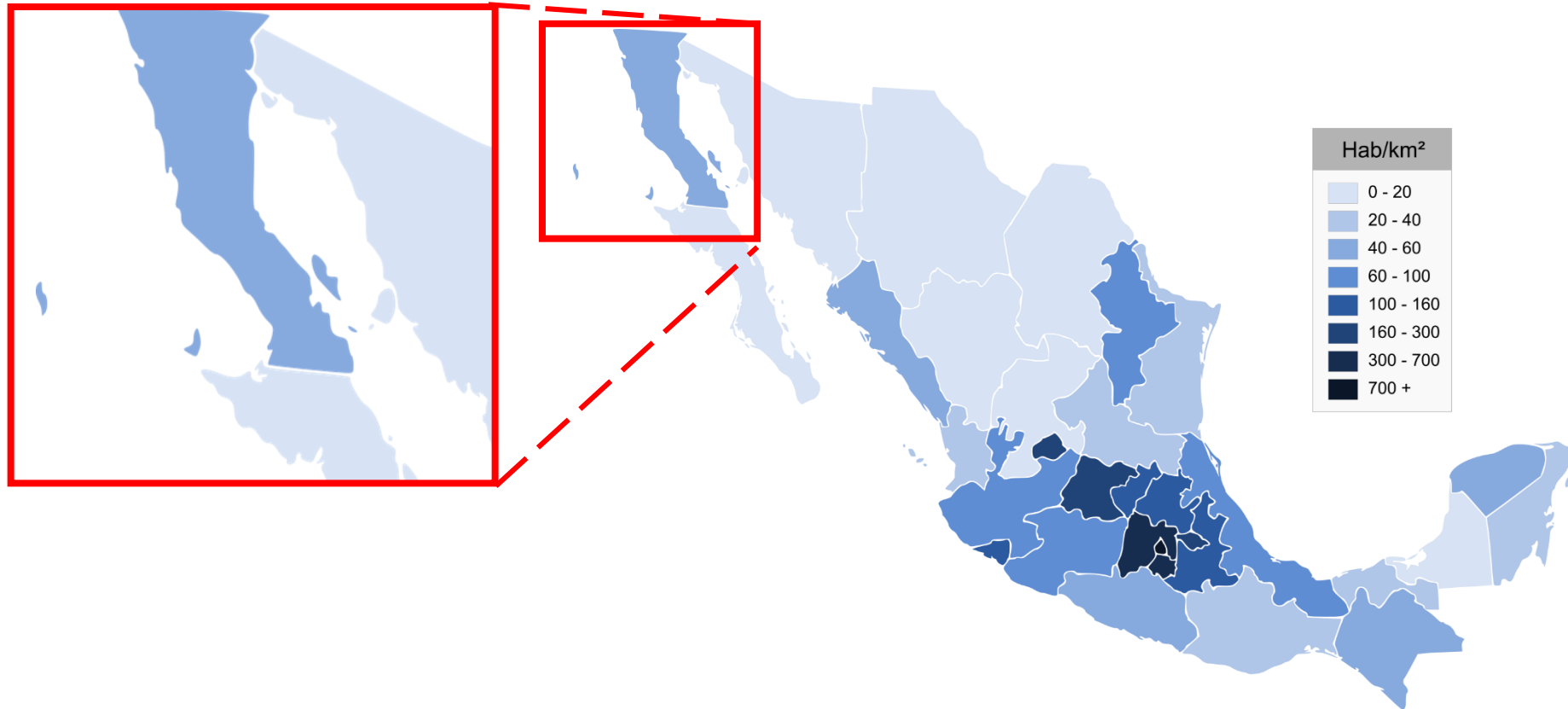
Source: California Public Utilities Commission 2012 RPS Program Status Report

# Baja California

The current state

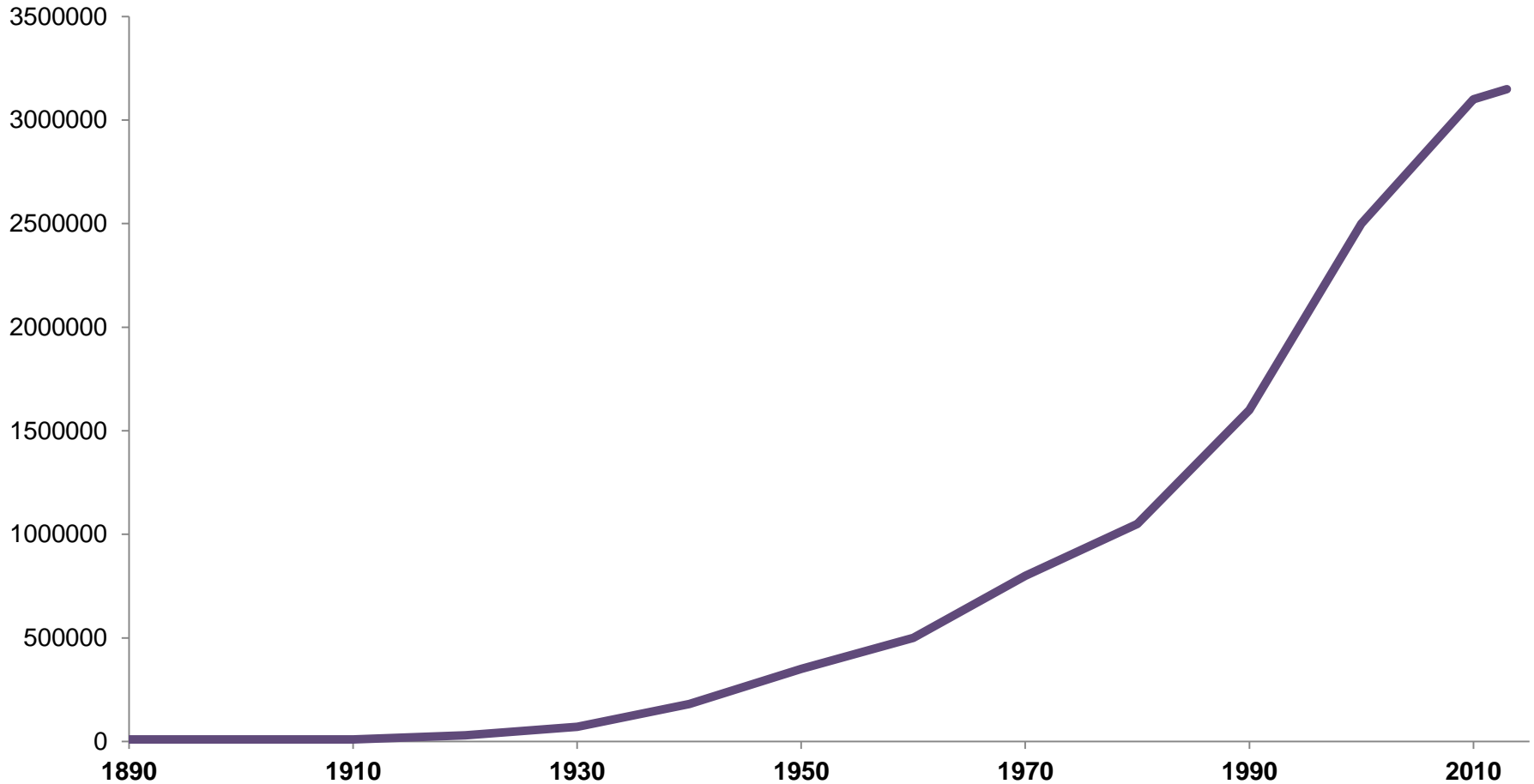


# Baja Population Density



Source: INEGI Population Distribution

# Baja Population Trend

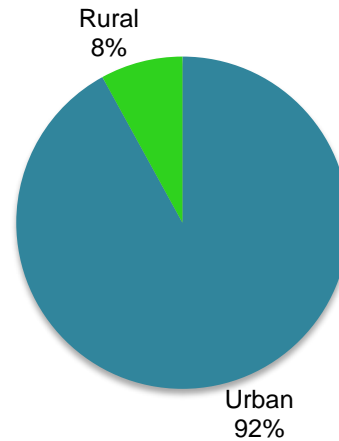
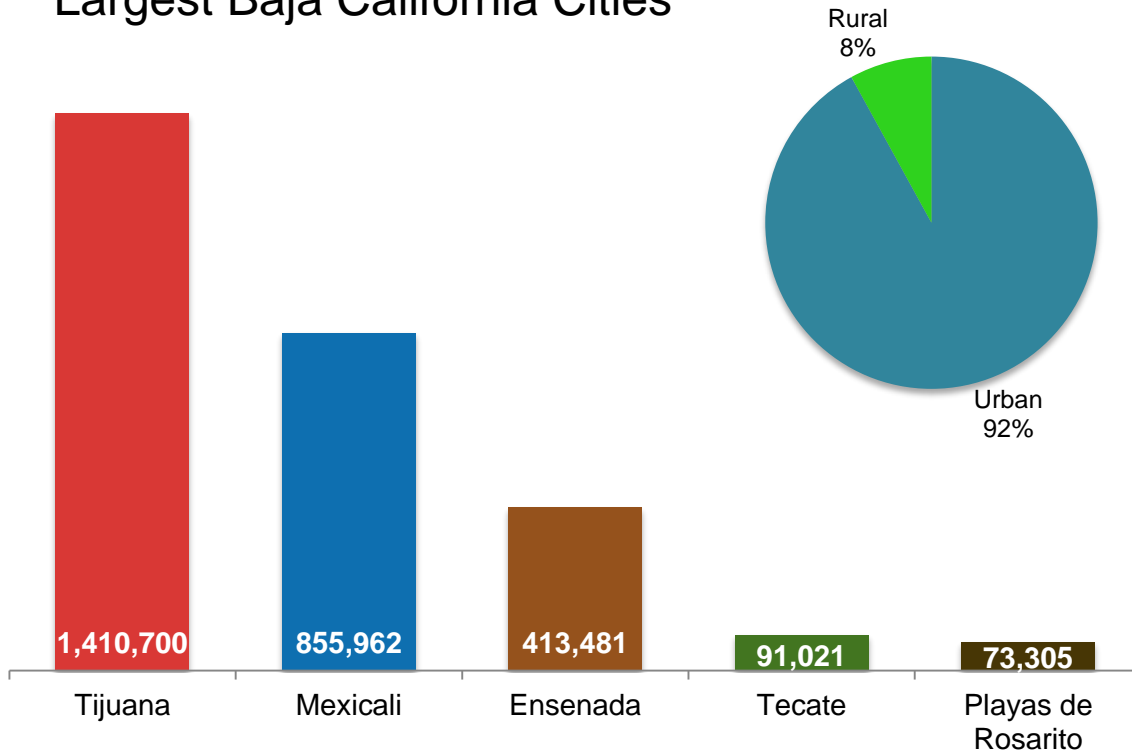


Source: Panorama Social Demographics of Baja California



# Baja Population Distribution

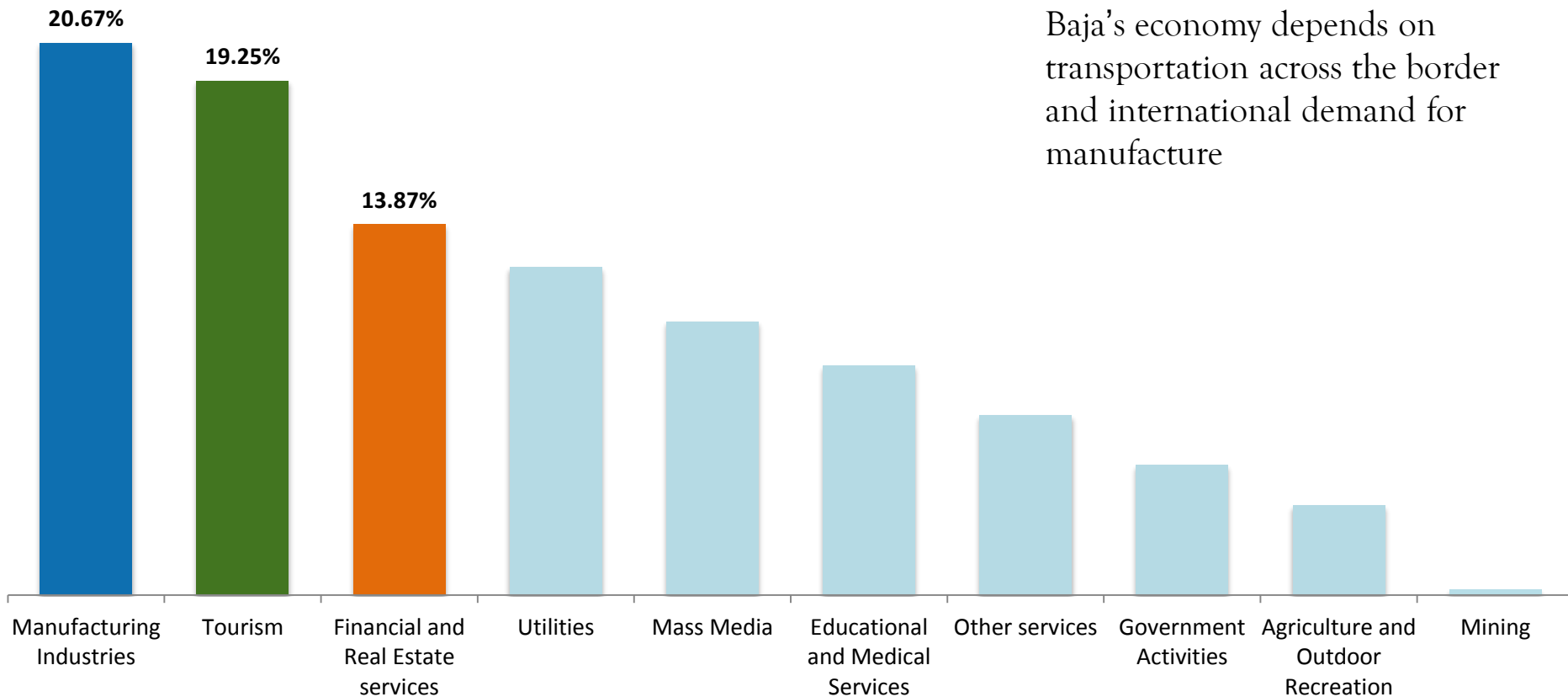
Largest Baja California Cities



Source: CIA World Fact Book

# Baja Economic Activity

## Top Baja Industries (%GDP)



Baja's economy depends on transportation across the border and international demand for manufacture

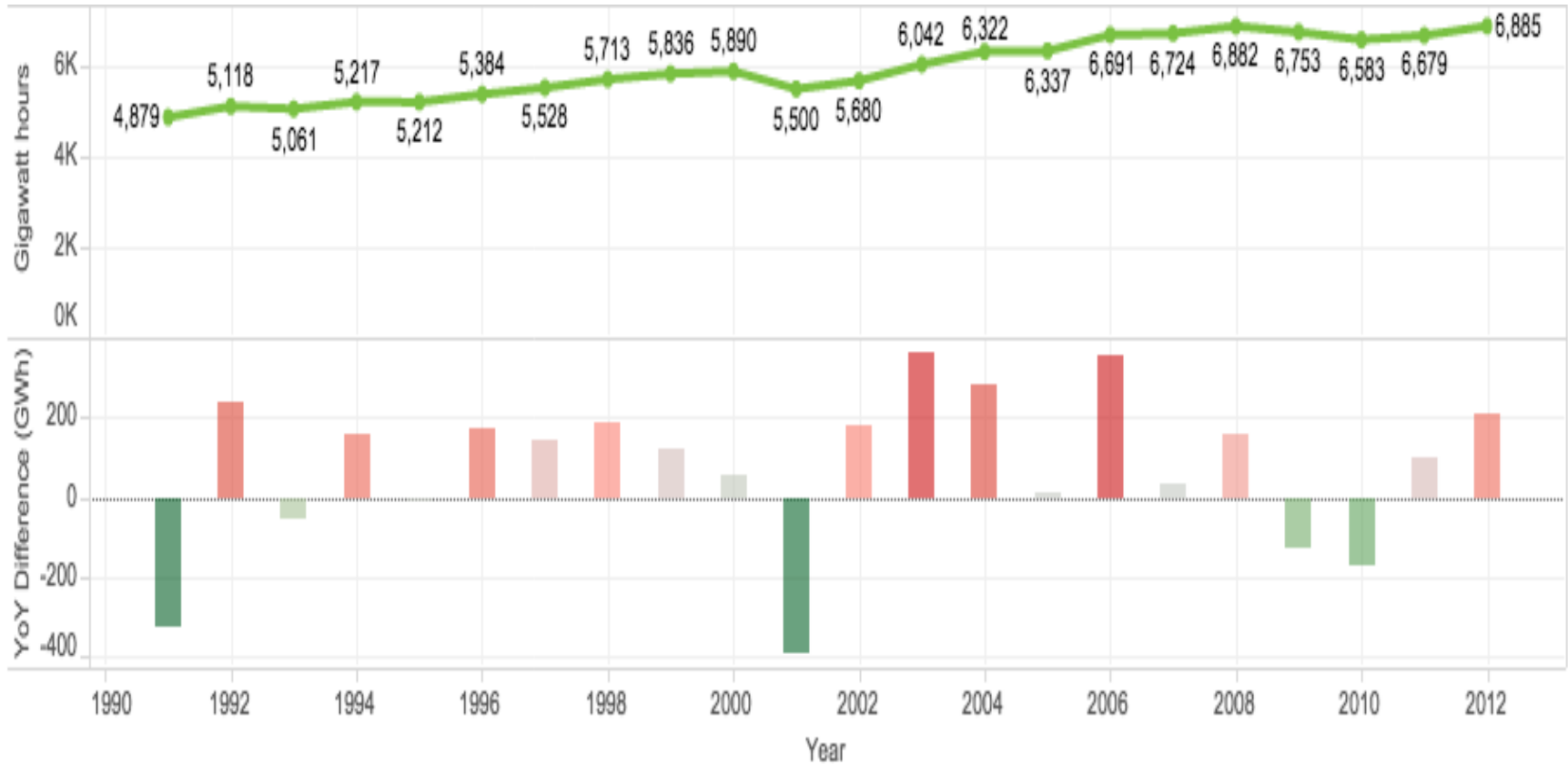
Source: INEGI System of National Accounts of Mexico

# San Diego

Problems with the current state

# Electricity Consumption

## Annual Residential Electricity Consumption (GWh)



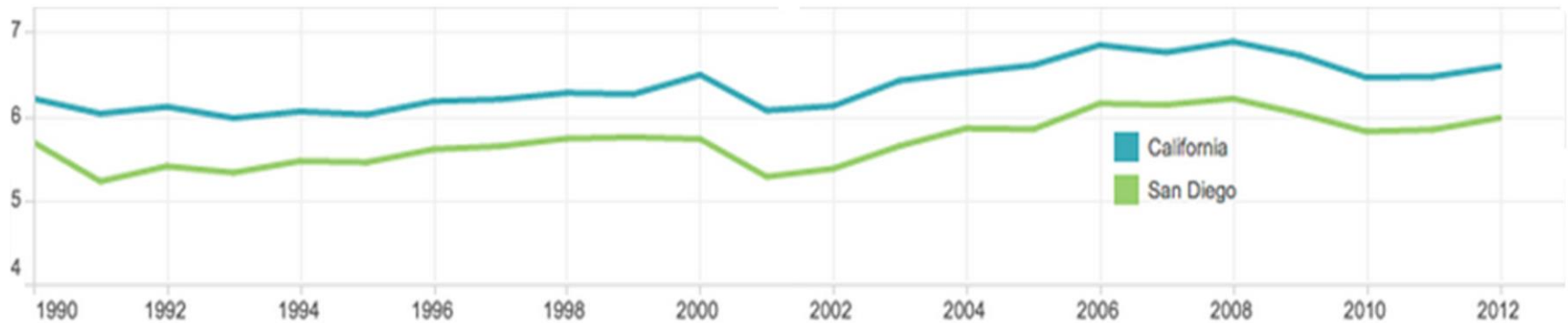
- Households' electricity consumption about **40%** of San Diego's total electricity use

Source: Equinox Center – Quality of Life Dashboard 2015



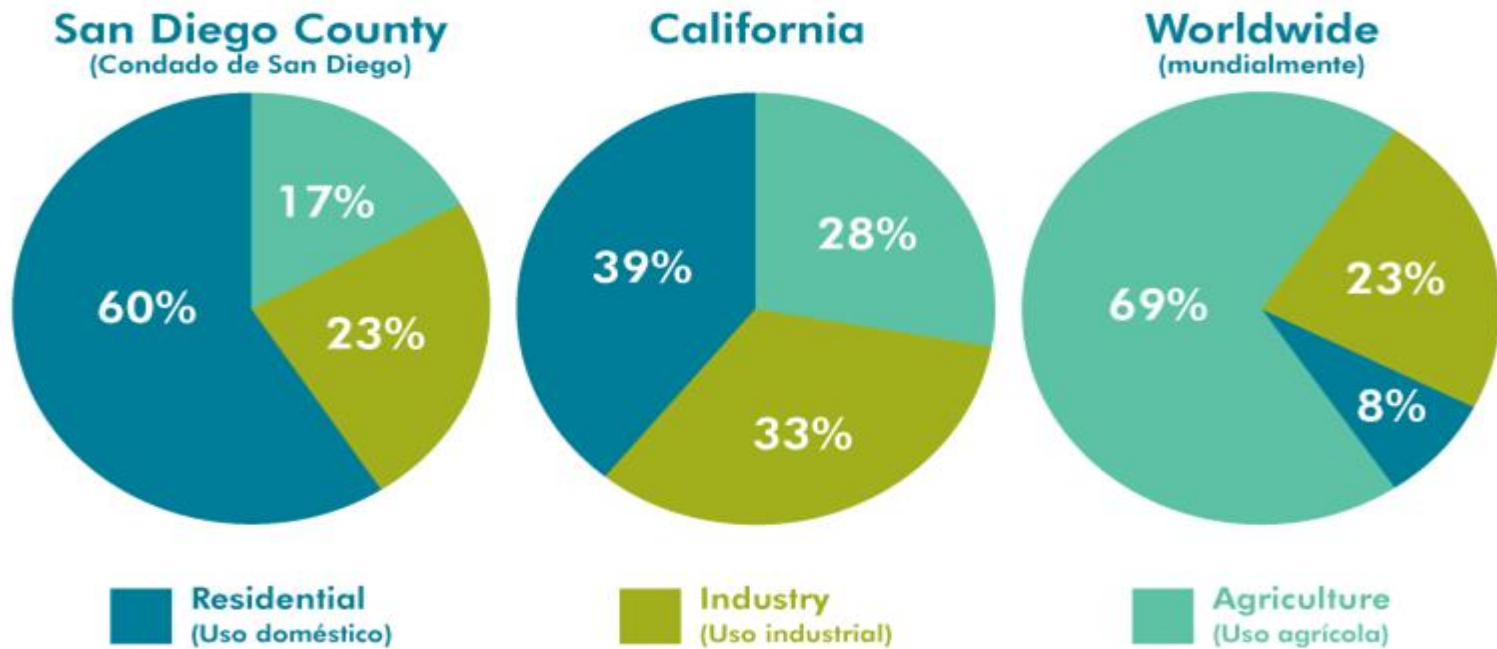
# Electricity Consumption

Domestic Electricity Consumption Per Capita (kWh/day)



- San Diego's Electricity use is increasing in the last 2 years

# Water Consumption

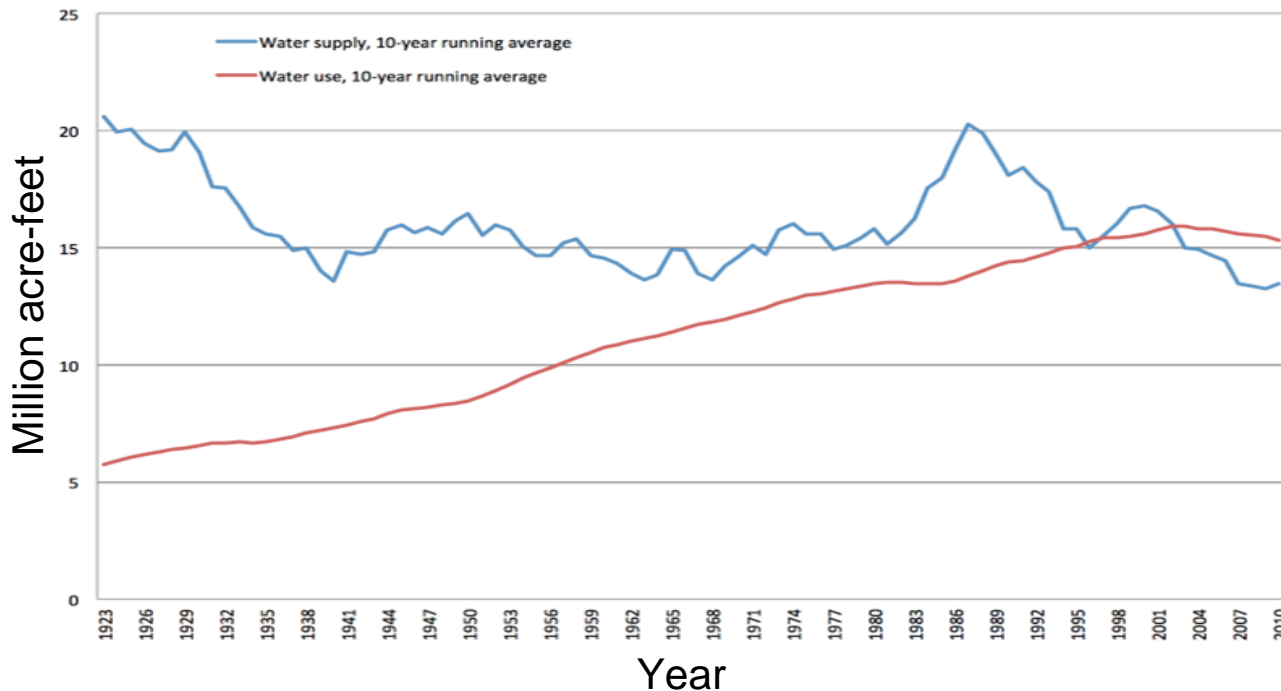


- **Over 50%** of San Diego's Water is used in **Residential Areas**
- Water Usage Exceeds the State's Average
- In **North County** the average water usage is anywhere from **250-500 gallons per capita per day**. In the city and out east it is closer to **150 gallons per capita per day**.

Source: World Resources Sim Center

# Water Supply - River

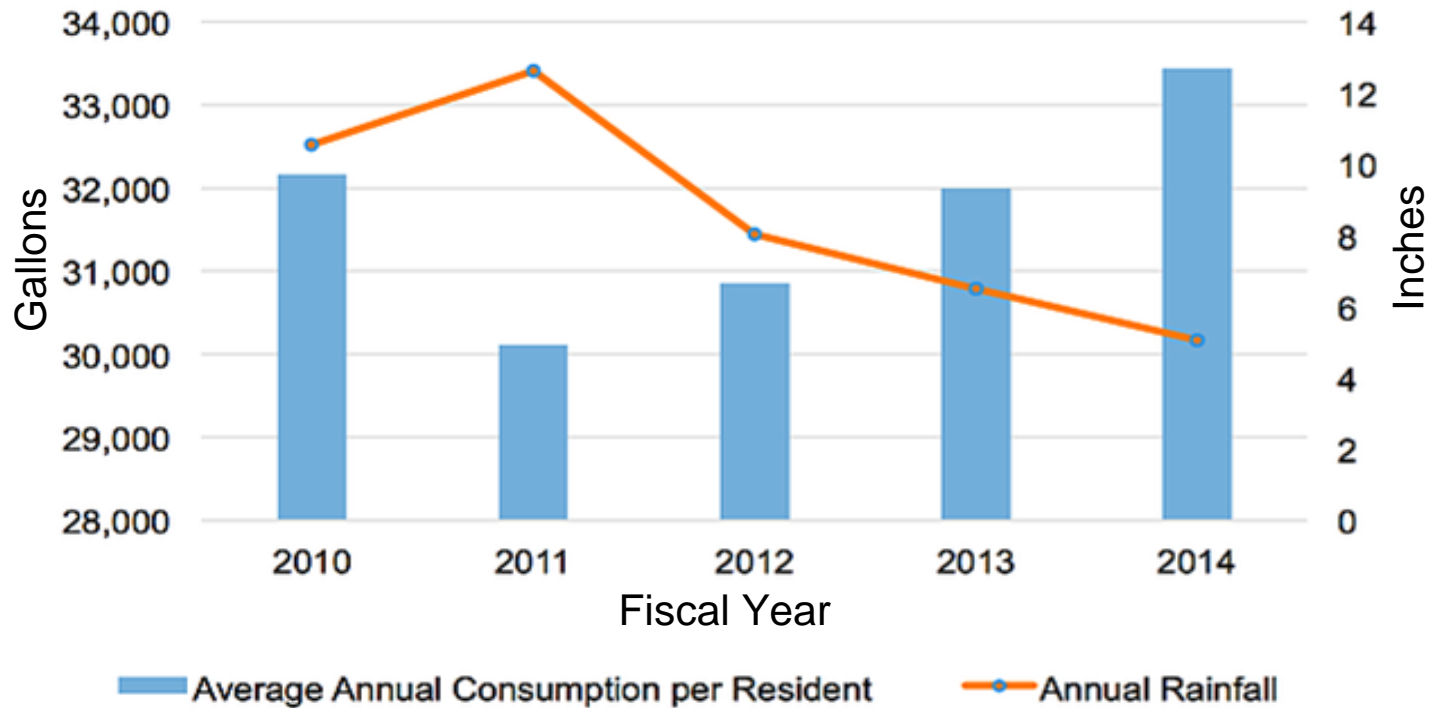
## Water supply and water use in the Colorado River Basin



- The Colorado River levels have dropped by 40% and is still falling.

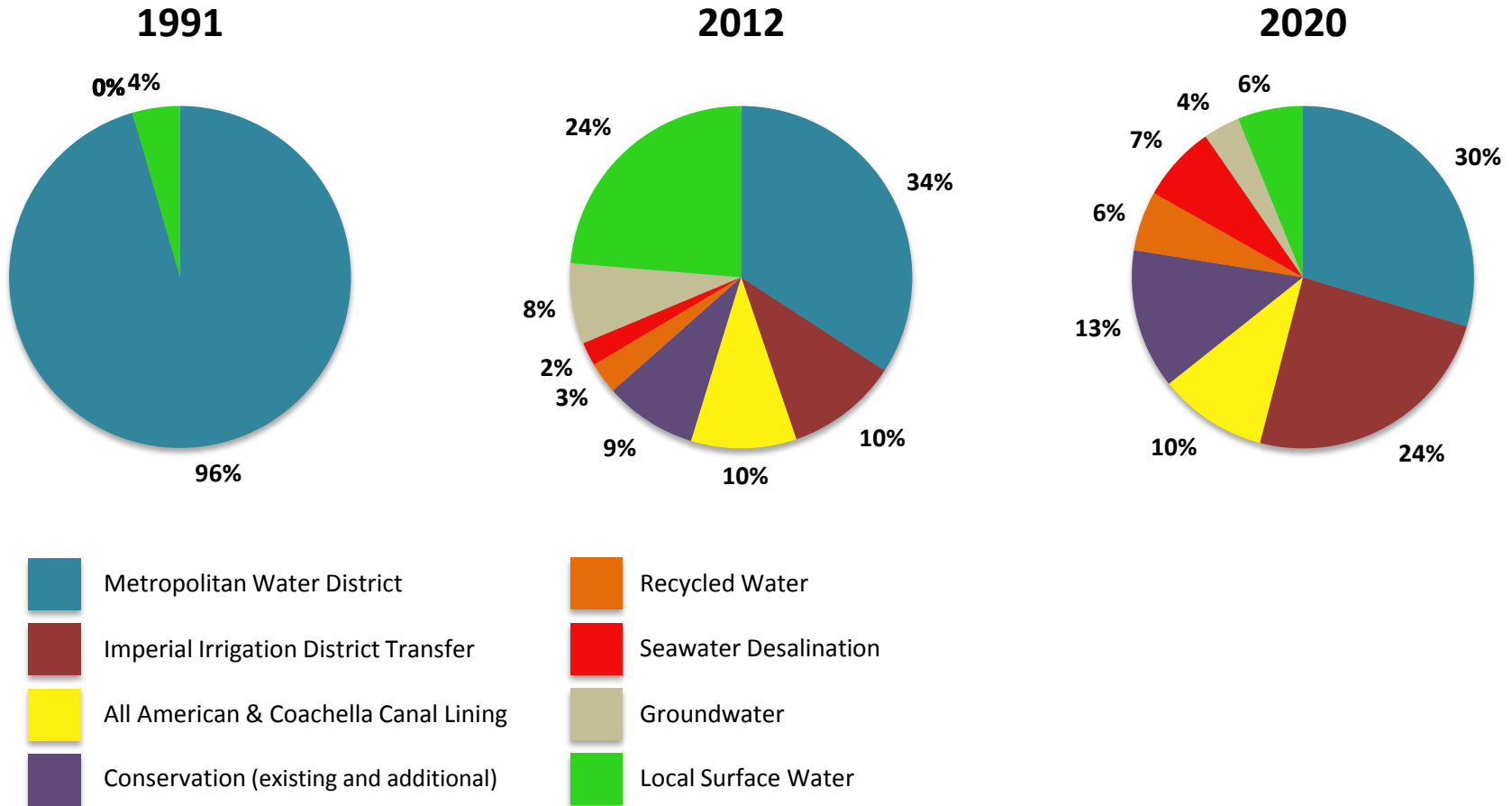
# Water Supply - Rainfall

Average Annual Residential Water Consumption per Resident vs. Annual Rainfall



Source: KBPS Radio

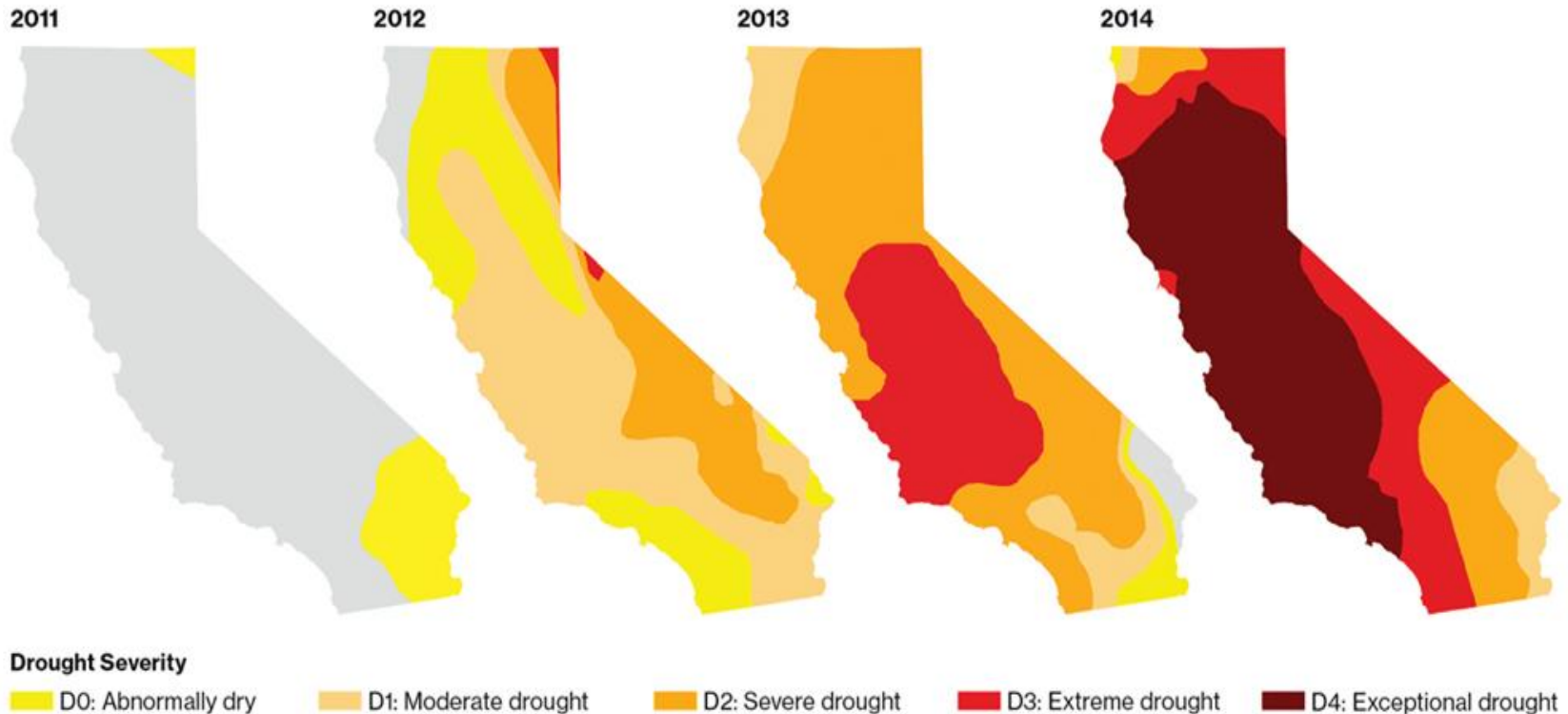
# Water Supply



Source: San Diego County Water Authority



# Current Drought Situation



- A recent estimate suggests that the 2012-2014 drought is the worst in 1200 years.

Source: U.S. Drought Monitor.

# Depleted Reservoirs

Lake Powell of the Colorado River



Source: NASA Earth Observatory.

# Depleted Reservoirs



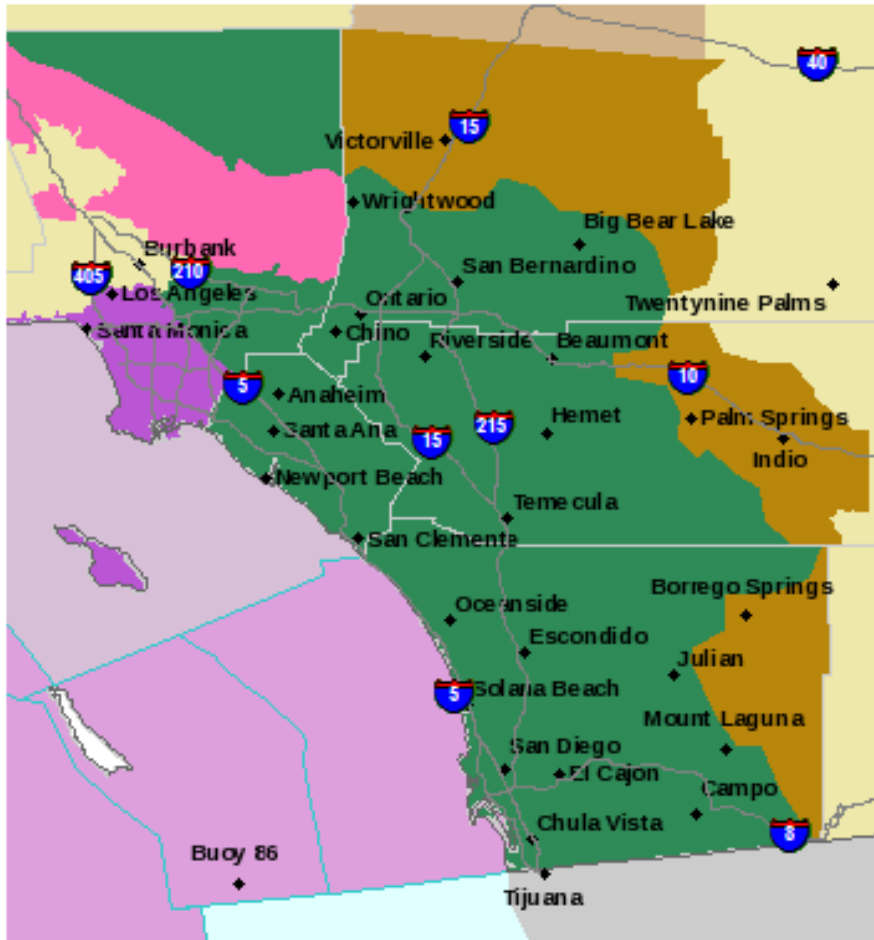
- Southern California **relies mostly on reservoirs** coming from the Colorado.
- Both Lake Powell and Lake Mead have suffered from **less snowpack** in the Rockies.

Lake Mead (Above) in 2015, showing the 80 ft. change in water line in the past decade and a half.

Source: NASA Earth Observatory.



# Flash Flood Control



Green region on the map indicates areas that are subjected to flash floods.

- Because of Southern California's low rainfall there tends to be **higher risk for flash floods.**
- A combination of **poor ground infiltration** of developing areas and unique **alluvial soil formations** cause **mudslides and flash flood.**

Source: National Weather Service 2014

# Coast/Cliffside Erosion



- As ocean water levels increase, California coastlines are being **eroded at quicker rates**.
- Even minimal increases in ocean water levels ( $\sim$  mm), causes **significant change**.

Source: USGS



# More Frequent Wild Fires



- Wildfires are becoming larger and more frequent as a result of a combination of hotter, drier weather and changing Santa Ana winds.
- Of the 20 largest fires in CA since 1932, 19 occurred after 1970.
- New research suggests that this is linked to more droughts caused by human-induced climate change.

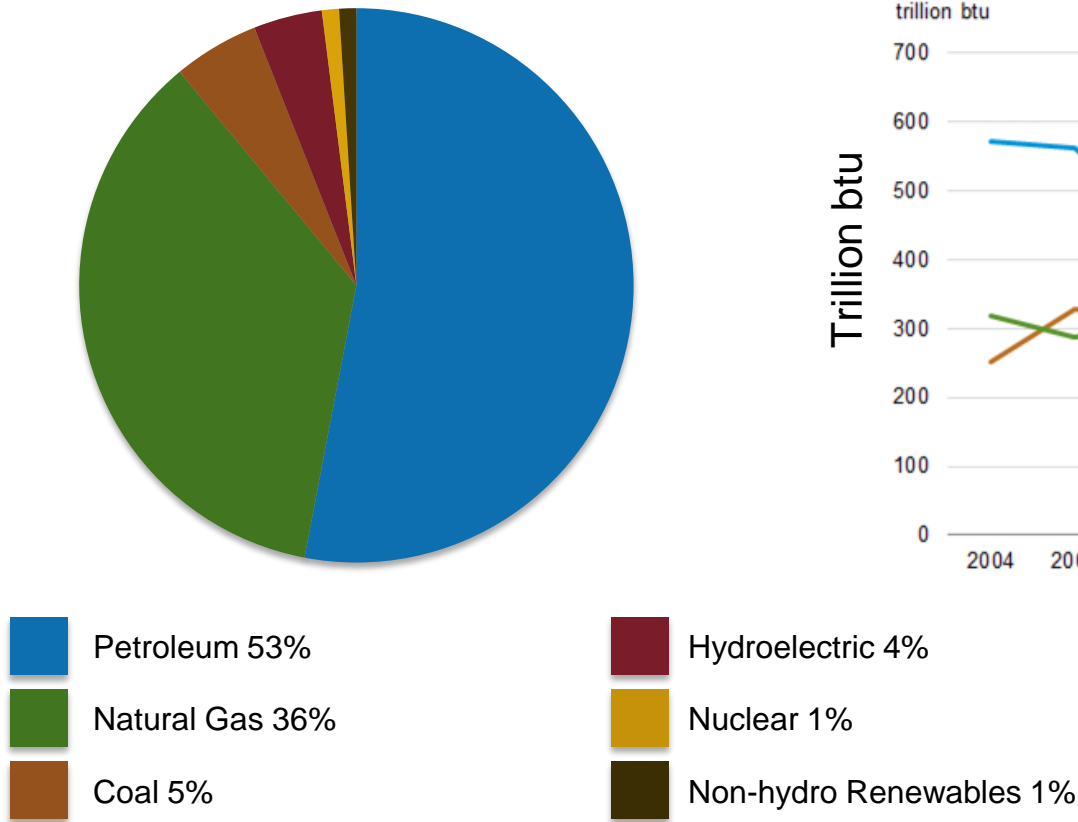
Source: FOX news

# Baja California

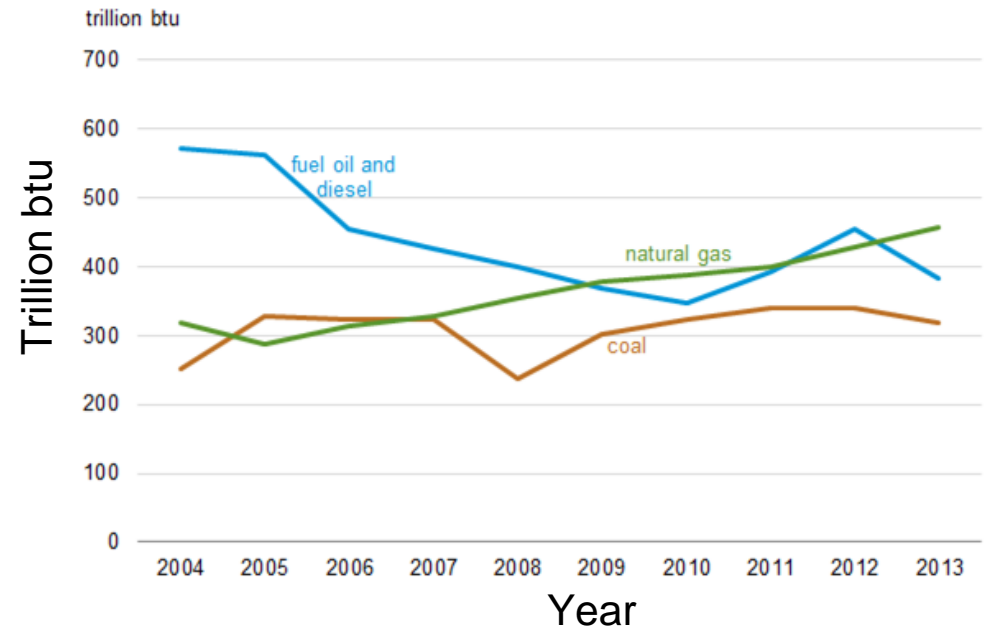
Problems with the current state

# Baja Energy Consumption

2012 Energy Mix



Consumption of Fossil Fuels for Electricity

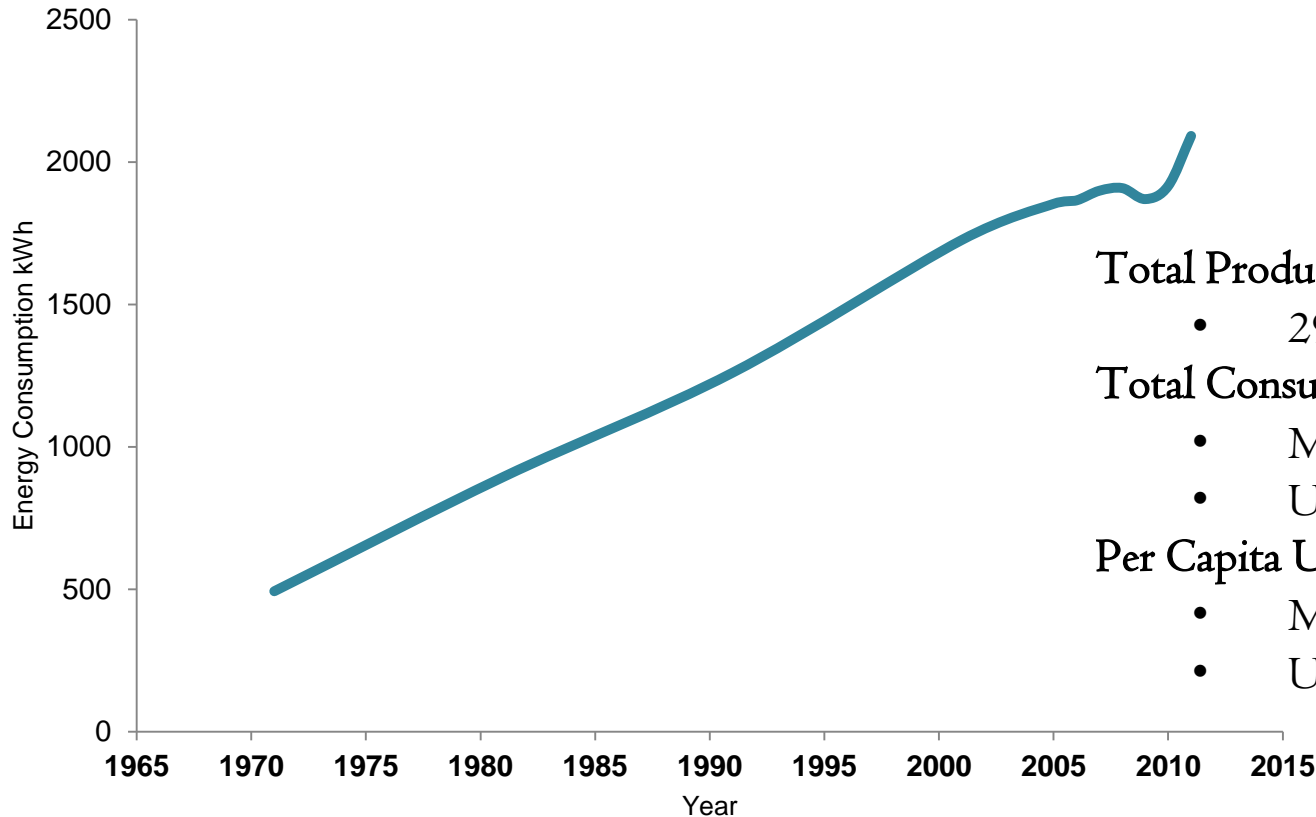


Mexico is highly dependent on fossil fuels

Source: EIA U.S. Energy Information Administration

# Mexico Energy Statistics (2011 est.)

Energy Consumption per Capita (kWh) Per Year



## Total Production/Year

- 296 billion kWh

## Total Consumption/Year

- Mexico: 249.7 billion kWh
- U.S.: 4.13 trillion kWh

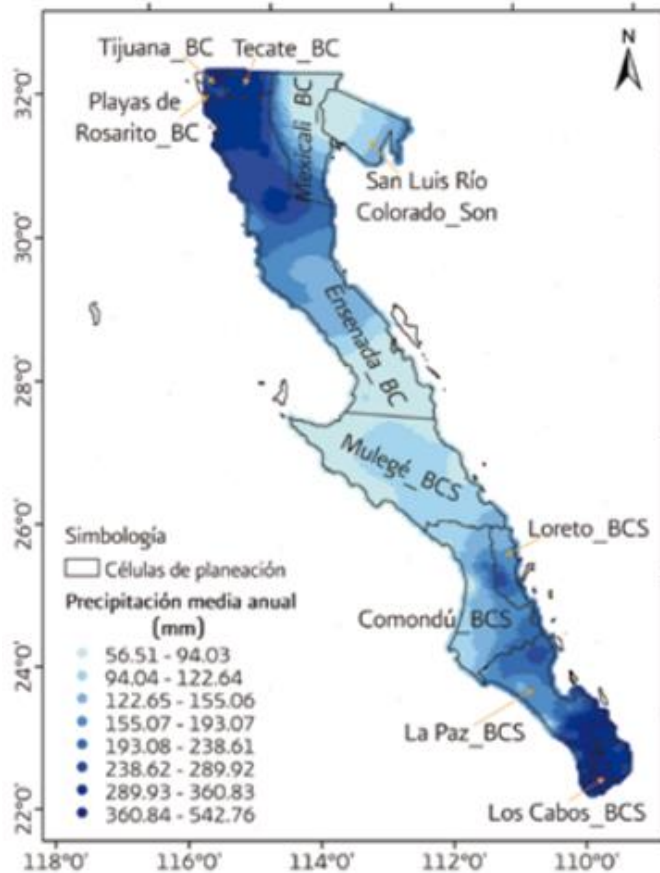
## Per Capita Use

- Mexico: 2.091 kWh
- U.S.: 13.246 kWh

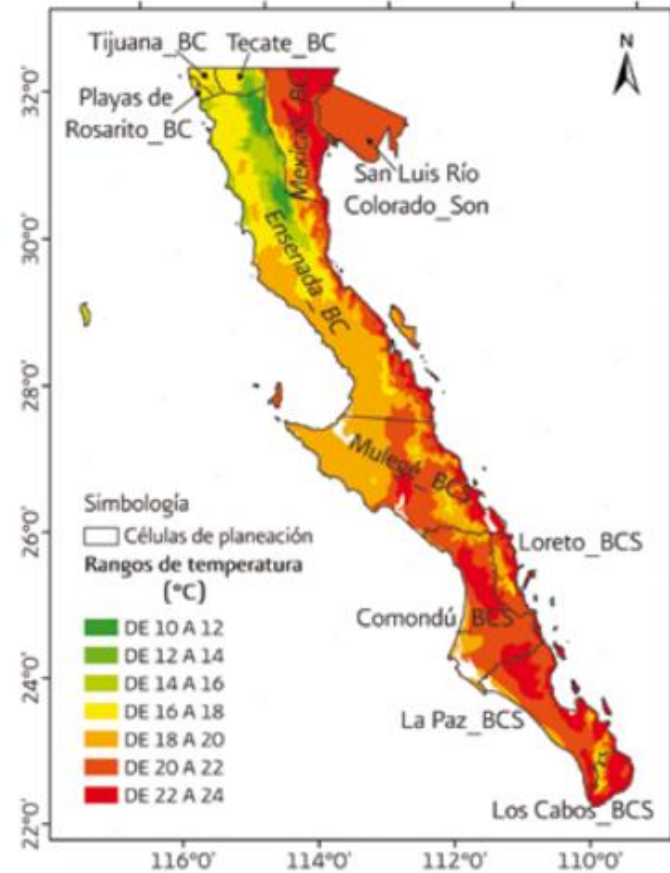
Source: World Bank

# Baja Weather

## Precipitation



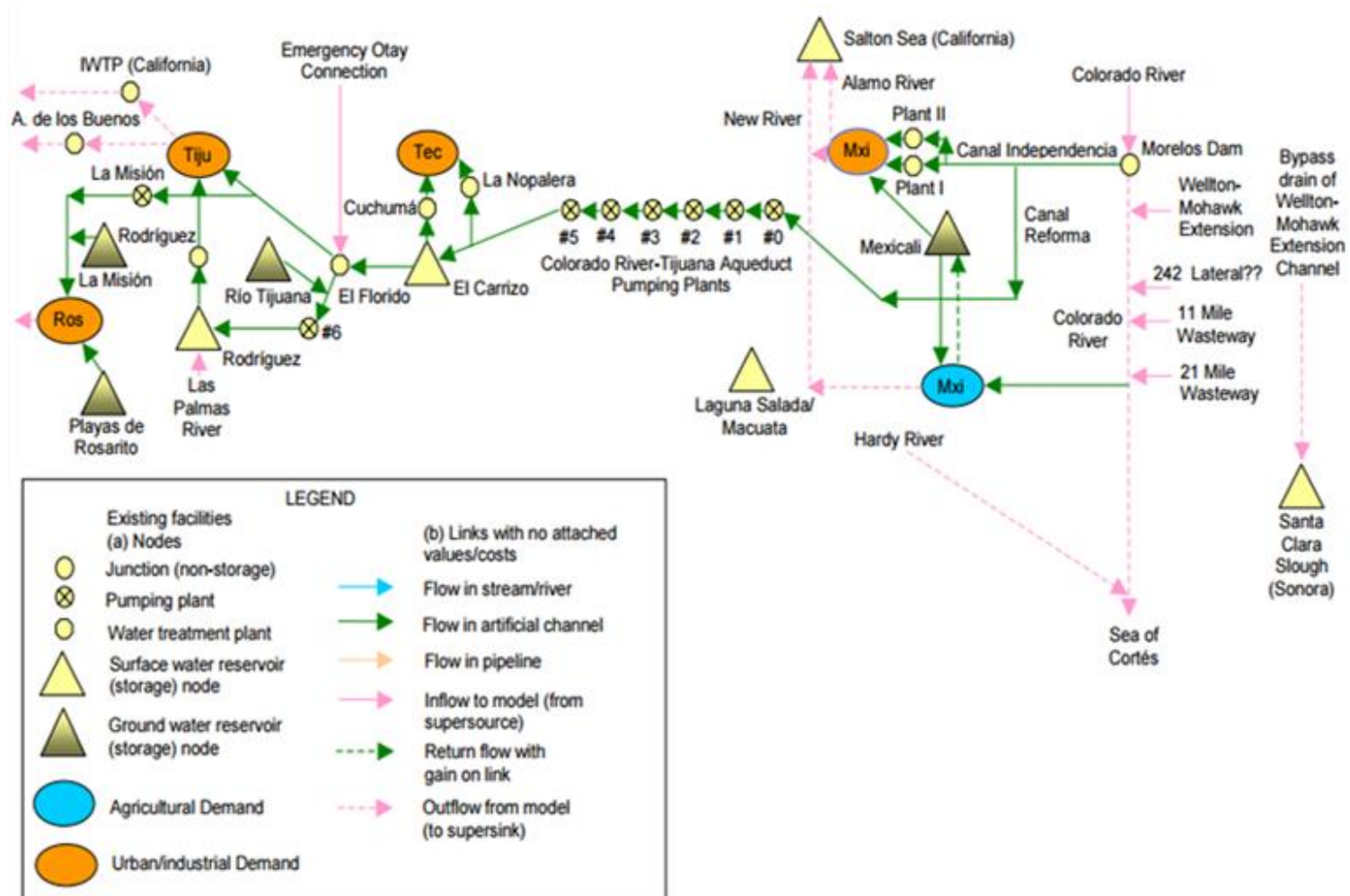
## Climate



Source: SGP CONABUA 2010

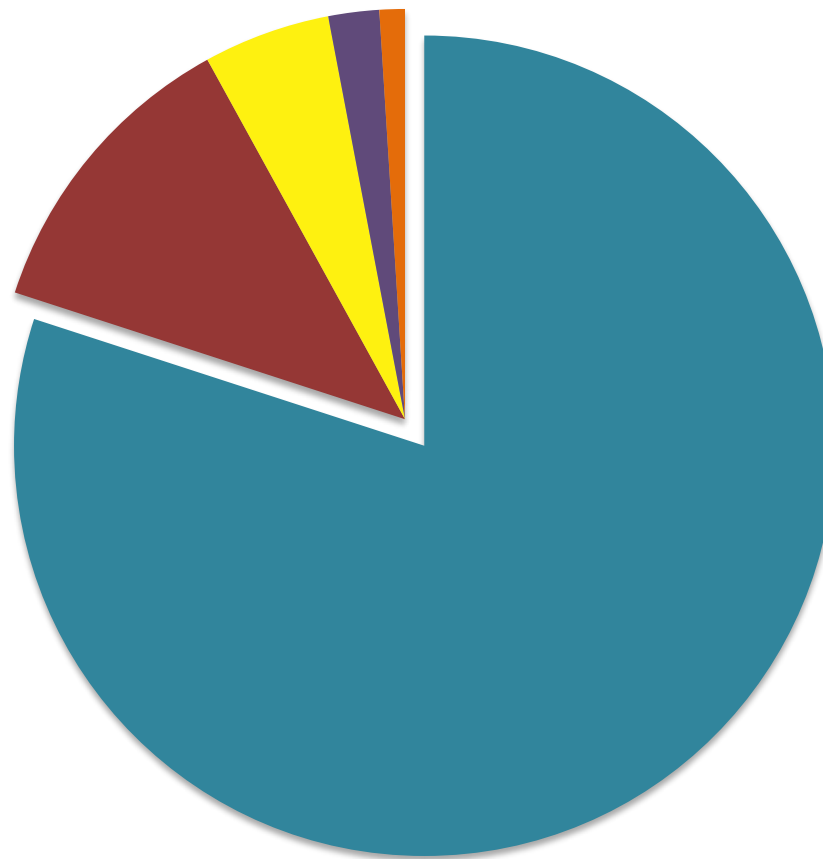


# Baja Water Supply Infrastructure



Source: SGP CONABUA 2010

# Baja Water Use




## Overview

- Like California, Baja devotes much of its water to agriculture
- A majority of water comes from aquifers and risks **overdrawing and depleting** them.

 Agriculture 80%

 Public Use 12%

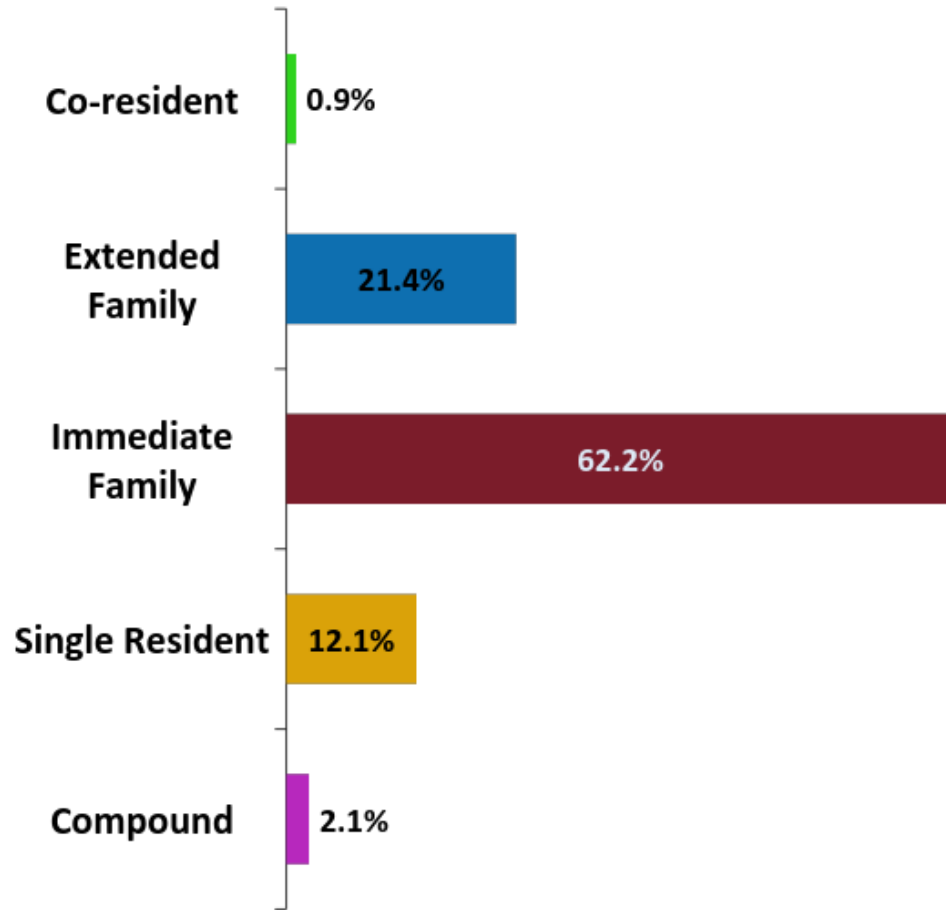
 Industrial 5%

 Thermoelectric 4%

 Other 1%

Source: REPDA 2010

# Household Water Distribution by Type



94.6% have access to running water



98.5% have access to electricity

Source: Population and Housing Census 2010

# Demographic Summary

## San Diego Demographics

### **GDP (2014 USD)**

- \$200 billion

### **Unemployment Rate**

- 4.8%

### **Annual GDP growth rate**

- 4.5%

## Baja Demographics

### **GDP (2011 USD)**

- \$29 billion

### **Unemployment Rate (2014 est.)**

- 4.7%

### **GDP Growth Rate**



Source: World Bank

# Demographic Summary

## San Diego Demographics

### GDP (2014 USD)

- \$200 billion

### Unemployment Rate

- 4.8%

### Annual GDP growth rate

- 4.5%

## Baja Demographics

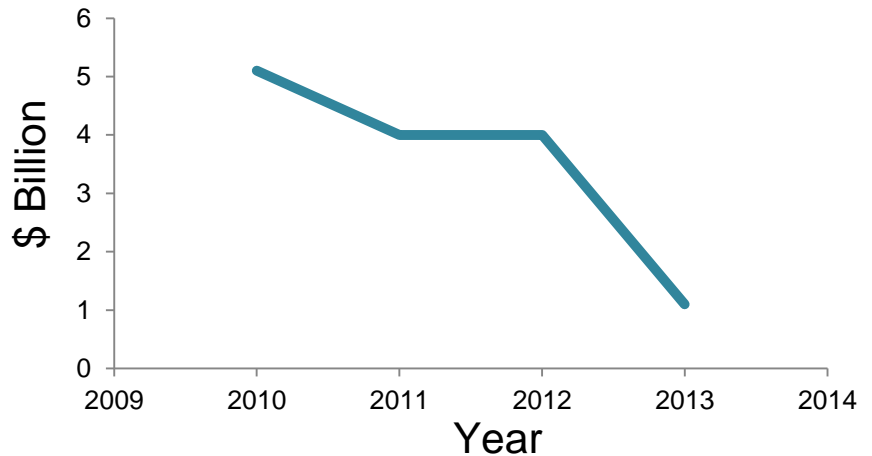
### GDP (2011 USD)

- \$29 billion

### Unemployment Rate (2014 est.)

- 4.7%

### GDP Growth Rate



Source: World Bank



# Preferred State

Energy and Water for San Diego and Baja

# Preferred State

| Water for San Diego   | Water for Baja                               |
|---|--|
| Sustainable, Reliable, affordable, and safe water supply                      | Accessible and clean drinking water for all. |
| Adequate water in spite of drought.   | Sustainable water use.                       |
| Reduce the overall consumption of water and replenish existing water sources. |  |

# Preferred State

| Energy for San Diego                                | Energy for Baja                               |
|---|---|
| 100% Renewable energy.                              | Achieve 2000 kWh per Capita per Year for All. |
| Renewable energy produced by utility and consumers. | Diversify into Renewable Energy Sources.      |

# Questions?