

## California's Air Pollution and Climate Change Policies

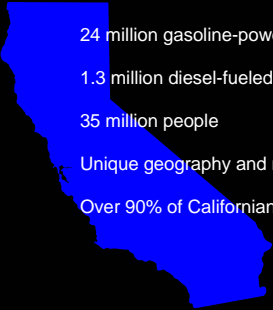


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 **California Air Resources Board**  
California Environmental Protection Agency

## Control policy drivers ...

## California's Air Quality Problem



- 24 million gasoline-powered vehicles
- 1.3 million diesel-fueled vehicles and engines
- 35 million people
- Unique geography and meteorology confine air pollutants
- Over 90% of Californians breath unhealthy air

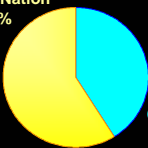
## Unique, Adverse Meteorology Lowest Per Capita Emission Targets

**Onshore circulation pattern, high temperatures, stagnant air masses, and mountain ranges that trap pollutants lead to ...**

	Population (million)	Carrying Capacity (VOC+NO <sub>x</sub> ) (tpd)	(lb/person/yr)
Los Angeles	16.9	840	36
San Joaquin Valley	4.1	630	69
Houston	5.5	1360	181

## California's Disproportionate Air Pollution Exposure

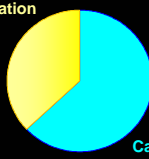
**8-Hour Ozone**  
(NAAQS = 80 ppb)



Rest of Nation 59%

California 41%

**Annual PM2.5**  
(NAAQS = 15 µg/m<sup>3</sup>)



Rest of Nation 37%

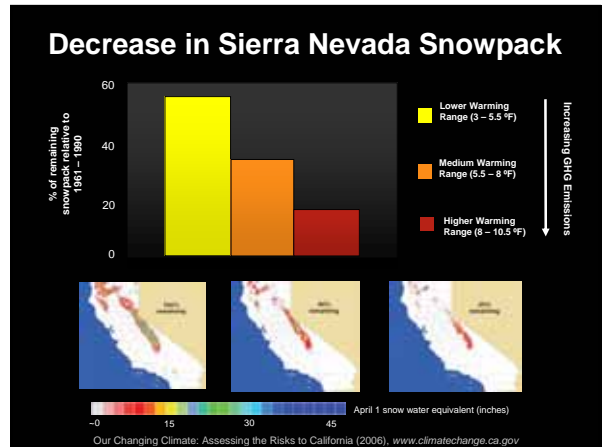
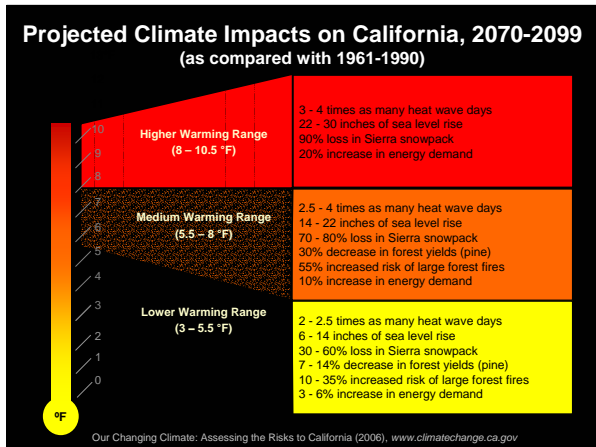
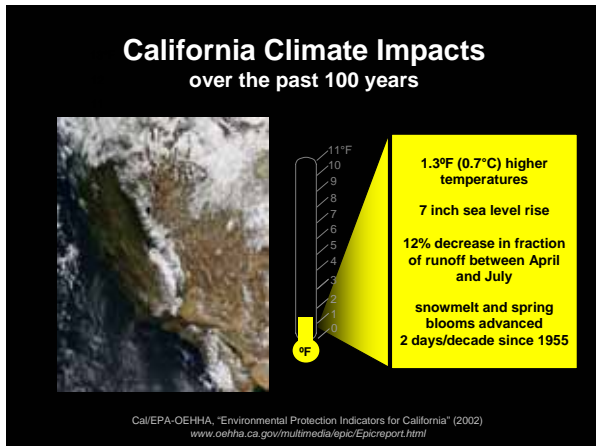
California 63%

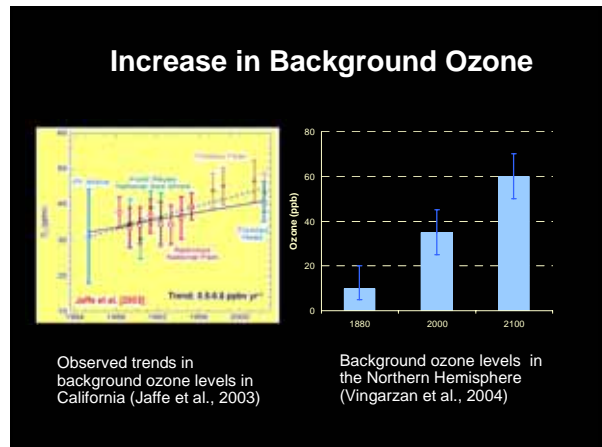
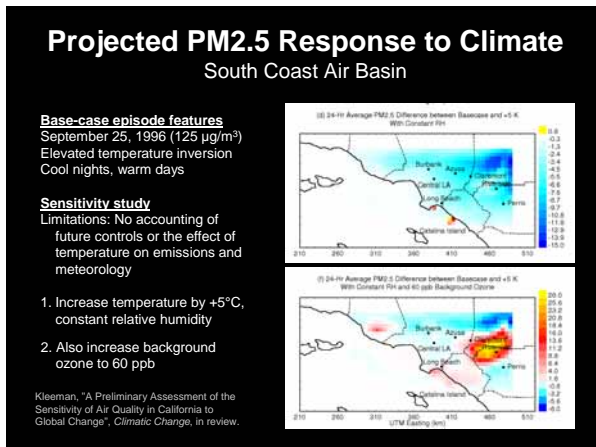
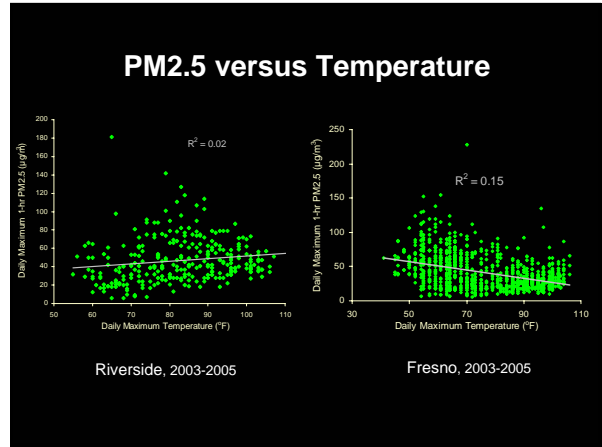
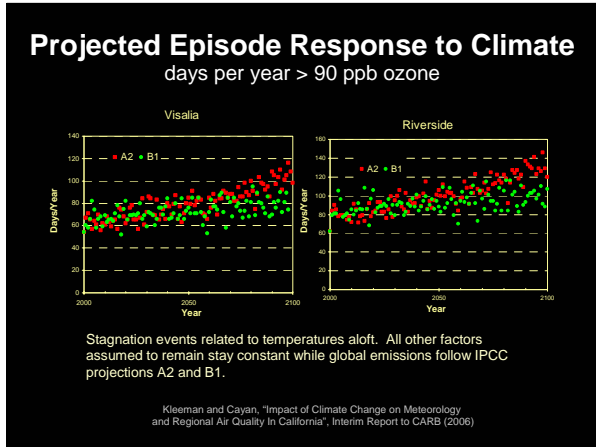
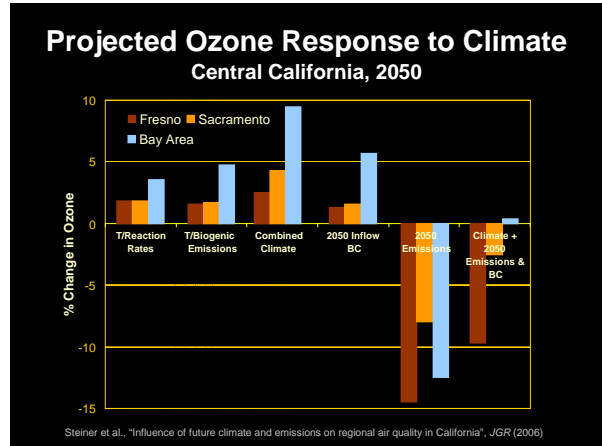
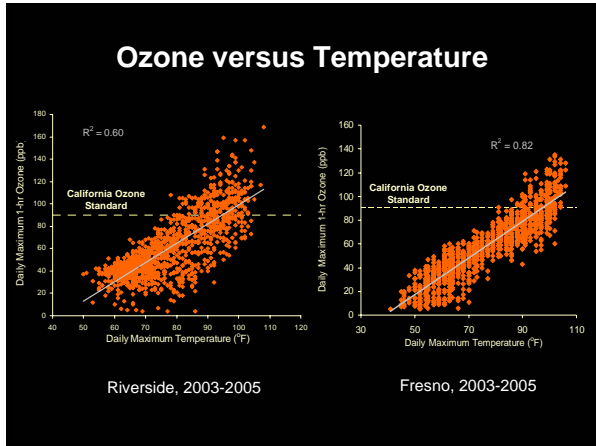
Population-weighted and minus national ambient air quality standard (NAAQS), based on 2000-2002 data

## Air Pollution and Premature Death Sample Calculations for California

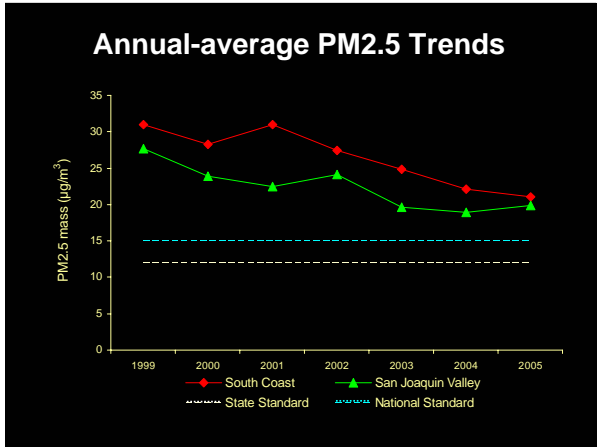
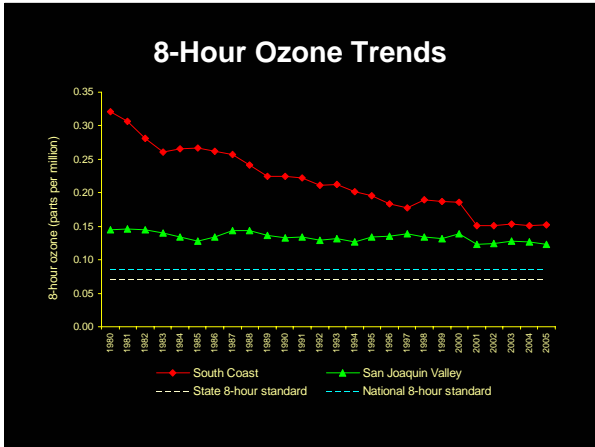
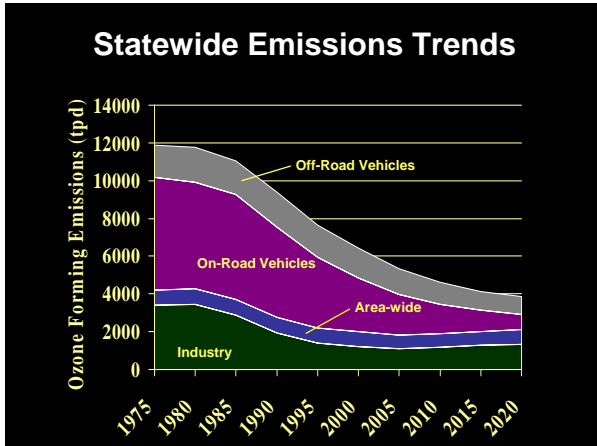
Pollutant	Averaging Time	Increased Risk in All-Cause Death (per 10 µg/m <sup>3</sup> ) <sup>a</sup>	Threshold or Background (µg/m <sup>3</sup> ) <sup>e</sup>	Annual Exposure (µg/m <sup>3</sup> ) <sup>f</sup>	Annual Deaths <sup>g</sup>
PM2.5	Annual	10% <sup>b</sup>	2.5 to 7	13.5	13,000 to 22,000
PM10	24-hour	0.25% <sup>c</sup>	5	22.3	1000
Ozone	8-hour	0.27% <sup>d</sup>	80	--	800

<sup>a</sup> At least a factor of two uncertainty  
<sup>b</sup> Median value from "An expert judgment assessment of the concentration-response relationship between PM2.5 exposure and mortality", Industrial Economics, Inc. (2006)  
<sup>c</sup> Revised analysis of time-series studies of air pollution and health", HEI Special Report, p. 21 (2003)  
<sup>d</sup> Ostro, Tran and Levy "The health benefits of reduced tropospheric ozone in California", JAWMA (2006)  
<sup>e</sup> Background for PM2.5 is 2.5 µg/m<sup>3</sup> while threshold of 7 µg/m<sup>3</sup> is the lowest measured PM2.5 level in American Cancer Society studies showing an association with premature death (Pope 2002)  
<sup>f</sup> 2003-2005 air quality data, population-weighted





**Policy response ...**



## Governor Schwarzenegger's Environmental Targets

50% improvement in air quality from 2003 to 2010



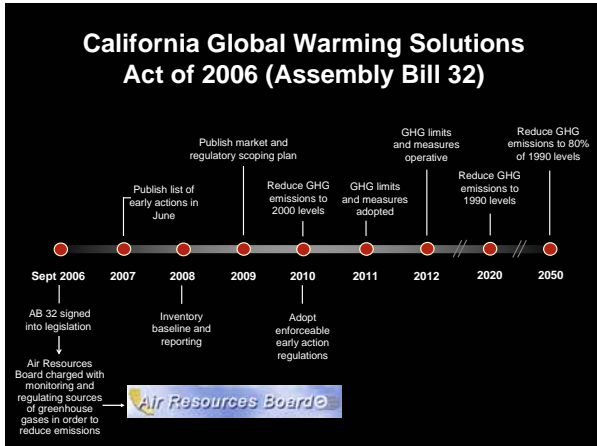
**Diesel Engines**  
75% below 2000 levels by 2010, 85% below by 2020  
Replace or retrofit every diesel engine in California

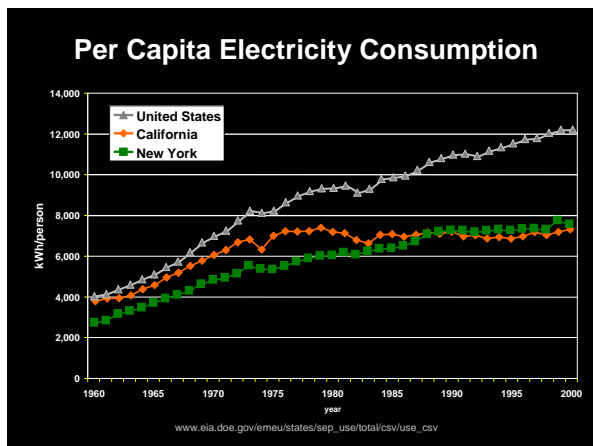
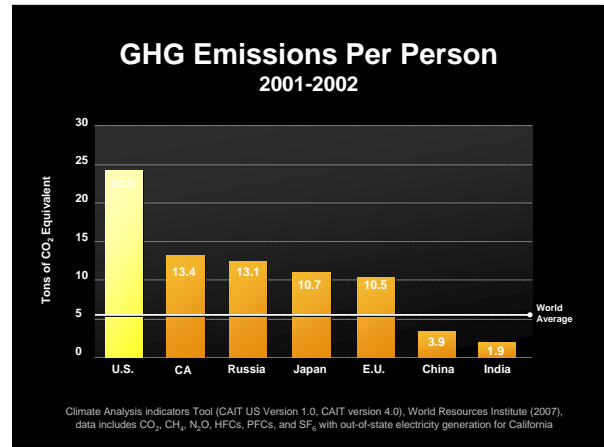
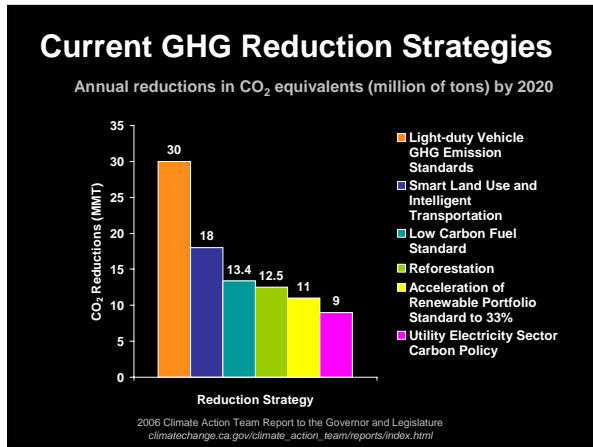
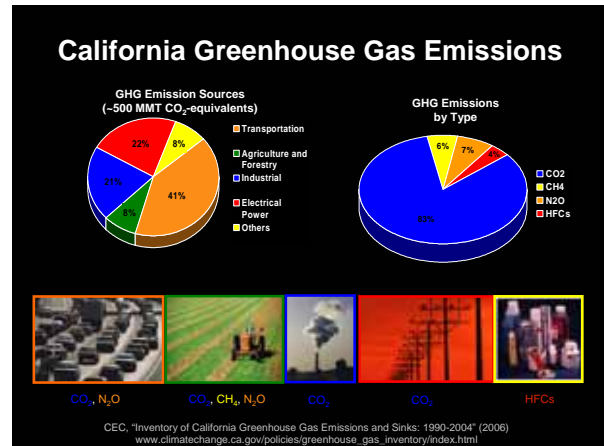
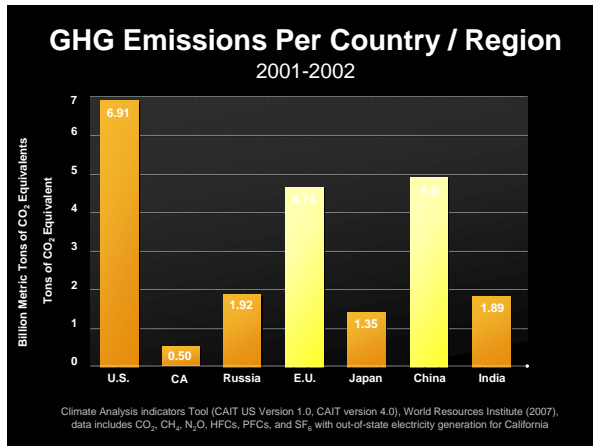
**Goods Movement**  
2001 emission levels by 2010  
Diesel PM risk 85% below 2000 by 2020

**Greenhouse Gases**  
By 2010, reduce to 2000 levels (60 MMT, 11% below BAU)  
By 2012, cap and trade market linked with EU-ETS and RGGI  
By 2020, reduce to 1990 levels (174 MMT, 30% below BAU)  
By 2050, reduce to 80% below 1990 levels

**Hydrogen Highway**

**Green Government Buildings**





### Non-Kyoto Climate Forcers in California Sample Calculations

Climate Forcer	100-year Global Warming Potential <sup>a</sup>	MMT <sup>b</sup>	MMT CO <sub>2</sub> E
CO	1.0 – 3.0	4.56	5 – 15
VOC	1.1 – 6.2	0.81	1 – 5
NO <sub>x</sub>	-10 – 5	1.07	-10 – 5
Diesel PM	500 – 1,200	0.029	15 – 35
Other PM	unknown	--	likely negative
CFC and HCFC	100 – 10,000	0.014	10 – 100

<sup>a</sup> Fossil fuel soot GWP range from Hansen et al. (2007) and Jacobson (2005), all others from IPCC  
<sup>b</sup> CFC and HCFC estimate from USEPA Vintaging model, all others from CARB emission inventory

## Summary

Public health is the most important control policy consideration – especially premature deaths due to PM2.5

California already affected by climate change – future warming threatens water supply and agriculture

Climate change makes ozone standards more difficult to attain – overall impact on PM2.5 and PM10 is unclear

### California greenhouse gas reduction policies

- Adopted: light-duty vehicle standards, energy efficiency measures
- Jan. 1, 2010: low carbon fuel standard, other early actions
- Jan. 1, 2012: cap and trade market, other regulations