

California Environmental Quality Act,

GREENHOUSE GAS REGULATION and CLIMATE CHANGE



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by

David Friedman & Jennifer Hernandez¹

Special thank you to Joel Kotkin, Ann Gordon and Lenae Reiter





Center for Demographics and Policy

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AUTHORS:

David Friedman and Jennifer Hernandez are attorneys in the California environmental and land use practice group of Holland & Knight LLC, an international law firm. The practice group periodically publishes analyses of California legal and policy data in support of its continued study of the use, and abuse, of the California Environmental Quality Act of 1970, which allows anyone (even anonymous entities, and entities seeking to advance nonenvironmental objectives) to file a lawsuit alleging inadequate environmental evaluation of any type of project requiring a discretionary approval from any state, regional or local agency. As confirmed by several research studies including those completed by the firm, California courts have upheld approximately half of such lawsuit challenges in reported appellate court cases decided over the past 15 years, most commonly ordering reversal of project approvals pending further environmental studies. The delays and uncertainties caused by CEQA litigation abuse against environmentally benign or even beneficial projects have prompted repeated calls for CEQA reform by California's elected leaders, but meaningful reform faces fierce opposition from entrenched special interests.

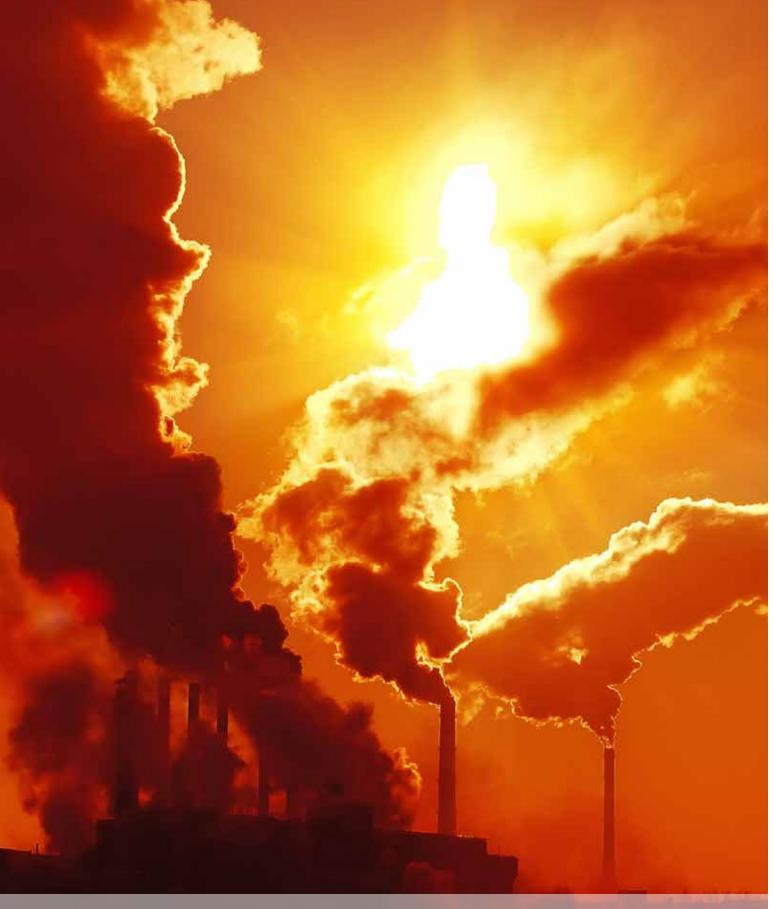
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Introduction and Summary

California has adopted the most significant climate change policies in the United States, including landmark legislation (AB 32)² to lower state greenhouse gas (GHG) emissions to 1990 levels by 2020. Proposed new laws, and recent judicial decisions concerning the analysis of GHG impacts under the California Environmental Quality Act (CEQA), may soon increase the state's legally mandated GHG reduction target to 80% below 1990 levels by 2050.³ The purpose of California's GHG policies is to reduce the concentration of human-generated GHGs in the atmosphere. The United Nations Intergovernmental Panel on Climate Change (IPCC) and many other scientific organizations have predicted that higher GHG atmospheric concentrations generated by human activity could cause catastrophic climate changes.

This paper demonstrates that even the complete elimination of state GHG emissions will have no measurable effect on climate change risks unless California-style policies are widely adopted throughout the United States, and particularly in other countries that now generate much larger GHG emissions. As California Governor Jerry Brown, a staunch proponent of climate change policies, recently observed, "We can do things in California, but if others don't follow, it will be futile." Similarly, the California legislature recognized at the time that AB 32 was enacted that atmospheric GHG concentrations could only be stabilized through national and international actions, and that the state's "far-reaching effects" would result from "encouraging other states, the federal government, and other countries to act." Nevertheless, the extent to which California's GHG policies have and may be likely to inspire similar measures in

other locations, is rarely, if ever seriously evaluated by state lawmakers or the California judiciary. Absent such considerations, imposing much more substantial GHG mandates may not only fail to inspire complementary actions in other locations, but could even result in a net increase in GHG emissions should population and economic activity move to locations with much higher GHG emission rates than California.

"...even the complete elimination of state GHG emissions will have no measurable effect on climate change risks unless California-style policies are widely adopted throughout the United States, and particularly in other countries that now generate much larger GHG emissions.

Key findings include the following:

1. Most scientists agree that climate change risks are associated with the atmospheric accumulation of gases with high global warming potential including carbon dioxide and other gases attributed to human activity (collectively "carbon dioxide equivalent" or "CO2e" emissions). In 2011 California accounted for less than 1% of global CO2e emissions, and less than 0.065% of the worldwide annual CO2e emissions increase that occurred during 1990-2011. The state's per capita CO2e emissions are much lower than in the rest of the United States, and comparable with relatively efficient advanced industrial countries like Germany and Japan.

Despite its sizable population and economy, California generates a relatively minute, and falling, share of global CO2e emissions. The amount of global CO2e emissions and atmospheric concentrations would have been virtually unchanged, even if California's GHG emissions were zero from 1990-2011, and remained at that level and assuming current emission trends in other locations continued through 2050.

3. As recognized in AB 32 and by other state leaders, California's ability to reduce climate change risks is not primarily a function of reducing state emissions. To have any measurable effect on global CO2e levels, the state must show that CO2e emissions can be reduced in a manner that also allows societies, such as China and India, to improve the prospects for the vast majority of the population now living in or near poverty conditions. Over the last several decades, and especially since the mid-2000s, when climate change emerged as the state's dominant environmental policy focus, California has failed to demonstrate that it can sustain a thriving middle and working class in addition to its most affluent population.°

4. As sharply illustrated by Tesla's recent decision to locate a \$5 billion electric car facility, and 6,500 green jobs, in Nevada, California continues to suffer from a relatively poor global economic reputation as a place to do businesses outside high-end services and technology development. This drives even green energy manufacturing, let alone more traditional industries, from the state. State policies also reduce middle and working class employment opportunities, and increase housing and other key living expenses, such as energy costs.

5. Ironically this has resulted in a massive displacement of former state businesses and residents to other locations with higher per-capita CO2e emission levels. Since 1990, 3.8 million former residents, approximately the population of Oregon or Oklahoma, relocated to other states. Billions of dollars of economic activity which might have remained in California have now been relocated to states and foreign countries with much higher emissions and weaker regulations. The cumulative net CO2e emission increases generated by the unprecedented movement of the state's former residents and continuing loss of economic activity to higher GHG generating locations nearly offsets the GHG reductions that would be achieved in California under AB 32.

Section I of this paper provides background information about historical CO2e atmospheric concentrations, the extent of global CO2e emissions over time, climate change risks associated with these trends, and California's relative contribution to worldwide CO2e emissions. This section demonstrates that California accounts for a minute and falling share of global GHG emissions.

Section II discusses the development of California's current climate change policies and shows that, in the past, California consistently recognized that CO2e emission reduction goals must be adopted in a measured, balanced manner to facilitate the concurrent need for economic growth and other important social objectives. Despite recent increases in corporate earnings by Silicon Valley corporations, increased home prices to pre-recession levels, and a decrease in reported unemployment rates, California also includes the nation's largest number and highest percentage of people living in poverty. Nearly 24% of the state's population is impoverished according

to recently released U.S. Census Bureau statistics and faces enormous economic and social challenges.

The state's ability to meet its pressing social and economic challenges could be worsened by proposed legislation and judicial interpretations of CEQA mandating much more substantial GHG reductions than even sympathetic scientific assessments have found to be unachievable using any current technology.⁷

Sections III and IV show that, even assuming that California had zero CO2e emissions during 1990-2011, and for an additional four decades projected to 2050, global CO2e emission levels and atmospheric CO2e concentration would be virtually unaffected. In fact, unrealistic unilateral GHG reduction mandates can actually increase global CO2e levels and associated climate change risks by discouraging states and countries from adopting similar policies, and by displacing people and industries to locations with higher emissions.

The achievement of significant, but more realistic GHG objectives and broad-based economic and social growth would have an immeasurably greater effect on atmospheric CO2e concentration levels if the state's economic vitality proved a workable model that also allows for the achievement of critical social aims, such as reducing poverty and improving the standard of living for the middle class and those aspiring to join the middle class.



8 CHAPMAN UNIVERSITY • CENTER FOR DEMOGRAPHICS AND POLICY Industrial Emissions

Background: GHG Emissions, Climate Change, and California

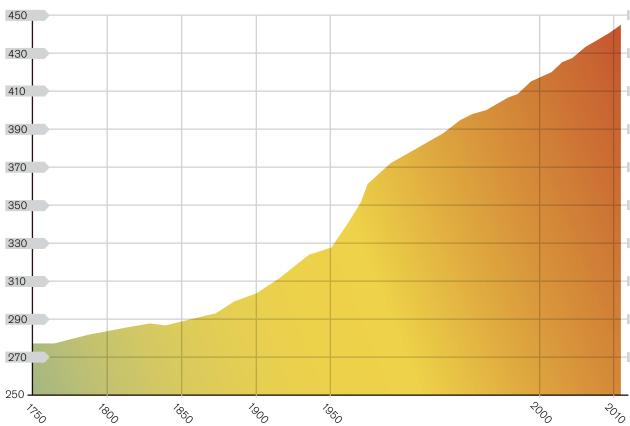
California's GHG policies are based on widely accepted scientific evidence that human-related greenhouse gas emissions raise atmospheric concentrations of carbon dioxide and other gases, increase the amount of energy the atmosphere can absorb, and increase global surface temperatures. GHG emissions and atmospheric concentrations are frequently characterized in terms of the CO2-equivalent (CO2e) global warming potential of the most active greenhouse gases because CO2 comprises more than 80% of human-related GHG emissions. Global atmospheric CO2e concentrations rose

from approximately 278 parts per million (ppm) in 1750 to 446 ppm in 2011.8

Global surface temperatures have increased since the last ice age, and even more since the mid-18th century. Many scientists believe that feedback and similar phenomena eventually will amplify the effects of increased CO2e levels in the atmosphere and "force" additional warming. The sensitivity of global temperatures to additional forcing mechanisms has not yet been precisely verified. A recent summary of satellite-based temperature data has found that, except at far northern latitudes, almost all of the current climate research models have been "predicting too much warming," particularly since 1998:

Atmospheric CO2e Concentrations, 1750–2011 (ppm)

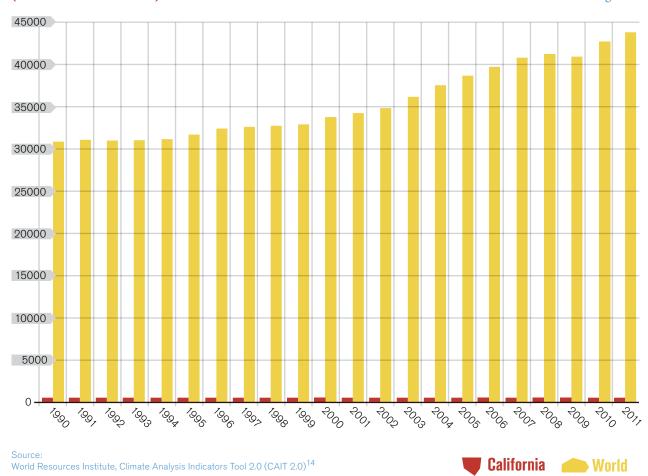




European Environment Agency, Observed trends in total global concentration of the Kyoto gases (http://www.eea.europa.eu/data-and-maps/daviz/observed-trends-in-total-global#tab-chart_2, accessed September 2014)

California and World CO2e Emissions, 1990-2011 (million metric tons)

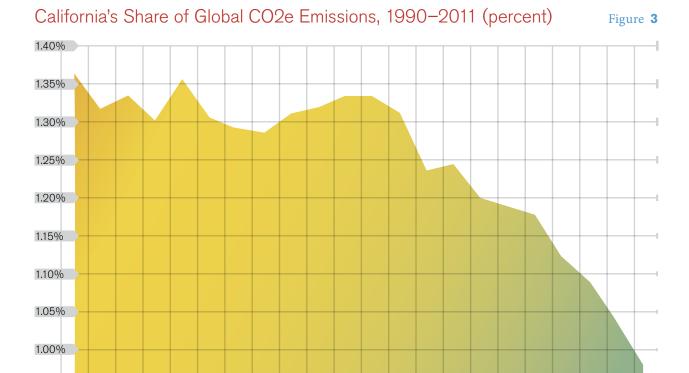




The troposphere has not warmed as fast as almost all climate models predict... The reasons for the discrepancy between the predicted and observed warming rate are currently under investigation by a number of research groups. Possible reasons include increased oceanic circulation leading to increased subduction of heat into the ocean, higher than normal levels of stratospheric aerosols due to volcanoes during the past decade, incorrect ozone levels used as input to the models, lower than expected solar output during the last few years,

or poorly modeled cloud feedback effects. It is possible (or even likely) that a combination of these candidate causes is responsible.

Similarly, a 2014 update on the AB 32 Scoping Plan prepared by the California Air Resources Board (CARB) notes that "The rate of global surface air temperature warming over the past 15 years—about 0.05 degrees C per decade—has been slower than the average rate since 1951." The most recent analysis by the Intergovernmental Panel on Climate Change (IPCC) suggests that doubling the atmospheric concentration



CAIT 2.0 (1990-2011 CO2e emissions for California and world)

.95%

of CO2e would most likely increase global surface temperatures by 1.5 to 4.5 degrees Celsius (C).11

1903

The extent to which global temperatures can increase as a result of human-related CO2e emissions without causing catastrophic climate change is also subject to ongoing scientific evaluation. Studies by the IPCC and other leading research organization have generally concluded that global temperatures cannot rise by more than 2 degrees C without increasing the risk of catastrophic climate change. Potential effects from such an increase include the stimulation of more severe heat waves, wildfires, droughts, rapid sea level rise, degraded air quality, and other adverse outcomes.

The 2014 Scoping Plan update notes that because "the sensitivity of the climate system to GHGs has uncertainty," the appropriate temperature target may be lower than 2 degrees C to avoid "irreparable harm" to "future generations and nature."¹² Due to these uncertainties, it is not possible at this time to identify a precise atmospheric CO2e concentration level that will safely "stabilize" the world's climate. The 2014 Scoping Plan update indicates that atmospheric CO2e should be stabilized at least below 450 ppm to reduce, but not necessarily avoid, catastrophic climate change risks.¹³

2003

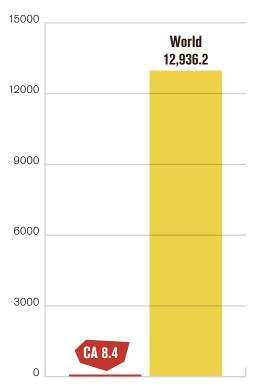
200₹

2006

California has a large population and economy, both of which have continued to grow over time. Nevertheless, the state

Figure 4

Net Increase in Annual CO2e Emissions from 1990-2011 (million metric tons)



CAIT 2.0 (1990 and 2011 CO2e emissions for California and world)

has historically accounted for a relatively minute share of total worldwide GHG emissions (see Figure 2). State emissions have fallen from about 1.36% of the global total in 1990 — well before global warming was a widespread concern — to 0.98% in 2011 (see Figure 3). The annual amount of global CO2e emissions increased by 12,936 MtCO2e from 1990 to 2011, or by more than 40% since 1990. Over the same period, California's CO2e emissions rose by only 8.3 MtCO2e (2%), and declined by approximately 10.7% from 2007 to 2011. Overall, California accounted for only 0.065% of the net global CO2e emissions increase between 1990 and 2011 (see Figure 4).

California emits approximately 50% less CO2e per capita than the rest of the United States, and much less than locations such as the Russian Federation, Texas and Canada (see Table 1). The state also generates approximately 253 tons of CO2e per million dollars of gross domestic product (CO2e per M\$GDP) compared with 442.2 tons of CO2e per M\$GDP in the rest of the U.S., 781.9 tons of CO2e per M\$GDP in China, 416 tons of CO2e per M\$GDP in India, and a global average of 485.6 tons of CO2e per M\$GDP.

> California's CO2e per capita and per M\$GDP emission rates are comparable with those in Germany and Japan.

California's CO2e per capita and per M\$GDP emission rates are comparable with those in Germany and Japan. Germany is widely recognized as one of the world's leaders in the development of zero-emission power sources, and approximately 26% of all German energy was obtained from renewable sources by early 2012. 16 Japan has approximately the same land mass as California (but four times the population) relies on non-CO2e emission nuclear power to a much greater extent, and has a per-capita vehicle miles traveled rate approximately 70% lower than the United States.¹⁷ California's emission patterns more closely resemble larger advanced European economies than the rest of the U.S.; most of these countries maintain relatively high living standards and lower CO2e emission levels from personal (e.g., transportation, electricity, home heating and cooling) and industrial activities.

California and Large Emitter CO2e Profiles, 2011

TABLE 1

	CO2e Emissions (million metric tons)	CO2e per capita (metric tons)	CO2e per M\$GDP (metric tons)
World	43,817	6.3	485.6
China	10,553	7.9	781.9
United States	6,550	21.0	421.7
United States without California ¹⁵	6,121	22.3	442.2
European Union (27 Nations)	4,541	9.0	270.1
India	2,486	2.0	416.9
Russian Federation	2,374	16.6	738.1
Japan	1,307	10.2	298.5
Germany	883	10.8	263.4
Texas	719	30.9	684.2
Canada	716	20.9	516.4
CALIFORNIA	429	11.4	253.6

Source: CAIT 2.0.

California's GHG Policies and **Broad-Based Economic Growth**

From their inception, state GHG policies have explicitly recognized that California must combine C02e reductions with robust and broad-based economic and social growth to stimulate global GHG emission cutbacks. The legislative findings in AB 32 state that a major component of California's contribution towards climate change solutions would be leading by example and developing low-carbon practices and technologies that other nations would adopt:

National and international actions are necessary to fully address the issue of global warming. However, action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to act.... By exercising a global leadership role, California will also position its economy, technology centers, financial institutions, and businesses to benefit from national and international efforts to reduce emissions of greenhouse gases. More importantly, investing in the development of innovative and pioneering technologies will assist California in achieving the 2020 statewide limit on emissions of greenhouse gases established by [AB 32] and will provide an opportunity for the state to take a global economic and technological leadership role in reducing emissions of greenhouse gases. 18

The legislature also recognized that the state's GHG reduction measures must take account of economic impacts and costs:

It is the intent of the Legislature that [CARB] design emissions reduction measures to meet the statewide emissions limits for greenhouse gases established pursuant to [AB 32] in a manner that minimizes costs and maximizes benefits for California's economy, improves and modernizes California's energy infrastructure and maintains electric system reliability, maximizes additional environmental and economic co-benefits for California, and complements the state's efforts to improve air quality. 19

Consistent with the legislature's AB 32 findings, CARB implemented regulations and GHG reduction plans that explicitly considered the need for economic growth and the importance of other social objectives in the context of developing state climate change policies. In 2008, a team of economists, including the director of the Harvard Environmental Economics Program, warned that AB 32 would impose costs on the state's economy that could not be addressed by making unsubstantiated claims of new "green job" creation, to reduce employment and other negative social impacts. In response, CARB developed a "capand-trade" market-based program for

reducing many sources of GHG emissions to phase-in and limit the social and economic effects of higher energy costs.20 In setting special reduction targets for state agencies, CARB further attempted to "maximize the experience and contributions of each agency involved to achieve the [agency target] reduction of greenhouse gas emissions while growing the economy and protecting the environment." ²¹ The 2014 Scoping Plan update, the most recently revised version of the AB 32 implementation plan, includes an entire section that discusses "Fostering Resilient Economic Growth." 22

As discussed below, it is vitally important for California to demonstrate that significant GHG emission reductions can be achieved without sacrificing important social and economic needs. A global commitment to implementing GHG reduction measures is essential if state efforts are to have any significant effect on atmospheric CO2e concentration. California has started, but has not yet completed, the process of changing the state's utility, transportation, energy and housing infrastructure and complex regulatory programs to achieve the AB 32 objectives.

Despite a recent uptick from the depths of the last recession, the state has yet to demonstrate that it can also sustain a broad-based recovery that benefits an enormous population living in poverty as well as sustain upward mobility for lessskilled and middle-class workers. Regulatory costs and litigation risks, including CEQA lawsuits, have contributed to the widespread perception that the state is a very poor location for business and employment growth. Since 1990, California job growth has averaged about 1% per year, far below the state's 3% average during 1970-1990 despite almost the same population increase in both periods. California's employment growth generally kept pace with similar fast-growing and high immigration states like Texas and Florida during 1970-1990, but subsequently declined substantially below the rates achieved in these locations. In 1991-2013, Texas, with only 70% of California's population, generated nearly 4.1 million new jobs compared with just 2.6 million in California. Florida, a state with half the population of California, generated 2.2 million jobs over the same period.²³

Recent national trends towards greater wage and income inequality have been especially pronounced in California, where incomes for all but the wealthiest 20% of the population have either increased well below the U.S. average, or actually declined even after government program payments are included in the analysis. 24 Since 2010, manufacturing employment, which the Los Angeles Times recently characterized as "the classic path to higher paying jobs for less-educated workers," grew by only 1% in the state compared with a remarkable rise of nearly 7% in the rest of the country. 25

Skyrocketing home values, increased corporate earnings and rising stock prices for famed Silicon Valley companies have clearly improved the fortunes of California's most wealthy communities, located largely along the coast. These trends, on the other hand, have had a major and disproportionate impact on the less advantaged 80% of the state's population. Recent U.S. Census Bureau analyses show that California has by far the highest poverty rate in country, with 24% of the population impoverished versus a national average of 16%, and the largest number of people in poverty (nearly 9 million). Since 1970, the number of adults in California without at least a high school diploma increased by over 500,000, by far the largest rise anywhere in the U.S., and during a period when there was a 23 million decrease

in the nation as a whole.²⁶ A study by the state Legislative Analyst's Office found that California home prices are twoand-a-half times the national average (\$440,000 compared with \$180,000 nationwide) and average monthly rents are about 50 percent higher than the rest of the country (\$1,240 versus \$840 per month). Lower income households often cannot afford to buy a home, and still spend much more of their income on housing than elsewhere in the country. Workers in California's coastal communities commute 10 percent further each day than commuters elsewhere, and Californians are four times more likely to live in crowded housing.²⁷

Finally, California has some of the highest utility and fuel costs in the nation. These expenses disproportionately burden lower income residents with less disposal income to spend on everyday necessities like electricity or gasoline. In December 2014, California's electricity cost for all sectors was 14.54 cents per kilowatt hour, 43.5% higher than the national average of 10.13 cents per kilowatt hour. Compared with December 2013, the state's electricity costs increased by 10.5%, nearly five times faster than the 2.7% increase in the nation as a whole.²⁸ In mid-March 2015, California's average cost per gallon of regular unleaded fuel was \$3.29, the highest in the country even including Hawaii and Alaska, and 86 cents (36%) higher than the national average. Year over year gas prices fell by over 31% on average in the U.S., but by only 17% in California.²⁹

Even as the state is still struggling to demonstrate that the significant AB 32 emission targets and robust, broadly shared economic growth can be simultaneously sustained, California faces an escalation of regulations through judicial fiat³⁰ or new legislation³¹ to further cut CO2e emissions to 80% of 1990 levels by

2050. Unlike the measured and economically responsible approach taken by the legislature and CARB in the context of AB 32, there is no currently feasible or reasonable method for achieving a potential 80% reduction mandate. A 2012 report commissioned by the California Energy Commission and prepared by the California Council on Science and Technology (CCST), in fact, concluded that even a reduction of 60% below 1990 levels by 2050 would only be possible assuming the deployment of existing plus demonstrable, but not yet available or cost-effective (scalable) technologies and very significant, costly initiatives, including the following:

"[A]ll buildings would either have to be demolished, retrofitted, or built new to very high efficiency standards, ... vehicles of all sorts would need to be made significantly more efficient, and ... industrial processes would need to advance beyond technology available today. Moreover, widespread electrification wherever technically feasible would be required, through the use of hybrid or all-electric vehicle drivetrains, heat pumps for space and water heating, and specialized electric heating technology (microwave, electric arc, etc.) in industrial applications...." 32

Meeting an 80% reduction target, then, would require the use of even more speculative technologies, including those that the CCST found to be "in development, not yet available" or merely "research concepts." ³³ Legislative or judicial imposition of a technologically infeasible 80% reduction is more likely to actually reduce California's ability to inspire other jurisdictions to lower atmospheric CO2e levels, which is the only relevant policy outcome that would address climate change risks.

California Cannot Meaningfully **Affect Global CO2e Levels** By Imposing New Emission **Reductions Within California**

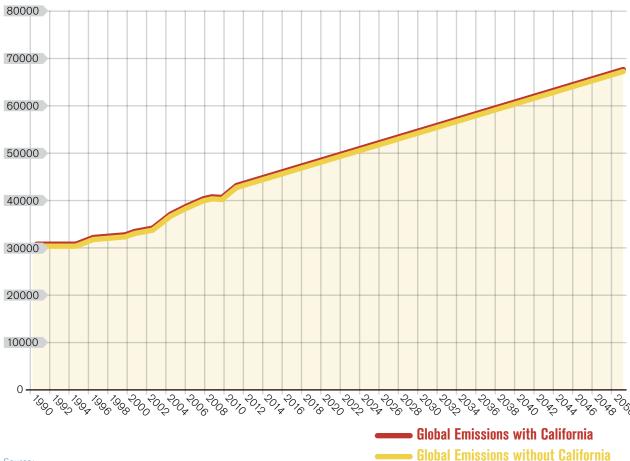
As Governor Brown recently observed, state efforts to reduce and stabilize atmospheric CO2e levels will prove "futile" if other states and countries do not implement complementary measures. As shown in Figure 3 and Figure 4, California accounted for less than 1% of total global GHG emissions in 2011, and just 0.065% of the 12,936 Mt per year increase in annual global emissions from 1990 to 2011. Although the state is often characterized as one of the world's largest economies, its CO2e emissions are relatively minute compared with those globally. These emissions and atmospheric CO2e levels would have been virtually unchanged if California had produced zero levels of CO2e during 1990-2011, and would also be unaffected to any meaningful extent if no state emissions occurred through 2050.

Figure 5 plots global CO2e emissions from 1990-2050 with California and assuming California emissions were zero ("without California") from 1990 to 2050. The results for 1990-2011 are based on reported state and global emission data for those years. The results for 2012-2050 are projected by assuming that the average annual emission growth during 1990-2011 for each scenario would continue to occur in subsequent years. Figure 5 demonstrates that global emissions would remain almost identical during 1990-2050 even if California emitted absolutely no CO2e over that period.

Table 2 examines the 1990-2050 projections in more detail. Based on reported 1990-2011 state and global data, total world emissions in 1990 would have been slightly more than 1% lower without California in 1990, and 0.98%

Global CO2e Emissions with and without California 1990-2011 (reported data) and 2012–2050 (projected) (million metric tons)





CAIT 2.0 for 1990-2011, total California and world CO2e annual emissions; 2012-2050 emissions based on 1990-2011 average annual increase in world emissions with and without California

> lower without the state in 2011. As shown in Figure 3 above, California accounted for an increasingly small proportion of global GHG emissions during 1990-2011 as emissions from other sources, including China, India and the Russian Federation, increased much more rapidly. Table 2 shows that, if 1990-2011 trends are projected for an additional four decades, global emissions in 2050 would be just 0.66% lower without California. Zero state emissions—much lower than even the proposed 80% reductions below 1990

levels would achieve—over the entire 60 years from 1990-2050 would have no meaningful effect on global CO2e emissions.

Several factors affect the relationship between GHG emission levels and the amount of CO2e in the atmosphere, including the earth's carbon cycle, the efficiency of "sinks" (such as forests) that remove atmospheric carbon by various means over time, and the temporal persistence of different greenhouse gases. The magnitude of California's poten-

1990, 2011 and Projected 2050 Global CO2e Emissions with and without California (million metric tons per year) TABLE 2

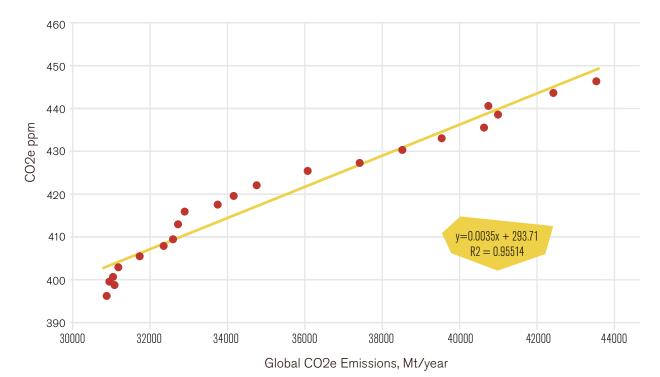
	Global Emissions with California	Global Emissions without California	Percent Change
1990	30,880	30,460	-1.36%
2011	43,817	43,388	-0.98%
2050	67,871	67,396	-0.66%

Source: see Figure 6

tial effect on atmospheric CO2e levels can be generally assessed, however, by considering the statistical relationship between reported annual global CO2e emissions and atmospheric CO2e during 1990-2011. As shown in Figure 6, a very good statistical "fit" (R2=.955) between these two variables can be achieved with a simple linear equation. The mathematical relationship between observed CO2e

Correlation between Annual Global CO2e Emissions (million metric tons) and Annual CO2e Atmospheric Concentration (ppm)

Figure 6



CAIT 2.0 for 1990-2011 total world CO2e annual emissions; European Environment Agency (see Figure 1) for 1990-2011 CO2e concentration levels

emissions and atmospheric levels over this period can be used to broadly illustrate the potential relative magnitude (but not to make precise predictions) of CO2e atmospheric concentration changes in response to global emissions with and without California.

Table 3 indicates that California can not, on its own, meaningfully affect atmospheric CO2e concentrations by reducing emissions to any level, including zero. Using the statistical data shown in Figure 6, CO2e concentrations with and without California in 2011 would range from 447.1 ppm with California to 445.6 ppm if no California emissions occurred, a difference of 0.336%. Table 3 also compares the magnitude of CO2e concentrations assuming the 1990-2011 annual emission trends with and without California extend to 2050. The difference between 2050 CO2e concentrations in both instances would also be miniscule (0.293%). Changes of this magnitude would not have a measurable affect on climate change risks. If the projected 2050 CO2e concentration with California shown in Table 3, for example, increased global average surface temperatures by 2 degrees C, the 0.293% concentration decrease projected without California

would still result in net temperature gain of 1.994 degrees C. Given measurement and analysis uncertainties, for all practical purposes the projected CO2e levels with and without California, and the implied global temperature changes, would be functionally identical.

These examples show that the state cannot, in fact, meaningfully influence atmospheric CO2e levels unless it develops and implements reasonable GHG control measures that other states and countries voluntarily seek to adopt. Pursuing technologically infeasible and unilateral emission reduction obligations at the same time that inequality, poverty, and middle and working class housing and employment needs remain unmet is highly unlikely to produce stable, effective policy outcomes that other states and countries will eagerly emulate. California would be far better served by pursuing reasonable, if less dramatic GHG reductions, building a broad-based economy, and using proven evidence of social, economic and climate change policy successes to convince others to follow the state's lead on GHG reductions.

Figure 7 illustrates the potential change in global emissions that could occur from a 100% reduction (i.e., zero

2011 and 2050, CO2e Concentration Levels, with and without California

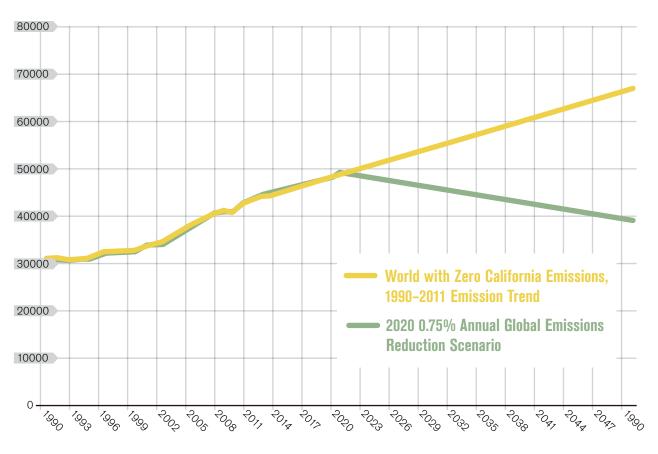
TABLE 3

	Atmospheric CO2e Concentration(ppm)	
Scenario Year	2011	2050
Global Emissions with California	447.1	531.2
Global Emissions without California	445.6	529.6
Percent Change	-0.336%	-0.293%

Concentration values derived from the linear statistical relationship between observed CO2e emissions and concentrations for 1990-2011 shown in Figure 7 and are used to illustrate relative magnitudes and not as specific predictive results.

Global Emissions without California, and Global Emissions (including California) with 0.75% Reduction per year from 2020 (million metric tons per year)

Figure 7



CAIT 2.0 for 1990-2011, total California and world CO2e annual emissions; 2012-2050 emissions based on 1990-2011 average annual increase in world emissions without California and assuming 0.75% annual reduction from prior year emission levels after 2020.

state emissions) in California emissions versus a more measured state policy based on AB 32 that contributes towards a globally applicable CO2e program. Figure 7 includes the analysis of global emissions without California for 1990-2050 shown in Figure 5 contrasted with an alternative scenario that assumes: (a) California achieves its AB 32 emissions target of 431 MtCO2e in 2020, and (b) California, and the rest of world, agree to reduce emissions by 0.75% per year from 2020 to 2050.

Figure 7 indicates that, even assuming zero California CO2e output, global emissions would be almost completely unaffected during 1990-2011 and would continue to rapidly increase over time based on current trends. By 2050 the world would generate approximately 67,400 MtCO2e per year, more than double the 1990 level of 30,880 MtCO2e. Using the statistical relationship between global CO2e emissions and atmospheric concentration shown in Figure 6, projected CO2e levels would rise to about 530 ppm in 2050.

Figure 7 also illustrates the result that could occur if California fully implements AB 32, demonstrates that significant GHG reductions can be achieved without adversely affecting the working and middle class, and thus contributes towards a global commitment to reduce worldwide emissions by just 0.75% per year from 2020-2050. Under these assumptions, annual global emissions would peak in 2020 at about 49,930 MtCO2e, and fall by about 20% to 39,400 MtCO2e by 2050. Even very modest, but globally-based reductions would cut 2050 emissions by nearly half from the levels that would occur in the world-without California projection, and be much closer to 1990 levels of about 30,880 MtCO2e. Using the statistical relationship between global CO2e emissions and atmospheric concentration shown in Figure 6, projected CO2e levels would be about 430 ppm in 2050.

Due to the complexity of the factors that could affect GHGs in the atmosphere over time, these projections can not provide a precise estimate of future CO2e concentrations. They do confirm the California legislature's findings when enacting AB 32, and the Governor's

recent insight, that only global-scale emission reduction programs, even if extremely modest in scope, will have measurable effects on climate change risks. Recent proposed legislation, and judicial interpretations of CEQA (enacted in 1970), to commit to the much more aggressive and, as indicated by recent scientific studies, technologically, economically and socially unobtainable 80% GHG reductions within California, would be far less likely to stimulate similar efforts in other locations that produce orders of magnitude more CO2e emissions. Indeed, as the following section demonstrates, these efforts can actually increase net GHG emissions when population and industrial responses to the state's highly unfavorable regulatory system, CEQA and other litigation risks, and significantly higher housing and energy costs are considered.

Population and industrial displacement have and likely will continue to offset in-state GHG emission reductions

California's markedly unbalanced economy has quietly stimulated one of the largest domestic population shifts

Emissions per Capita and Change from California Levels, attributable to 1990-2010 Net Domestic Migration from California. (tons of CO2e)

TABLE 4

	Per Capita Emissions	Emissions from 1990-2010 Net Domestic Migration (3.8 Million individuals)	Net Increase from California levels
CALIFORNIA	11.4	43,271,944	
Rest of United States	22.4	84,986,557	41,714,614

Derived from CAIT 2.0. See Figures 3 and 4.

in recent American history. Until about

1990, the state historically attracted Americans from the rest of the country who were drawn by the promise of its astonishing natural resources and diverse economic opportunities. This long-established domestic migration pattern—the net flow of U.S. residents from and to California over time—has completely reversed since 1990 as the state experienced an unprecedented "exodus" of former residents to other locations. According to a 2012 study, California lost a net of 3.8 million people, approximately the current size of Oregon or Oklahoma, to other states during 1990-2010 alone.³⁴

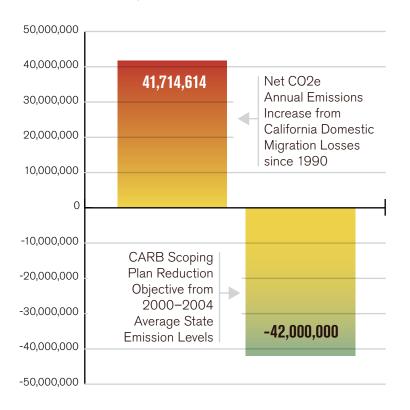
The GHG emission consequences of major population shifts from the state are almost never addressed by state policymakers, but they can have an enormous cumulative and adverse impact on California's climate change policy goals. As shown in Table 4, per capita California GHG emissions were 11.4 tons of CO2e per person in 2011, half the rate in the rest of the U.S. (22.36 tons of CO2e per person). On average, the net domestic migration of 3.8 million people to other parts of the U.S. increased emissions by 41.7 MtCO2e per year from levels that would have occurred in California.

The cumulative increase in global GHG emissions per year caused by net domestic migration from the state seriously undermines the potential global benefits of California's in-state GHG emission reductions. As shown in Figure 8, the CARB Scoping Plan set a 42 MtCO2e reduction goal from 2002-2004 average emission levels.³⁵ Based on the average per capita emissions data for California and the rest of the United States in Table 5, domestic migration to higher emission locations since 1990 has already offset almost all of this objective.

California also undermines state GHG policies by causing industrial

Figure 8

Emissions increases caused by Net Domestic Migration from California Versus CARB 2020 Reduction Target from 2000-2004 Levels (tons of CO2e per annum)



Derived from CAIT 2.0. See Figures 3 and 4.

relocation and growth, even for the green technologies and industries it most wants to stimulate, to occur in other, higher emission locations. The severity of this problem was recently highlighted in the well-publicized decision by Tesla, an electric car pioneer, to locate a massive \$5 billion battery factory in Nevada. Tesla's decision was particularly difficult for California, because state tax and electric car development policies have been a major factor, if not the primary reason for, the company's successes to date. In recent decades, companies have increas-

Emissions from 5% of 2013 Gross State Product in California, rest of World, and in China (tons of CO2e per annum

TABLE 5

	Emissions per Million Dollars GDP	Emissions from 5% of State 2013 Real Output	Net Increase from California Levels
CALIFORNIA	253	25,941,266	
World	486	49,790,826	23,849,560
China	782	80,171,843	30,381,017

Derived from CAIT 2.0. See Figures 3 and 4.

ingly induced multiple states to compete for business by offering a variety of economic incentives. Tesla was reportedly wooed by Texas, New Mexico and Arizona in addition to California and Nevada. A crucial factor in the decision to reject California, however, was the risk that the state's infamously complex and unpredictable regulatory process, including CEQA lawsuits, would delay the planned 2017 start of battery manufacturing. Based on published reports, Tesla officials specifically "expressed concerns about the state's cumbersome environmental regulations," and state legislators drafted a 35 page bill providing, among other benefits, "for waiving large portions of the landmark California Environmental Quality Act to speed construction." In part due to widespread opposition by environmental activists to the partial waiver of CEQA, the Tesla legislative package stalled and ultimately none of these measures were sufficient to induce Tesla to locate in California.30

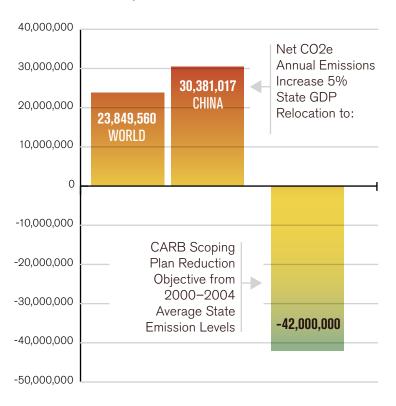
Tesla represents only one of a growing number of enterprises that have left, reduced operations in, or expanded outside of California in response to high housing costs for employees, high utility

and energy costs, and regulatory uncertainty. Other high-profile recent examples include Farmer Brothers, Chevron, Nestle, Sony, Charles Schwab, Occidental Petroleum, Toyota, Campbell Soup, Nissan and Comcast.³⁷ As shown in Table 1, California generates only about 253 tons of CO2e per million dollars of domestic output compared with a worldwide average of about 485 tons, and about 782 tons in China, which supplies a significant amount of the consumer goods consumed by residents and products sold by firms in the state. According to the California Department of Finance, in 2013 the state's real (in 2009 dollars) domestic output was about \$2.050 billion.³⁸ Table 5 shows the net increases in annual GHG emissions from California levels that would be associated with economic activity equal to about 5% of the state's GDP occurring in other parts of the world and in China.

As shown in Figure 9, even a relatively small displacement of economic activity from California can generate net global GHG emissions increases that would offset much of the state's current objectives. On average, a shift just 5% of state GDP to the rest of the world would

Figure 9

Net Emissions Increases from Movement of 5% of State GDP to Rest of World and China versus CARB 2020 Reduction Target from 2000-2004 Levels (tons of CO2e per annum)



Source: Derived from CAIT 2.0. See Figures 3 and 4.

result in emissions that offset about 57% of the state's 2020 42 MtCO2e reduction goal from 2002-2004 levels. Shifts to higher emissions locations, such as China, could offset over 70% of the in-state reductions planned for 2020.

Conclusion

Despite its reputation for regulatory overreach, California has to date enacted a relatively measured approach to climate change that seeks achievable, and significant GHG emission reductions,

the development of low-carbon "green" technologies, and economic growth. California's per capita CO2e and economic carbon efficiency are well below the U.S. average and comparable with other relatively low emission, advanced industrial economies. California has also successfully implemented GHG reduction measures that demonstrate the feasibility of further reducing CO2e emissions beyond the current AB 32 objectives, but cannot achieve proposed 80% reductions below 1990 levels using existing and known technologies.



The state can only meaningfully contribute to global CO2e reductions on a global scale, however, by demonstrating to other states and nations that a low-carbon, robust economy and diverse society with quality jobs can simultaneously be sustained. The potential adoption of technologically infeasible reductions of 80% below 1990 levels by either new legislation or legal decree would almost certainly increase the state's housing and energy costs, adversely affect income and job growth for most of the state's residents and disproportionately harm the state's vast number of impoverished residents, and significantly decrease the likelihood that similar policies would be implemented elsewhere. In fact, if California policies continue to stimulate significant population and economic activity relocation to higher GHG emission states and countries, the state could inadvertently increase global CO2e levels. Under these circumstances, an apparently significant in-state GHG reduction would actually increase adverse climate change risks by leading to net emission increases and higher CO2e atmospheric levels.

Until it is clear that other jurisdictions are willing to implement complementary GHG reduction measures, the California courts should not impose technically infeasible GHG reduction mandates into CEQA, and California's next legislatively adopted GHG reductions goals should be carefully calibrated and implemented to enhance California's job base and economy. The true measure of the state's GHG policy success is not achieving reductions solely attributable from sources within California, but contributing to meaningful global CO2e reductions. This objective can only be

achieved by inspiring other states and nations to concurrently pursue GHG reductions without sacrificing economic prosperity that benefits all social groups. A purely unilateral GHG reduction focus could well be associated with significant net increases in CO2e levels if higher emissions activities and population move to higher per capita and less efficient GHG locations.

> California would be far better served by pursuing reasonable, if less dramatic GHG reductions, building a broad-based economy, and using proven evidence of social, economic and climate change policy successes to convince others to follow the state's lead on GHG reductions.

At present, while the state has made significant progress towards reducing GHG emissions, including the development of innovative market-based emission trading and other measures, its economy remains unbalanced and particularly unable to benefit poor and middle-class households. If GHG reductions are associated with adverse social outcomes for much of the population, few policy makers in other jurisdictions would be likely to adopt similar policies. The challenge for California is to prove that a full spectrum economy can flourish in a lower-carbon regulatory environment. California should work to achieve this objective in the context of AB 32 before it seeks additional, but potentially pyrrhic GHG emission reduction goals.

- 1. David Friedman and Jennifer Hernandez are attorneys in the California environmental and land use practice group of Holland & Knight LLC, an international law firm. The practice group periodically publishes analyses of California legal and policy data in support of its continued study of the use, and abuse, of the California Environmental Quality Act of 1970, which allows anyone (even anonymous entities, and entities seeking to advance non-environmental objectives) to file a lawsuit alleging inadequate environmental evaluation of any type of project requiring a discretionary approval from any state, regional or local agency. As confirmed by several research studies including those completed by the firm, California courts have upheld approximately half of such lawsuit challenges in reported appellate court cases decided over the past 15 years, most commonly ordering reversal of project approvals pending further environmental studies. The delays and uncertainties caused by CEQA litigation abuse against environmentally benign or even beneficial projects have prompted repeated calls for CEQA reform by California's elected leaders, but meaningful reform faces fierce opposition from entrenched special interests.
- 2. The Global Warming Solutions Act is codified at Cal. Health and Safety Code Section 38500 et seg., and became effective in 2006. The Act is often referenced as "AB 32," the assembly bill number assigned to the legislation.
- 3. In February 2015 newly elected Senate President Pro Tem Kevin de León (D) announced a package of bills, including Senate Bill (SB) 350 that would extend the state's greenhouse gas targets to midcentury, expand the state's renewable electricity target to 50 percent, cut petroleum use by 50 percent, require all new and existing commercial buildings to be twice as energy efficient and require state employee pension funds to divest from coal. Senator Fran Pavley, the principal author of California's first major GHG reduction bill, Assembly Bill (AB) 32, also introduced SB 32, which establishes a new 2050 GHG reduction target of 80% below 1990 levels. Debra Kahn, *Top lawmakers launch a clean energy 'gold rush' with sweeping new climate change proposals*. ClimateWire, February 11, 2015 (http://www.eenews.net/stories/1060013256, accessed February 2015).
- 4. Carla Marinucci, Top Democrat's plan: *Divest in coal to fight global warming*, San Francisco (December 16, 2014) (http://www.sfgate.com/news/article/Top-state-Democrat-pushes-coal-divestment-to-5959147.php accessed February 2015).
- 5. Cal. Health and Safety Code Section 38501(d)-(e).
- 6. D. Friedman and J. Hernandez, *California's Social Priorities*. Chapman University Center for Demographics and Policy. Chapman University Press (2015) (http://www.chapman.edu/wilkinson/files/CA Soc Prior FnSm2.pdf. accessed March 2015).
- 7. California Council on Science and Technology (Jeffery Greenblatt and Jane Long), California's Energy Future: Portraits of **Energy Systems for Meeting Greenhouse Gas Reduction Targets** (September 2012).
- 8. CO2e data compiled by world climate change agencies and research organization often requires several years to compile and finalize. The time series databases used in the report were selected because they are produced by climate change specialists that are widely recognized as leaders in the field and use comparable measures of emissions (i.e., CO2e). These databases generally extend to 2011. Based on preliminary data produced by several organizations, state and global trends do not appear to have markedly changed since 2011 in a manner that would significantly affect the analysis in this report. The concentration of CO2e in the atmosphere is generally larger than reported CO2 levels alone because other gases, such as methane, are included in the measurement of CO2e.

- 9. Remote Sensing Systems (RSS), Climate Research, (available at http://www.remss.com/research/climate#Atmospheric-Temperature, accessed September 2014). RSS is a scientific research company located in Northern California, specializing in satellite microwave remote sensing of the earth. The company's research is supported by NASA, NOAA, and the NSF, and many of the firm's researchers participate in NASA science research teams and working groups, collaborating with other industry leaders and the scientific community (see http://www.remss.com/about/who-we-are, accessed September 2014).
- 10. CARB, First Update to the Climate Change Scoping Plan: Executive Summary (2014), page 9.
- 11. IPCC. Climate Change 2013: The Physical Science Basis, Summary for Policymakers (2013), p. 16.
- 12. CARB, First Update to the Climate Change Scoping Plan: Executive Summary (2014), p. 12.
- 13. CARB, First Update to the Climate Change Scoping Plan: Executive Summary (2014), pp. 1, 12 and 13.
- 14. The World Resources Institute CAIT 2.0 database (http://cait2.wri.org accessed September 2014) provides accessible, transparent, high-quality information about national, global and state GHG emissions standardized in terms of CO2e levels, which represents the most comprehensive measure of potential global warming effects from GHG emissions. CAIT 2.0 is unique in that it applies a consistent methodology to create a six-gas, multi-sector, and internationally comparable data set for 186 countries and all U.S. states. The current range of available data in CAIT 2.0 is 1990-2011. CAIT has been used by United Nations Framework Convention on Climate Change and other climate change forums and, is considered one of the most trusted sources of policy-relevant climate data, and is referenced by the U.S. Environmental Protection Agency as a source of global climate change data (http://www.epa.gov/climatechange/ghgemissions/global. html, accessed September 2014). National, international and state agencies calculate CO2e emissions (often called "inventories") using different methodologies that are subject to uncertainty. As a result, CAIT and other estimates may not be strictly comparable, but the CAIT estimates are considered to be within the range of estimation uncertainty in most cases. All CAIT 2.0 data used in this report utilizes total reported emissions excluding potential forestry and land use-related reductions (these factors tend to reduce net emissions from more heavily vegetated areas due carbon uptake by plants, but adds an additional layer of uncertainty to the emissions calculations). California has generally high levels of vegetation-related carbon uptake, and the use of the forestry and land use adjusted values in the CAIT 2.0 database would tend to lower the state's relative contribution to global emissions, and reduce its capacity to meaningfully affect climate change risks through emission reductions alone. Consequently, the data used in this report tends to overstate (i.e., provides a conservative analysis of) the extent to which California emission reductions can affect climate change.
- 15. The totals for the "United States without California" were derived by subtracting the California state data in the CAIT 2.0 state database from the U.S. data in the CAIT 2.0 country database. U.S. per-capita and per MSGDP data differs slightly in these databases, and the national database results were used to provide comparability with world and other country reported data.
- 16. See Germany 26% of Electricity from Renewable Energy in 1st Half of 2012 http://cleantechnica.com/2012/07/26/ germany-26-of-electricity-from-renewable-energy-in-1st-half-of-2012/ (accessed 2014).
- 17. Melinda Burns, *A Road Less Traveled* (January 2011) (available at http://www.psmag.com/environment/a-road-less-traveled-26524/ (accessed 2014).
- 18. Cal. Health and Safety Code Section 38501(d)-(e).
- 19. Cal. Health and Safety Code Section 38501(h).

- 20. San Diego Union Tribune Editorial Board, *Green jobs: More delusion and dishonesty*, February 11, 2015 (http://www. utsandiego.com/news/2015/feb/11/green-jobs-more-delusion-and-dishonesty/, accessed March 2015).
- 21. CARB, *Climate Change Scoping Plan* (December 2008) pp. 24-25 (emphasis in original).
- 22. CARB, First Update to California's Climate Change Scoping Plan, (2014) pp. 92-93.
- 23. D. Friedman and J. Hernandez, *California's Social Priorities*, Chapman University Center for Demographics and Policy, Chapman University Press (2015) (http://www.chapman.edu/wilkinson/_files/CA_Soc_Prior_FnSm2.pdf, accessed March 2015).
- 24. D. Friedman and J. Hernandez, *California Social Priorities*. Chapman University Center for Demographics and Policy. Chapman University Press (2015). According to a recent U.C. Berkeley analysis, real wages for the lower 50% of all income groups actually fell in California since 1970, and this negative trend increased during 2003-2013, when real wages fell for all income groups but the highest 20%. S. Allegretto, M. Reich and R. West, *Ten Dollars or Thirteen Dollars?*
- 25. Chris Kirkham. *Manufacturing slower to grow in California than elsewhere in U.S.*, Los Angeles Times (January 20, 2015) http://www.latimes.com/business/la-fi-california-manufacturing-20150120-story.html#page=1 (accessed February 2015).
- 26. Poverty data reflect cost of living adjustments in the Census Bureau's supplemental poverty analysis as summarized in D. Friedman and J. Hernandez, *California's Social Priorities*, Chapman University Center for Demographics and Policy, Chapman University Press (2015) (http://www.chapman.edu/wilkinson/files/CA Soc Prior FnSm2.pdf, accessed March 2015).
- 27. M. Taylor, *California's High Housing Costs, Causes and Consequences*, California Legislative Analyst's Office (March 17, 2015).
- 28. U.S. Energy Information Agency, *Electric Power Monthly, with Data for December 2014.* Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, December 2014 and 2013 (Cents per Kilowatt-hour) (February 2015).
- 29. American Automobile Association. *Daily Fuel Gauge Report: State Prices*. http://fuelgaugereport.aaa.com/todays-gas-prices/ (accessed March 21, 2015).
- 30. In 2014, a California appellate court found that a CEQA analysis of GHG impacts must consider an 80% reduction level suggested in a 2005 gubernatorial executive order that was not, at the time the case was decided, enacted into law. In March 2015, the California Supreme Court accepted the case for review. See California Supreme Court, Summary of Cases Accepted and Related Actions for Week of March 9, 2015, March 13, 2015): 2005 Executive Order S-3-05 (2005) (urging the state to reduce emissions to 80% below 1990 levels by 2050); Wendy Fry et al., *Court Ruling Shuts Down* SANDAG's 40-Year Transportation Plan, http://www.nbcsandiego.com/news/local/Lawsuit-Challenging-Regional-Transportation-Plan-Upheld--283772261.html (November 25, 2014; accessed January 2015).
- 31. In February 2015 newly elected Senate President Pro Tem Kevin de León (D) announced a package of bills, including Senate Bill (SB) 350 that would extend the state's greenhouse gas targets to midcentury, expand the state's renewable electricity target to 50 percent, cut petroleum use by 50 percent, require all new and existing commercial buildings to be twice as energy efficient and require state employee pension funds to divest from coal. Senator Fran Pavley, the principal author of California's first major GHG reduction bill, Assembly Bill (AB) 32, also introduced SB 32, which establishes a new 2050 GHG reduction target of 80% below 1990 levels. Debra Kahn, *Top lawmakers launch a clean energy 'gold rush' with sweeping new climate change proposals.* ClimateWire, February 11, 2015 (http://www.eenews.net/stories/1060013256, accessed February 2015).

- 32. California Council on Science and Technology (Jeffery Greenblatt and Jane Long), California's Energy Future: Portraits of **Energy Systems for Meeting Greenhouse Gas Reduction Targets** pages 5-6, (September 2012) (http://www.ccst.us/publications/2012/2012ghg.pdf, accessed February 2015).
- 33. California Council on Science and Technology (Jeffery Greenblatt and Jane Long), California's Energy Future: Portraits of **Energy Systems for Meeting Greenhouse Gas Reduction Targets** page 4, (September 2012) (http://www.ccst.us/publications/2012/2012ghg.pdf, accessed February 2015).
- 34. Tom Gray & Robert Scardamalia, *The Great California Exodus: A Closer Look*, Manhattan Institute for Public Policy, Table 2 (September 2012).
- 35. CARB, Climate Change Scoping Plan (December 2008), p. 12.
- 36. Marc Lifsher, California Legislature fails to reach a deal on Tesla battery factory, Los Angeles Times, August 31, 2014, and California may waive environmental rules for Tesla battery factory Los Angeles Times, August 12, 2014.
- 37. J. Coupal, *Farmer Brothers another company driven out of California by high costs*, Los Angeles Daily News, February 17, 2015 (http://www.dailynews.com/opinion/20150217/farmer-brothers-x2014-another-company-drivenout-of-california-by-high-costs-jon-coupal, accessed March 2015).
- 38. California Department of Finance, California State Domestic Product, 1963-2013, http://www.dof.ca.gov/HTML/FS_DATA/ LatestEconData/documents/BBStateGDP.XLS (accessed March, 2015).

Design Notes

California's Social Priorities and the graphics utilize the following:

To achieve visual harmony a modified version of the grid Jan Tschichold conceived for his book Typographie was employed.

MINION PRO Chapman's serif family, is a digital typeface designed by Robert Slimbach in 1990 for Adobe Systems. The name comes from the traditional naming system for type sizes, in which minion is between nonpareil and brevier. It is inspired by late Renaissance-era type.

BERTHOLD AKIZEDENZ GROTESK is Chapman's san serif family. It is a grotesque typeface originally released by the Berthold Type Foundry in 1896 under the name Accidenz-Grotesk. It was the first sans serif typeface to be widely used and influenced many later neo-grotesque typefaces after 1950.

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Book exterior and interior design by Chapman University professor Eric Chimenti. His work has won a Gold Advertising Award, been selected for inclusion into *LogoLounge: Master Library, Volume 2 and LogoLounge Book 9*, and been featured on *visual.ly*, the world's largest community of infographics and data visualization. He has 17 years of experience in the communication design industry. To view a client list and see additional samples please visit www.behance.net/ericchimenti.



Professor Chimenti is also the founder and head of Chapman's **Ideation Lab** that supports undergraduate and faculty research by providing creative visualization and presentation support from appropriately qualified Chapman University undergraduate students. Services include creative writing, video, photography, data visualization, and all aspects of design. The students specialize in the design and presentation of complex communication problems.



