

THE ECONOMIC IMPACTS OF CALIFORNIA'S
MAJOR CLIMATE PROGRAMS ON THE

SAN JOAQUIN VALLEY

ANALYSIS THROUGH 2015 AND
PROJECTIONS THROUGH 2030



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EXECUTIVE SUMMARY

The San Joaquin Valley plays a critical role in shaping California's climate policy and is worthy of study due to its function as a bellwether of the state's transition to a low-carbon economy. Reducing emissions is vitally important for the San Joaquin Valley. The Valley's topography traps pollution, and air quality and the resulting health conditions are far worse in the Valley than in other region of the state. The region also faces more socioeconomic challenges than the state as a whole. Thus the Valley is vulnerable to both climate change and to climate policy. If policymakers can make climate policy work for the Valley, it will work for the state and demonstrate that these policies and programs can work for vulnerable communities around the world.

In the California Legislature, some San Joaquin Valley ("Valley") representatives have raised concerns about the impact the state's climate policy and programs could have on jobs.¹ But claims and counter-claims about the economic impact of climate policies have been wielded in an informational vacuum. To date, no comprehensive independent or academic study has sought to calculate and analyze current and future economic impacts of state climate policies within the San Joaquin Valley, comprised of the eight counties of Fresno, Madera, Merced, Kern, Kings, San Joaquin, Stanislaus, and Tulare. Together, these counties represent 11 percent of the state's population.

With this report, the UC Berkeley Donald Vial Center on the Green Economy (DVC) and the Center for Law, Energy and the Environment (CLEE) at UC Berkeley School of Law, with support from Next 10, offer a quantitative assessment of the economic impacts of three of California's major climate programs and policies in the Valley: cap and trade, the renewables portfolio standard, and investor-owned utility (IOU) energy efficiency programs. We also offer policy recommendations based on the findings.

Results for each of the three programs and policies investigated are summarized in brief below. As the costs and benefits for each program were calculated differently, results cannot be equally compared across all programs. However, analysis from this report suggests that total net economic benefits thus far for the three programs investigated is more than \$13.4 billion. In short, the findings indicate that despite the heightened fears of job loss, California's major climate policies have been a net economic boon to the San Joaquin Valley. Strengthening those policies, not backtracking on them, is likely to continue that success and accentuate the positive effect in the region. After accounting for the costs and benefits, the net impacts are bulleted below:

Cap and Trade

Net economic impacts from the cap-and-trade program through December 2016 include \$200 million in total economic impact, including \$4.7 million in state and local tax revenue. These programs have created 1,612 total jobs in the Valley, including 709 direct jobs.

When one includes expected benefits based on funds for projects approved but not yet spent (with funds to be disbursed on a yet-to-be-determined date), this figure balloons to nearly \$1.5 billion when accounting for total impact on the economy. These projects will create 10,500 total jobs, including 3,000 direct jobs.

RPS

The state's Renewables Portfolio Standard has had a substantial economic impact on the Valley and is a key source of job creation. Construction on RPS-related projects resulted in a total economic impact of \$11.6 billion in the Valley. Between 2002-15, the RPS created 88,000 total jobs, including 31,000 direct jobs.

Energy Efficiency

Energy efficiency projects in the Valley have had a net economic benefit of \$1.18 billion. Energy efficiency is also a significant job creator, particularly in the construction sector, and was responsible for creating a total of 17,400 jobs in the Valley between 2006 – 2015, including 6,700 direct jobs. Benefits from efficiency programs include lower electricity costs, consumer savings from reduced energy use, jobs created to implement energy upgrades and jobs flowing from the boost in local economies that results from lower utility bills.

Economic Impacts

This analysis presents costs and benefits to the Valley economy, including job gain and loss, of three programs: Cap and trade, the Renewables Portfolio Standard and energy efficiency programs overseen by the California Public Utilities Commission (CPUC). The methods used to evaluate the economic impacts of three significant climate policies and programs varied due to the data and modeling tools readily available for an initial analysis. As a result, the impacts, and the employment impacts in particular, are reported by program rather than in aggregate. Because of this, we have not summed these impacts and caution against doing so. However, the economic data and methods used can provide the foundation for more robust regional analyses of California's climate programs in the future.

CAP AND TRADE

One of the key climate policies initiated under AB 32 is the state's cap-and-trade program, which is a market-based program to reduce greenhouse gas (GHG) emissions from designated entities.

To determine the net economic impacts of cap and trade in the Valley, we first estimated the direct impacts – the costs of compliance and investments of revenue raised from auctioning the allowances, and then used IMPLAN to model the macroeconomic effects. The negative direct impact is due to the aggregate regional compliance cost, comprised of on-site reductions plus cost of acquiring allowances or offsets, net of free allocations. The positive direct impact is based on spending and projected spending in the Valley of allowance auction proceeds.

Table 1 shows the estimated compliance obligation for the San Joaquin Valley. Cost estimates are based on the estimated compliance obligation for the Valley (emissions minus free allowances). Full details on compliance cost methodology can be found in the Methodology section for cap and trade.

The total estimated positive impact on economic activity from all expected and disbursed expected and disbursed Greenhouse Gas Reduction Funds (GGRF) is \$668 million, with a total impact on employment (including direct, indirect and induced jobs) of 6,190 jobs.

Table 2 summarizes the net economic impacts of cap and trade in the Valley. The results are unambiguously positive but remain a small fraction of the region's increasingly dynamic, diverse economy. We estimate that benefits (net of costs) represent 0.04 percent of total employment and regional domestic product of over \$150 billion. Also notable is that

TABLE 1 Summary of Emissions, Free Allowances, and Cost of Cap-and-trade Compliance (2013-15), San Joaquin Valley and Total

MMTCO ₂ e	Capped Emissions*	Allocation of Free Allowances	Estimated Compliance Obligation	Estimated Compliance Cost (Dollars)
Total	632.5	504.0	128.5	\$4,990 million
San Joaquin Valley	130.7	42.7*	90.9	\$628 million

Source: Authors' analysis using ARB auction, emissions, and allowance allocation data

*Value estimated

TABLE 2 Summary of Costs and Benefits of Cap-and-trade Implementation in the Period 2013-15 in the San Joaquin Valley

Category	Direct Effects (\$ and jobs)	Total Impact on Economic Activity	Total Impact on Employment	Impact on State & Local Tax Revenue*
Cost of Compliance (2013-15)	(\$200 million) (151 jobs)	(\$265 million)	(428 jobs)	(\$9.6 million)
Implemented GGRF Revenue (2013-15)	\$319 million 860 jobs	\$467 million	2040 jobs	\$14.3 million
Expected GGRF Revenue (2013-15)**	\$1203 million 3190–3800 jobs	\$1750 million	7840 jobs	\$54.9 million
Net Impact (to-date)	\$119 million 709 jobs	\$202 million	1612 jobs	\$4.7 million
Expected Net Impact**	\$1003 million 3039- 3649 jobs	\$1485 million	7412 jobs	\$45.3 million

Source: Authors' IMPLAN analysis. Results reported in 2016 dollars.

* Excludes property tax revenue

**Expected includes both the already disbursed

even though only a small fraction of GGRF funds have been disbursed at time of writing, the net impact on jobs, total economic activity, and state and local tax revenue was positive (1612 jobs, \$202 million, and \$4.7 million, respectively). Generally, the industries receiving GGRF funds are more labor-intensive than the industries needing to comply with the emissions cap. Furthermore, despite the modeled negative impact indicating the contraction of 428 jobs in emission intensive industries due to cap-and-trade compliance, there has been no evidence of actual job loss in the region. In fact, total employment, personal income, and household incomes rose over the first three years of cap-and-trade implementation.

The program has had a positive stimulus effect due to the investment in the region of revenues from the auction allowances, which are collected into the Greenhouse Gas Reduction Fund (GGRF). In the San Joaquin Valley, GGRF revenues are now being spent on the planning and construction of the initial portion of the state's high-speed rail system, as well as a variety of other programs that reduce GHG emissions. Because a portion of the GGRF is required to benefit or be spent in disadvantaged communities, as defined by SB 535, and many of these communities are located in the San Joaquin Valley, the region is poised to receive a higher share of expenditures than its share of the state's capped emissions.

Should California decide to extend the cap-and-trade program beyond 2020, as the California Air Resources Board has proposed, and assuming that the state will legally be able to continue auctioning allowances, a number of factors will determine the future costs and benefits of the program to the Valley. Compliance costs will be less expensive if covered entities can reduce emissions more cheaply than the cost of procuring allowances. The benefits to the Valley will be determined by the number and price of allowances sold in the state auction, the percentage of GGRF funds spent in the Valley, allocation to utility

customers, and the activities funded by the GGRF. Other more difficult to quantify benefits include improved public health and lower health care costs as well as the expansion of low carbon substitutes for carbon intensive industries.

RENEWABLES PORTFOLIO STANDARD

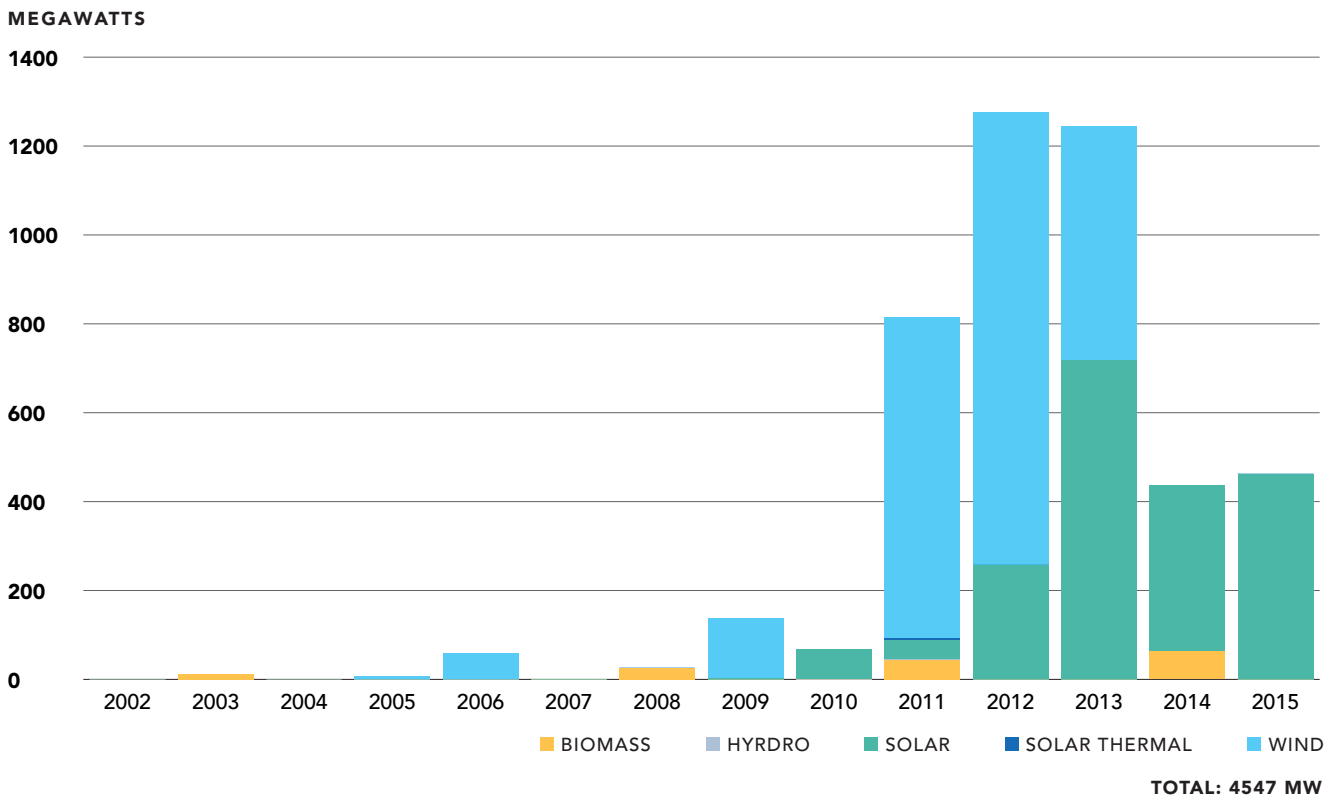
Another key climate policy shaping California's transition to a low-carbon economy is the Renewables Portfolio Standard (RPS). Initiated in 2002 and later strengthened twice, it requires all retail electricity sellers to procure 33 percent of their electricity from eligible renewable energy resources by 2020 and 50 percent by 2030.

As of December 2015, the Valley was the site of almost 31 percent of the RPS-qualifying energy capacity statewide, showing a concentration much greater than its share of the state's electricity consumption (15 percent). In total, by the end of 2015, 4547 Megawatts (MW) of renewable energy generation was constructed in the Valley (See Figure 1).

Using the Jobs and Economic Development Impact (JEDI) models developed by the National Renewable Energy Laboratory (NREL), we estimate that construction of those projects from 2002-15 created about 88,000 direct and indirect jobs,² of which 80,000 were created since 2012. Within this figure, 31,000 of these were "direct jobs" including jobs associated with on-site development. This construction resulted in \$11.6 billion in total economic output in the Valley.

Jobs in the construction of utility-scale renewable power plants throughout California have generally been local, career-track jobs because almost all projects have been built under project labor agreements (PLAs). PLAs ensure that workers are paid a living wage and benefits and require that many of the workers are trained through the state-certified apprenticeship system, which provides broad occupational training

FIGURE 1 Renewable construction in the 8-county San Joaquin Valley region, 2002-15



and a path into a middle class skilled trade career. As it is designed, California’s RPS has yielded significant beneficial economic impacts to the San Joaquin Valley and other economically depressed regions of the state.

The future economic impacts of California’s renewable energy policies in the Valley will be determined, in part, by the amount of renewables built in the region to meet statewide demand. This amount is, in turn, influenced by resource cost, generation profile, and the state’s decisions on how much to expand its grid market outside of California. Grid expansion could allow for more out-of-state renewables to meet in-state demand.

As California policymakers consider the modification of state rules to allow for the buying and selling electricity more freely across state lines in the Western region, it is important to consider the potential

costs and benefits for California and the San Joaquin Valley. A recent California Independent System Operator (CAISO) study indicated that the results of a multi-state grid could be largely positive for the San Joaquin Valley as long as the current renewable procurement rules (i.e. category system) stay intact.³

Overall, given the region’s prime location for solar exposure (‘insolation’) and wind resources (particularly in eastern Kern County), the low transmission costs from the region, the state’s ambitious renewable goals and the likely increasing need for electricity for the transportation sector, the Valley is likely better positioned than any other part of the state to benefit economically from renewable deployment through 2030. The RPS-related jobs and economic benefits to-date are likely to continue to increase as the state deploys more renewable energy through 2030.

TABLE 3 Economic Impacts of the Renewables Portfolio Standard on the San Joaquin Valley, 2002-2015

Renewable technology	Capacity in Megawatts (MW)	Direct jobs (construction phase)	Total economic output (construction phase)	Total jobs (construction phase)
Solar	1926	28,880	\$9,708 million	76,330*
Wind	2471	1,600	\$1,726 million	10,400*
Other	151	600	\$166 million	1110*
TOTAL	4547	31,000	\$11,600 million	87,800*

Source: Authors' analysis using JEDI with power plant data from the California Energy Commission

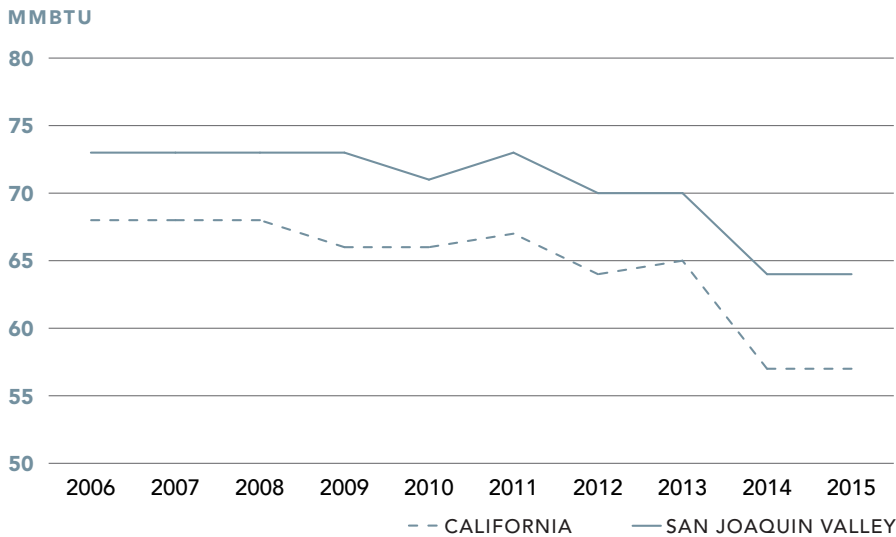
ENERGY EFFICIENCY (EE)

Energy efficiency (EE) is the highest priority energy resource in the state's energy planning system and is key to minimizing the costs of transitioning to a cleaner energy system. The Valley has one of the hottest climates in the state, and per household energy use is slightly higher than the state average (Figure 2). As a result, energy efficiency has special significance for this region. Ratepayer-funded programs, administered by the investor-owned utilities, are the largest consolidated source of funding for incentives and assistance for energy efficiency investments in California and represent the basis for the analysis in this report.⁴ These programs help residential, commercial, and industrial and agricultural customers by reducing the cost of energy-efficient technologies and related energy services.

Based on county-specific CPUC data from 2010-15 program years, Valley customers received a total of \$257 million in rebates and other incentives including direct install services. Additional calculated spending associated with administering, marketing, and implementation, combined with customer investments, brought the total investment in energy efficiency in the Valley (through IOU programs) to \$846 million.

Energy efficiency investments have a high positive rate of return. Customers save money year after year, and energy efficiency helps keep rates low for everyone by reducing the need for costly new energy generation infrastructure. The CPUC evaluates the cost-effectiveness of the IOU energy efficiency programs in order to ensure they return more benefits to ratepayers than they cost. Since 2010, the Valley has had the highest cost effectiveness in the state, with benefits from EE projects totaling \$1.183 billion. After subtracting total ratepayer and consumer costs, these programs provide a net benefit of \$248 million.

FIGURE 2 Per Household energy consumption in the San Joaquin Valley compared to California, 2006-2015



In addition to the benefits of avoided future costs, energy efficiency investments in the Valley create work in the construction sector. This impact is important because construction jobs have higher economic and employment multipliers than retail and service jobs: a job created in construction will stimulate more economic activity in the region. Based on publicly available data at California's energy agencies, a wide review of literature on energy efficiency job impacts, and research from the Lawrence Berkeley National Laboratory, we estimate that between 2006-15, IOU energy efficiency programs created 6,700 direct job and 10,700 indirect and induced jobs, for a total of 17,400 jobs.

While California's IOU energy efficiency programs represent only a fraction of the state's commitment to efficiency, they account for the largest consolidated source of funding for energy efficiency in the state. If the amount of expenditures were to stay constant or increase with a corresponding increase in energy efficiency investment in the Valley, the Valley and the state would see even greater benefits.

The benefits include lower electricity costs due to the avoidance of additional energy generating infrastructure, consumer savings from reduced energy use, the number and quality of jobs created to implement energy upgrades, and the jobs created in the local economy due to increased discretionary spending as a result of lower utility bills.

If the rate of annual energy savings from efficiency projects in the Valley were to remain constant through 2030, we project that Valley efficiency investments would likely create continued job and economic benefits. Doubling the rate of energy efficiency savings by 2030, as SB 350 (de Leon, 2015) requires, would increase these benefits for the Valley, particularly if more funding for efficiency is directed to the Valley. Based on past cost effectiveness of energy efficiency programs in the Valley, the region presents considerable opportunities for high impact EE investments.

TABLE 4 Estimated Costs and Benefits of IOU Energy Efficiency Programs, San Joaquin Valley, 2010-15

Region	Sum of TOTAL IOU energy consumption (GWh)*	Share of IOU Energy Consumption (combined gas and electric)	Estimated Funding Collected from Ratepayers (\$ million)*	Total Customer Costs**^ (\$million)	Total Costs (Ratepayer + Customer) (\$million)	Share of Total Costs
SAN JOAQUIN VALLEY	430,416	14.3%	\$646	\$288	\$934	13.5%
TOTAL STATEWIDE	1,177	100.0%	\$4,516	\$2,486	\$6,936	

Region	Sum of Total Incentives** (\$million)	Share of IOU Incentives	Total IOU Expenditures (Incentives + Program Costs) (\$million)	Total Customer Investment (\$million)	Total IOU + Customer Investment (\$million)	Share of Total Investment
SAN JOAQUIN VALLEY	\$257	12.0%	\$558	\$288	\$846	13.0%
(NO GEOGRAPHIC DATA)	\$67	3.1%	432	\$66	\$498	7.7%
TOTAL STATEWIDE	\$2,149	\$2,367	\$4,516	\$2,420	\$6,504	

* Source: California Energy Commission, California Energy Consumption Database (by IOU by County, 2008 - 2015). MMTherms have been converted to GWh using conversion ratio 29.3001 GWh: 1MMTherm

** Estimated based on region's share of IOU energy (combined electricity and gas) consumption

*** Total incentive paid including rebates, direct install labor costs, direct install materials, and incentives to others.

**** Program-level costs are allocated based on the avoided costs (i.e. the ElecBen + GasBen). This includes Market&Outreach, Implementation, Administrative, Overhead, and EM&V.

***** Total ratepayer funds incurred to run the program. Total expenditure = Weighted Program Costs + Incentives. This is different from (higher than) the reported Program Administrator Cost (PAC).

TABLE 5 Energy Savings and Gross Employment Gains of the IOU Energy Efficiency Programs on the San Joaquin Valley, 2006-2015

Sector	Net GWh	Direct jobs	Indirect + induced jobs	Total jobs
Residential	207	940	810	1,750
Commercial	750	2,890	4,420	7,310
Industrial/Ag	734	2,830	5,500	8,330
TOTAL	1,691	6,650	10,740	17,390

**may not sum exactly due to rounding*

Policy Recommendations

Climate program design and implementation has had positive impacts overall in the San Joaquin Valley, but there is also room for improvement. To maintain and improve the positive impacts, state leaders should consider the following priority law and policy changes to ensure the state’s climate programs continue to benefit the Valley:

- Remove uncertainty for the cap-and-trade program, particularly the allowance auction mechanism, beyond 2020. The program is having net positive economic effects on the Valley, despite a thread in the public discourse to the contrary.
- Disburse auction proceeds in a timely and predictable manner and ensure that the Valley receives an appropriate level of statewide spending based on its economic and environmental needs.
- Ensure that cap-and-trade auction proceeds are spent on Valley programs that create jobs, further greenhouse gas reduction benefits, and reduce co-pollutants, particularly in disadvantaged communities, per SB 535 (de Leon) and AB 1550 (Gomez) governing auction revenue spending.
- Improve the economic and job benefits of renewable energy and energy efficiency projects through labor agreements that promote local and career-track jobs.
- Expand energy efficiency incentives for the Valley where per capita energy use is higher than the state average, cost effectiveness is the highest in the state, and unemployment is far above the state average. This will help ensure greater cost-effectiveness of the portfolio as a whole, improve the building and housing stock in the Valley, reduce energy costs for residents, businesses, and industry, create jobs, and increase economic activity in the region. GGRF funding should be used, in addition to ratepayer funds.
- Develop robust transition programs for workers and communities affected by the decline of the Valley’s greenhouse gas-emitting industries, including re-training and job placement programs, income supports, bridges to retirement, and regional economic development and diversification initiatives.

California has other critical climate programs in addition to the ones studied here, such as the low carbon fuel standard, zero-emissions vehicle incentives, net-metering, and the draft plan to reduce short-lived climate pollutants plan. Future studies should analyze the combined impacts of these programs in addition to the ones studied here. Ultimately, given the significant economic needs and environmental challenges in the San Joaquin Valley, policy leaders who wish to continue the positive momentum in the Valley should stay the course on existing policies and strengthen them as needed.

ENDNOTES

1. In 2015, a group of centrist Democrats led by Assemblymember Henry Perea of Fresno forced the removal of transport fuels reduction measures from SB 350 (de Leon), the landmark climate bill, claiming they would damage the region's economy. In 2016, members of the centrist caucus, now co-chaired by Assemblymember Rudy Salas of Bakersfield, played pivotal roles in the debate over another major climate bill, SB 32 (Pavley), reprising the same fears that it will cost jobs. See Fresno Bee, "Moderate Democrats are right to press for better California clean-energy plan," August 27, 2015. Available at: <http://www.fresnobee.com/opinion/editorials/article32574789.html> (accessed August 30, 2016); Sacramento Bee, "How Long Will This Blue State Let Oil Remain King?" September 11, 2015. Available at: <http://www.sacbee.com/opinion/editorials/article34948194.html> (accessed August 30, 2016); Sacramento Bee, "How Oil Won the Battle for SB 350, September 12, 2015. Available at: <http://www.sacbee.com/opinion/opn-columns-blogs/dan-morain/article34976295.html> (accessed August 30, 2016); Fresno Bee, "Climate retreat? Legislature may ditch plan to radically reduce emissions," August 9, 2016. Available at: <http://www.fresnobee.com/news/politics-government/politics-columns-blogs/political-notebook/article94618592.html> (accessed August 30, 2016); Los Angeles Times, "Business-friendly Democrats pick new leaders for informal, but powerful Sacramento caucus," December 9, 2015. Available at: <http://www.latimes.com/politics/la-pol-sac-moderate-democrats-leaders-20151209-story.html> (accessed August 30, 2016).
2. In this context, a "job" is a "job-year," which is a full-time equivalent position for one year. One job-year equals 2080 work hours.
3. David Roland-Holst et al., "Senate Bill 350 Study: The Impacts of a Regional ISE-Operated Power Market on California, Volume VIII, Economic Impact Analysis," July 8, 2016. Available at: [https://www.caiso.com/Documents/SB-350Study-Volume 8 Economic Impacts.pdf](https://www.caiso.com/Documents/SB-350Study-Volume%208%20Economic%20Impacts.pdf) (accessed August 29, 2016).
4. U.S. Department of Energy, "Energy Incentive Programs, California," March 2015. Available at: <http://energy.gov/eere/femp/energy-incentive-programs-california> (accessed August 30, 2016).
5. California Assembly Bill 32 (Nuñez, Chapter 488, Statutes of 2006). Available at: http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_0001-0050/ab_32_bill_20060927_chaptered.html (accessed August 30, 2016).
6. California Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016). Available at: https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32 (accessed August 30, 2016).
7. California Senate Bill 350 (De Leon, Chapter 547, Statutes of 2015). Available at: http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb_0301-0350/sb_350_bill_20151007_chaptered.pdf (accessed August 30, 2016).
8. California Partnership for the San Joaquin Valley, "2015 Annual Report," November 2015. Available at: http://sjvpartnership.org/wp-content/uploads/2015/11/2015_PartnershipAnnualReport_post.pdf (accessed August 30, 2016).
9. Data Source: U.S. Census Bureau, "Quick Facts California." Available at: <https://www.census.gov/quickfacts/table/PST045215/06> (2015 data) (accessed August 30, 2016).
10. Id
11. Id
12. Author's analysis based on data source: Fisher, Sheehan & Colton, "Home Energy Affordability Gap: Current Year Affordability Gap Data." Available at: http://www.homeenergyaffordabilitygap.com/03a_affordabilityData.html, 2015 data (accessed August 30, 2016).
13. Id
14. U.S. Census Bureau, "Quick Facts: California." Available at: <https://www.census.gov/quickfacts/table/PST045215/06> (2015 data) (accessed August 30, 2016).
15. Ibid (2012 data).
16. California Energy Commission, "Second California Climate Change Assessment 2010." Available at: http://climatechange.ca.gov/climate_action_team/reports/second_assessment.html (accessed August 30, 2016).
17. U.S. Department of the Interior, Bureau of Reclamation, "Reclamation: Managing Water in the West. West-Wide Climate Risk Assessment: Sacramento and San Joaquin Basins, Climate Impact Assessment. Available at: <http://www.usbr.gov/watersmart/wcra/docs/ssjbia/ssjbia.pdf> (accessed December 5, 2016).
18. California Air Resources Board, "California Greenhouse Gas Emission Inventory – 2016 Edition." Available at: <https://www.arb.ca.gov/cc/inventory/data/data.htm> (accessed December 5, 2016).
19. See California Air Resources Board, "Scoping Plan – Agriculture Sector" webpage. Available at: <http://www.arb.ca.gov/cc/scopingplan/agriculture-sp/agriculture-sp.htm> (accessed August 30, 2016).
20. California Air Resources Board, "Revised Proposed Short-Lived Climate Pollutant Reduction Strategy" November 2016. Available at: <https://www.arb.ca.gov/cc/shortlived/meetings/11282016/revisedproposedslcp.pdf> (accessed December 5, 2016)
21. Cal. Code Regs. tit. 17, §§ 95800-96023.