December 16, 2016

Via Electronic Filing on ARB Website

Richard Corey, Executive Officer
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments on the 2030 Target Scoping Plan Discussion Draft (Discussion Draft)

Dear Mr. Corey:

On behalf of the undersigned environmental justice and public health organizations, we submit these comments on the 2030 Target Scoping Plan Discussion Draft ("Discussion Draft"**)**. The organizations and groups listed below work directly with low-income residents and residents of color who are disproportionately impacted by industrial pollution, toxic air emissions, and climate change. Climate change solutions must protect all Californians, starting with those already overburdened by air pollution and climate change.

The Discussion Draft offers a three-scenario roadmap for achieving the 2030 target established by Senate Bill 32: (1) existing measures, a twenty percent reduction at refineries ("Refinery Rule"),[1] and Cap and Trade; (2) existing measures, the Refinery Rule with at thirty percent reduction, no Cap and Trade, and additional direct reduction measures; and (3) existing measures, the Refinery Rule with a

[1] The twenty or thirty percent reduction in refinery emissions in the three scenarios targeted by the Board are in all cases less than the required 40 percent target for 2030, disparately leaving refinery communities behind. The apparent proposal to measure it based on a refinery's product output rather than its crude input reduces the transparency of future compliance for these same communities, exhibiting both of the major flaws in the agency's past approach discussed herein.

twenty percent reduction, and a carbon tax. *See* Discussion Draft at 86.

We offer three main comments on the Discussion Draft. First, the Draft identifies Cap and Trade, existing measures, and the Refinery Rule as the primary strategy to meet the 2030 target. Cap and Trade does not work for communities of color and low-income communities, with in-state emissions going up in several sectors, while out-of-state emissions reductions through divestment (resource shuffling) and out-of-state offsets provide the primary emissions reductions attributed to the program. Cap and Trade inflicts a disparate adverse impact on communities of color and approval of a Plan that includes Cap and Trade would violate Government Code section 11135. Furthermore, the Board does not have the legal authority to implement Cap and Trade beyond 2020, and should thus revise the Discussion Draft accordingly.

Second, the Discussion Draft defers an analysis and strategy which comports with Assembly Bill 197, which directs the Board to prioritize direct emissions reductions when adopting rules and regulations to meet the 2030 target. The Draft only offers a twenty percent reduction at refineries as a potential direct reduction measure, and otherwise defers its Assembly Bill 197 strategy to later drafts. We look forward to a plan that incorporates and prioritizes direct emissions reduction strategies for <u>all</u> the sources identified by Assembly Bill 197.

Third, the Discussion Draft inadequately analyzes the carbon tax alternative which, like Cap and Trade, would generate revenue and be subject to a Proposition 26 super-majority vote in the Legislature. The Draft constructs a straw man carbon tax alternative, and dismisses a carbon tax by ignoring the important, unique characteristics of California's current climate laws. The Board should thus revise the Draft to meaningfully consider a carbon tax as an alternative to Cap and Trade.

I. Cap and Trade is an Inappropriate Strategy and Should not be Part of the Scoping Plan to meet the 2030 Target.

A. Implementation Data Indicate Communities of Color are Adversely and Disproportionately Affected.

In September 2016, leading researchers released a report assessing the inequalities in the location of greenhouse gas-emitting facilities and the amount of greenhouse gases and particulate matter ("PM10") emitted by facilities regulated under Cap and Trade.[2] The report also provides a preliminary evaluation of changes in localized greenhouse gas emissions from large stationary sources since the advent of the program. The report found:

1. On average, neighborhoods with a facility within 2.5 miles have a 22 percent higher proportion of residents of color and 21 percent higher proportion of residents living in poverty than neighborhoods that are not within 2.5 miles of a facility.
2. These communities are home to a higher proportion of residents of color and people living in poverty than communities with no or few facilities nearby. Indeed, the higher the number of proximate facilities, the larger the share of low-income residents and communities of color.

[2] Lara J. Cushing, *et al.*, A PRELIMINARY ENVIRONMENTAL EQUITY ASSESSMENT OF CALIFORNIA'S CAP AND TRADE PROGRAM, attached as Exhibit 1.

3. The neighborhoods within 2.5 miles of the 66 largest greenhouse gas and PM10 emitters have a 16% higher proportion of residents of color and 11% higher proportion of residents living in poverty than neighborhoods that are not within 2.5 miles of such a facility.
4. The first compliance period reporting data (2013-2014) show that the cement, in-state electricity generation, oil & gas production or supplier, and hydrogen plant sectors have increased greenhouse gas emissions over the baseline period (2011-2012).
5. The amount of emissions "offset" credits exceed the reduction in allowable greenhouse gas emissions (the "cap") between 2013 and 2014 and were mostly linked to projects outside of California.

The Discussion Draft fails to discuss this report, the data, or its conclusions. The report raises significant concerns and discloses new data that should foreclose the Air Board from extending the Cap and Trade program. The report demonstrates three fundamental points that environmental justice advocates have raised for years: (1) Cap and Trade disparately affects communities of color; (2) Cap and Trade denies communities the benefits of on-site reductions; and (3) greenhouse gas reductions attributed to Cap and Trade occur primarily outside of California.[3] It concludes:

> Preliminary analysis of the equity and emissions impacts of California's cap-and-trade program indicates that regulated GHG emission facilities tend to be located in neighborhoods with higher proportions of residents of color and those living in poverty. There is a correlation between GHG emissions and particulate matter levels, suggesting a disparate pattern of localized emissions by race/ethnicity and poverty rate. In addition, facilities that emit the highest levels of both GHGs and particulate matter are similarly more likely to be located in communities with higher proportions of residents of color and those living in poverty. This suggests that public health and environmental equity co-benefits could be enhanced if there were more GHG reductions among the larger emitting facilities that are located in disadvantaged communities. Currently, there is little in the design of cap-and-trade to insure this set of localized results. Moreover, while the cap-and-trade program has been in effect for a relatively short time period, preliminary evidence suggests that in-state GHG emissions from regulated companies have increased on average for several industry sectors and that many emissions reductions associated with the program were located outside of California. Large emitters that might be of most public health concern were the most likely to use offset projects to meet their obligations under the cap-and-trade program.[4]

The Board has taken no final action to assess or prevent these impacts, and instead has consistently demonstrated its intent to prevent the public from accessing facility-specific compliance data and delayed implementation of its Adaptive Management Plan. The Board has taken the position that the public may not access critical Cap and Trade compliance and trading data, claiming that

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[3] Claimed reductions from imported electricity generation remain suspect given the Board's creation of safe harbor exemptions from the resource shuffling prohibition, which allow greenhouse gas emissions to continue in fact as leakage. *See* Danny Cullenward, BULLETIN OF THE ATOMIC SCIENTISTS, 2014, Vol. 70(5) 35–44, attached as Exhibit 2.

[4] Lara J. Cushing, *et al.*, A PRELIMINARY ENVIRONMENTAL EQUITY ASSESSMENT OF CALIFORNIA'S CAP AND TRADE PROGRAM at 7-9, attached as Exhibit 1.

compliance with Cap and Trade constitutes "confidential business information."[5] When promulgating the Cap and Trade regulations in 2011, the Board claimed that it would assess and prevent adverse impacts through an Adaptive Management Plan. The Initial Statement of Reasons ("ISOR") for the recently proposed Cap and Trade extension admits that the Board has not finalized or implemented the Adaptive Management Plan.[6] ISOR at 302. Collectively, these two issues show how the Board withholds important information from the public regarding sources' compliance and has not prevented Cap and Trade inequities.

B. Approval of a Scoping Plan that Includes Cap and Trade will Violate Government Code Section 11135.

The Board has a duty under California civil rights law to avoid racially disparate treatment and the disparate effects of its programs or policies. Gov. Code § 11135. The Board will violate section 11135 if it adopts a Scoping Plan which includes Cap and Trade because, as set forth above in section I.A, Cap and Trade results in racially disparate and adverse impacts when it denies communities the benefits of direct reductions. Moreover, the Discussion Draft reflects deliberate indifference and thus violates section 11135. The Board has the authority to adopt alternatives to Cap and Trade, has actual knowledge of the racially disparate and adverse impacts from the denial of benefits, yet does not adequately prevent racial discrimination prohibited by Government Code section 11135.

C. The Board should Remove Cap and Trade from the Draft Scoping Plan because the Board has no Authority to Extend Cap and Trade after 2020.

The Board lacks authority to include Cap and Trade in the Scoping Plan for reductions to achieve the 2030 target. A fundamental principle of administrative law dictates that agencies only have those powers delegated by the Legislature. The Board's authority to implement the Cap and Trade program expires on December 31, 2020 and the Board has no authority to extend the program beyond that date. Health & Safety Code §§ 38562(c), 38570.

ARB staff have claimed that AB 32 authorizes these regulations because of language in Part 3 of AB 32 related to the statewide greenhouse gas limit (the level of emissions in 1990). "It is the intent of the Legislature that the statewide greenhouse gas emissions limit continue in existence and be used to maintain and continue reductions in emissions of greenhouse gases beyond 2020." Health & Safety Code § 38551(b). Grasping on to the words "continue reductions," the staff believe they can extend Cap and Trade to 2030 to achieve the reductions required by Senate Bill 32. Section 38551, however, must be understood in the context of the statutory scheme as a whole. The very next subsection of section 38551 directs the Board to make recommendations to the Governor and the Legislature on how to continue reductions, and does not give the Board the authority to take those actions *sua sponte*. "The state board shall make recommendations to the Governor and the Legislature on *how* to continue reductions of greenhouse gas emissions beyond 2020." Health & Safety Code § 38551(c) (emphasis

[5] *See, e.g.* Email from Edie Chang to Brent Newell, dated August 19, 2015, attached as Exhibit 3.
[6] Even if the Board had finalized the Adaptive Management Plan, as currently proposed it would not address the section 11135 issues. The Adaptive Management Plan only proposes to take action at the Board's sole discretion when cap and trade causes an emissions increase, and does not resolve the denial of benefits issue or negate the Board's deliberate indifference.

added).

Nor has the Legislature acted to extend the Board's authority. During the 2015 legislative session, the version of Assembly Bill 1288 (Atkins) containing an extension of the Board's authority to implement Cap and Trade beyond December 31, 2020 did not become law. Instead, the Legislature amended Assembly Bill 1288 to add two environmental justice seats to the Board, demonstrating a legislative intent to prioritize environmental justice, not Cap and Trade. During the 2016 legislative session, Senate Bill 32 became law and requires the Board to achieve a 40 percent reduction in greenhouse gas emissions below the statewide greenhouse gas limit (1990 levels) by 2030. Stats. 2016, ch. 249, § 2, p. 88 (codified as Health & Safety Code § 38566). No provision of Senate Bill 32 amended section 38562(c) or otherwise authorized the Board to implement Cap and Trade after the year 2020. Accordingly, the Board lacks the authority to include Cap and Trade as part of the Scoping Plan.

II. The Board Must Prioritize Direct Emissions Reductions at Stationary and Mobile Sources.

Assembly Bill 197 recently became law and expressly directs the Board to prioritize direct emissions reductions at large stationary sources, mobile sources, and all other sources. The Board has no authority to disregard direct emissions reduction strategies for the purposes of meeting the additional reductions required by Senate Bill 32. Rather, the Board must prioritize "emissions reduction rules and regulations that result in direct emission reductions at large stationary sources of greenhouse gas emissions and direct emissions reductions from mobile sources." Stats. 2016, ch. 250, § 5, subdivision (a), p. 92 (codified as Health & Safety Code § 38562.5(a)).

Except for the Refinery Rule, which calls for efficiency increases to achieve a twenty percent reduction, the Discussion Draft defers an analysis and inclusion of other strategies to comply with Assembly Bill 197 until the January 2017 draft. We look forward to a fully compliant Scoping Plan where the Board prioritizes direct reductions for <u>all</u> of the sources specified in Assembly Bill 197.

III. The Discussion Draft Inadequately Analyzes a Carbon Tax as an Alternative to Cap and Trade.

The Discussion Draft erects a straw man carbon tax scenario which it then strikes down as failing to meet several criteria. Discussion Draft at 96-101. The Draft first paints a carbon tax as lacking the certainty to meet the 2030 target by not having limits at facilities individually or in the aggregate (the "cap" part of Cap and Trade), and then uses an example from British Columbia. What the Draft fails to consider or disclose are several unique characteristics in California that surround a carbon tax and provide emissions certainty. First, Assembly Bill 197 prioritizes direct emissions reductions beyond the Refinery Rule which the Draft excludes from the scenario. Thus, additional direct reductions that apply and occur <u>before</u> a carbon tax provide certainty while the carbon tax places further downward pressure on emissions.

Second, the Draft ignores the Board's on-going authority to update the Scoping Plan on a five-year interval and its authority to promulgate direct reductions to address any carbon tax-related shortfalls. The Board has the overall duty to ensure that California meets the 2030 target, and the authority to make that happen through direct emissions reductions as provided in Assembly Bill 32 and Senate Bill 32. The Draft does not recognize this authority in the scenario, nor does such authority exist

in the misleading British Columbia example. The Board claims a carbon tax has "no mechanism to limit the actual amount of emissions" but ignores the Board's statutory authority to institute those limits.[7] In other words, if a carbon tax underperforms, the Board could adopt the additional measures such as those identified in the No Cap and Trade Scenario, including a more stringent Refinery Rule that achieves a thirty percent (or more) reduction. The carbon tax scenario also omits a "Cap and Tax" option, where the Board adopts a facility specific and aggregate limit to ensure the state meets the 2030 target to act in concert with the carbon tax. In other words, a carbon tax could price carbon directly and simultaneously mandate an emissions limit.

Third, the Draft states that a carbon tax forgoes existing linkages with the current Cap and Trade program and questions whether a carbon tax would comply with the Clean Power Plan. Discussion Draft at 97-98. Just because the Cap and Trade program links with Quebec does not justify its existence. The Draft implies that other U.S. states in the Western Climate Initiative may adopt Cap and Trade programs, but that prospect has diminished to a zero probability with the 2016 Presidential election and the impending rescission of the Clean Power Plan.[8] Finally, even if the Trump EPA retains the Clean Power Plan, the Clean Power Plan itself recognizes that a carbon tax would be a permissible state measures strategy, something the Draft fails to recognize. Discussion Draft at 101; 80 Fed. Reg. 64662, 64836 (Oct. 23, 2015).

Finally, the Draft's analysis reflects a pattern and practice at the Board. The 2008 Scoping Plan failed to adequately analyze and consider a carbon tax when the Board opted to pursue Cap and Trade. As a result, the Superior Court held that the Board violated the California Environmental Quality Act. This Draft reflects the same bias in favor of Cap and Trade. Instead of misrepresenting a carbon tax as a flawed strategy to bolster the problematic and inequitable Cap and Trade program, the Board should engage in a good faith and reasoned analysis of the benefits that a carbon tax offers.

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[7] The Discussion Draft repeats this error when considering the No Cap and Trade Alternative. "Unlike the Cap-and-Trade Program in the draft 2030 Target Scoping Plan Scenario, none of the measures in this scenario scale to deliver any additional reductions if other measures underperform." Discussion Draft at 93-94. The Board fails to recognize that it could promulgate additional measures under its existing authority to achieve the 2030 target.

[8] The interstate nature of two U.S. states authorizing interstate pollution trading – interstate commerce – would invoke federal jurisdiction under the Commerce Clause, a likely adverse reaction from the Trump Administration, and a legal challenge from those opposed to such a program.

IV. Conclusion

We look forward to further iterations of the Scoping Plan and a climate policy that places environmental justice at its core. Thank you for your time and courtesy.

Sincerely,

Brent Newell
Center on Race, Poverty & the Environment

Martha Dina Argüello
Physicians for Social Responsibility – Los Angeles

Quanah Brightman
United Native Americans.org

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Gary Hughes
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Jan Dietrick
Ventura County Climate Hub

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Sequoia ForestKeeper

Exhibit 1

RESEARCH BRIEF - SEPTEMBER 2016

A PRELIMINARY ENVIRONMENTAL EQUITY ASSESSMENT OF CALIFORNIA'S CAP-AND-TRADE PROGRAM

By Lara J. Cushing[1,5] Madeline Wander[4] Rachel Morello-Frosch[1,2] Manuel Pastor[4] Allen Zhu[3] James Sadd[6]

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OVERVIEW

California's cap-and-trade program is a key strategy for achieving reductions in greenhouse gas (GHG) emissions under AB32, the California Global Warming Solutions Act. For residents living near large industrial facilities, AB32 offered the possibility that along with reductions in GHGs, emissions of other harmful pollutants would also be decreased in their neighborhoods. Carbon dioxide (CO_2), the primary GHG, indirectly impacts health by causing climate change but is not directly harmful to health in the communities where it is emitted. However, GHG emissions are usually accompanied by releases of other pollutants such as particulate matter (PM_{10}) and air toxics that can directly harm the health of nearby residents.

In this brief, we assess inequalities in the location of GHG-emitting facilities and in the amount of GHGs and PM_{10} emitted by facilities regulated under cap-and-trade. We also provide a preliminary evaluation of changes in localized GHG emissions from large point sources since the advent of the program in 2013. To do this, we combined pollutant emissions data from California's mandatory GHG and criteria pollutant reporting systems,[1,2] data on neighborhood demographics from the American Community Survey, cumulative environmental health impacts from the California Environmental Protection Agency's CalEnviroScreen tool, and information from the California Air Resources Board (CARB) about how regulated companies fulfilled their obligations under the first compliance period (2013-14) of the cap-and-trade program. Our methodology is described in greater detail in the appendix to this report.

In this analysis, we focus primarily on what are called "emitter covered emissions," which correspond to localized, in-state emissions (derived mostly from fossil fuels) from industries that are subject to regulation under cap-and-trade. The cap-and-trade program also regulates out-of-state emissions associated with electricity imported into the state and, beginning in 2015, began regulating distributed emissions that result from the burning of fuels such as gasoline and natural gas in off-site locations (e.g., in the engines of vehicles and in homes).

We found that regulated GHG-emitting facilities are located in neighborhoods with higher proportions of residents of color and residents living in poverty. In addition, facilities that emit the highest levels of both GHGs and PM_{10} are also more likely to be located in communities with higher proportions of residents of color and residents living in poverty. This suggests that the public health and environmental equity co-benefits of California's cap-and-trade program could be enhanced if there were more emissions reductions among the larger emitting facilities that are located in disadvantaged communities. In terms of GHG emission trends, in-state emissions have increased on average for several industry sectors since the advent of the cap-and-trade program, with many high emitting companies using offset projects located outside of California to meet their compliance obligations. Enhanced data collection and availability can strengthen efforts to track future changes in GHG and co-pollutant emissions and inform decision making in ways that incentivize deeper in-state reductions in GHGs and better maximize public health benefits and environmental equity goals.

FINDINGS

1. Facilities that emit localized GHGs are located in more disadvantaged communities.

On average, neighborhoods with a facility that emitted localized GHGs within 2.5 miles[3] have a 22 percent higher proportion of residents of color and 21 percent higher proportion of residents living in poverty than neighborhoods that are not within 2.5 miles of such a facility. Neighborhoods within 2.5 miles of a facility are also more than twice as likely to be among the worst statewide in terms of their CalEnviroScreen score, a relative ranking of cumulative impact based on indicators of social and environmental stressors to health (**Table 1**[4]).

TABLE 1
Characteristics of Neighborhoods within 2.5 miles of GHG-emitting Facilities
(N=255 facilities)

	Block groups with at least one facility within 2.5 miles (N=6,397)	Block groups with no facilities within 2.5 miles (N=16,705)
Mean % People of Color	66%	54%
Mean % People Living Below Twice the Poverty Level	41%	34%
% of Block Groups in a "Top 10%" CalEnviroScreen tract	17%	7%
% of Block Groups in a "Top 20%" CalEnviroScreen tract	31%	15%

2. Many of California's residential communities are within 2.5 miles of more than one GHG-emitting facility (Figure 1[5]).

These communities are home to a higher proportion of residents of color and people living in poverty than communities with no or few facilities nearby. Indeed, the higher the number of proximate facilities, the larger the share of low-income residents and residents of color (**Figure 2**).

FIGURE 1
Residential Proximity to Facilities Reporting Emitter Covered GHG Emissions during the 2013-14 Compliance Period (N=321 facilities)

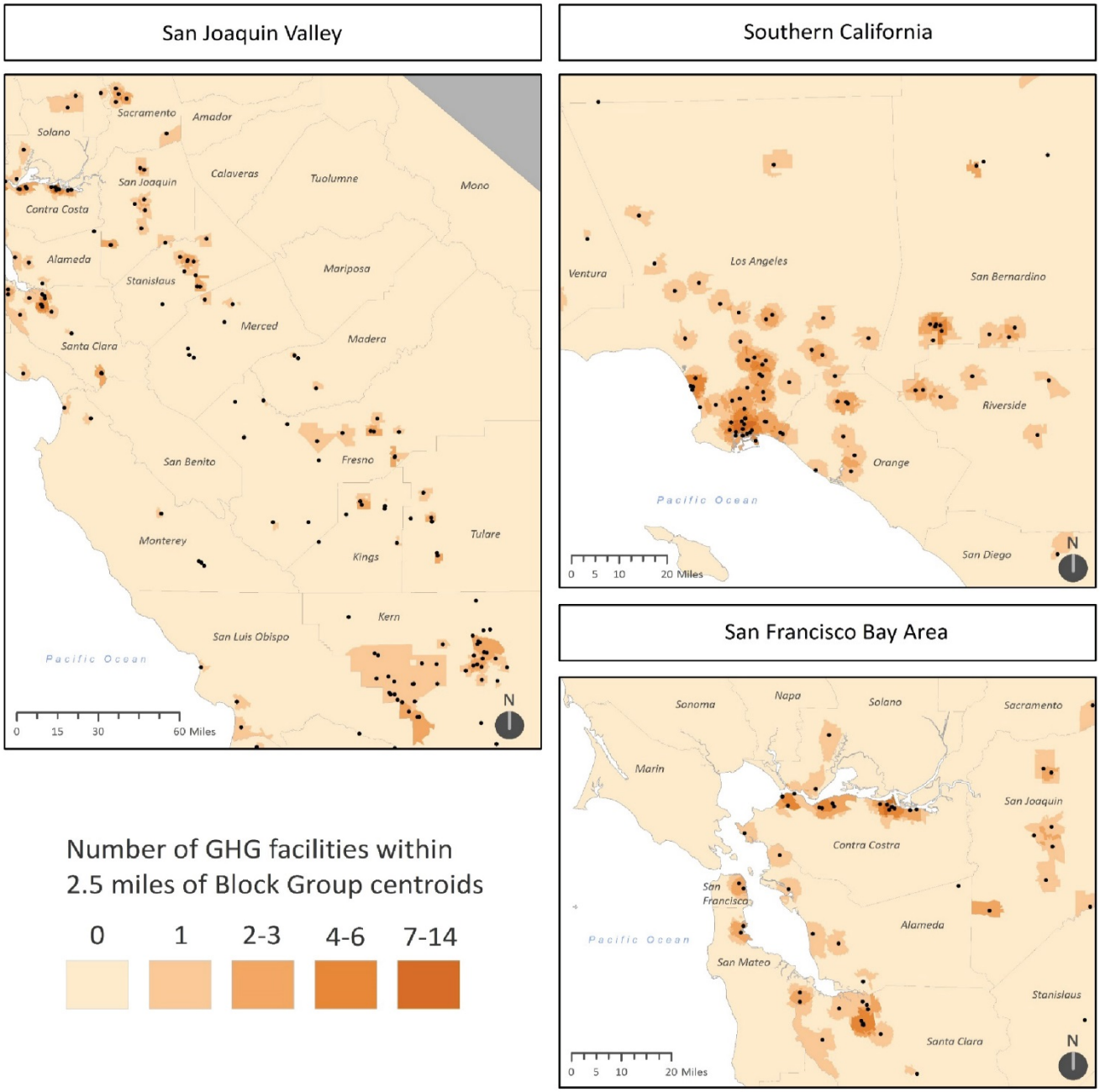
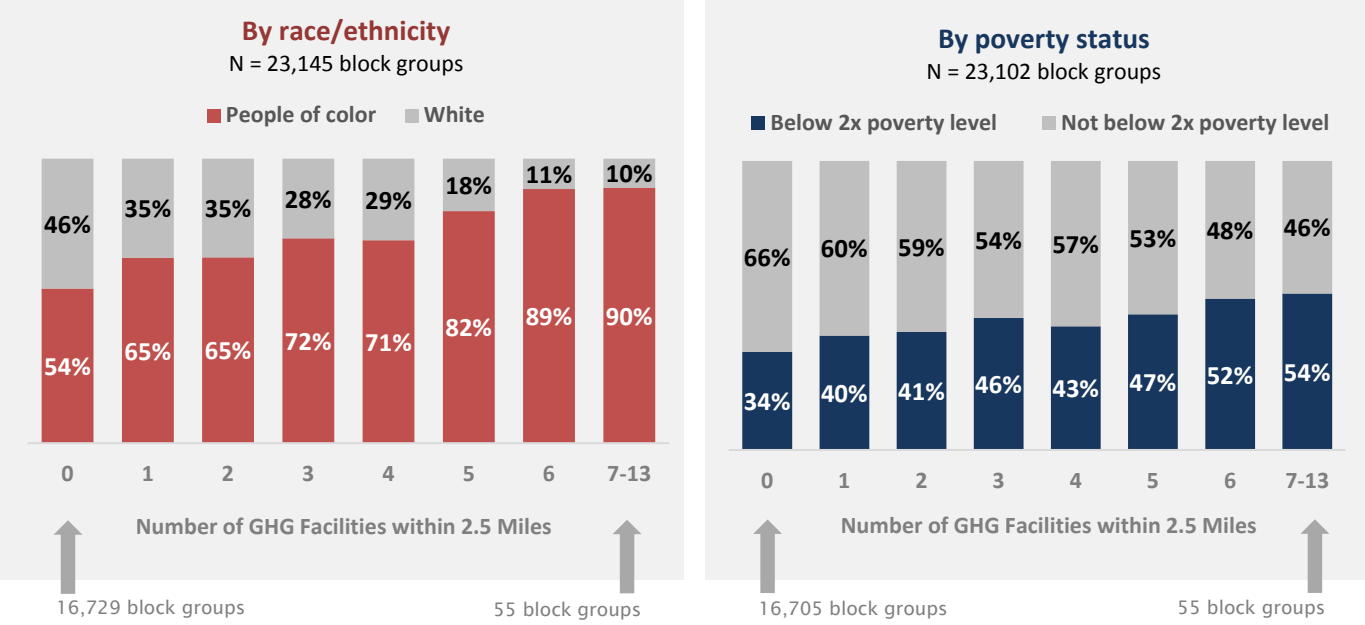


FIGURE 2
Demographics in Block Groups near GHG-emitting Facilities (N=255 facilities)



3. While GHG emissions do not generally have direct health impacts, co-pollutants such as particulate matter (PM_{10}) do. Such emissions are correlated (Figure 3[6]), with large GHG emitters reporting that they emit more particulate matter. The largest emitters of both GHGs and PM_{10} also tend to be located near neighborhoods with higher proportions of disadvantaged residents (Table 2[7]).

The neighborhoods within 2.5 miles of the 66 largest GHG and PM_{10} emitters (defined as the top third in emissions of both PM_{10} and GHGs and highlighted in orange in **Figure 3**) have a 16 percent higher proportion of residents of color and 11 percent higher proportion of residents living in poverty than neighborhoods that are not within 2.5 miles of such a facility (**Table 2**). Compared to other parts of the state, nearly twice as many neighborhoods within 2.5 miles of these highest-emitting facilities are also among the worst statewide in terms of their CalEnviroScreen score. We also found that 40 (61 percent) of these high-emitting facilities reported increases in their localized GHG emissions in 2013-14 relative to 2011-12, versus 51 percent of facilities overall. Neighborhoods near the top-emitting facilities that increased emissions had higher proportions of people of color than neighborhoods near top-emitting facilities that decreased their emissions (**Table 6** in the Appendix).

FIGURE 3
Correlation between Emitter Covered GHG Emissions and Particulate Matter (N=317 facilities)

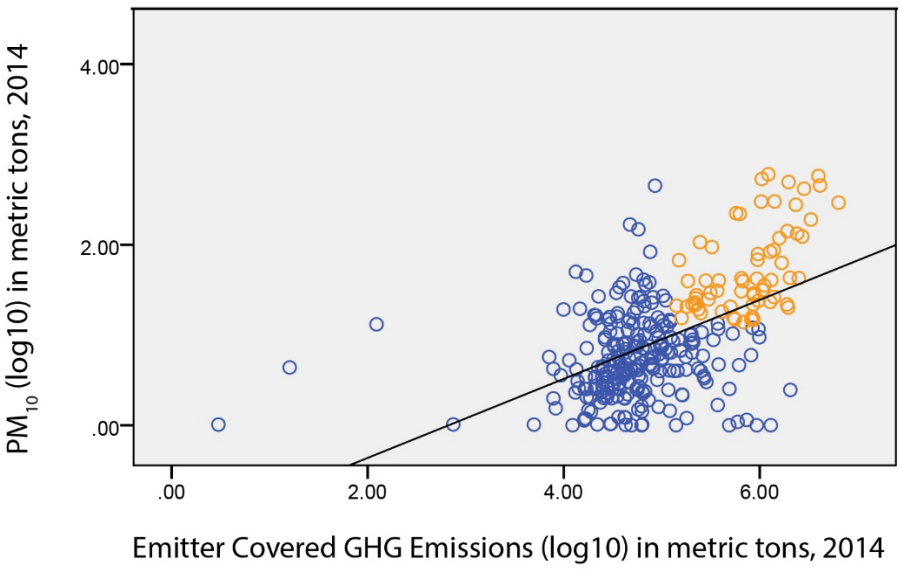


TABLE 2
Characteristics of Neighborhoods within 2.5 miles of the top GHG- and PM_{10}- Emitting Facilities (N=66 facilities)

	Block groups within 2.5 miles of the largest GHG and PM_{10} emitters (N=1,290)	All other block groups (N=21,812)
Mean % People of Color	66%	57%
Mean % People Living Below Twice the Poverty Level	40%	36%
% of Block Groups in a "Top 10%" CalEnviroScreen tract	18%	9%
% of Block Groups in a "Top 20%" CalEnviroScreen tract	35%	19%

4. While overall, GHG emissions in California have continued to drop from a peak in 2001, we find that, on average, many industry sectors covered under cap-and-trade report increases in localized in-state GHG emissions since the program came into effect in 2013.[8]

Only a portion of the state's total GHG emissions are regulated under the cap-and-trade system. For example, the industrial and electrical sectors accounted for about 41 percent of the state's estimated total GHGs emissions in 2014.[9] (The remainder originated from sectors such as transportation, commercial and residential buildings, and agriculture.) As a result, overall emissions and emissions regulated under cap-and-trade can exhibit slightly different patterns. Moreover, not all emissions regulated under the cap-and-trade program occur in-state. For example, according to CARB's 2016 Edition of the California GHG Emission Inventory, emissions from electrical power decreased by 1.6 percent between 2013 and 2014. However, when these emissions are disaggregated, we see that it is the emissions associated with *imported* electricity that decreased, while emissions from *in-state* electrical power generation actually increased.[8]

Figure 4 shows the distribution of the change in localized GHG emissions regulated under cap-and-trade for two time periods: the two years prior and the two years after the program came into effect. We present the range in emissions changes reported by individual facilities within seven industry sectors for 2013-14 versus 2011-12; this includes the median (50th percentile), mean (average), and 10th to 90th percentile of changes in emitter covered emissions for 314 GHG facilities. For example, six of the nine cement plants included in **Figure 4** reported increases in emissions during 2013-14 relative to 2011-12. The median value corresponds to the 143,295-ton increase reported by the cement plant in the middle of the distribution (5th highest emitting facility out of the nine total). Similarly, the 25th and 75th percentiles correspond to the increases reported by the 3rd and 7th highest emitting facilities. The facilities with the minimum and maximum emissions changes are not shown in this graph to make it more legible; for example, the Cemex Victorville cement plant reported an increase of over 843,000 tons, an amount that far exceeds the range portrayed in **Figure 4**.

FIGURE 4
Change in Emitter Covered GHG Emissions by Industry Sector (N=314 facilities)

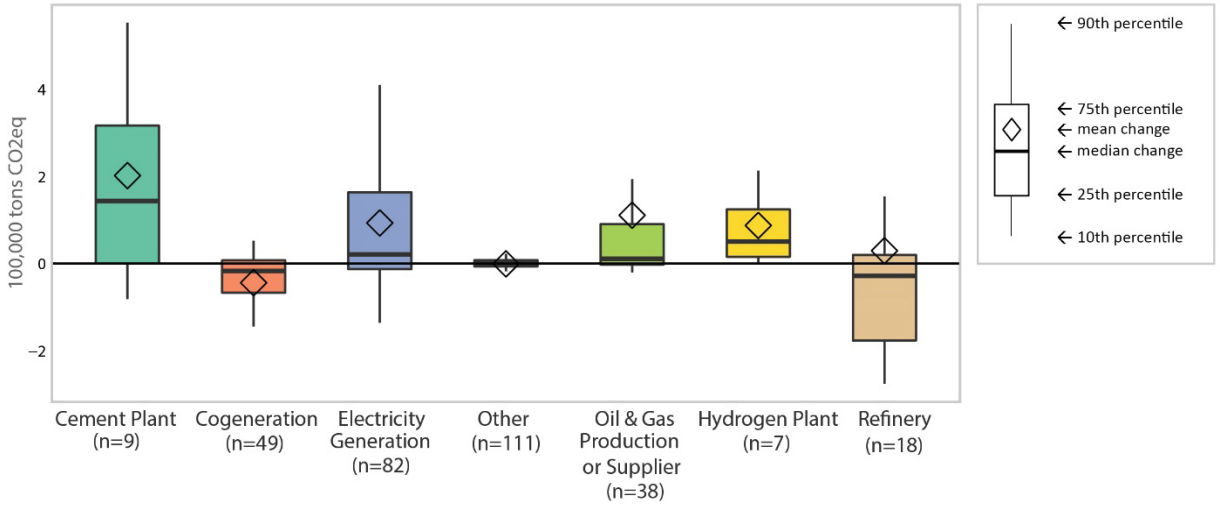
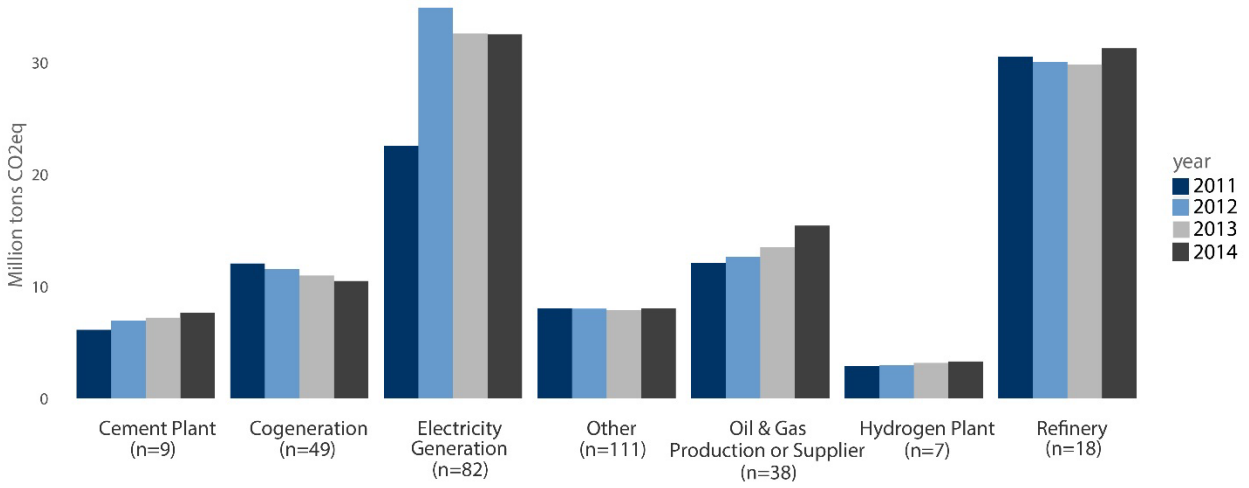


Figure 5 shows temporal trends in total emitter covered emissions (the sum of emissions from all individual facilities) by industry sector for 2011-2014. The number of facilities can change from year to year due to shutdowns, startups, and changes in emissions that affect whether facilities are required to report GHG emissions to CARB. In both **Figure 4** and **Figure 5**, we included only those facilities that: 1) report to the inventory every year during the four-year period, and 2) report at least some emitter covered emissions during those same four years. Again, the upward trend in several sectors is notable.

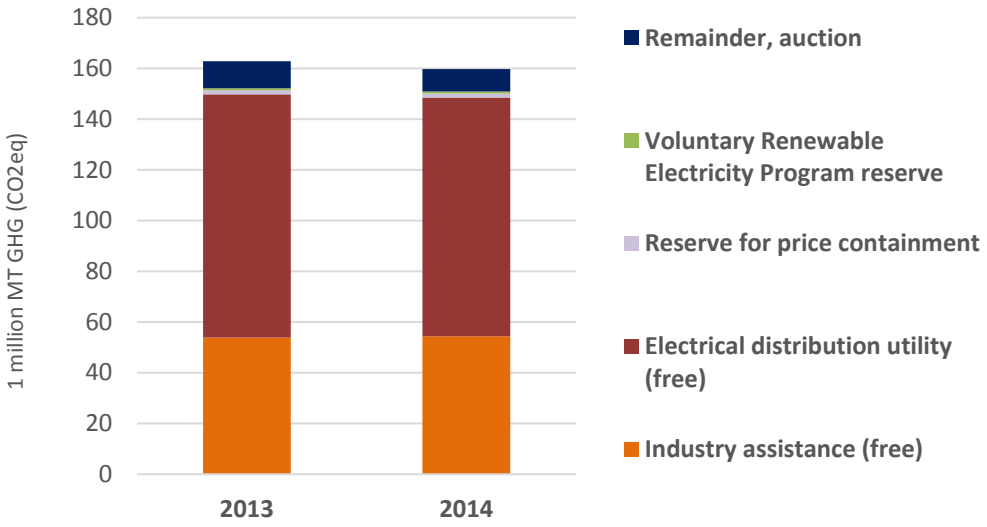
FIGURE 5
Temporal Changes in Total Emitter Covered GHG Emissions by Industry Sector



5. Between 2013 and 2014, more emissions "offset" credits were used than the total reduction in allowable GHG emissions (the "cap"). These offsets were primarily linked to projects outside of California, and large emitters of GHGs were more likely to use offset credits to meet their obligations under cap-and-trade.

The cap-and-trade program requires regulated companies to surrender one compliance instrument—in the form of an allowance or offset credit—for every ton of qualifying GHGs they emit during each compliance period. These instruments are bought and sold on the carbon market. The total number of allowances is set by the "cap," which decreases by roughly 3 percent per year in order to meet GHG reduction targets. In 2013 and 2014, most allowances were given to companies for free for leakage prevention, for transition assistance, and on behalf of ratepayers (**Figure 6**). Additional offset credits were generated from projects that ostensibly reduce GHGs in ways that may cost less than making changes at a regulated facility.

FIGURE 6
Allocation of Allowances



Regulated companies are allowed to "pay" for up to 8 percent of their GHG emissions using such offset credits. The majority of the offset credits (76 percent) used to date were generated by out-of-state projects (**Figure 7**). **Figure 8** shows that most offset credits were generated from projects related to forestry (46 percent)[10] and the destruction of ozone-depleting substances (46 percent). Furthermore, over 15 percent of offset credits used during the first compliance period were generated by projects undertaken before final regulations for the cap-and-trade program were issued in 2011, calling into question whether these GHG reductions can be attributed to California's program, or whether they might have happened anyway.

FIGURE 7
Origin of Offset Credits

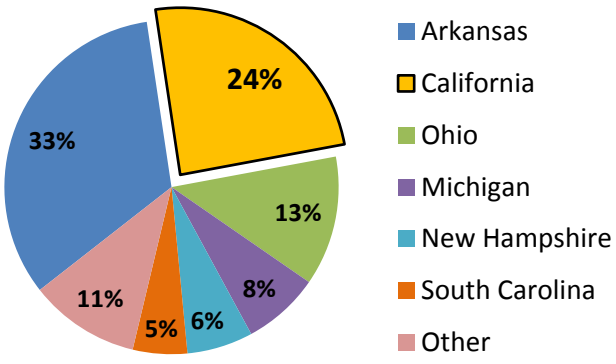
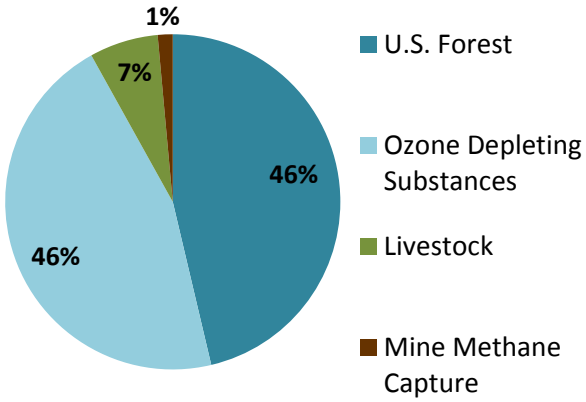


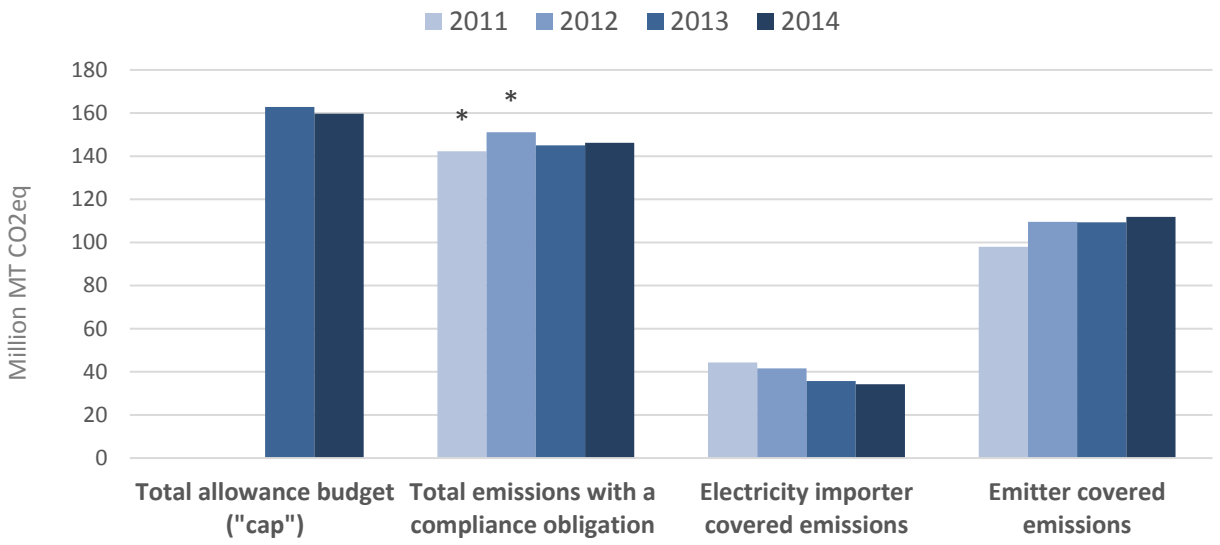
FIGURE 8
Offset Credits by Project Type



During the first compliance period of 2013-14, the total emissions that were subject to a compliance obligation (the second set of columns in **Figure 9**) were lower than the cap set by the allowance budget (left-most set of columns in **Figure 9**). This total includes both the emitter covered emissions that have been the focus of our analysis so far (right-most set of columns in **Figure 9**) and out-of-state emissions associated with imported electricity (which went down every year during the four-year period as shown by the third set of columns in **Figure 9**). Offset credits worth more than 12 million tons of CO_{2eq} were utilized to meet these obligations. These offsets represent 4.4 percent of the total compliance obligation of all regulated companies and over four times the targeted reduction in GHG emissions from 2013 to 2014 as established by the cap (**Figure 10**).

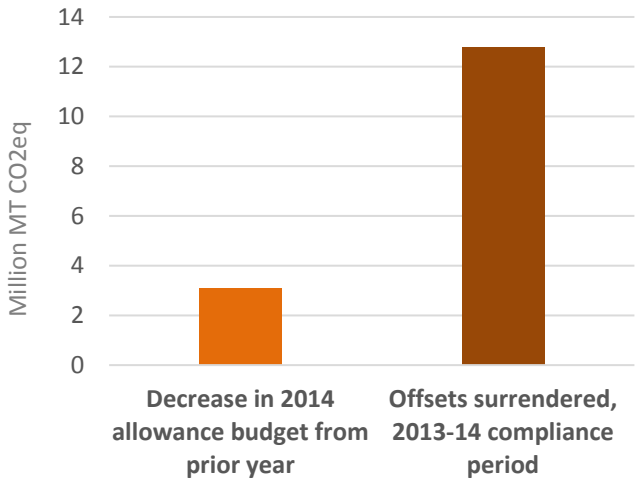
We found that the majority of companies did not use offset credits to meet their compliance obligation; however, those companies that *did* use offsets tended to have larger quantities of GHG emissions. The top 10 users of offsets account for 36 percent of the total covered emissions and 65 percent of the offsets used. These top offset users included Chevron (1.66 million offsets), Calpine Energy Services (1.55 million offsets), Tesoro (1.39 million offsets), SoCal Edison (1.04 million offsets), Shell (0.62 million offsets), PG&E (0.44 million offsets), Valero (0.43 million offsets), La Paloma Generating Company (0.40 million offsets), San Diego Gas & Electric (0.39 million offsets), and NRG Power (0.33 million offsets).

FIGURE 9
Total GHG Budget



* *Only emissions during 2013 and 2014 were subject to a compliance obligation. Estimates of comparable emissions during 2011 and 2012 were derived by summing the "emitter covered" and "electricity importer covered" emissions reported by regulated facilities for those years.*

FIGURE 10
Offset Credits vs. Decrease in Allowance Cap



CONCLUSIONS

California's efforts to slow climate change by reducing GHG emissions can bring about additional significant co-benefits to health, particularly in disadvantaged communities. Preliminary analysis of the equity implications of California's cap-and-trade program indicates that regulated GHG-emitting facilities tend to be located in neighborhoods with higher proportions of residents of color and residents living in poverty. There is a correlation between emissions of GHGs and PM_{10}, and facilities that emit the highest levels of both GHGs and PM_{10} are similarly more likely to be located in communities with higher proportions of residents of color and residents living in poverty. This suggests that the public health and environmental equity co-benefits of California's cap-and-trade program could be enhanced if there were more emissions reductions among the larger emitting facilities that are located in disadvantaged communities.

Currently, there is little in the design of cap-and-trade to ensure this set of localized results. Indeed, while the cap-and-trade program has been in effect for a relatively short time period, preliminary evidence suggests that in-state GHG emissions from regulated companies have increased on average for several industry sectors and that many emissions reductions associated with the program were linked to offset projects located outside of California. Large GHG emitters that might be of most public health concern were the most likely to use offset projects to meet their obligations under the cap-and-trade program.

Further research is needed before firm policy conclusions can be drawn from this preliminary analysis. As regulated industries adapt to future reductions in the emissions cap, California is likely to see more reductions in localized GHG and co-pollutant emissions. Thus far, the state has achieved overall emissions reductions in large part by using offsets and replacing more GHG-intensive imported electricity with cleaner, in-state generation. Steeper in-state GHG reductions can be expected going forward if the use of offsets were to be restricted and the opportunity to reduce emissions by replacing imported electricity with in-state generation becomes exhausted.

However, ongoing evaluation of temporal and spatial trends in emissions reductions will be critical to assessing the impact of the cap-and-trade program. Several recommendations would strengthen future analyses and facilitate better tracking of the public health and environmental equity aspects of the cap-and-trade program going forward.

These include:

- Building better linkages between state facility-level databases on GHG and co-pollutant emissions. To conduct this preliminary analysis, we had to do a series of matches between datasets with different facility ID codes (see Appendix for details). Harmonization of facility ID codes between relevant data sources could be built into facility emissions reporting requirements going forward in order to facilitate analysis of temporal and spatial GHG and co-pollutant emissions trends.
- Publicly releasing data on facility- and company-specific allowance allocations.
- Tracking and making data available on facility- and company-specific allowance trading patterns.

Good quality, publicly accessible data and robust analysis will be critical to informing policy discussions and improving regulatory implementation of California's climate law in ways that incentivize deeper in-state GHG reductions and that achieve both sustainability and environmental equity goals.

ACKNOWLEDGEMENTS

We thank USC PERE Data Manager Justin Scoggins, Graduate Research Assistant Melody Ng, and Communications Specialist Gladys Malibiran for their assistance in the production of this brief; the California Environmental Justice Alliance for helpful feedback on an early version of this brief; and the Energy Foundation (grant number G-1507-23494), the Institute for New Economic Thinking (grant number INO1500008), and the Resource Legacy Fund for their support of this work.

APPENDIX

This appendix includes a description of the methods used in our preliminary environmental equity assessment of California's cap-and-trade program. We also present supplemental analyses, including a comparison of neighborhood demographics near regulated GHG facilities using different buffer distances to define proximity.

Methods

GREENHOUSE GAS EMISSIONS

To start, we downloaded annual, facility-specific GHG emissions data for 2011-2014 from the Mandatory Reporting of Greenhouse Gas Emissions (MRR) program.[1] The MRR includes self-reported estimates of annual emissions of greenhouse gases (GHGs)—carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated GHGs—from regulated industries that have been verified by an independent third party. Emissions are given in units of CO_2-equivalents, a metric that combines the quantity of individual gases emitted with the potency of each gas in terms of its contribution to climate change over a 100-year time frame (also known as "global warming potential"). Our analysis focused on one class of emissions included in this database called "emitter covered emissions," which corresponds to localized, in-state emissions resulting from "the combustion of fossil fuels, chemical and physical processes, vented emissions…and emissions from suppliers of carbon dioxide"[11] as well as emissions of GHGs other than CO_2 from biogenic fuel combustion. The term "covered" refers to the fact that these emissions are subject to a compliance obligation under the cap-and-trade program; releases of CO_2 that result from the combustion of biogenic fuels, for example, are exempted. The cap-and-trade program also regulates out-of-state emissions associated with electricity imported into the state and, beginning in 2015, began regulating distributed emissions that result from the burning of fuels such as gasoline and natural gas in off-site locations (e.g., in the engines of vehicles and in homes); although we did not analyze distributed emissions in this report, this category of emissions will be a future research topic.

The number of facilities reporting to the MRR can change from year to year due to shutdowns, startups, and changes in emissions that affect whether facilities are required to report. In our analysis of trends in emissions across industry sectors, we excluded facilities that did not report to the emissions inventory every year during 2011-14, as well as facilities that reported no emitter covered emissions during the four-year period. Facilities were categorized according to the sector reported in the MRR with slight modifications to reduce the number of categories. Facilities described as a refinery alone or in combination with any of the following were categorized as a refinery: hydrogen plant, CO_2 supplier, or transportation fuel supplier. Facilities described as "other combustion source" or "other combustion source/ CO_2 supplier" were categorized as "other."

We determined or confirmed the geographic location of each facility using a variety of data sources and methods. Geographic point locations for some facilities were obtained directly from the California Air Resources Board (CARB), and facility addresses reported in CARB's online GHG visualization tool were geocoded.[12] We located some sites using individual internet searches. All locations inside California were visually confirmed, and point locations were adjusted for accuracy using aerial imagery in Google Earth Pro.

CO-POLLUTANT DATA (PM_{10})

We obtained emissions of criteria air pollutants from the California Emission Inventory Development and Reporting Systems (CEIDARS) database for years 2011-14.[2] Reporting requirements, including the way in which facilities are defined, the numeric identifier attached to each facility, and the frequency of reporting, differ between CEIDARS and the MRR GHG database. This presents a challenge for combining emissions estimates from the two sources. In particular, criteria air pollutants are not required to be reported annually, and emissions estimates contained in the 2014 CEIDARS database may correspond to estimates from prior years. We joined data on PM_{10} emissions from the 2014 CEIDARS with GHG emissions information from the MRR GHG database based on the facility name, city, and ZIP code. For some GHG facilities listed in the MRR GHG database, we obtained addresses from CARB's Facility GHG Emissions Visualization and Analysis Tool.[12] Since the CEIDARS database also contains addresses, we were able to use the address field to confirm and find additional matches. When all variables (facility name, city, and ZIP code) did not match between the two data sources, matches were confirmed by hand through internet searches of company websites and online databases containing facility names and addresses.

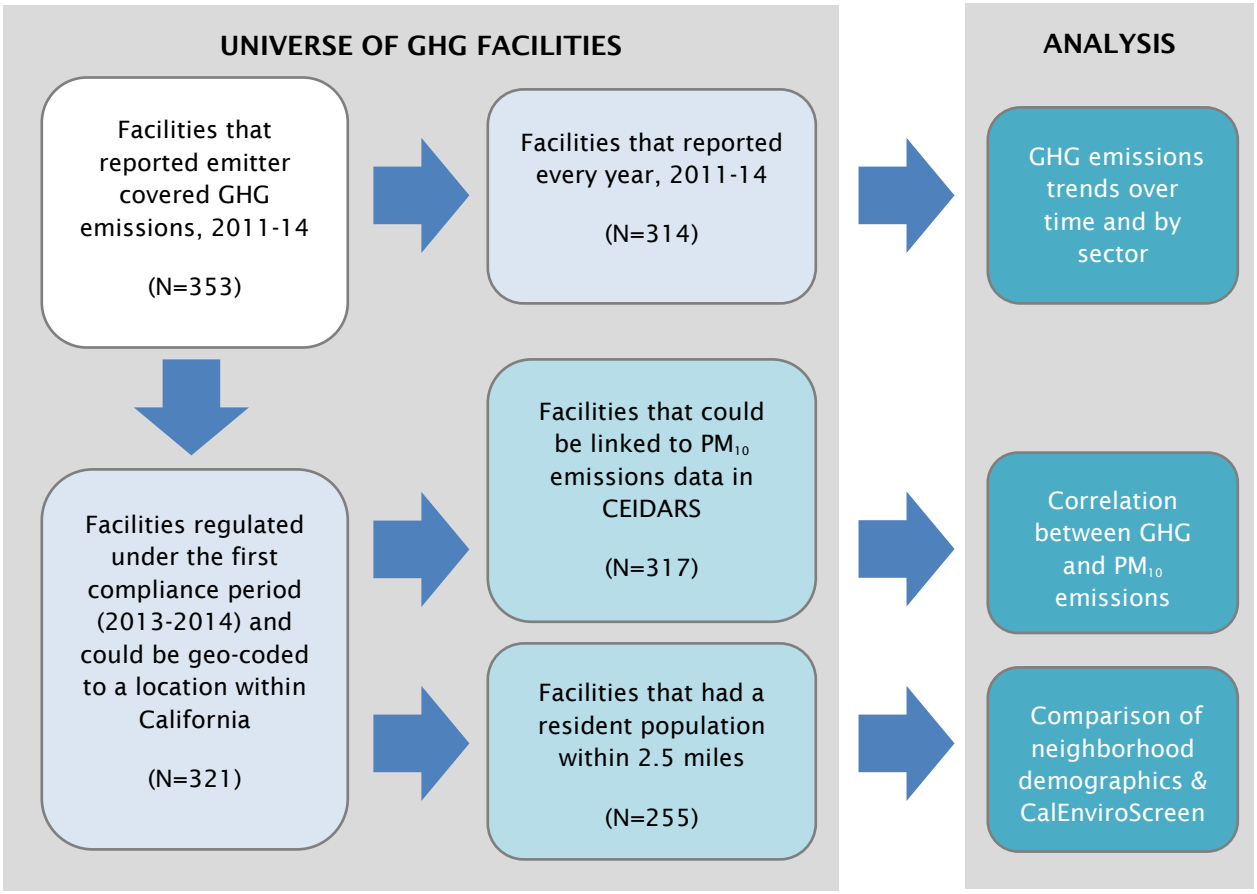
NEIGHBORHOOD DEMOGRAPHICS AND CUMULATIVE IMPACT

We defined neighborhoods on the basis of 2010 vintage Census block group boundaries provided by the U.S. Census.[13] Block group centroids were created by using the point-to-polygon tool in ArcGIS and the distance between block group centroids and GHG facility locations was calculated using the point-distance tool in ArcGIS (ESRI, Redlands, CA).

Demographic information for each block group was obtained from the 2014 5-year American Community Survey estimates. White individuals were defined as those who self-identified as white but not Hispanic. People of color were defined as all other individuals, including those who identified as multiracial or of Hispanic ethnicity. Poverty was defined as twice the federal poverty level (FPL) to reflect increases in the cost of living since the FPL was established and California's high cost of living.

CalEnviroScreen is a state-level screening tool developed by the California Environmental Protection Agency that helps identify California communities that are disproportionately burdened by multiple sources of pollution.[14] It includes indicators of proximity to environmental hazards and population vulnerability to derive a relative score of cumulative environmental health impact. We assigned block groups the most recent CalEnviroScreen score of their census tract in order to compare CalEnviroScreen rankings near GHG facilities to the rest of the state. **Figure 11** summarizes the construction of our facility-level dataset.

FIGURE 11 – Construction of the Dataset



ALLOWANCES AND OFFSETS

Unlike the emissions data, information on the allocation of allowances and ways in which regulated industries are complying with the cap-and-trade program is reported on an industry- and company-specific basis, rather than at the facility level. One company may own several regulated facilities. Information on the allocation of allowances was compiled from the California Code of Regulations (17 CA ADC § 95841 and 17 CCR § 95870) and CARB publications on the public allocation of allowances and estimates of state-owned allowances.[15] We obtained the number of allowances and offsets surrendered by each company at the completion of the first compliance period from CARB's 2013-14 Compliance Report.[16] Information on individual offset projects was compiled from CARB documents on offsets issued as of August 10, 2016[17] and individual project descriptions provided in the American Carbon Registry and Climate Action Reserve carbon offset registries.[18]

Supplemental Analyses

Consistent with the findings presented in **Table 1** in the main text, **Table 3** shows that neighborhoods within 1.5 miles of a facility with localized GHG emissions have a 16 percent higher proportion of residents of color, a 26 percent higher proportion of residents living in poverty, and a higher likelihood of scoring among the worst statewide in terms of their CalEnviroScreen score than neighborhoods that are not within 1.5 miles of such a facility. **Table 4** and **Table 5** show similar trends when neighborhoods up to a larger distance of 3.5 and 6 miles away are considered. These results confirm that the findings presented in our main analysis were not sensitive to our choice of buffer distance.

TABLE 3
Characteristics of Neighborhoods within 1.5 miles of GHG-emitting Facilities
(N=255 facilities)

	Block groups with at least one facility within 1.5 miles (N=2,710)	Block groups with no facilities within 1.5 miles (N=20,392)
Mean % People of Color	66%	57%
Mean % People Living Below Twice the Poverty Level	44%	35%
% of Block Groups in a "Top 10%" CalEnviroScreen tract	20%	9%
% of Block Groups in a "Top 20%" CalEnviroScreen tract	36%	18%

TABLE 4
Characteristics of Neighborhoods within 3.5 miles of GHG-emitting Facilities
(N=255 facilities)

	Block groups with at least one facility within 3.5 miles (N=9,991)	Block groups with no facilities within 3.5 miles (N=13,111)
Mean % People of Color	66%	51%
Mean % People Living Below Twice the Poverty Level	39%	33%
% of Block Groups in a "Top 10%" CalEnviroScreen tract	15%	6%
% of Block Groups in a "Top 20%" CalEnviroScreen tract	29%	13%

TABLE 5
Characteristics of Neighborhoods within 6 miles of GHG-emitting Facilities (N=255 facilities)

	Block groups with at least one facility within 6 miles (N=16,365)	Block groups with no facilities within 6 miles (N=6,737)
Mean % People of Color	65%	41%
Mean % People Living Below Twice the Poverty Level	37%	32%
% of Block Groups in a "Top 10%" CalEnviroScreen tract	13%	3%
% of Block Groups in a "Top 20%" CalEnviroScreen tract	25%	7%

In the main text, we defined the 66 largest GHG and PM_{10} emitting facilities as those that were within the top third in terms of their 2014 emissions of both PM_{10} and localized GHGs, and highlighted them in orange in **Figure 2**. We found that 40 (61 percent) of these high-emitting facilities reported increases in their localized GHG emissions in 2013-14 relative to 2011-12, versus 51 percent of facilities overall. Neighborhoods near the top-emitting facilities that increased emissions had higher proportions of people of color than neighborhoods near top-emitting facilities that decreased their emissions (**Table 6**).

TABLE 6
Characteristics of Neighborhoods near top GHG- and PM_{10}-Emitting Facilities that Increased and Decreased GHG Emissions (N=66 facilities[19])

	Block groups within 2.5 miles of at least one top emitting facility that increased GHG emissions (N=675)	Block groups within 2.5 miles of at least one top emitting facility that decreased GHG emissions (N=669)
Mean % People of Color	74%	58%
Mean % People Living Below Twice the Poverty Level	46%	34%
% of Block Groups in a "Top 10%" CalEnviroScreen tract	25%	14%
% of Block Groups in a "Top 20%" CalEnviroScreen tract	46%	28%

ENDNOTES

[1] Mandatory Reporting of Greenhouse Gas Emissions (MRR), http://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/ghg-reports.htm.
[2] CEIDARS, http://www.arb.ca.gov/ei/disclaim.htm; http://www.arb.ca.gov/ei/drei/maintain/dbstruct.htm.
[3] GHG facilities were limited to those that report emitter covered emissions during the first compliance period of cap-and-trade (2013-14), could be geo-coded in California, and had a resident population within 2.5 miles (N=255). We define neighborhoods using Census block groups. Residential proximity to a GHG facility was based on the distance between the facility location and each block group's centroid. We chose a 2.5 mile distance due to its common use in other environmental justice analyses. The Appendix gives results using alternative distance buffers.
[4] For calculations in Table 1, we used the universe of block groups for which there are valid data (i.e., non-missing data) for all four measures shown. However, the results were the same when we included all block groups with valid data for each measure on an individual basis.
[5] The map in Figure 1 shows 66 additional facilities that are not included in Table 1 and Figure 2 because they are not within 2.5 miles of a block group centroid with a resident population. See Figure 11 in the Appendix for details.
[6] Because there are several PM_{10} values that are between zero and one metric ton, in Figure 3 we added 1 to the PM_{10} value for all facilities prior to taking the log10 to avoid reporting negative values.
[7] Similar to Table 1, for calculations in Table 2, we used the universe of block groups for which there are valid data (i.e., non-missing data) for all four measures shown. However, the results were the same when we include all block groups with valid data for each measure on an individual basis.
[8] The results were qualitatively similar when we compared 2014 emissions to 2012 emissions. That is, the median and mean for each industry sector were in the same direction as shown in Figure 4 (above, near, or below zero), with one major exception: electricity generators on average decreased their emitter covered emissions in 2014 relative to 2012.
[9] California GHG Emission Inventory, 2016 Edition, http://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2014/ghg_inventory_trends_00-14_20160617.pdf.
[10] Some have critiqued the appropriateness of forestry projects for carbon offset purposes. For example, tree planting projects can take decades to reach maturity in terms of their ability to sequester carbon. Younger trees sequester less carbon and often take decades to fully mature. Moreover, it is challenging to measure and quantify the ability of forestry projects to sequester carbon over time. In particular, the permanence of forestry projects cannot be guaranteed as they remain susceptible to fire, disease, natural decay, clearing, or mismanagement. Forestry projects are also vulnerable to "leakage." This refers to the fact that, unless global demand for wood products goes down, a reduction in logging in one location can simply result in greater deforestation in another location.
(See http://www.ipcc.ch/ipccreports/sres/land_use/index.php?idp=0 and http://www.web.uvic.ca/~repa/publications/REPA%20working%20papers/WorkingPaper2007-02.pdf for overviews of these issues.)
[11] https://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/2014-ghg-emissions-2015-11-04.xlsx
[12] http://www.arb.ca.gov/ei/tools/ghg_visualization/
[13] https://www.census.gov/geo/maps-data/data/cbf/cbf_blkgrp.html
[14] http://oehha.ca.gov/calenviroscreen/report/calenviroscreen-version-20
[15] http://www.arb.ca.gov/cc/capandtrade/allowanceallocation/publicallocation.htm; http://www.arb.ca.gov/cc/capandtrade/allowanceallocation/edu-ng-allowancedistribution/electricity-allocation.pdf; http://www.arb.ca.gov/cc/capandtrade/stateauction.htm
[16] http://www.arb.ca.gov/cc/capandtrade/2013-2014compliancereport.xlsx
[17] http://www.arb.ca.gov/cc/capandtrade/offsets/issuance/arb_offset_credit_issuance_table.pdf
[18] http://americancarbonregistry.org; http://www.climateactionreserve.org
[19] 66 GHG facilities fell in the top third in terms of both PM_{10} and localized GHG emissions. We found that 40 of these facilities increased localized GHG emissions, 23 decreased emissions, and three did not report to the database all four years (2011-2014) so we could not determine an increase or decrease.

Exhibit 2

Bulletin of the Atomic Scientists

IT IS 5 MINUTES TO MIDNIGHT

Feature

Bulletin of the Atomic Scientists
2014, Vol. 70(5) 35–44

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How California's carbon market actually works

Danny Cullenward

Abstract

Almost 10 years ago, California's legislature passed Assembly Bill 32, the Global Warming Solutions Act of 2006. AB 32 set the most ambitious legally binding climate policy in the United States, requiring that California's greenhouse gas emissions return to 1990 levels by the year 2020. The centerpiece of the state's efforts—in rhetorical terms, if not practical ones—is a comprehensive carbon market, which California's leaders promote as a model policy for controlling carbon pollution. Over the course of the past 18 months, however, California quietly changed its approach to a critical rule affecting the carbon market's integrity. Under the new rule, utilities are rewarded for swapping contracts on the Western electricity grid, without actually reducing greenhouse gas emissions to the atmosphere. Now that the Environmental Protection Agency is preparing to regulate greenhouse gases from power plants, many are looking to the Golden State for best climate policy practices. On that score, California's experience offers cautionary insights into the challenges of using carbon markets to reduce greenhouse gas emissions.

Keywords

California, cap-and-trade, carbon market, climate policy, emissions, leakage, resource shuffling

For years, Southern California Edison imported electricity from the Four Corners Power Plant, a coal-fired facility in northwestern New Mexico. When California's groundbreaking carbon market took effect in 2013, Edison, like all other in-state utilities, became responsible for the climate pollution from its generating fleet. A few months later, the company sold its interest in the coal plant to an Arizona utility (APS, 2013). Whatever replacement supplies Edison selects will be cleaner than coal, the most carbon-intensive fossil fuel, and Edison will report reduced emissions in California's carbon market.

At first this sounds like a positive story: Policy puts price on carbon, pollution falls. But this transaction will not reduce net greenhouse gas emissions to the atmosphere. The coal plant will keep emitting pollution just as before—only now it serves customers in Arizona, not California.

As it has with many other environmental issues before, California aims to set an example for the United States on climate policy. The key to its success, according to state officials, is a

comprehensive carbon market—featuring "good policy design, clear oversight and strong enforcement" (Nichols, 2014). Ironically, one of the most visible consequences of the market's first year is a rush to swap coal power imports for cleaner replacements, limiting the extent to which California's policy leadership actually helps the climate. Is this perverse outcome the unavoidable consequence of California acting without its neighbors' support, or could the state have done more to ensure that its market creates real environmental benefits?

An efficient theory

The slow birth of American climate policy coincides with a transition in the way our country manages its environmental problems. Most of our national environmental laws were drafted at a time when both political parties supported government regulation of the private sector. That was, of course, a different era. Since then, the center of national political opinion has shifted dramatically in favor of the free market. And that trend is visible in contemporary environmental policy, which, over the last few decades, has moved away from traditional regulatory approaches to controlling pollution. Flexible, market-based mechanisms are now the preferred route.

The thinking goes something like this: Rather than impose specific requirements on individual companies or industries, it is more efficient for the government to set economy-wide policy targets and let the private sector find the cheapest way to meet them. In theory, this not only increases the flexibility of regulated industries' compliance options but also reduces the policy's administrative complexity. Thus, if done right, economic approaches to environmental policy should result in a win-win.

Enter a uniquely American invention, the carbon market—also known as emissions trading or cap-and-trade.[I] The idea is simple, though the practice is not. Economic theory says that all a government needs to do is: set a quantitative cap on emissions; create and freely distribute or auction emissions permits, with the total number of permits equal to the cap; and require polluters to turn in a permit for each unit of pollution they emit. With this framework in place, the government steps back to let the private sector do what it does best: trade permits to minimize costs.

The most critical component of a carbon market is the cap. Typically, the cap is expressed as a maximum quantity of emissions allowed in any given year, with each year's limit declining toward a long-term goal. Think of it like a game of musical chairs—with carbon pollution as the players, and the chairs representing emissions permits. At the end of every year, the music stops and the players must seat themselves. When there are more people than chairs, market forces dictate who leaves the game and who can stay; the government's role in this analogy is only to set up the rules and remove the correct number of chairs at each stage. So long as the government counts the right number of chairs, everything should work out fine.

California's climate policy

After the United States withdrew from the Kyoto Protocol and elected George W. Bush, whose administration strongly opposed legally binding federal climate

policy, momentum shifted to the states. California moved to claim its traditional role as an environmental policy leader by passing AB 32, the Global Warming Solutions Act of 2006. Most notably, this bill requires California's emissions to fall to 1990 levels by the year 2020. AB 32 also designated a primary regulator, the California Air Resources Board (CARB), making CARB responsible for developing specific policies and measures that would lead California to its 2020 target.

The key to understanding California's climate policy system lies in recognizing the overlapping structure of the instruments that CARB and other agencies eventually adopted. Arguably the state's best-known climate policy is its comprehensive carbon market, which CARB designed and implements. At the same time, California has a number of robust regulatory programs that apply to sectors that are also covered by the carbon market. For example, California has one of the strongest renewable portfolio standards (requiring utilities to purchase 33 percent of their electricity from renewable sources by 2020), as well as world-class energy efficiency programs and a clean transportation fuels policy.

Climate experts refer to these programs as "complementary policies"—a phrasing that suggests they exist to support the primary instrument, a carbon market. In practice, however, the complementary policies do most of the work. When CARB created its plan for meeting California's 2020 emissions target, it relied on complementary policies for approximately 80 percent of the reductions, leaving a mere 20 percent to "additional reductions" in the sectors covered by the state carbon market (CARB, 2008)—meaning that most of the emissions reductions are being accomplished by individual policies, not driven by the comprehensive market price on carbon. As my colleague Michael Wara (2014) explains elsewhere in this issue, the complementary policies effectively hide the true cost of California's climate policy: Because most of the necessary emissions reductions are required by separate regulation, rather than left to the carbon market, the carbon price reflects only a fraction of the state's climate policy efforts.[2]

California's market design

California benefits from the experience of the emissions trading systems that came before it. By carefully observing the early years of the European Union's Emissions Trading Scheme (ETS), for example, CARB was able to avoid many of the hiccups that confronted its predecessors. These successes are all the more laudable because California has implemented the most comprehensive market to date. While the northeastern states' Regional Greenhouse Gas Initiative controls only emissions from power plants, California's market currently covers the power and industrial sectors (as does the European ETS), and will expand next year to include the transportation fuels and natural gas sectors. All told, this will encompass about 85 percent of the state's total emissions—a comprehensive policy by any standard.

On the other hand, California faces many new challenges that previous markets never had to address. In particular, the state must contend with the fact that it is only a small part of a regional electricity transmission grid stretching from the Pacific Ocean to the Rocky Mountains. The scale of the Western grid matters because California is a

significant net importer of electricity. Recognizing that the emissions profile of its electricity imports is part of California's carbon footprint, regulators rightly included electricity imports in the cap-and-trade program. But geography introduced new headaches. Because California is the only western state that prices its greenhouse gas emissions, utilities and power traders now face an incentive to swap their high-emitting imports for cleaner replacements—a practice known as resource shuffling. (Recall the earlier example of Southern California Edison divesting its interest in a New Mexico-based coal power plant: Emissions reported in California go down, but emissions across the western United States do not change.)

If utilities are allowed to shuffle electric power imports, the emissions reductions they report in California's carbon market will not reflect reduced emissions to the atmosphere. Instead, the dirty resources California utilities divest will continue polluting the air under new, unregulated ownership. Given this dilemma, what should carbon market regulators do?[3]

A quiet coup

As it happens, the California Legislature anticipated these concerns. When the legislature delegated broad authority to CARB to create climate policy, it also issued guidelines that the regulator must incorporate in its policies. Specifically, state law requires that "to the extent feasible," climate regulations must "minimize leakage."[4] California law defines leakage as "a reduction in emissions of greenhouse gases within the state that is offset by an increase in emissions of greenhouse gases outside the state."[5]

In plain English, this requirement means that CARB should not give credit to actions that merely shift the responsibility for greenhouse gas emissions beyond state borders. Instead, AB 32 dictates that CARB should only recognize net reductions in emissions to the atmosphere. For a time, CARB followed this instruction. Its initial carbon market regulations banned resource shuffling, and went so far as to require companies' executives to attest that they were not engaged in this practice.[6]

But this approach proved controversial. In the months leading up to the beginning of the market's first compliance period, several stakeholders objected to the resource shuffling rules and began agitating for reforms. The first public proposal came from California's investor-owned utilities, which in September 2012 advocated a series of exemptions to the prohibition on resource shuffling (Joint Utilities Group, 2012). The following month, CARB directed its staff to develop modifications to the resource shuffling regulations, providing 13 fully developed "safe harbor" exemptions to the definition of resource shuffling (CARB, 2012a)—directly comparable to, if not more permissive than, the Joint Utilities Group proposal. A few weeks later, CARB staff released a new regulatory guidance document that incorporated these safe harbors, almost word for word (CARB, 2012b).

When a regulator issues a guidance document that publicly describes how to interpret its rules, that description provides a legal defense to any private party that reasonably relies upon it. After all, it would be extremely unfair if following the regulator's own advice could get one in legal trouble. But consider what this meant for the carbon

market. On the eve of the program's launch in January 2013, the regulator quietly rewrote its own rules through informal guidance documents. Formally, its regulations prohibited resource shuffling. Yet CARB's own guidance document indicated that this straightforward prohibition would not apply to 13 broad categories of transactions. Thus, when the market began operation in 2013, its practical function had already diverged from its formal legal rules.

The market springs a leak

My colleague David Weiskopf and I had been studying CARB's resource shuffling rules during this tumultuous time. We recognized that CARB faced an incredibly difficult task in writing effective and legally permissible cross-border accounting rules, yet we were surprised at the scope of CARB's informal guidance document. We believed that a compromise was possible, to give utilities clear and flexible rules without undermining the environmental integrity of the market.

Meanwhile, we were deeply concerned that the informal guidance document effectively revoked the prohibition on resource shuffling. We published our analysis of the safe harbors and the leakage risks they created in July 2013 (Cullenward and Weiskopf, 2013). Most important, we described how several of the safe harbors were broader than the underlying prohibition. In addition, we pointed out that two safe harbors explicitly allowed California utilities to divest their long-term contracts with out-of-state coal power plants.

As it happens, these coal power imports account for a significant portion of California's emissions. We calculated that if California utilities relied on the safe harbors to divest from just six coal power plants, they could cause between 108 and 187 million tons of carbon dioxide to leak out of California's market—a quantity that is roughly equivalent to the expected size of the market, after accounting for the likely impact of the complementary policies. Furthermore, we realized that our analysis was consistent with calculations from CARB's own economic advisory committee, called EMAC, which found that resource shuffling of all types could lead to leakage of between 120 and 360 million tons of carbon dioxide (Borenstein et al., 2013). (The EMAC report did not assess whether the safe harbors would enable leakage; it looked only at what the effects of resource shuffling would be if there were no prohibition against it.)

In addition to presenting our concerns, we also developed a complete regulatory text to implement an alternative approach to controlling resource shuffling. Even if our suggestions could have been helpful, they probably arrived too late. That same month, CARB hosted a workshop to consider draft regulatory amendments that would codify the safe harbors into law. As it became clear that CARB would proceed without any public acknowledgement of the leakage problem, I wrote an op-ed in the *San Jose Mercury News* raising the issues described here (Cullenward, 2013a), as well as two comment letters addressing the technical and legal questions in the formal administrative process (Cullenward, 2013b, 2014a).

Over the following months, three of the six coal power plants that Weiskopf and I identified became involved in resource-shuffling-related transactions, leaking between 30 and 60 million tons of carbon dioxide out of California's carbon market (Cullenward, 2014b).

Two of these contracts have already left the regulatory system, while a third—under which the Los Angeles utility LADWP imports power from the coal-fired Navajo Generating Station on tribal lands in Arizona—is on its way out. In a regulatory filing connected with its purchase of replacement power, LADWP even disclosed that a benefit of divestment from the Navajo Generating Station would be "relieving LADWP from having to purchase emission credits" in the carbon market (LADWP, 2013: 3). Yet, as I pointed out in my second comment letter to CARB (Cullenward, 2014a), there is little doubt that the utility's divestment plan fits squarely in one or more of the safe harbors, and therefore does not violate CARB's guidance. By the time CARB unanimously voted to approve its new regulations, it had substantial evidence that its safe harbors were facilitating significant leakage—despite AB 32's clear requirements to the contrary.

A weak cap

What does leakage mean for California's climate policy? First and foremost, it means the "cap" in cap-and-trade is much less than it seems.

Return for a minute to the analogy of carbon markets as a game of musical chairs. Earlier, I suggested that so long as the government sets out the right number of chairs (a shrinking supply of emissions permits), the game should run smoothly. But resource shuffling essentially allows players to leave the game—say, by offering them an open spot on a comfortable couch in a nearby room. If resource shuffling is allowed, counting the number of chairs no longer provides reliable information about the environmental performance of the system.

And that's the major flaw in California's system. Now that resource shuffling is happening, we know that California's supposed reductions reflect bad bookkeeping, because the market cap is no longer firm. If the remaining coal power imports leave the carbon market, or if utilities take full advantage of the other safe-harbor provisions, a significant majority of the market's apparent emissions reductions will be attributable to leakage, not progress.

Although the market is no longer producing the net emissions reductions for which it was designed, it does have other, positive impacts. Notably, it sets a minimum price, which was $11.34 per metric ton of carbon dioxide in July 2014. The price had previously ranged from approximately $13 to $20 per ton, but began a steady decline in approximately July 2013. As this article went to press, it rested slightly above the price floor, as can be seen at the California Carbon Dashboard website (http://calcarbondash.org). These data show that an oversupply of emissions permits—caused in no small part by reduced demand due to resource shuffling—has crashed the market price down to its legal minimum.

Curiously, so long as these conditions persist, the market actually looks like a carbon tax. In other words, after years of complex negotiations, emissions trading, and hundreds of pages of market rules, California's market operates much like the carbon tax (or "fee") policies preferred by both moderate Republicans (Paulson, 2014; Shultz and Becker, 2013) and grassroots environmentalists (Citizens' Climate Lobby, 2014)—only without the transparency and accountability mechanisms that motivate many of these advocates' positions.[7] Perhaps simplicity is a virtue in climate policy after all.

In all fairness, California has managed to create the highest price on carbon pollution in the United States. It also has robust energy policies that are encouraging the expanded use of clean and efficient resources. These are all significant accomplishments, but the carbon price is still too low to do much good. We know it is lower than the actual cost of California's clean energy policies—for example, CARB reports that California's clean fuels policy credits were trading between $63 and $79 per metric ton of carbon dioxide during the last three months of 2013 (CARB, 2014), well above the carbon market price—and therefore the carbon market is not driving compliance in those sectors. In any case, the market price is certainly lower than the levels needed for the long-term transformation of the energy system.

A cautionary tale

Can anything be done about the failure of California's flagship carbon market to live up to expectations? Yes, but the political challenges are far greater than the technical issues. At this point, there is only one solution that can preserve the market's integrity: CARB must observe the leakage that results from its permissive resource shuffling rules, then tighten the overall market cap accordingly. (In my musical chairs analogy, this means removing a chair for every person who leaves the game before the music stops.) But acknowledging and resolving the problem will likely increase the carbon market price, and hence political opposition.

Some stakeholders prefer to place hope in new developments in state and federal climate policy. They argue that resource shuffling will be less of a problem if enough of California's neighbors adopt their own climate regulations. For example, the leaders of California, Oregon, Washington, and British Columbia signed an agreement to harmonize their approach to climate policy (Center for Climate and Energy Solutions, 2013). There is little chance, however, of a similar agreement with southwestern states, where most of California's legacy coal power imports originate. Waiting for the Environmental Protection Agency to act isn't an option, either. Assuming that the EPA's proposed rules are finalized and survive intense litigation, they won't produce results until after 2020, the current end date for California's legally binding market. (Moreover, the proposed federal rules do not apply to tribal lands, yet two of the three coal-fired power plants that have already leaked from California's market are located in Navajo territory.) Thus, the prospects for California's neighbors to independently resolve this problem are dim.

Even if CARB fails to address the leakage issue, California's experience offers useful insights into the politics of climate policy—though the precise lessons depend on one's point of view. The optimistic perspective looks something like this: Perhaps the flaws in the current plan reflect realistic concessions on the road to deep, long-term emissions reductions. (State policy makers are currently discussing how to set a goal for 2030 and have a nonbinding aspirational target of reducing emissions 80 percent below 1990 levels by 2050.) Even the most proactive government officials have to navigate a maze of political obstacles, technically complex issues, and the constant threat of litigation—especially when working on controversial issues such as climate policy, which challenges powerful established interests.

Sometimes policy makers make mistakes, and sometimes they make compromises. Whatever the case here, the good news is that a state can only rely on leakage once: After the high-emitting resources are gone, there are no more opportunities for resource shuffling. Instead of fighting over complex market rules, climate policy makers should focus on raising the minimum market price in future reforms. Their critics should remember that the complementary policies are unaffected by a weak market cap.

Taking a less optimistic perspective, one might question the credibility of the market regulators. At the end of the day, CARB let the utilities write their own rules. Whether CARB intended to rely on leakage to artificially lower the market price, or simply didn't understand what its economic advisers were saying about the probable consequences of these reforms, it deferred to the industry it was charged with regulating. Political realists who worry about costs should also be concerned with the environmental performance of policy instruments designed to keep costs low; California will need these policies to work if it is to achieve long-term climate targets. Equally important is consistency with the rule of law, which will be necessary to strengthen climate policy over the coming decades. From this perspective, relying on questionable accounting tricks is hardly the mark of a strong regulator that is prepared to impose tough rules for 2030 and beyond.

If there is a broader lesson in California's experience, it is this: The political and technical challenges of implementing climate policy are greater than most people appreciate—even within the expert community, which tends to view carbon markets as both eminently tractable (Newell et al., 2014) and politically expedient (Stavins, 2014). It is not enough to pass legislation or propose new regulations. Indeed, that is only the beginning.

Acknowledgements

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Notes

1. Many people incorrectly think of the carbon market as a European invention because the European Union was the first to apply it to climate policy. Europe did create the world's largest carbon market, the EU Emissions Trading Scheme, as part of its Kyoto Protocol obligations (Ellerman et al., 2007). Nevertheless, emissions trading actually got its start in the United States. For example, the US Environmental Protection Agency developed cap-and-trade markets to control lead in gasoline in the 1980s (Stavins, 2014) and for sulfur dioxide pollution from power plants in the 1990s (Ellerman et al., 2000).
2. This is not to say that California's climate policy is too expensive. My point is merely that the apparent cost observed in the carbon market is significantly lower than the true cost.
3. This challenge is not unique to California; it applies to nearly all sub-national carbon markets, including the Regional Greenhouse Gas Initiative and the pilot programs in China (Cullenward and Wara, 2014). So long as the carbon market is smaller than the region's electricity market, cross-border accounting issues will be present.
4. See California Health and Safety Code (2014: §§ 35852(b), (b)(8)).

5. See Legislative Counsel of California (2014: § 38505(j)).
6. See California Code of Regulations (2014: § 95852(b)(2)). The attestation requirement was suspended soon after adoption and recently repealed in its entirety.
7. Although advocates of these policies use different terminologies, they share the common goal of putting a price on emissions—for all practical purposes, a tax. But framing matters in politics. Citizens' Climate Lobby eschews "tax" and prefers "fee and dividend," returning all revenue back to households. Shultz and Becker promote a "revenue-neutral carbon tax," which they distinguish from other taxes by requiring that all revenues be returned to individual (and potentially corporate) taxpayers. Finally, others, like Paulson, refer simply to a carbon tax, without specifying how the revenue would be used.

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Author biography

Danny Cullenward is the inaugural Philomathia Research Fellow at the Berkeley Energy and Climate Institute (BECI) at the University of California, Berkeley, USA. An energy economist and lawyer by training, his work focuses on the design and implementation of science-based climate policy. Cullenward has been working on carbon markets for 10 years. In 2013, he represented climate scientists before the Ninth Circuit, successfully defending the constitutionality of California's climate policy. He holds a PhD in Environment & Resources (E-IPER) from Stanford University and a JD from Stanford Law School.

Exhibit 3

From: Chang, Edie@ARB
To: Brent Newell
Subject: RE: C&T Adaptive Management Plan
Date: Wednesday, August 19, 2015 6:08:21 PM

Hi Brent – we don't release information about transactions within the C&T program because that information is considered market sensitive. There is information posted on our website about allowance allocation (http://www.arb.ca.gov/cc/capandtrade/allowanceallocation/v2015allocation.pdf) and auction participation (http://www.arb.ca.gov/cc/capandtrade/auction/may-2015/summary_results_report.pdf and http://www.arb.ca.gov/cc/capandtrade/auction/may-2015/ca_proceeds_report.pdf .

As I mentioned in my note, we're going to starting some outreach in the fall on AM. We've haven't taken actions on adaptive management to date.

Thanks,
Edie

From: Brent Newell [mailto:bnewell@crpe-ej.org]
Sent: Tuesday, August 18, 2015 5:28 AM
To: Chang, Edie@ARB
Subject: RE: C&T Adaptive Management Plan

Edie,

Please send me information (1) on where facilities obtained their allowances/offsets for the 2013 compliance event; and (2) any actions ARB has taken pursuant to the Adaptive Management Plan in response to the 2013 compliance event.

Thanks!

PLEASE NOTE OUR NEW ADDRESS

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PROVIDING LEGAL AND TECHNICAL ASSISTANCE TO THE GRASSROOTS MOVEMENT FOR ENVIRONMENTAL JUSTICE

From: Chang, Edie@ARB [mailto:edie.chang@arb.ca.gov]
Sent: Friday, August 14, 2015 10:26 AM
To: Brent Newell
Subject: RE: C&T Adaptive Management Plan

HI Brent – I've attached links to the cap and trade data that is available.

Reported and verified GHG emissions data is available here. The latest data posted is 2013. We will be posting the 2014 data in November. We've been collecting data under the reporting reg since 2008 and I think it's available on that website. http://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/ghg-reports.htm

We have had one compliance event so far - in November of 2014. At that time, entities were required to submit allowances to cover 30% of their 2013 emissions. This is the report from that compliance event. You can see how many compliance instruments (allowances and offset) each entity submitted and also what offsets were used. Our next compliance event is November 2015 at which time allowances to cover the remaining 70% of 2013 emissions and 100% of 2014 emissions will be due. We will post a similar report after that compliance event.
http://www.arb.ca.gov/cc/capandtrade/2013compliancereport.xlsx

This is a report that shows the total compliance instruments that have been issued.
http://www.arb.ca.gov/cc/capandtrade/complianceinstrumentreport.xlsx

We're continuing to work on our adaptive management plan and will be starting some outreach in the fall. Let me know if you have any questions,
Edie

From: Brent Newell [mailto:bnewell@crpe-ej.org]
Sent: Thursday, August 13, 2015 3:39 PM
To: Chang, Edie@ARB
Subject: C&T Adaptive Management Plan

Edie,

I hope all is well. On the CAA 111(d) call in July you mentioned that ARB had analyzed cap and trade program data for 2013 as part of the Adaptive Management Plan. I would like to receive that data,

especially data that shows how each source met its compliance obligation (e.g. through surrendering allowances, buying offsets, etc.). I'd also like to receive source specific emissions data to understand how each source has increased or decreased its emissions under cap and trade.

Please advise.

Thanks,
Brent

Please note our new address

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