GOLDMAN SCHOOL
OF
PUBLIC POLICY
UNIVERSITY OF CALIFORNIA BERKELEY

Advancing Environmental Justice:

A New State Regulatory Framework to Abate Community-Level Air Pollution Hotspots and Improve Health Outcomes

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Preface

This report grew out of the Environmental Justice and Climate Policy Solutions Dialogue convened by the University of California, Berkeley Goldman School of Public Policy's Center for Environmental Public Policy (CEPP). It recommends development of a new state regulatory framework to abate community-level air pollution hotspots to protect public health. The enactment of AB 617 (C. Garcia), Nonvehicular air pollution: criteria air pollutants and toxic air contaminants, in July 2017 establishes a platform and provides opportunities for full development of this report's recommended approach.

Launched by UC President, Governor Janet Napolitano, the Dialogue's initial goal was to develop win-win strategies to achieve the state's new target under California state law (SB32) to reduce climate change causing greenhouse gas (GHG) emissions by 40 percent below 1990 levels by 2030 while also reducing local criteria and toxic air emissions and their adverse health impacts on California's disadvantaged communities and other communities facing disproportionate exposure. Key California state and local government officials, staff from the Governor's Office and the California State Legislature, Members of the California Air Resources Board, stakeholders from the environmental justice community, industry and non-profit sector representatives, and faculty experts from the University of California participated. They provided input through two multi-stakeholder dialogue sessions as well as through working group meetings, small group discussions, and one-on-one engagement. Appendix A describes the dialogue process. Appendix B is a list of the participants.

A participant-driven process, the dialogue gravitated to examining policies that optimize criteria and toxic air emissions reductions and protect the health of disadvantaged communities. A number of dialogue participants strongly preferred leaving the discussion of achieving the 40 percent GHG reduction goal through the cap and trade system and other measures to debate in the legislative arena. Consequently, dialogue presentations and discussions focused on air quality and:

- The opportunity presented by emerging low-cost sensor technologies that help measure local air pollution levels in communities, identify the

sources, and provide a catalyst and a platform for community engagement in developing an action plan to eliminate elevated emissions exposures and their adverse health impacts;

- Approaches to abating elevated air pollution exposures from all sources in disadvantaged communities through a collaborative effort combining community engagement, regulation, and incentive financing;
- Strategies to reduce emissions from heavy duty vehicles through enhanced regulation of facilities like warehouses and marine terminals and through model state-of-the-art design rules for such facilities; and
- Strategies to encourage air districts to use the full extent of existing and new authority and financing incentives to abate air pollution hotspots.

The recommendations in this report are drawn from many of the discussions as well as the related research by the CEPP team. The draft executive summary of this report was circulated to all dialogue participants on June 1 for comment, and the authors discussed it with virtually all of the dialogue participants individually or in small groups in early June as well as with several outside experts. The final recommendations in this report are those of Ned Helme, Executive Director of the Goldman School of Public Policy's Center for Environmental Public Policy (CEPP) at the University of California Berkeley, and his co-authors, Stacey Davis of the Center for Clean Air Policy, Nancy Ginn Helme, Suzanne Reed, Michelle Levinson, and David Wooley of Keyes and Fox. Simone Cobb, project coordinator; Manuel Coquet, graduate student researcher; and Christian Joshua Willerth, student volunteer also contributed to the report as part of the CEPP project team.

We thank each dialogue participant (listed in Appendix B) for their invaluable insights. In addition, special thanks goes to all of the presenters and respondents at the dialogue sessions (listed in Appendix A), as well as to the staff of the California Air Resources Board, the Bay Area Air Pollution Control Authority, and the South Coast Air Quality Management District for the technical support they provided throughout the dialogue process.

CEPP is grateful to the Energy Foundation, to the Office of the President of the University of California, and to the Goldman School of Public Policy for funding this report and the EJ and Climate Policy Solutions Dialogue project and appreciates the leadership of UC President Janet Napolitano and Dean Henry E. Brady, Goldman School of Public Policy, UC Berkeley in supporting this effort.

Executive Summary

California has been a leader in the United States, and indeed, the world, in reducing air pollution—both criteria and toxic pollutants that adversely impact health and greenhouse gases (GHG) that contribute to worldwide climate change. For example, the last two decades saw a 70 percent decline in diesel cancer risk and a 76 percent decline in the collective cancer risk from exposure to seven toxic air contaminants in California. GHGs are declining toward the goal of reducing emissions to 1990 levels by 2020. Despite this progress, California's work is not done. There are numerous communities across the state where population exposures to harmful air pollution continue to threaten public health. California and federal air pollution laws focus on achieving ambient air quality standards, with compliance measured at monitoring sites chosen to reflect typical or average air quality in a region. But people don't breathe average air.

New health research and data available over the last several years make it abundantly clear that as our regions progress toward regional air quality standard attainment, exposure to elevated levels of pollution on a local scale continues to have serious public health consequences. Hotspots with excessive emissions overwhelmingly occur in low income and minority communities, which tend to be located closer to multiple pollution sources. Some air districts have made progress in beginning to understand and address these localized emissions impacts through community engagement, supplemental monitoring, and initial abatement efforts, laying the groundwork for this report's recommendation to create a new, more robust, community-focused system of air quality reduction and public health protection statewide.

As California continues to demonstrate much-needed international leadership in reducing GHG emissions, it is critically important that the state show an equal commitment to providing healthful air for all of its communities and stemming the debilitating impacts of air pollution on disadvantaged communities. The effect on these communities is not only a human health burden — high rates of asthma and other lung diseases, cancer, heart disease, and premature death — but also an economic one in terms of medical care costs and lost wages, which erode income needed for housing and food.

The Goldman School's Center for Environmental Public Policy (CEPP) at UC Berkeley brought together. Key California state and local government officials, staff from the Governor's office and the California State Legislature, California Air Resources Board members, stakeholders from the environmental justice community, industry and non-profit sectors, and faculty experts from the University of California in an Environmental Justice and Climate Policy Solutions Dialogue. The dialogue was convened by UC President Janet Napolitano to identify strategies to achieve SB 32's 40 percent GHG reduction goal by 2030 while ensuring that environmental justice is being served in low income and minority communities through reduction of criteria and toxic air emissions.

A participant-driven process, the dialogue gravitated to examining policies that optimize criteria and toxic air emissions reductions to protect the health of disadvantaged communities. Given the virtually simultaneous timing of the California Legislature's consideration of the Governor's request to reauthorize the GHG emissions trading system, a number of dialogue participants strongly preferred leaving that discussion to debate in the legislative arena. Consequently, dialogue presentations and discussions focused on air quality and:

- The opportunity presented by emerging low-cost sensor technologies that help measure local air pollution levels in communities, identify the sources, and provide a catalyst and a platform for community engagement in developing an action plan to eliminate elevated emissions exposures and their adverse health impacts;
- Approaches to abating elevated air pollution exposures in disadvantaged communities through a collaborative effort aimed at all air pollution sources, combining community engagement, regulation, and incentive financing;
- Strategies to reduce emissions from heavy duty vehicles through enhanced regulation of facilities like warehouses and marine terminals and

through model state-of-the-art design rules for such facilities; and

- Strategies to encourage air districts to use the full extent of existing and new authority and financing incentives to abate air pollution hotspots.

In the course of the dialogue, it became clear that new, low cost stationary and mobile sensor technology promises to revolutionize air quality protection and deepen our understanding of the excessive health risks in disadvantaged communities. Currently, PM2.5 sensors are producing the most reliable data, but technology to measure other air pollutants is advancing rapidly. PM2.5, one of the most deleterious air pollutants, causes lung and heart disease and early death. The readiness of relatively low cost PM2.5 sensors serves as a starting point for the integrated regulatory framework proposed in this report. Using community-based sensors to help identify pollution hotspots as well as the stationary and mobile sources causing harmful exposures, air districts can work with communities and local government to target the sources with the appropriate mix of regulatory measures, incentive financing, traffic management, and/or land use strategies to reduce emissions and improve public health. The demand for regulatory action to reduce emissions will only intensify as community sensor use increases and the sources of harmful emissions are identified.

Actions to reduce emissions and health risk exposure may range from something as simple as limiting school bus idling and moving student pick-up and discharge stops away from school playgrounds to more expensive options including retrofitting pollution controls on buses or replacing them with electric and hybrid models. In communities with marine terminals or warehouses, regulatory actions would include implementing efficient cargo and vehicle management at the warehouse or marine terminal to expedite truck passage through the facility and reduce diesel emissions and energy use. In other communities, regulatory steps would include requiring technological improvements at a refinery or cement plant. Using this flexible approach, air districts working with communities would choose the most appropriate options to reduce emissions and exposures consistent with their particular situations.

This report's recommendations for dealing effectively with the criteria and toxic air contaminant challenges in environmental justice communities are based on the CEPP team's research as well as information gathered from the dialogue sessions, working group meetings, and one-on-one and small group discussions with various stakeholders and experts. Though it is informed by those extensive discussions, this report reflects solely the recommendations of the authors.

Recommendation: New State Regulatory Framework to Abate Community-Level Air Pollution Hotspots

The CEPP team proposes a bold new system for localized air quality and health improvement designed to rapidly reduce air pollution by identifying and focusing resources on local air pollution hotspot areas. Enactment of AB 617 (C. Garcia), Nonvehicular air pollution: criteria air pollutants and toxic air contaminants, in July 2017 is an important first step in launching such a system. It expands opportunity to build a comprehensive program that includes the following elements:

IMMEDIATE ACTION AND TIMELY RESULTS THROUGH NEW COMMUNITY-LEVEL AIR QUALITY ACTION PLANS.

- CARB should define criteria for the selection of geographic areas with high particulate matter (PM2.5) exposures based on exceedance of the National Ambient Air Quality Standard (NAAQS) for PM2.5 or high rates of emergency room admissions for asthma.
- CARB should designate expeditiously the first 12 communities as hotspots for PM 2.5.
- Air Districts would be required to collaborate with community members and other stakeholders to develop required Community Air Quality Action Plans (CAQAPs) for designated hotspots.
- The first hotspot emissions reductions would occur within 36 months
- Additional PM2.5 hotspot areas would be designated every two years and hotspot designation for other air pollutants by CARB would also occur.

COMPREHENSIVE REGULATORY REQUIREMENTS FOR ALL SOURCES CONTRIBUTING TO HOTSPOTS INCLUDING:

- Identification and inventory of contributing sources and categories of sources affecting the designated hotspot;
- Best Available Control Technology (BACT) for new, and Best Available Retrofit Control Technology (BARCT) or equivalent emission reduction rules and regulations for existing, stationary sources larger than 50 tons/year affecting the hotspot;
- Regular review and strengthening of permits, rules, and regulations for all sources affecting the hotspot;
- Efficiency-based regulation of marine terminals and warehouses and other indirect sources to speed up truck passage, cut idling time, and reduce emissions;
- Model rules for terminals/warehouses to improve vehicle management and cargo handling, reduce energy use, and achieve zero- or near-zero-emitting equipment by 2030-35; and
- Emission reduction milestones to be achieved every three years.

ENHANCED EMISSIONS DATA AND COMMUNITY ENGAGEMENT.

A successful program requires:

- Funding for sensor deployment, CAQAP design, and meaningful community engagement in developing the CAQAP; and
- Transparency and continuous engagement with the community to build trust in the process and the results.

INCENTIVES, ENFORCEMENT AND OVERSIGHT OF COMMUNITY ACTION PLANS. "CARROTS AND STICKS" INCLUDE:

- New funding for CAQAP implementation;
- Targeting of existing and new emissions abatement incentive funding to hotspots and in particular to heavy duty vehicles contributing to elevated exposures in the designated hotspots;
- A requirement that CARB develop and implement the CAQAP if the air district is unable to do so;
- Consequences applied by CARB for failure by the air district or regulated sources to meet implementation timelines or emission reduction milestones; and
- Annual reports to the legislature by CARB and air districts of hotspot emissions reduction progress and recommendations for program improvement.

This report envisions a new frontier in air quality management not only for California but also for communities all across the U.S. and the world. The new frontier is defined by much more accurate and localized data from new sensor technology, and an increased ability to target the specific sources responsible for elevated exposures, taking into account the time of day, meteorological conditions and the specific populations most adversely impacted by the air pollution. This approach allows us to move beyond traditional reliance on a broad regional air pollution approach to a community level framework that engages citizens and stakeholders to target the specific pollution sources that need to be abated and/or eliminated to protect vulnerable populations, children with asthma, the elderly, and people with lung and heart conditions.

Table of Contents

Cover photo by Scott Hess

The Challenge: Abating Community-Level Air Pollution Hotspots in Disadvantaged Communities

California has been a leader in the United States , and indeed, in the world, in reducing air pollution – both criteria and toxic pollutants that impact health and greenhouse gases (GHG) that contribute to worldwide climate change. Nonetheless, there are communities across the state where population exposure to harmful air pollution continues to endanger public health. New health research and data available over the last several years make it abundantly clear that while the state is advancing on a regional basis toward air quality standard attainment, exposure to elevated levels of pollution on a local scale continues to have serious public health consequences. Hotspots with excessive criteria and toxic emissions overwhelmingly occur in low income and minority communities, which tend to be located near multiple pollution sources.

Representatives from these highly impacted communities and Environmental Justice (EJ) organizations have been fighting to have this harmful pollution reduced. Yet, to date, progress has not been sufficient.

A more robust approach is needed to tackle the community-level hotspot challenge.

The Past: Air Quality Improvements on a Regional Basis

California has long been a leader in attacking the scourge of air pollution. Residents of Los Angeles experienced the first episode in the summer of 1943 in what would become a decades-long fight against air pollution. Smog limited visibility to a distance of three blocks and people suffered from smarting eyes, respiratory discomfort, nausea, and vomiting.[i] As California's population and economy grew, problems of air quality and pollution rose too; yet, communities, scientists, and political decision-makers stepped forward to establish laws and regulations, create new systems of governance, and establish monitoring and enforcement protocols. California has become a global leader in policies to improve air quality, making significant strides through approaches ranging from market interventions, regulatory standards, and technological innovations. For a complete history of California Air pollution regulation see https://www.arb.ca.gov/html/brochure/history.htm.

California's clean air policies have been successful in general in reducing public health threats from air pollution without hindering economic growth. The state has decoupled the traditional indicators of emissions growth from increased levels of pollution: from 1993-2013, California's population grew by 22 percent and the number of vehicle miles traveled each year rose by more than 45 percent; meanwhile, statewide emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx) decreased by 50 and 60 percent, respectively.[ii] With the advancement of cleaner vehicle technologies and programs targeting toxic air contaminants at point sources, this period also saw a 70 percent decline in diesel cancer risk and a 76 percent decline in the collective cancer risk from exposure to seven toxic air contaminants.[iii, iv] Average concentrations of PM2.5 are 40 to 50 percent lower than they were in 1999.[v]

With this progress, some areas of the state are now meeting the federal standards and others are expected to reach attainment in the next few years. For example, the Bay Area, South Coast, San Joaquin, and Sacramento Air Basins have all achieved attainment status for the 24-hour PM10 federal standard,[vi] and more than a handful of areas previously designated as transitional or nonattainment for ozone and/or PM2.5 are now listed as attainment, attainment/unclassified or transitional.[vii, viii, ix]

The Present: Health Risks Associated with High Pollution Levels Continue in Many Local Communities

Even as California's air quality continues to improve on average both statewide and over broad areas, elevated exposures persist in many California locales, disproportionately affecting disadvantaged communities. This can be the case even within regions that meet the national ambient air quality standards.

While disadvantaged communities have benefited from the wider state and regional mitigation efforts—air monitors in environmental justice communities measured the greatest reductions of diesel particulate matter;[x,xi] many communities continue to experience exposures to unhealthy levels of air pollution,[xii] including exposures to diesel particulates and other air toxics that are unacceptably high.[xiii] Certain parts of the state continue to experience some of the worst air quality in the country.[xiv] The health impact can be exacerbated when elevated exposures to air pollution are accompanied by stressors associated with race and poverty.[xv]

The CalEnviroScreen tool highlights disparities across the state in pollution exposure, vulnerability and health impacts. For example, whereas in 2012-2014, the typical census region in the state experienced average annual PM2.5 exposures around 10.4 micrograms per cubic meter, in the worst regions,[xvi] average annual exposures ranged from 14.5 to 19.6 micrograms per cubic meter—well above the national standard of 12. In fact, the actual exposures in communities located near pollution sources could be much worse since the reported exposure levels are based on ambient air monitors, which are intentionally sited away from individual pollution sources in order to capture the ambient air across a large area. While the typical census region in California had roughly 45 (age adjusted) emergency room admissions for asthma for every 10,000 people in 2011-2013, in the worst regions in the state,[xvii] that number ranged from 112 to 279.[xviii]

Elevated exposures are experienced disproportionately by low income communities of color. For example, a detailed neighborhood mapping project conducted in East Oakland found that significant numbers of point, area, indirect, and mobile sources were concentrated within a low income community of color and close to a number of sensitive receptors. Many of the sources found in the survey fell below the 10-ton-per-year reporting threshold and were not included in CARB databases and reports even though they contribute to the cumulative exposures experienced by the local community.[xix] More recent mapping in West Oakland using mobile sensors found exposure to unhealthful air pollution remains high due to proximity to major roadways, ports, and other facilities that attract truck traffic.[xx] A recent study of point sources covered by California's cap-and-trade program similarly showed that neighborhoods near a greenhouse gas facility (as compared to those further away from such facilities) are more likely to have residents of color and residents living in poverty and are more than twice as likely to be among the worst statewide in terms of their CalEnviroScreen score.[xxi] A separate study showed that these GHG facilities are positively correlated with toxicity-weighted emissions and criteria air pollutants.[xxii]

This debate is far from academic; disproportionate exposure to air pollution affects lives and livelihoods by causing poor health and reducing academic performance and worker productivity. Fine particulate matter (PM2.5), a substantial contributor to mortality in California, causes lung irritation and exacerbates respiratory and cardiovascular problems. Young children and the elderly are especially susceptible. Fine particulates exposure has been shown to increase hospitalizations for children with respiratory diseases and for adults with cardiovascular and/or respiratory issues.[xxiii] Diesel particulates, a component of fine particulate matter that can cause irritation to eyes, throat, and nose; are linked to cardiovascular and pulmonary disease; can increase asthma symptoms and attacks, lung cancer, and blood pressure; and can trigger heart attack and strokes. Center for Disease Control (CDC) studies have shown a 15% decrease in the risk of heart disease deaths with every 10 mcg decrease of PM2.5.[xxiv] US EPA projects that after 2020; only seven counties in the nation will have PM2.5 concentrations above the national standard, all in California.[xxv] Other pollutants such as hexavalent chromium increase the risk of lung and nasal cancers and can make certain allergy symptoms worse.

Exposures to these pollutants do not affect people equally; people already living with stress can be at a tipping point for early mortality and serious illness even when PM2.5 exposure levels are below federal standards.

The community impacts of these air pollutants are a clear and present danger. Allowing these impacts to continue is inconsistent with the state's goal to provide a decent home and suitable living environment for every Californian.[xxvi]

Continuing to regulate on a regional basis alone is unlikely to rectify the disparities. While areas of the state that remain in nonattainment must continue to implement measures to reduce ambient emissions, this does not guarantee progress in communities located adjacent to point and area air pollution sources. Moreover, areas in the state that are newly designated as attaining the standard are no longer required to improve air quality; rather, they would be designated as a maintenance area, which requires ensuring that air quality does not get worse. A true solution requires targeting the exact geographic areas, census regions, zip codes, and neighborhoods experiencing disproportionate impacts and reducing emissions from the specific sources—factories, ports, warehouses, agricultural operations, refineries and major roadways—contributing to elevated exposures.

The Future: New Sensor Technology Promises to Revolutionize Local Air Quality Protection and Improve Health Outcomes

Fortunately, exciting developments in air quality monitoring technologies—low-cost mobile and stationary sensors—are making it possible to identify the areas with disproportionate exposures and understand the source-receptor relationships critical to eliminating the hotspot problem. In fact, by producing more granular data, this new technology makes it possible to map pollution exposures block-by-block, helping to pinpoint problem areas and identify contributing sources.

Low cost sensor technology projects in the Imperial Valley and West Oakland are producing a wealth of data and experience on community engagement; and data management, presentation and application. This collective experience is advancing prospects for incorporating community sensors into the statewide air quality monitoring system. Testing by the South Coast Air Quality Management District (SCAQMD) has shown that low-cost particulate matter sensors produce reliable, verifiable data.[xxvii] Sensors capable of detecting other air pollutants are in development. (See Appendix C)

Coupling sensor technology with recent innovations in community engagement and a new emphasis on local air quality management make it possible to define and implement targeted abatement solutions that will be effective in reducing disproportionate exposures and improve health outcomes in the most vulnerable communities. Using community-based sensors to help identify pollution hotspots as well as the stationary and mobile sources causing harmful exposures, air districts can work with communities and local government to target the sources with the appropriate mix of regulatory measures, incentive financing, traffic management, and/or land use strategies to reduce emissions and improve public health.

Actions to reduce emissions and health risk exposure may range from something as simple as limiting school bus idling and moving student pick-up and discharge stops away from school playgrounds to more expensive options including retrofitting pollution controls on buses or replacing them with electric and hybrid models. In communities with marine terminals or warehouses, regulatory actions could include implementing efficient cargo and vehicle management at the warehouse or marine terminal to expedite truck passage through the facility and reduce diesel emissions and energy use. In other communities, regulatory steps could include requiring technological improvements at a refinery or cement plant. Using this flexible approach, air districts working with communities would choose the most appropriate options to reduce emissions and exposures consistent with their particular situations.

Through this new combination of strategies, California has the opportunity to lead the nation and the world in opening a new frontier in air quality management focused on targeting localized hotspots of high exposure to air pollution and providing all of its residents access to clean air.

A New State Regulatory Framework to Abate Community-Level Air Pollution Hotspots

As described in the previous section, the existing air quality measures deployed by the state have made substantial progress in reducing ambient air pollution levels. However, because the existing air quality regulations and standards have a regional focus, they do not systematically address the many communities that continue to experience elevated pollution levels and adverse health impacts due to their close proximity to point, area, indirect, and/or mobile sources. A new program is needed that singles out hotspots for focused emission reductions at the specific sources shown by more granular data to be critical contributors to the local problem. The following proposal developed by the CEPP team describes key elements and features of a new state regulatory framework to abate hotspots.

This focused approach seeks to ensure:

- Immediate action to improve health outcomes and environmental justice, including measurable progress within three years;
- Comprehensive regulatory requirements that address each of the sources contributing to elevated exposures;
- Enhanced emissions data and community engagement to ensure effective solutions and community buy-in to the abatement approach; and
- Incentives, enforcement and oversight to make sure hotspots are abated as planned.

The recommended program begins by targeting PM2.5 pollution because PM2.5 community sensors have, thus far, proven to be the most accurate and reliable, and also because PM2.5 causes some of the most serious health impacts, including health impacts associated with diesel PM. The program can move on to other localized air pollutants later based on community priorities and improvements in sensor technology.

Immediate Action

This new framework is aimed at rapid elimination of hotspots where communities are exposed to elevated pollution levels that stem from proximity to one, or often, multiple sources of pollution. It would require expeditious actions by CARB and the air districts to define and identify hotspots for the target pollutant(s), starting with the most problematic areas but eventually reaching all of them, and makes use of new and existing regulatory authority and incentives. Under the proposal, air districts (or CARB if an air district fails or is unable to act) would be required to develop and implement a community air quality action plan (CAQAP) for each hotspot within their jurisdiction on an expedited basis. To ensure that all of the responsible sources are quickly addressed, the CAQAP should encompass standards for ***all*** sizes of stationary sources (BACT for new sources, BARCT for existing, and/or equivalent standards or rules for categories of smaller sources) as well as new requirements for ports, rail yards, and warehouses, the heavy duty vehicles that serve those facilities, and other important sources of pollution located within (or just upwind from) the hotspot community. **The first emissions reductions would occur within 36 months.** A prospective timeline for implementation is shown in Figure 1.

To launch the new hotspot program, CARB would establish guidance and procedures to define and designate hotspot communities and establish the basic framework for implementation, including expectations for how air districts will engage the affected communities, identify the sources contributing to elevated exposures, and define regulatory requirements. Specifically, we envision the following process:

- **CARB, in consultation with the California Air Pollution Control Officers Association (CAPCOA), defines criteria within six months that would be used to designate PM2.5**

Figure 1. Community Air Quality Action Plan and timeline

hotspots for abatement. Communities would qualify as a PM2.5 hotspot if they meet one of the following exposure or health benchmarks:

1. The air quality within the community exceeds the annual PM2.5 NAAQS standard, currently 12 micrograms/m3; or
2. The community's incidence of emergency room visits for asthma ranks in the top 5 percent of all communities in the California EnviroScreen database.

All hotspots meeting at least one of these criteria would be abated through this program. Other factors that may be considered in identifying and prioritizing hotspot communities include: air emission inventories; ambient air quality monitoring from criteria pollutant monitors and mobile sensors; data from special air quality monitoring projects; information supplied by community groups; public health data on rates of disease or lung impairment related to PM2.5 exposure; air pollution modeling, and any other information that CARB believes indicates disproportionate exposure. Communities could petition CARB for designation as hotspots based on such information.

Additional factors to consider in prioritizing hotspots include selection of geographic areas: 1) where a range of stationary, area, indirect and mobile sources are present; 2) where CARB believes the threats to public health are the greatest; and 3) where CARB believes the opportunity to make significant progress is greatest. In addition, the initial selection of hotspots should reflect geographic balance so all parts of the state can gain experience.

Importantly, the above criteria are meant to ensure that CARB is able to quickly designate communities that are most impacted by PM2.5 pollution. That said, air districts should have the ability to adopt more stringent criteria that would capture additional communities within their jurisdictions. Local communities should also have the ability to petition CARB for consideration as a designated hotspot, and CARB should respond to the petitions within six months. In addition, while the proposed approach starts with PM2.5 for the reasons stated earlier, CARB should also designate hotspots for other pollutants under this program.

- **CARB, in consultation with air districts, designates an initial set of (12) areas as PM2.5 hotspots within 10 months.** An additional 12 designations would be made within 24 months, and 12 more designations would be made every two years thereafter until all areas that meet the selection criteria have been designated. **The formal designation of a hotspot would trigger a requirement for air districts to submit community air quality action plans (CAQAPs) for the designated hotspots within 9 months of designation.**
- **CARB, in consultation with CAPCOA, issues guidelines for development of CAQAPs.** This guidance should include standards for community engagement; guidance on emission or technology standards for stationary sources affecting hotspots; guidance on management plans and requirements for indirect sources; goals and milestones for reducing emissions and excessive exposures that ensure reasonable and continuous progress (at least every three years) towards hotspot abatement; and recommendations to link hotspot measures to the regional attainment plan (as applicable). The guidance should offer flexibility to air districts and communities that already have equivalent planning efforts underway to address hotspots.

Comprehensive Regulatory Requirements

The proposed hotspot abatement program would require air districts to develop community air quality action plans (CAQAPs) geared towards eliminating the designated hotspots. The plans must be developed with meaningful community involvement and must reduce emissions from the full range of point, area and indirect sources contributing above a de minimus level to the elevated air pollution. In particular, this program aims to target sources that have largely

been overlooked in conventional air pollution control programs but have an important impact on the air that communities breathe, including medium and small stationary sources and indirect sources such as port terminals, warehouses, rail yards and similar venues that can attract significant amounts of truck traffic.

By targeting hotspots, CAQAPs can also require regular review of permits and rules for existing sources affecting a given hotspot. Given the volume of permitted facilities and the number of small and medium sized sources regulated in each air district, this more focused approach can help sources and regulators find additional opportunities for tightened standards that can be effective in abating hotspots. Relatively simple adjustments like moving to "no-leak" valves in existing refineries and chemical facilities can provide significant localized benefits. While air districts may already be authorized to regulate these sources, the sheer volume of such sources and the limited budgets of air districts make a hotspot-focused approach based on granular data a more cost-effective strategy.

For example, air districts that are in nonattainment have authority, but are not required, to control emissions from indirect sources. Specifically, under Health and Safety Code Section 40716, air districts are permitted to adopt and implement regulations that will 1) reduce or mitigate emissions from indirect and area-wide sources of air pollution, and 2) encourage or require the use of measures which reduce the number or length of vehicle trips. However, without a mandate to utilize this authority, only a few jurisdictions have done so. CARB's board in the spring of 2017 at its Riverside meeting voted to direct staff to prepare an indirect source rule within one year. This rule should require air districts to implement indirect source controls in designated hotspots where it is clear marine terminals and warehouses and other sources are significant contributors of air pollution.

photo by Russell Mondy

Combining direct source and indirect source controls provides an optimal approach for reducing hotspot emissions and forms the heart of the CAQAP. Specifically, under the proposed regulatory framework:

- **Air districts would be required to regulate all point sources that contribute above a 50 tons/year level to elevated pollution in the hotspot community.** CAQAPs should mandate controls on all point sources—major sources as well as small and medium sources—that contribute above a 50 tons per year threshold to the elevated pollution in the designated hotspot. This includes reviewing and strengthening existing major stationary source permits as well as source-specific rules for medium or small stationary sources and categories of sources. For existing sources covered by Best Available Retrofit Control Technology (BARCT), standards should be updated and strengthened, and existing sources should meet those standards or produce comparable emissions reductions. For more detail on recommended stationary source measures, see Box 1 below.
- **Air districts would be required to implement indirect source rules for warehouses, marine terminals, and other indirect sources that contribute to elevated exposures in hotspot communities.** CARB would issue new regulations requiring warehouses, marine terminals, rail yards and other facilities with extensive heavy duty vehicle activity to achieve zero or near-zero emissions by 2030-35 from cargo handling, drayage trucks, and other vehicles serving the facilities. In the near-term, air districts would require such facilities to implement efficiency-

Important Components of Point Source Requirements for Hotspot Communities

Point source requirements for hotspot communities should include the following elements:

- **Designation and regulation of existing sources.** Air districts would be required to identify all stationary sources emitting more than 50 tons/year of PM2.5 that adversely affect air quality in the hotspot and, within six months of the hotspot being designated, would be required to review and update/strengthen permits or rules for all such sources or categories of sources. For permits for existing major stationary sources, Best Available Retrofit Control Technology (BARCT) standards would be reviewed and strengthened as necessary. Based on sensor and monitoring data, air districts could regulate small and medium-sized stationary sources individually or on a category of source basis that reflects their relative contribution.
- **Regulatory approach for new sources. New or modified stationary sources whose emissions have potential to affect air quality in a designated hotspot and which emit above the 50 tons per year threshold would be required to control emissions consistent with Best Available Control Technology (BACT).**
- **Establishment of a BARCT database.** To facilitate implementation of these requirements by the air districts, CARB would establish and make publicly available a database similar to the USEPA RACT/BACT/LAER clearinghouse, describing BARCT determinations for all stationary sources.
- **Continuous improvement.** To ensure that regulations stay current with new technological developments, air districts would review and revise stationary source standards at least every 5 years to reflect a level of control consistent with the most stringent standard for the applicable source category recorded in the BARCT Clearinghouse.

box 1

based management systems to minimize the elapsed time each truck spends in loading and unloading cargo. Such win-win approaches can reduce truck idling, diesel consumption and emissions while improving the competitiveness of California ports.

- **CARB would issue model rules for new and modified warehouses and marine terminals that air districts can use to reduce energy use and manage heavy duty vehicles at these facilities in a way that limits emissions by a date certain.** These model rules would encourage state-of-the-art energy measures, including deployment of warehouse rooftop solar arrays, increased reliance on distributed energy resources, expansion of battery storage to enhance power reliability, reduced reliance on fossil fuel peaking plants, and expanded on-site electric capacity and charging stations. Model rules could also provide additional guidance on measures that indirect sources can use to minimize the amount of time trucks spend loading and unloading cargo, see Box 2 below.

Important Components of an Indirect Source Requirement for Hotspot Communities

An indirect source provision should include the following elements:

- **A clear definition of an Indirect Source.** The indirect source definition would capture the broad range of facilities and sites—marine terminals, warehouses, rail yards and staging areas—where large numbers of heavy duty vehicles operate or pass through daily.
- **A requirement for air districts to use indirect source authority where such sources contribute to elevated pollution levels in hotspots.** Air districts are already authorized to adopt or implement indirect source rules to meet ambient air quality standards. CARB should require use of this authority to reduce emissions from indirect sources such as marine terminals or warehouses that are adversely impacting designated hotspot areas. Inexpensive GPS technologies are available that can provide real-time reporting of both dwell time and idling, facilitating compliance and enabling enforcement.
- **As a longer term strategy, CARB should direct all air districts to require indirect sources near pollution hotspots to achieve 100% utilization of zero or near-zero emitting cargo handling and drayage trucks by 2030 and 2035 respectively,** a goal the Mayors of Long Beach and Los Angeles have recently set for their ports. Indirect sources would develop management plans demonstrating regular progress toward those zero-emitting deadlines and detailing strategies for improving vehicle efficiency management in the near term.
- **Model rule on reducing energy use and encouraging electrification at indirect sources.** This could include encouraging low-emitting sources of electricity (e.g., rooftop solar energy), battery storage (to enhance power reliability), increased reliance on distributed energy resources, reduced reliance on fossil fuel-fired peaking plants, as well as the siting of electric charging stations.
- **New Source Review (NSR) under the Clean Air Act.** New port terminals, new warehouses, and major modifications of existing port terminals and warehouses should be required to consider electrification of equipment and yard vehicles during the New Source Review permitting process.

box 2

We further recommend that the California Public Utilities Commission complement these actions by prioritizing locations near indirect sources for the siting of electric charging stations. This could be implemented in any open proceeding considering the construction of charging stations as well as in proceedings that are set to review progress on implementation of previous Commission orders on electrification. The Commission should also adopt policies prioritizing both greenhouse gas and criteria pollutant reduction benefits in its evaluation of applications for rate treatment for electric charging station investments, particularly for heavy duty vehicles, as the criteria pollutant reduction benefits of electric drayage trucks and related vehicles are substantial.

Enhanced Emissions Data and Community Engagement

The availability of low-cost, community-based sensors underlies the proposed hotspot abatement program, empowering CARB, air districts, and communities to manage for healthy air for all California residents. Emerging low-cost stationary and mobile air quality sensor technology makes it possible to assess exposures at a more granular, community scale and to identify sources of emissions that pose serious health risks for local populations that are not always detected by the current air quality monitoring network. According to an article published in Environmental Science & Technology (June 2017) by a collaboration of academic, for-profit, and non-profit experts:

> *Routine availability of high-resolution air quality data in all major urban areas could have transformative implications for environmental management, air pollution science, epidemiology, public awareness, and policy. By highlighting localized pollution hotspots, these data may identify new opportunities for pollution control. Street-level air quality data can complement, challenge, and validate other diverse air quality data sets, including regulatory data, CTM outputs, land-use regression predictions, and remotely sensed observations. In turn, this refinement can help address exposure misclassification in epidemiological studies. Through combination with personal GPS data on smartphone applications, rich "personal exposure analytics" become possible, which could inform epidemiological studies and alter personal behavior, much as real-time traffic data now inform individual driving patterns. Broader societal consequences of the public awareness enabled by high-resolution pollution maps might include shifts in urban land-use decisions, regulatory actions, and in the political economy of environmental "riskscapes".*[xxviii]

California and its state and regional air pollution agencies can either mobilize to make the most of this technology revolution by carefully designing an integrated air quality monitoring system or continuously face growing public discontent and demand for action based on more ad hoc sets of data and evidence of substantial adverse health impacts from unabated pollution sources.

Data from community sensors have already been used as a basis for reducing or eliminating emissions at the source. And while no low-cost stationary or mobile sensor has yet been designated by the US Environmental Protection Agency (US EPA) as a federal reference method (FRM) or federal equivalent method (FEM) for use to demonstrate compliance with federal air quality standards, testing and verification by the South Coast Air Quality Management District SCAQMD) have shown PM2.5 sensors do produce reliable data. Sensors for other pollutants have thus far proven less reliable but the technology development continues to progress.

The sensor technology itself is only one part of the story. To build a common understanding of the problem, and more importantly, trust in the results, policy makers must emphasize meaningful community participation in how sensors are deployed (see Box 3). Other important considerations include deploying sensors in a coordinated way as part of a state program to help ensure high standards for data quality; replicating best practices; promoting integration with the state's wider air quality monitoring programs, and bringing this new technology closer to acceptance as a regulatory tool.

Important Elements of a Process to Support Meaningful Community Participation

- Transparency and access to the process for all.
- Funding for community groups as partners in project development, implementation, and community outreach.
- Early consultation with the community by the air district/CARB to identify priority concerns.
- Continuous community involvement in project design, implementation, and action plan development.
- Local government participation.
- Opportunities for hands-on learning about the science of air pollution, health impacts, and mitigation.
- Regular meetings for feedback and recommendations from a community advisory group and the community at large.
- User-friendly presentation of data, information and outcomes, translated into appropriate languages.
- User-friendly website.

box 3

photo courtesy of Luis Olmedo

Our recommended approach includes funding community sensor projects and expanding the community, air district, and CARB partnership. The new framework also needs to build the state's capacity to support community and air district efforts and to incorporate community sensor data and monitoring into the statewide air quality monitoring system and air quality management framework. Community sensor projects can assist in designating hotspots and in the continuing CAQAP development and implementation process.

As envisioned, community sensor projects would serve the hotspot abatement effort and CAQAP program in several ways:

- First, currently operating community data and monitoring projects could generate data that qualify communities for hotspot designation and CAQAP development;
- Second, new sensor projects funded as part of the CAQAP planning process would assist in identifying the contributing sources—including indirect sources; and
- Third, existing or new projects could be used to monitor emissions reduction measure(s) effectiveness, compliance, and progress in reducing emissions in accordance with the CAQAP.

The projects would be designed to fill gaps in data available from the current air quality monitoring network and assist in identifying sources of emissions causing the hotspots. At the same time the projects would advance understanding and development of best practices for effective community engagement, sensor deployment, and data management and analysis. Outcomes and lessons learned from the program would lay the groundwork for integrating community data and monitoring into the user-friendly, statewide integrated air quality monitoring system envisioned by AB 197 (*Stats. 2016, Ch. 250, Sec. 5. Effective January 1, 2017*).

The new state framework would:

- **Provide funds for new community mobile and stationary sensors and monitors, as needed, to support the CAQAP process,** for technical assistance to implement community sensor projects, and to install regulatory monitors where appropriate. While it is anticipated that the majority of this support will be used initially to deploy PM2.5 sensors, other priority pollutants would also be eligible. As demand will likely exceed available financing, CARB should prioritize financing for communities where such sensor projects promise to have the greatest positive impact on the design of successful hotspot abatement strategies.
- **Provide funding for CARB to develop:** 1) guidance for deploying sensor technologies to ensure high quality outcomes and enhance alignment with the state monitoring network; 2) a statewide, user-friendly website portal linking community sensor projects and presenting data visualization, best practices, lessons learned and outcomes; 3) in-house capacity to respond to community and or air district requests for technical assistance or for action based on sensor project data analysis and findings; 4) in-house capacity to test sensors including for toxics and other pollutants beyond PM2.5 as they are developed and become available; and 5) a program to accelerate new sensor technology development for various pollutants through research and development grants or a technology challenge.
- **Provide funds for community participation in designing the CAQAP.** This should include meaningful participation in deploying sensors as well as defining mitigation solutions. Funds could be used to hold meetings, support outreach via community groups, translate materials, and ensure data are clearly communicated and can be readily accessed.

Incentives, Enforcement and Oversight

New authority and mandates alone may not be enough to ensure the proposed measures are implemented in the intended manner. Air districts and CARB will require new funding to fulfill the new hotspot elimination obligations and the related new obligations. Moreover, incentives such as preferential financing for truck replacement can help air districts move forward on some of the more politically difficult measures while consequences such as loss of funding can increase the likelihood that parties will act in good faith. In addition, various types of oversight are proposed to ensure that CARB and the air districts meet their responsibilities to address hotspots.

The new state hotspot abatement program would:

- **Provide state funding for air districts** to cover the reasonable additional costs of designing and implementing a CAQAP and engaging communities in the process. Air districts and communities that already have hotspot mitigation efforts underway should be eligible for incremental support to fulfill any new requirements, as needed, to align with the CARB guidelines.
- **Prioritize distribution of existing and new state incentive financing programs to indirect sources that are required to mitigate emissions in hotspot communities and to the heavy duty vehicles that serve those sources.** Examples include support for electric charging stations from the local public utility, and funds from the Carl Moyer truck retrofit program, Prop 1B, or other state funding sources. This approach of coupling funding sources with mandatory requirements would help ensure that incentive financing programs align with the state goal of eliminating hotspots.
- **Establish consequences to encourage compliance and enforcement.** This could include linking achievement of milestones in the CAQAPs to loss of funds or other consequences (e.g., graduated cutoffs of incentive funds and/or implementation funds;, authority to order remedies), and requiring back-up implementation and enforcement by CARB. These steps are needed to ensure effective implementation of CAQAPs and the permits they establish for direct and indirect sources.
- **Require CARB to report to the Legislature** annually on progress and outcomes of the CAQAP and community sensor programs and to submit Interim and Final Reports evaluating program effectiveness and recommending improvements and a process for expanding the program to air pollutants other than PM2.5.
- **Establish an Advisory Council** similar to the Biomonitoring California Scientific Guidance Panel with OEHHA, TSCB, CEHTP and outside technical experts and EJ community representatives to assist in program design, guidelines development, and program implementation.

Conclusions

A new regulatory framework is needed to address the elevated pollution exposures that are disproportionately impacting disadvantaged populations. The available data from sensors and CalEnviroScreen show substantial inequities in pollution exposures across the state and already identify communities that are breathing air that is well above the national standards and/or experiencing elevated rates of hospitalization for asthma or other health impacts that are closely linked to air pollution. These elevated exposures to air pollution run counter to the state's goal to provide a decent home and suitable living environment for every Californian.

The proposal described in this report can achieve the goal of abating community air pollution hotspots in an expeditious, comprehensive, and cost-effective manner. The proposal combines a new mandate, clear deadlines, and new regulatory powers with the funds needed for community engagement, sensor deployment, data integration, regulatory planning, and heavy duty vehicle retrofits and replacements. Both pieces—new authority and new money—are critical to successful implementation.

This proposal also marks the start of a new chapter in policy efforts to reduce air pollution and its deleterious effects on public health. Thanks to the development of new low-cost sensor and monitoring equipment and the emerging ability to analyze "big data", air regulators will be able to address pollution problems on a far more granular and localized basis. The new frontier in air quality management lies in much more accurate and localized data, and an increased ability to define the specific sources of pollution, taking account of the time of day, the connection to meteorological conditions, and the specific populations most adversely impacted by air emissions. We no longer need to rely on traditional broad regional compliance or improving "average air"—we can target the sources that need to be mitigated, eliminated, or moved in order to protect those vulnerable populations. We are also learning that those sensitive populations, be they children, the elderly, or the disadvantaged, may be threatened by pollutant concentrations that are lower than the national standard. The remedies air districts select need to reflect those facts.

The recommended approach has the benefit of targeting cost effective emissions reductions where they are needed most to address disproportionately high air pollution exposures. We would expect the results to be reflected in declining levels of illness and early death in the communities that are most impacted by air pollution. As health metrics improve, we would anticipate lower health care costs, fewer emergency room visits, higher school attendance, higher levels of worker productivity, and fewer sick days, resulting in an economic boost to businesses and residents alongside an improved quality of life.

All of California's communities deserve to breathe clean air. By eliminating disproportionately high exposures to air pollution and mitigating the excessive health burdens experienced by the most vulnerable communities, the proposed approach would establish clear mandates, timelines, procedures, and tools to help make that possible. At the same time, the proposed new air quality management and regulatory framework offers a sustainable, replicable solution that can work in other communities, creating an opportunity for California to lead the nation and the world in addressing the imperative for environmental justice and equal access to health protection and clean air.

APPENDIX A: Environmental Justice and Climate Policy Solutions Dialogue

The UC Berkeley Goldman School of Public Policy, under the auspices of University of California President Janet Napolitano, convened a dialogue on Environmental Justice and Climate Policy Solutions in January 2017. Key California state and local government officials; staff from the Governor's office and the California State Legislature, California Air Resources Board members, stakeholders from the environmental justice community, industry and nonprofit sectors; and expert faculty from the UC system participated. A list of participants can be found in Appendix B.

The initial goal of the dialogue was to help California and its environmental justice communities craft a win-win pathway to meeting the state's long-term greenhouse gas (GHG) emissions reduction goals while reducing emissions and exposure to harmful criteria and toxic air pollutants and building healthier and more sustainable communities. The dialogue session agendas were crafted to address the environmental justice community's interest in seeing criteria and toxic air pollution emissions reductions in their communities be a central element of California's ambitious GHG reduction program. The objective was to develop a package of strategies to achieve the state's new target to reduce GHG emissions by 40 percent below 1990 levels by 2030 and reduce air pollution to protect California's disadvantaged communities.

The dialogue was facilitated by Ned Helme, Executive Director of the Goldman School of Public Policy's Center for Environmental Public Policy (CEPP) at UC Berkeley. A participant-driven process, the dialogue gravitated to examining policies that optimize criteria and toxic air emissions reductions to protect the health of disadvantaged communities. Given the virtually simultaneous timing of the California Legislature's consideration of the Governor's request to reauthorize the GHG emissions trading system, a number of dialogue participants strongly preferred leaving that discussion to debate in the legislative arena. Consequently, dialogue presentations and discussions focused on air quality and:

- The status of air pollution data and monitoring, including the emergence of low-cost community sensor technology and community-based processes for deploying sensors;
- Options for reducing criteria and toxic emissions from stationary sources;
- Options for reducing criteria and toxic emissions from mobile sources; and
- Mechanisms for transitioning to sustainable jobs and communities.

Two Dialogue sessions were held; a one-day session in February and a second, two-day session in March. In addition, three working groups were formed — Data & Monitoring, Stationary Source Emissions Reduction, and Mobile Source Emissions Reduction — to develop proposals in each area.

Discussions with the three working groups, dialogue participants, and other practitioners and experts, as well as research by the CEPP team informed the development of the specific proposals that are presented in this report. The draft executive summary of this report was circulated to all dialogue participants on June 1 for comment, and the authors discussed it with virtually all of the dialogue participants individually or in small groups in early June as well as with several outside experts. Though the final report was informed by those extensive discussions and feedback, the final recommendations in this report are solely those of the authors.

Dialogue Presentations:

FEBRUARY 10TH 2017

Monitoring and Emissions Data Supporting CARB's Programs- Karen Magliano, Division Chief, Air Quality Planning & Science, CARB

Tracking and Evaluation of Benefits and Impacts of Greenhouse Gas Limits in Disadvantaged Communities- John Faust, Chief, Air, Community & Environmental Research, OEHHA

Community Air Risk Evaluation (CARE) Program- Dr. Phil Martine, Air Quality Engineering Manager, BAAQMD

Prioritizing Policy Areas for Dialogue Focus- Ned Helme, Executive Director, Center for Environmental Public Policy.

Respondents: Amy Vanderwarker, Co-Director, California Environmental Justice Alliance, and Caroline Choi, Senior Vice President, Regulatory Affairs, Southern California Edison

Bay Area AQMD Refinery Rulemaking- Jack Broadbent, Executive Officer, BAAQMD

Air Quality Programs in California- Edie Chang, Deputy Executive Officer, CARB

Respondents: Roger Lin, Staff Attorney, Citizens for a Better Environment and Cathy Reheis-Boyd, President, Western States Petroleum Association

MARCH 15TH 2017

"Low- Cost" Sensors and Sensor Networks- Dr. Olga Pikelnaya, Air Quality Specialist, SCAQMD

Elements of the San Ysidro Study- Vanessa Galaviz, PHD, MPH, University of Washington

Community Engagement in Developing a Community Air Monitoring Network- Luis Olmedo, Executive Director, Comité Cívico del Valle

Integrating Community Air Monitoring Using Next Generation Air Monitors into State Programs- Karen Magliano, Division Chief, Air Quality Planning & Science, CARB

Advancing Equity in California Climate Policy: A New Social Contract for Low-Carbon Transition- Carol Zabin, Research Director, Center for Labor Research and Education, UC Berkeley

Respondents: Joel Espino, Environmental Equity Legal Counsel, The Greenlining Institute; John Gioia, Contra Costa County Supervisor; and John Brauer, Executive Director of the Workforce Economic Development Program at the California Labor Federation

West Oakland Environmental Indicators Project- Margaret Gordon and Brian Beveridge, Co-Directors, West Oakland Environmental Indicators Project

Comparison of Utility Proposals: Southern California Edison, PG&E, and SDGE- Caroline Choi, Senior Vice President, Regulatory Affairs, Southern California Edison

Focus of Data and Monitoring Working Group- Suzanne Reed, Consultant, Center for Environmental Public Policy

MARCH 16TH 2017

Stationary Source Options to Reduce Exposures to PM2.5 and Air Toxics in Disadvantaged Communities- Ned Helme, Executive Director, Center for Environmental Public Policy

Respondents: Roger Lin, Staff Attorney, CBE; Steve Konig, Director of California Government Affairs, Tesoro; and Jean Roggenkamp, Deputy Executive Director, BAAQMD

The Transformative Climate Communities Program- Randall Winston, Executive Director of the Strategic Growth Council

Respondents: Transformative Climate Communities: The Fresno Pilot- Danielle Bergstrom, Policy Director, Central Valley Community Foundation and Perspective on Transformative Climate Communities - Phoebe Seaton, Director and co-founder of the Leadership Counsel

APPENDIX B: Participant List

Hosts

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California Air Resources Board

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Dorothy Rothrock
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California Manufacturers & Technology Association (CMTA)

Phoebe Seaton
Co-Founder and Co-Director
Leadership Counsel

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Senior Strategist
Asian Pacific Environmental Network (APEN)

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APPENDIX C: Background on Emissions Monitors and Sensors in California

Background

California is divided geographically into 15 air basins encompassing 58 counties. The state's air monitoring network is shared and operated by ARB, three air districts (SCAQMD, BAAQMD, SDAPCD), local air monitoring organizations, private contractors, and tribal authorities. These combined entities operate more than 250 air monitoring stations and more than 700 air monitors in California. ARB operates monitoring stations in 12 of the 15 air basins. In some places, private companies operate monitoring stations under contract with businesses as required by their permits. If ARB utilizes air monitoring data generated by any of the entities mentioned above, the data must meet all applicable US Environmental Protection Agency (U.S. EPA) requirements and comply with the quality assurance policies and procedures.

The purpose of the air quality monitoring program is to collect accurate, real-time measurements of ambient level pollutants throughout the state. The data are used to: 1) define the nature and severity of pollution in California; 2) determine which areas of the state are in attainment or non-attainment with federal and state air quality standards; 3) identify pollution trends; 4) support agricultural burn forecasting; and 5) develop air models and emission inventories. Elements of the program include:

- Operation of the sampling and monitoring network,
- Laboratory analysis of air samples, and
- Activities to ensure the quality of the data collected and disseminated by the ARB and the local Air Quality Management and Air Pollution Control Districts.

In addition, technical assistance is provided to local air quality districts and others active in air pollution programs. A detailed description of the network can be found here: https://www.arb.ca.gov/aqd/amnr/amnr2016.pdf. (Source: https://www.arb.ca.gov/aaqm/aaqm.htm.)

State law also requires ARB to identify and control toxic air contaminants (TAC). ARB established a 20-station toxic monitoring network within major urban areas in 1985. This network provides data to determine the average annual concentrations of toxic air contaminants for use in the identification process and to assess the effectiveness of controls. The toxic air contaminants monitored are:

- **Volatile Organic Compounds.** Sources include motor vehicle exhaust, waste burning, gasoline marketing, industrial and consumer products, pesticides, industrial processes, degreasing operations, pharmaceutical manufacturing, and dry cleaning operations.
- **Carbonyl Compounds.** The major sources of directly emitted carbonyls are fuel combustion, mobile sources, and process emissions from oil refineries
- **Toxic Metals.** This program is designed to identify and then control chemical, physical or biological agents found in ambient air that interfere with life processes
- **Hexavalent Chromium.** The primary sources of hexavalent chromium are chrome plating operations and cooling towers. (Source: https://www.arb.ca.gov/aaqm/toxics.htm)

Funding the Monitoring and Data Network

California's air quality monitoring program is funded primarily by two state sources. Mobile sources monitoring is funded from the Motor Vehicle Account and stationary source monitoring is funded by the Air Pollution Control Fund, where penalties and fees collected on vehicular and nonvehicular air pollution control sources are deposited. The system is also funded through the end of the federal fiscal year in 2018 by an $860,000 grant from the US EPA.

New Technologies Provide More Granular Data

A major concern over the current state air quality monitoring system is that the data and information produced are regional in nature and rely heavily on engineering calculations and modeling. The data fail to describe the air quality in local communities, where regional standards can be exceeded by over 100%, or identify the actual sources of these emissions. Environmental justice communities throughout the state, because they are commonly situated near industrial and commercial air pollution sources, experience disproportionately high pollution exposures and serious health impacts.

The emerging technology of low-cost stationary and mobile air pollution sensors is now making more granular data available to assist in identifying the source/receptor relationship. Private, public and non-profit sectors are all active in this arena and there is a growing number of community projects employing low-cost sensors throughout California. The emergence of this technology promises to revolutionize the current air pollution management and regulatory system.

One source of funding for community sensor projects has been the US EPA, which is conducting research to meet the growing demand for local air quality data to better understand the relationship among air pollution, exposure, and human health. As described on the US EPA website, this research program includes:

- **Sensor Evaluations.** US EPA is supporting the advancement of air sensor technology by evaluating devices in the laboratory and in field studies to:
  - Develop a better understanding of basic sensor performance characteristics,
  - Provide results to sensor manufacturers that encourage improvements in sensor performance, and
  - Communicate findings to stakeholders to improve outcomes of sensor applications.
- **Air Sensor Development.** Mobile and lower cost sensors for citizen scientists are being developed to collect air quality data in real time in a given area, such as a neighborhood or city and to be worn by individuals as they go about their daily activities.
- **Village Green Air Monitoring System.** The Village Green Project is a flagship research project to measure real-time local air quality with an innovative solar and wind-powered system, designed and incorporated into a park bench. The air measuring benches installed at numerous locations in the U.S. are being tested in partnership with state and local organizations to advance air quality measurement capabilities.
- **AirMapper.** The AirMapper is a new portable air sensor that EPA researchers are developing to allow environmental conditions to be easily mapped by researchers and citizen scientists. The AirMapper is a small instrument case that can be carried or attached to a bicycle, and includes rechargeable battery power, a global positioning system (GPS), particle pollution sensor, and other sensors measuring environmental conditions (e.g., temperature, humidity). The AirMapper uses miniaturized sensors for exploring air quality and a touchscreen interface. Participants can explore the various measurements collected using a free data explorer tool that EPA developed, called RETIGO.
- **PM Sensor.** A miniaturized particular matter (PM) sensor is under development through a Cooperative Research and Development Agreement (CRADA) with ACLIMA, a technology company in California.
- **Data Mapping Tools.** The increased availability of air measurement tools that are less costly and portable has resulted in more individuals and groups measuring air quality. After the data are collected, technical hurdles may exist to explore and analyze the measurements. There is growing interest in visualizing data through an interactive, web interface so that the measurements can be more easily and effectively analyzed. US EPA researchers are developing analytical tools such as the REal-Time GeOspatial Data Viewer (RETIGO) that enable users to easily analyze the data they have collected.
- **US EPA-Funded Research.** To tap the creativity and ingenuity of scientists across the country, US EPA's Science to Achieve Results (STAR) Program is supporting the advancement of air

sensor technologies with grants to universities and research organizations to develop innovative air monitoring instruments for use by the public.

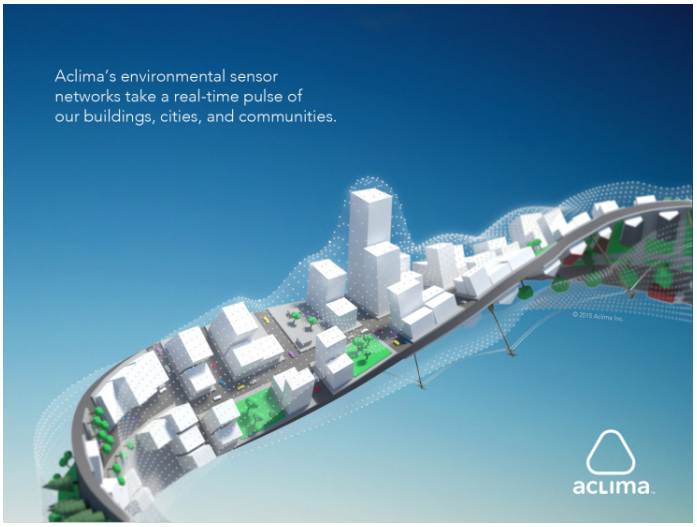
Source: https://www.epa.gov/air-sensor-toolbox/air-sensor-toolbox-what-epa-doing#pane-1

More information on the state of sensor development and deployment can be found here:

https://www.epa.gov/air-research/air-pollution-monitoring-communities-grants https://www.epa.gov/sites/production/files/2016-01/documents/2014_em-3_deliverable-state_of_the_science_presentation.pdf.

US EPA has produced a tool box for use by local communities, researchers and developers interested in pursuing local air quality monitoring deployment or development. The toolbox can be found here: https://www.epa.gov/air-sensor-toolbox.

Private sector engagement includes a project involving **Aclima, Inc.**, a San Francisco-based company that designs and deploys environmental sensor networks, and Google Earth Outreach. In July 2015, Aclima announced its partnership with Google Earth Outreach to map and better understand urban air quality. According to the press release, "[t]he partnership enables a paradigm-shift in environmental awareness by equipping Street View cars with Aclima's mobile sensing platform to see the air around us in ways never before possible."



Aclima instrumented three Google Street View vehicles to perform a month-long system test in the Denver metro area during the DISCOVER-AQ study conducted by NASA and the US EPA. The cars clocked 750 hours of drive time to take measurements of nitrogen dioxide, nitric oxide, ozone, carbon monoxide, carbon dioxide, methane, black carbon, particulate matter, and Volatile Organic Compounds (VOCs). They gathered 150 million data points which were correlated with data from US EPA stationary measurement sites. US EPA provided scientific expertise in study design and instrument operations.

In the Fall of 2016, Aclima and Google expanded mapping efforts to the San Francisco Bay Area and began working with communities and scientists to explore applications for this new environmental tool. In June 2017, Google Earth Outreach, Aclima, the Environmental Defense Fund (EDF), and engineering researchers at The University of Texas at Austin (UT Austin) published the report, High-Resolution Air Pollution Mapping with Google Street View Cars: Exploiting Big Data, a year-long mobile mapping campaign to measure hyperlocal air pollution in Oakland, CA. According to the lead author of the report, Joshe Apte, "The new mobile technology allows us to measure pollution levels block-by-block where people actually breathe the air – at street level." According to the press release, the "measurements reveal that urban air pollution is surprisingly more variable than previously appreciated, with air quality changing over the course of a city block. Conventional fixed-site measurements provide regional snapshots of air quality, but local variation is known to profoundly impact public health and environmental equity." See https://aclima.io/press/google-acmka-edf-and-ut-austin-announce-results-of-breakthrough-study-mapping-air-quality/ 7/24/17 p.2

Two public sector California community sensor projects of note were developed through the efforts of the communities themselves. The first project, known as IVAN is a partnership among Comite Civico del Valle, the California Environmental Health Tracking Program, and the University of Washington School of Public Health working in collaboration with University of California at Los Angeles and George Washington University. This four-year project in Imperial County is funded by a grant from the National Institutes of Health.

IVAN is a network of 40 air monitors located throughout Imperial County that measure current levels of particulate matter (PM2.5 and PM10). A website (https://www.ivan-imperial.org/air) makes these data available to the public and provides information on how the data differ from regulatory monitor data and how the data can be used by the public to protect their health. IVAN serves as model being followed by other community sensor projects. More information can be found here: http://www.cehtp.org/page/imperial_county.

San Ysidro is located immediately north of the Mexican border, where an estimated 50,000 vehicles cross every day. There are no government operated regulatory monitors at the border. Concerned about air pollution health risks posed by lines of idling vehicles at the Ports of Entry, trade-related commercial trucks, and transport of pollutants from Mexico, San Ysidro residents devised their own community-based air quality project which uses the same low-cost monitors as IVAN.

The two-year San Ysidro study is a partnership with the California Office of Environmental Health Hazard Assessment (OEHHA), the University of Washington, and a San Diego community organization, Casa Familiar. A $225,000 OEHHA grant funds operation of 12 monitors throughout the San Ysidro area. More information can be found here: http://deohs.washington.edu/san-ysidro-air-quality-and-border-traffic-study.

The South Coast Air Quality Management District (SCAQMD) is operating or partnering in a number of projects including:

1. A citizen complaints driven partnership with a waste disposal facility. A network of nine sensors around the facility is transmitting (wireless) fugitive emissions data to a remote server. The data are processed and analyzed by a subscription-based contractor. Results of the analysis are being used to change operations at the facility. The goal is to make this a permanent system.
2. A pilot exploring how to deploy large sensor networks based on community science. A dense wireless network of PM2.5, PM10 and PM1 sensors deployed in Redlands to augment the one SCAQMD monitor now in place send data to a remote, subscription-based server. The project will test how feasible it is to scale up the network.
3. An US EPA STAR grant funded project is a partnership with UCLA and others, including CCV intended to develop low-cost sensor solutions beyond PM2.5 monitoring.
4. An US EPA air toxics grant is funding placement of PM 10, PM2.5, VOCs sensors around the perimeter of oil refineries in the air basin. The goal is to also install 40 sensors within downwind communities to determine how they are impacted by the facilities.
5. A NASA funded project that also involves Research Triangle is aimed at developing a framework for deploying spatially dense PM2.5 local sensors to augment satellite data.
6. An in-house study of sensor testing issues and what would be needed in the SCAQMD testing center to test sensors for toxic emissions.

Community sensor technology is being developed and utilized at an accelerating pace. There is a high demand for the capacity to identify the sources of pollution that are having a disproportionately high localized health impacts and much to be learned from projects throughout California and elsewhere. Federal funding has been a major source of support for the advancement of community sensor technology. But the future of federal programs is in doubt. Nonetheless, California has no organized program for capturing this information, lessons learned or best practices into a centralized repository or for integrating community sensor monitoring data into the current air quality monitoring system. Now is the time for California to take the next step in addressing environmental justice concerns by integrating community monitoring into its air quality monitoring system to further its data integration efforts and prioritization of direct emissions reductions in heavily impacted communities as required by AB197 (*Stats. 2016, Ch. 250, Sec. 5. Effective January 1, 2017*).

Footnotes

i. South Coast Air Quality Management District, "The Southland's War on Smog: Fifty Years of Progress Toward Clean Air," accessed 5/15/17. http://www.aqmd.gov/home/library/public-information/publications/50-years-of-progress

ii. California Air Resources Board, "The California Almanac of Emissions and Air Quality—2013 Edition," 2013. https://www.arb.ca.gov/aqd/almanac/almanac13/almanac2013all.pdf

iii. California Air Resources Board, "2017 Program Priorities," Staff Report to the Board, Item 17-1-2, 1/27/17. https://www.arb.ca.gov/board/books/2017/012717/17-1-2pres.pdf

iv. Ralph Propper, et al., "Ambient and Emission Trends of Toxic Air Contaminants in California," Environmental Science and Technology, 9/4/15. http://pubs.acs.org/doi/10.1021/acs.est.5b02766

v. California Air Resources Board, "The California Almanac of Emissions and Air Quality—2013 Edition," 2013. https://www.arb.ca.gov/aqd/almanac/almanac13/almanac2013all.pdf

vi. California Air Resources Board, "The California Almanac of Emissions and Air Quality—2013 Edition," 2013. https://www.arb.ca.gov/aqd/almanac/almanac13/almanac2013all.pdf

vii. California Air Resources Board, "Chronology of State Ozone Designations," 1/5/16. https://www.arb.ca.gov/desig/changes/ozone.pdf

viii. California Air Resources Board, Chronology of State PM2.5 Designations," 1/5/16. https://www.arb.ca.gov/desig/changes/pm25.pdf

ix. Bay Area Air Quality Management District Website, Air Quality Standards and Attainment Status, accessed 5/28/17. http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status

x. MATES-IV Final Report: Multiple Air Toxics Exposure Study in the South Coast Air Basin, South Coast Air Quality Management District, May 2015. http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf

xi. Martien, Philip et al., Identifying Areas with Cumulative Impacts from Air Pollution in the San Francisco Bay Area, Version 2, March 2014. http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CARE%20Program/Documents/ImpactCommunities_2_Methodology.ashx?la=en

xii. Martien, Phil et al., Identifying Areas with Cumulative Impacts from Air Pollution in the San Francisco Bay Area, Version 2, Bay Area Air Quality Management District, March 2014, p.8.

xiii. MATES-IV Final Report: Multiple Air Toxics Exposure Study in the South Coast Air Basin, South Coast Air Quality Management District, May 2015, p.ES-5. http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf

xiv. MATES-IV Final Report: Multiple Air Toxics Exposure Study in the South Coast Air Basin, South Coast Air Quality Management District, May 2015, p.2-54. http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf

xv. Martien, Philip et al., Identifying Areas with Cumulative Impacts from Air Pollution in the San Francisco Bay Area, Version 2, March 2014, p.7.

xvi. 95th percentile or worse in CalEnviroScreen 3.0

xvii. 95th percentile or worse in CalEnviroScreen 3.0

xviii. Data are from CalEnviroScreen 3.0. See https://oehha.ca.gov/calenviroscreen/maps-data/download-data

xix. Communities for a Better Environment, Cumulative Impacts in East Oakland: Findings from a community-based mapping study, September 2008.

xx. Mapping Air Pollution with New Mobile Sensors, EDF Website, accessed 7-27-17. https://www.edf.org/airqualitymaps

xxi. Cushing, Lara J., et al., A Preliminary Environmental Equity Assessment of California's Cap-and-Trade Program, Research Brief, September 2016. https://dornsife.usc.edu/assets/sites/242/docs/Climate_Equity_Brief_CA_Cap_and_Trade_Sept2016_FINAL2.pdf

xxii. OEHHA, Tracking and Evaluation of Benefits and Impacts of Greenhouse Gas Limits, in Disadvantaged Communities: Initial Report, February 2017. https://oehha.ca.gov/media/downloads/environmental-justice/report/oehhaab32report020217.pdf

xxiii. John Faust Ph.D., et al., Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, "CalEnviroScreen 3.0," Update to the California Communities Environmental Screening Tool, January 2017. https://oehha.ca.gov/media/downloads/calenviroscreen/report/ces3report.pdf

xxiv. Center for Disease Control and Prevention, p.205. https://ephtracking.cdc.gov/showAirHIA.action, 5/28/17 1:11 pm

xxv. Regulatory Impact Analysis for the Final Revisions to the National Ambient Air Quality Standards for Particulate Matter, U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Health and Environmental Impacts Division, EPA-452/R-12-005 December 2012, pg. ES-7.

xxvi. California Code, Health and Safety Code HSC§39601

xxvii. Olga Pikelnaya Ph.D., South Coast Air Quality Management District, Climate and Environmental Justice Dialogues, University of California, Berkeley, February 2017.

xxviii. High-Resolution Air Pollution Mapping with Google Street View Cars: Exploiting Big Data, Joshua S. Apte, Kyle P. Messier, Shahzad Gani, Michael Brauer, Thomas W. Kirchstetter, Melissa M. Lunden, Julian D. Marshall, Christopher J. Portier,Roel C.H. Vermeulen, and Steven P. Hamburg Environ. Sci. Technol., June 5, 2017