

Proposed Research Priorities for Fiscal Year 2027-2028

Introduction

Each year, the California Air Resources Board (CARB) Research Program funds approximately \$4-8 million worth of research projects (approximately 8-12 projects). The research planning process begins each year with public engagement. CARB is leveraging the Five-Year Strategic Research Plan and selecting the most urgent priorities with the potential of being developed into impactful research. Below is a list of the top 14 priorities under consideration for funding in fiscal year 2027-2028. Input at this stage is critical in finalizing the list of priorities that will be developed into project concepts and funded in fiscal year 2027-2028.

To submit input on the priorities listed below, use the following form:

Poll

Funding Year 2027-2028 Research Priorities

"At-A-Glance" List of Priorities

Research Category	Research Topics Under Consideration
Health	1. Benefits of Greenness 2. Indoor Air in Long-term Care Facilities 3. Effects of Air Pollution on Brain Health Outcomes 4. Follow-up to Cancer Valuation Project 5. Exposure and Health Impacts from Wildland-urban Interface Emissions
Air Quality	1. Volatile Pollutants and their Impact on Atmospheric Particulates 2. Updating Understanding of Gas-phase and Particle-phase Partitioning 3. Investigating Ambient Air Concentrations of Per- and Polyfluoroalkyl Substances
Climate	1. Greenhouse Gas Emissions from Woody Perennial Crops
Mobile Sources	1. Phase Two of the Exhaust Leak Rates Project 2. Ammonia and Air Toxics from Heavy-duty Vehicles and Off-road Equipment

	3. Energy Consumption of Advanced Zero-emission Vehicle Technologies 4. Tire-wear Volatile Organic Compound Emissions 5. Heavy-duty Vehicle Brake-wear Emissions
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Proposed Health Research Priorities

Five Year Plan Research Initiative and Research Priority Questions	Proposed Research Priority Focus
<i>Health Impacts of Climate Change and Wildfire Smoke:</i> What are the co-benefits of climate adaptation and mitigation strategies in California when examined at a finer geographic and demographic scale? How can we support climate adaptation programs to effectively achieve health co-benefits?	Benefits of Greenness • <i>Focus:</i> Expand our understanding of the health and ecosystems benefits of increased greenness in California communities • <i>Potential approach:</i> Assess benefits due to reductions in needs for cooling and health benefits from reduced heat in communities and increased opportunities for active transport.
<i>Indoor Health Pollution Sources, Exposure, and Mitigation:</i> What are the most effective strategies, such as educational outreach, guidance documents, and incentive programs, for promoting the adoption of tools and mitigation measures that protect indoor health, especially among vulnerable populations? What additional technologies or recommendations, whether behavioral, operational, or related to building management, can improve indoor air quality in high-risk settings such as schools, residential buildings, elder care facilities, and correctional institutions?	Indoor Air in Long-term Care Facilities • <i>Focus:</i> Characterize indoor air pollutant exposures experienced by residents of long-term care facilities (LTCFs) and identify the key factors that influence these exposures. • <i>Potential approach:</i> Combine indoor air quality (IAQ) measurements, LTCF building and operational assessments, and evaluate health data from LTCFs to identify factors that impact IAQ and pose the greatest health hazard risks.
<i>Health Analysis: Expanding Understanding of Health Outcomes and Environmental Justice Factors:</i>	Effects of Air Pollution on Brain Health Outcomes

Which additional health metrics and endpoints should be studied to better assess the impact of air pollution and climate change on public health?	• <i>Focus:</i> Investigate the effects of air pollution on incidence and exacerbation of brain health outcomes in California. These outcomes may include mental health outcomes such as mood disorders and neurodevelopmental endpoints as well as the associated economic costs in California. • <i>Potential approach:</i> Leverage existing California-specific, high spatial resolution exposure models and health data in a population-based study of dose response relationships between air pollution exposure and short- and long-term brain health outcomes.
<i>Health Analysis: Expanding Understanding of Health Outcomes and Environmental Justice Factors:</i> What novel methods, such as analysis and valuation of reduced cancer risks, can be developed to improve the assessment of air toxics risk reduction strategies?	Follow-up to Cancer Valuation Project • <i>Focus:</i> Operationalize monetization model developed by the current cancer valuation contract for priority toxic air contaminants and for pollutants of concern in overburdened communities. • <i>Potential approach:</i> Conduct additional case studies and develop monetized costs for relevant cancer types by estimating exposures using existing California-specific, high spatial resolution models.
<i>Health Impacts of Climate Change and Wildfire Smoke:</i> What are the effects of smoke and ash in indoor air quality, and which filtration methods, tools, and guidance can be most equitably deployed to protect priority communities, especially those living in WUI areas?	Exposure and Health Impacts from Wildland-urban Interface Emissions • <i>Focus:</i> Collect and measure indoor and outdoor levels of air pollutants resulting from WUI emissions to estimate possible levels of residential exposures and possible health impacts • <i>Potential approach:</i> Using samples collected during previous, or ongoing wildfire events or generated during studies conducted under controlled conditions, levels of chemicals associated with WUI emissions such as VOCs, PAH's, metals will be analyzed in both ash and gaseous samples. Levels of residential exposures to

	these compounds will be estimated based on ambient indoor levels as well as estimated exposures to ash. Possible health impacts will be determined using existing health values from State and Federal agencies or other survey data.
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To learn more about CARB's Health Research, please visit the [Health Research website](#).

Proposed Air Quality Research Priorities

Five Year Plan Research Initiative and Research Priority Questions	Proposed Research Priority Focus
<i>Understanding the Drivers of Future Ambient PM_{2.5} Formation:</i> What measurement techniques and analytical methods can advance our understanding of secondary organic aerosol (SOA) formation, including both gas-phase and aqueous-phase processes? Which chemical mechanisms require further investigation and inclusion in air quality models to enhance predictive accuracy?	Volatile Pollutants and their Impact on Atmospheric Particulates • <i>Focus:</i> Evaluate the secondary organic aerosol (SOA) yield from intermediate volatile organic compounds (IVOC) and semi-volatile organic compounds (SVOC). • <i>Potential approach:</i> Perform chamber studies.
<i>Understanding the Challenges of Meeting NAAQS in a Changing Climate:</i> How can we deepen our understanding of the interactions between air quality, meteorology, and climate in the context of evolving air quality and climate policies? What are the co-benefits of air quality and climate strategies?	Updating Understanding of Gas-phase and Particle-phase Partitioning • <i>Focus:</i> Evaluate the air quality benefits due to the reduction of various trace gases at high spatial resolution. • <i>Potential approach:</i> Investigate different chemical mechanisms and improve the connection between gas-phase and particle-phase.
<i>Reducing Air Quality Disparities:</i> Which sources and pollutants of concern (e.g., EtO, PCBTF, PFAS, VOCs, and Metals) should be further	Investigating Ambient Air Concentrations of Per- and Polyfluoroalkyl Substances

investigated to improve our understanding of their spatial distribution across California?	• <i>Focus:</i> Investigate the air impacts of per- and polyfluoroalkyl substances (PFAS) and fluorinated precursors in ambient air • <i>Potential approach:</i> Investigate the feasibility of measuring these compounds in the air in real-time
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To learn more about CARB's air quality research, visit the [Ambient Air Quality Research website](#).

Proposed Climate and Natural and Working Lands Research Priorities

Five Year Plan Research Initiative and Research Priority Questions	Proposed Research Priority Focus
<i>Greenhouse Gas Emissions and Sinks from Natural and Working Lands:</i> How will natural and working lands (NWL) influence air quality in California under changing climate conditions? How are the nitrogen and carbon cycles expected to evolve across the state under various climate scenarios, and what implications will these changes have on emissions?	Greenhouse Gas Emissions from Woody Perennial Crops • <i>Focus:</i> GHG emissions from woody perennial crops (multiple tree crops, grapes; cover crops, compost, tillage). • <i>Potential approach:</i> Use eddy covariance systems: CO₂, CH₄, N₂O, C Stocks (biomass and SOC).

To learn more about CARB's climate research, visit the [Climate Research website](#).

Proposed Mobile Sources Research Priorities

Five Year Plan Research Initiative and Research Priority Questions	Proposed Research Priority Focus
<i>Long-term Trends in NO_x and Greenhouse Gas Emissions:</i> What fraction of heavy-duty vehicles may malfunction, have deteriorating SCRs, or leak unfiltered exhaust? Can we quantify those emissions and their potential impacts on communities?	Phase Two of the Exhaust Leak Rates Project • <i>Focus:</i> Phase 2 of the heavy-duty vehicle (HDV)/off-road equipment (ORE) study on leak rates. • <i>Potential approach:</i> Estimate the statewide impacts of unfiltered emission leaks and the potential reductions from leak repair.

<i>Long-term Trends in NO_x and Greenhouse Gas Emissions:</i> What are the real-world in-use emissions trends of GHG and criteria pollutants from on-road vehicles, and how do regulatory programs impact them?	Ammonia and Air Toxics from Heavy-duty Vehicles and Off-road Equipment • <i>Focus:</i> Ammonia and air toxics emissions from on-road HDVs and OREs. • <i>Potential approach:</i> To be determined.
<i>Activity and Vehicle Energy Analysis:</i> What are the conventional and various ZEVs' operational characteristics and detailed energy consumption rates, including transit and commuter buses, off-road vehicles, heavy-duty and medium-duty vehicles, and passenger vehicles?	Energy Consumption of Advanced Zero-emission Vehicle Technologies • <i>Focus:</i> Characterization of Energy Consumption of Advanced EV Technologies. • <i>Potential approach:</i> To be determined.
<i>Improving Understanding of Non-Exhaust Emissions:</i> Do non-exhaust emissions have regional and/or local impacts? Which pollutant emissions are of greatest concern? Do volatile organic compounds from non-exhaust emissions have the potential to contribute to secondary PM on a regional scale?	Tire-wear Volatile Organic Compound Emissions • <i>Focus:</i> Tire-wear VOC emissions. • <i>Potential approach:</i> Develop a method for real-time characterization.
<i>Improving Understanding of Non-Exhaust Emissions:</i> What are the real-world non-exhaust emissions and their health effects from various vehicle types, including LDVs, MDVs, HDVs, trains, and off-road vehicles on paved and unpaved roads, and various vocations, including construction, transit, agriculture, passenger, goods movement, etc.?	Heavy-duty Vehicle Brake-wear Emissions • <i>Focus:</i> Internal combustion engine (ICE) HDV brake-wear emissions (adding to previous contract 25RD006). • <i>Potential approach:</i> To be determined.

To learn more about CARB's mobile sources research, visit the [Mobile Sources Research website](#).