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Justice-Centered Mapping Tools for Selecting Electric Vehicle Charger Locations

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Issue

Reducing air pollution from automobiles is a climate and public health imperative. Transportation is the "single largest source of CO2 emissions" in California and the second largest source nationwide.[1] State leaders recognize the need for zero-emission vehicles to achieve statewide carbon neutrality. Millions of electric vehicles (EVs) are expected on American roads in the coming decade. California alone will require over two million publicly accessible EV chargers to support over 15 million EVs by 2035, and nationwide over 28 million total chargers will be needed by 2030.[2]

To date, public charging infrastructure investment has not prioritized lower-income and black and brown communities,[3] and electrification has mostly benefitted higher-income, whiter communities.[4] Federal and state funding programs for charging infrastructure have begun directing vehicle and charging investment to lower-income communities, rural communities, and areas at greatest risk of environmental harm,[5] but this investment must be met with equity-oriented decision-making tools.

Local governments, which are responsible for permitting and approving new charging installations, and community residents who will use these resources often lack data-rich, user-friendly, open-access tools to identify where new chargers should go. Existing tools often include criteria relevant to vehicle electrification, such as local air quality, transportation burdens (e.g., lack of transit access), and income levels.[6] However, these tools typically operate only at the census tract level, and do not incorporate site suitability and feasibility factors such as energy capacity, transit conflicts, and nearby public facilities and assets.

Through engagement with city and state mobility program leaders, we developed a public, open-access platform to inform equity-oriented EV infrastructure decision-making at the local level to help marginalized communities leverage EV infrastructure investment for mobility equity. We analyzed existing research, EV and mobility plans, and obtained input from California local and state government program leaders to gather data across four core categories– equity, transportation infrastructure, grid infrastructure, and community resources.

Figure 1 shows how the model can combine data from these four categories at different geographic scales. This "pixel-grid" approach aggregates all geospatial data (e.g., point, line, polygons of different sizes) into 100x100 meter pixels overlaid on the map grid and by varying the intensity of various criteria using slider bars, the user can identify areas for potential investment that match local needs.

The map tool can generate two different pixel sets:

- "Priority" pixels incorporate data on environmental justice indicators (e.g., CalEnviroScreen), renter/ multifamily resident population, access to existing Level 2 and DC fast chargers, and EV registrations.
- "Feasibility" pixels incorporate data on eligibility for geographically determined federal funding programs (e.g., National Electric Vehicle Infrastructure corridors) and proximity to electric distribution grid lines with sufficient capacity to support varying sizes of charging facilities.

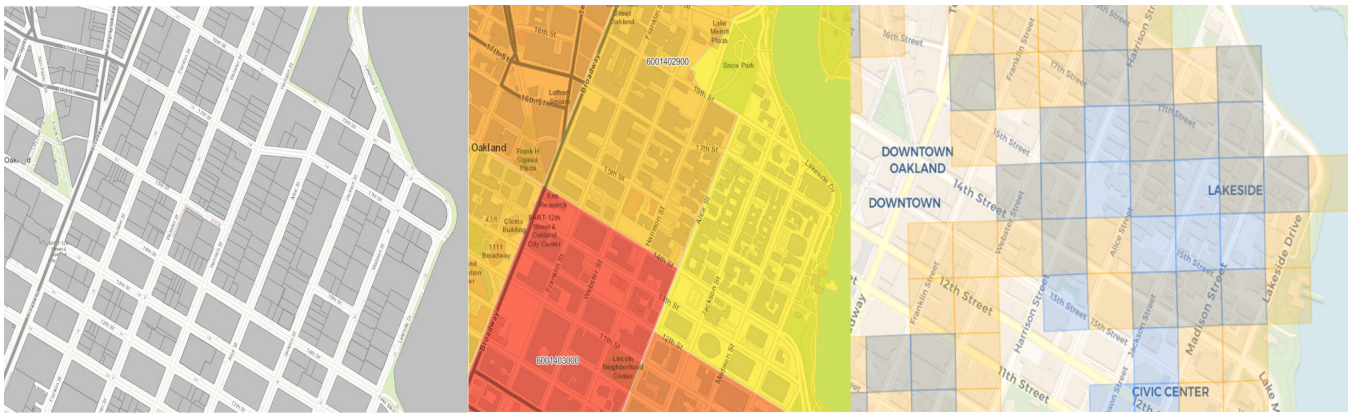

Figure 1. The tool can combine data from different geographies, such as block level (left) and census tract level (center) into 100x100 meter pixels for analysis (right).

In addition, users can overlay information about public parks, schools, affordable housing properties, and more. This will enable local agencies and community stakeholders alike to identify high-priority investment zones. To illustrate this point, Figure 2 provides an example of how users can utilize the tool to generate priority locations for EV chargers for a neighborhood in Oakland. The final web tool will cover all cities and counties in California with potential for expansion nationwide and will be accessible in late 2024 at https://evmap.climateplans.org/ and https://www.law.berkeley.edu/research/clee/ev-equity/.

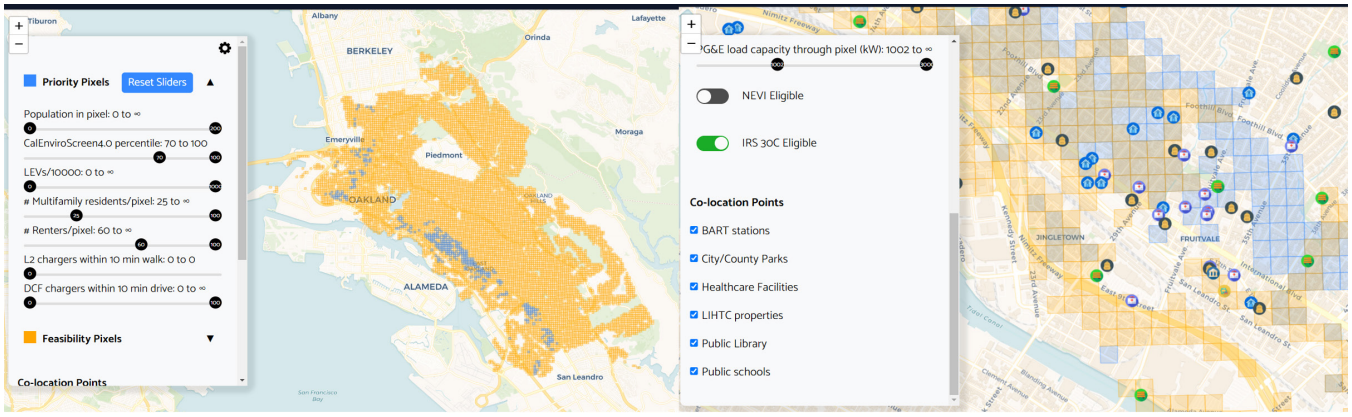

Figure 2. Map tool showing a user's "priority" selections for CalEnviroScreen percentile, multifamily and renter population and access to Level 2 chargers (left, blue pixels) and closeup of Oakland's Fruitvale neighborhood with the same priority selections, IRS 30C tax credit and grid capacity "feasibility" selections (gold pixels), and various public facilities (right).

More Information

This policy brief is drawn from the paper "Justice-Centered Mapping Tools to Support EV Charger Location Selection" submitted by the project team to the journal Applied Energy in October 2024. The authors thank UC Berkeley graduate students Eleanor Adachi, Ari Ball-Burack, Meagan LeBerth, Brad Rhymer, and Ankita Shanbhag for their work on this project. For more information about the material presented in this brief, please contact Ted Lamm at tlamm@berkeley.edu and Daniel Kammen at kammen@berkeley.edu.

[1]California Air Resources Board, 2022 Scoping Plan for Achieving Carbon Neutrality (December 2022), pp. 55, 185-189, available at https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf.

[2]California Energy Commission (CEC), Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment (March 2024), available at https://www.energy.ca.gov/data-reports/reports/electric-vehicle-charging-infrastructure-assessment-ab-2127; National Renewable Energy Laboratory, The 2030 National Charging Network (June 2023), available at https://www.nrel.gov/news/program/2023/building-the-2030-national-charging-network.html.

[3]Daniel M. Kammen, "How electric vehicles can help advance social justice," The San Francisco Chronicle (June 20, 2020), available at https://www.sfchronicle.com/opinion/article/How-electric-vehicles-can-help-advance-social-15351293.php; Chih-Wei Hsu and Kevin Fingerman, "Public electric vehicle charger access disparities across race and income in California," Transport Policy (January 2021), available at https://www.sciencedirect.com/science/article/pii/S0967070X20309021.

[4]Jaye Mejia-Duwan, Miyuki Hino, Katharine J. Mach, "Emissions redistribution and environmental justice implications of California's clean vehicle rebate project," PLOS Climate (May 2023), available at https://journals.plos.org/climate/article?id=10.1371/journal.pclm.0000183.

[5]See, e.g., 23 U.S.C. § 151(f)(8)(F) (requiring priority for rural, low- and moderate-income, and high-multifamily residence communities in the federal Charging and Fueling Infrastructure program); Cal. Health & Safety Code § 44272.1 (requiring at least 50 percent of Clean Transportation Program funds, including charging infrastructure funds, to benefit low-income and disadvantaged communities).

[6]See US Environmental Protection Agency, "EJScreen" (webpage), available at https://www.epa.gov/ejscreen; White House Council on Environmental Quality, "Climate and Economic Justice Screening Tool" (webpage), available at https://screeningtool.geoplatform.gov/en/; California Office of Environmental Health Hazard Assessment, "CalEnviroScreen4.0" (webpage), available at https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40.

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