CLIMATE POLICY INITIATIVE

California Landscape of Climate Finance (beta)

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Data sources include the California Air Resources Board Scoping Plan, the Princeton Net-Zero America project, Bloomberg NEF, California Climate Investments, and more. A full list is available in the Annex.

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This first-ever California climate finance landscape builds on a decade of CPI experience tracking climate finance globally

Climate Policy Initiative is an analysis and advisory organization focused on advancing economic development while addressing climate change.

CPI has more than a decade of experience tracking and analyzing climate finance data, including through our Global Landscape of Climate Finance. We also produce numerous regional, national, and sub-national landscape analyses.

This beta version of a California Landscape tracks deployed funds from private and public actors, by county, across several sectors — including energy and transport — from 2019 to 2022. We do not include many non-cap-and-trade-funded state programs, local spending, or private investment in sectors such as building electrification. As described in Part 1, to be consistent with our Global Landscape definition of climate finance, we do not include R&D spending, investments in low-carbon solution manufacturing, or secondary market transactions such as stock purchases.

In Part 1, we review California's climate context and our definition of climate finance. **Part 2** describes our assessment of climate finance needs in California. **Part 3** presents our analysis of past climate finance. In **Part 4** we present concluding observations and recommendations.

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Key takeaways

1. **California is making substantial progress in increasing climate finance**, with a 26% annual growth rate from 2019 to 2022. We estimate that California climate finance, or spending on deployed climate projects, is 63% of the annual investment needed through 2035 to meet California's climate goals. Globally, climate finance was only 14% of 2030 needs in 2021/2022. However, achieving California's climate goals will require quick progress to close the remaining gap, as needs will increase after 2035 and each year of delay increases decarbonization costs in subsequent years.

2. **Private sector investment is the largest source of finance** with 77% of the total, driven by an increase in passenger zero-emission vehicle sales, which in Q3 2023 represented 27% of new vehicle sales in the state. California's policy and budget actions played a key role in catalyzing new markets for private investment, especially in EVs and solar power. The trend of private climate finance growth is encouraging and demonstrates a sustainable and scalable model considering scarce public finance.

3. Given current budget constraints, **California should focus on using its public dollars to catalyze private and federal investment**, including through pre-development and matching, reducing regulatory barriers, and targeting investment in vulnerable communities.

4. **Climate finance in California is distributed relatively evenly across all counties on a per-capita basis**, although populations living in areas with higher pollution or more climate vulnerability will require higher-than-average investment going forward.

5. This beta landscape uses a limited data set. **A full Landscape—covering all climate sectors and a more detailed sub-county-level analysis—would better reveal investment trends and gaps,** including tracking finance to disadvantaged communities.

Part 1: Introduction

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California is a national leader in addressing climate change

Over the past decade, California has passed laws that:

- require an 85% reduction in emissions and carbon neutrality by 2045;
- phase out internal combustion engine vehicles by 2035 and decarbonizing medium- and heavy-duty vehicles; and
- increase the state's resilience to severe heat and drought.

The state's 2022 and 2023 budgets include $51.4 billion in mitigation and adaptation spending, and the state stands to receive substantial federal climate funding from the Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act (IIJA), which will provide an estimated $41.9 billion for California over the next five years.

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CPI aims to fill a gap in comprehensive data on climate finance and climate investment needs in the state

To support California in meeting its climate goals and using its capital most effectively, CPI created this first-of-its-kind landscape of climate finance in California.

This analysis will help policymakers and private sector actors identify opportunities, establish priorities, measure progress, and develop coordinated plans to meet the scale of the climate challenge, including for budgets, regulations, tapping into federal funding, and investment plans.

This beta version tracks public and private investments by county across several sectors, including energy and transport, from 2019 to 2022. CPI started with a beta version to demonstrate potential value and use cases of a complete landscape, particularly for data that covers all public and private financial flows across multiple sectors.

What does “climate finance” mean for this Landscape?

We focused on primary investments in mitigation and adaptation project deployments, adapting CPI’s standard-setting methodology developed for our Global Landscape of Climate Finance and subsequent regional, national, and sub-national Landscapes. A full description of the methodology is available in Part 3, including which sources we include in the beta version.

Our definition of climate finance* includes:

- **Primary investments:** excluding secondary market transactions such as stock purchases.
- **Committed finance**: finance that is tracked when there is a firm obligation of spending to a specific project, as opposed to upon disbursement.
- **Deployments:** we do not track R&D spending or investment in low-carbon solution manufacturing, to better align with the climate finance *needs* taxonomy described in Part 2.

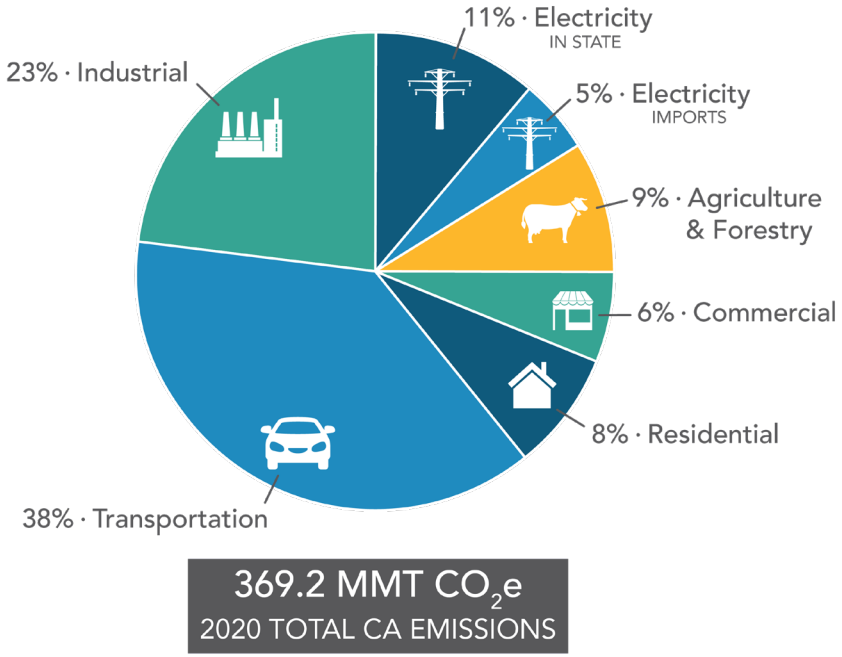
* The United Nations Framework for Convention on Climate Change’s definition of climate finance is: “Climate finance aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts.”

Part 2: Needs Assessment

CPI estimated future investment needs to put current spending in context

By understanding how much money will be needed to meet California's climate policy goals, policymakers will be able to set the appropriate level of ambition and identify the types of investments where scarce public funds can have the greatest catalytic effect to reduce emissions and increase resiliency.

As of 2020, the California Air Resources Board attributed emissions across the following economic sectors:



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How are investment needs estimated?

CPI estimated statewide climate finance needs by tailoring its established needs assessment methodology with state and third-party model estimates. We identified the investment needed in different sectors to meet California's climate goals, including net zero by 2045 and interim targets.

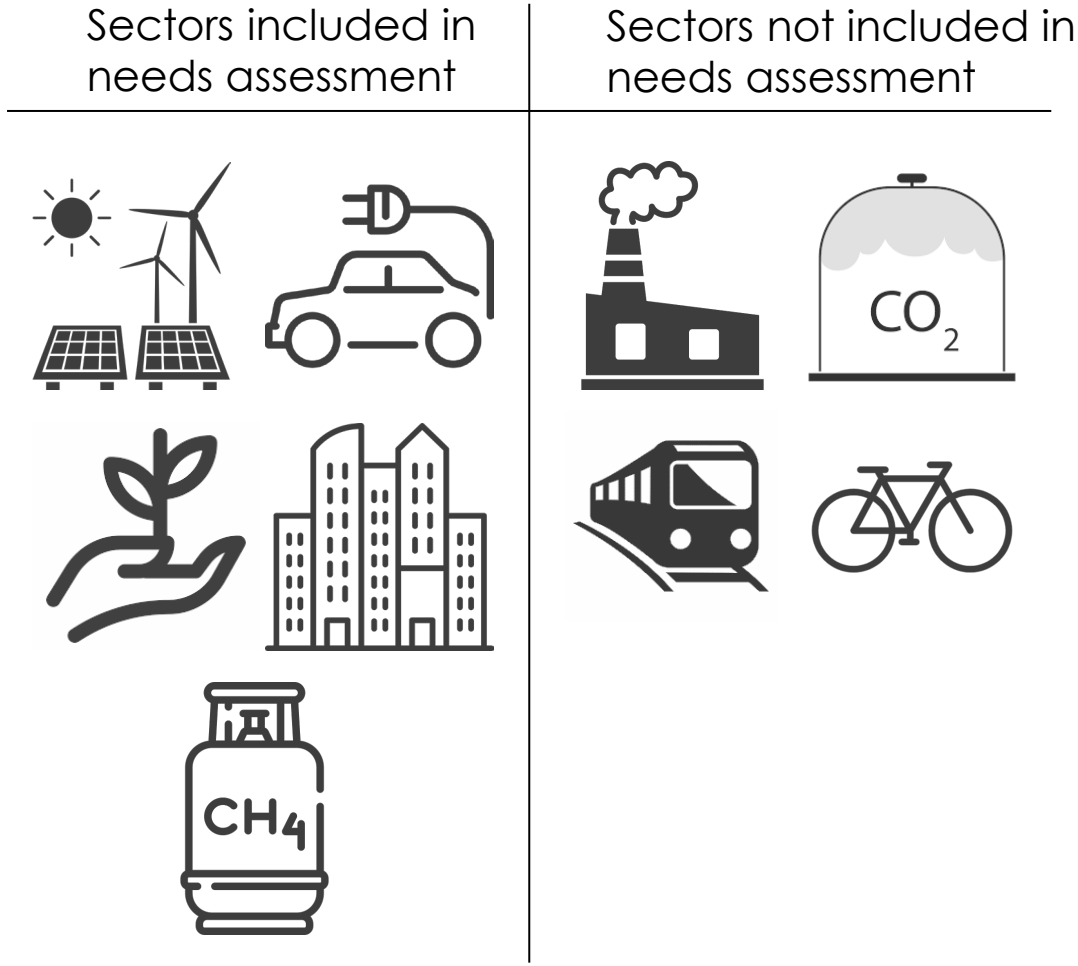
The needs assessment can help policymakers target budgetary resources and investments at sectors where the impact on emissions will be greatest.

This analysis is not intended to define the single "correct" way for California to meet its climate goals. Rather, these estimates represent one possible pathway that is dependent upon modeling, technological, and policy assumptions.

Needs assessment methodology

Our focus was on sectors with commercially viable green technologies for which the state has developed decarbonization plans for in the next decade. These include: energy, zero-emission vehicles, natural working lands, building decarbonization, and methane abatement. We did not include sectors such as industry (steel, concrete, etc.), oil & gas, carbon capture or removal, active transportation, and mass transit due to data availability and uncertainty as to the decarbonization path and scale of these sectors.

A full list of inputs is provided in the Annex, and include the California AB32 Scoping Plan, estimates from CPUC, CARB, and CAISO, and third-party estimates from the Princeton Net-Zero America project.



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Needs assessment methodology

We estimated climate finance needs in U.S. dollars on an annual basis through 2045.

- Sources used are estimates of investment needed to meet California's climate goals, including both net zero emissions by 2045 and interim targets. For sectors with limited data inputs (such as electric transmission), estimates are extrapolated through to 2045 as needed.
- For sources that only provided needs in real units (e.g., MW of renewable energy or number of air-source heat pumps), we incorporated unit prices from sources such as the National Renewable Energy Laboratory and the California Energy Commission. A full list of sources is in the Annex.

Within each sector, CPI identified the lowest and highest cost estimates, and provides an average of all inputs in each sector. For those sectors with only one input, the low, average, and high are the same.

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Needs assessment methodology

- These estimates are solely focused on achieving emissions targets, and therefore do not consider issues such as equity or economic priorities. Policymakers may decide to prioritize different types or schedules of investment given these other factors.

- The third-party inputs to our model consider technical and geographic limitations and make assumptions about cost trends through 2045. However, there may be additional limitations based on extended environmental permitting, supply chain challenges, or cost drivers such as higher interest rates.

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California will need between $40 and $83 billion of climate finance annually to meet its climate goals

Total average annual needs through 2035 are $62 billion annually.

Current climate finance, discussed in Part 3, was $39 billion in 2022.

Table 1: Annual Climate Finance Needs ($bn)

CPI Sector	2021/2022 Average Annual Investment ($bn/yr)	Average Implementation Cost of California Climate Policies ($bn/yr)					
		2023 - 2035			2036 - 2045		
		Low	Average	High	Low	Average	High
Total Climate Finance		**$40.64**	**$62.24**	**$83.18**	**$55.39**	**$79.60**	**$109.73**
Zero-Emission Vehicles	**$16.33**	**$15.24**	**$31.18**	**$45.13**	**$31.86**	**$49.42**	**$68.12**
Energy Systems	**$9.81**	**$7.75**	**$13.41**	**$20.40**	**$7.07**	**$13.70**	**$25.14**
Renewable Energy	$9.81	$5.20	$9.67	$15.50	$3.25	$8.51	$18.79
Electricity T&D	N/A	$2.55	$3.75	$4.90	$3.82	$5.19	$6.34
Natural Working Lands	**<$0.1**	**$10.68**	**$10.68**	**$10.68**	**$10.68**	**$10.68**	**$10.68**
Buildings & Infrastructure	**$0.52**	**$6.69**	**$6.69**	**$6.69**	**$5.65**	**$5.65**	**$5.65**
Residential buildings	N/A	$6.02	$6.02	$6.02	$4.65	$4.65	$4.65
Commercial buildings	N/A	$0.66	$0.66	$0.66	$0.99	$0.99	$0.99
Methane	**N/A**	**$0.28**	**$0.28**	**$0.28**	**$0.14**	**$0.14**	**$0.14**

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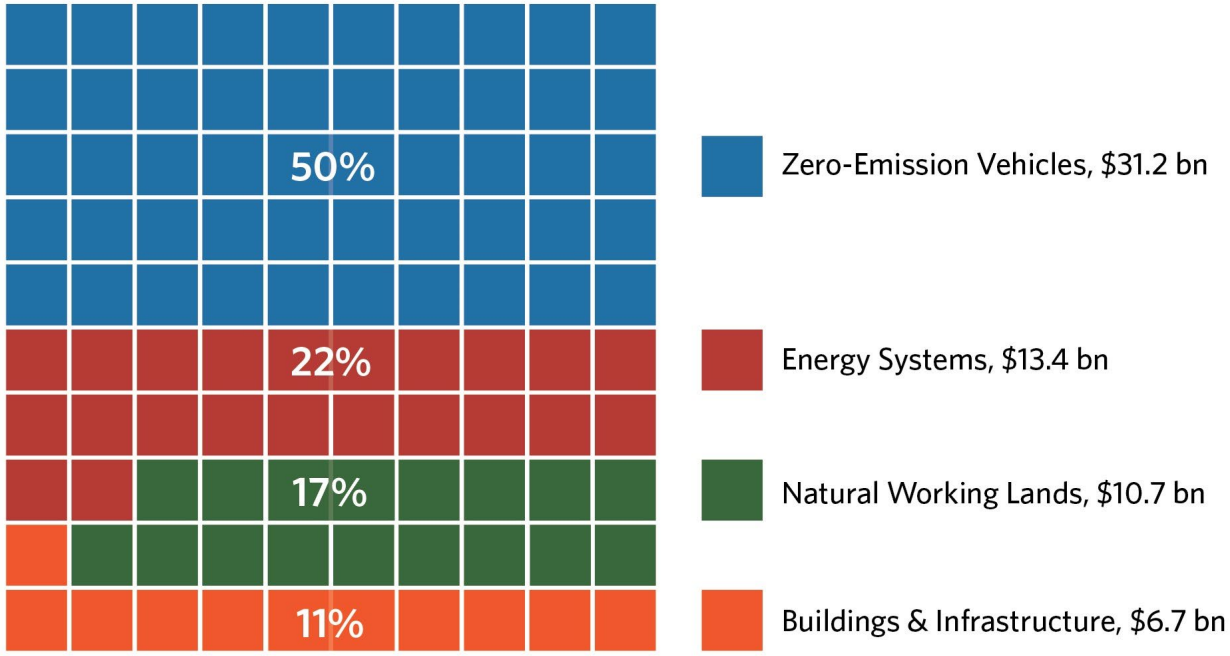
Figure 1: Average Annual Climate Finance Needs, 2023-2035 ($bn)



Note: Methane $0.3 bn

Zero-emission transport drives future needs

Half of annual needs through 2035 are for zero-emission vehicles (ZEV).

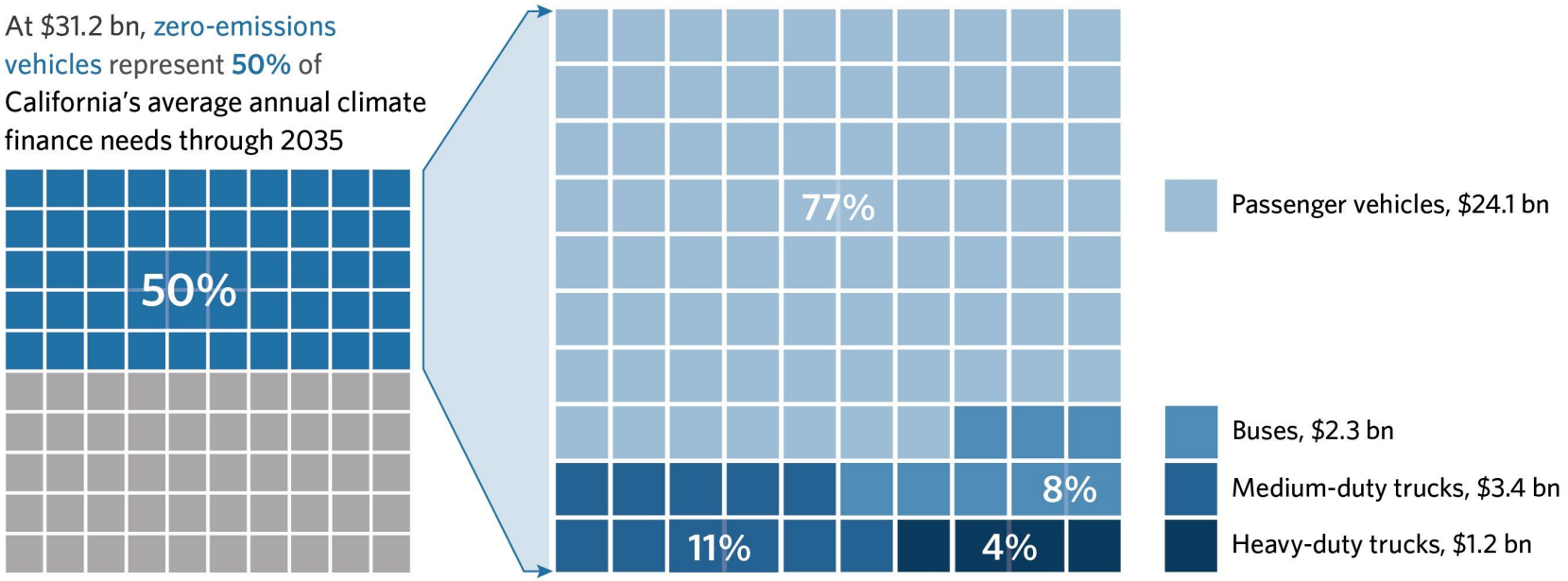
77% of ZEV needs are to decarbonize the 1 million passenger vehicles sold in CA every year.

- On an annual basis this represents a 76% increase in annual spending on passenger ZEVs compared to 2021/2022.
- CARB regulations require all passenger vehicles to be ZEVs starting in 2035.

Despite being a major barrier to EV adoption, ZEV charging needs are only tens of millions of dollars per year.*

Zero-emission trucks and buses, which are currently relatively nascent, will need more than $7 billion per year by 2035.

Figure 2: Average Annual Zero-Emission Vehicle Investment Needs, 2023-2035 ($bn)



* The average annual needs for ZEV chargers (DC Fast and Level 2) are not included in this chart, and are $17 million and $27 million respectively.

Energy systems is the next largest need, led by the state's renewable energy buildout

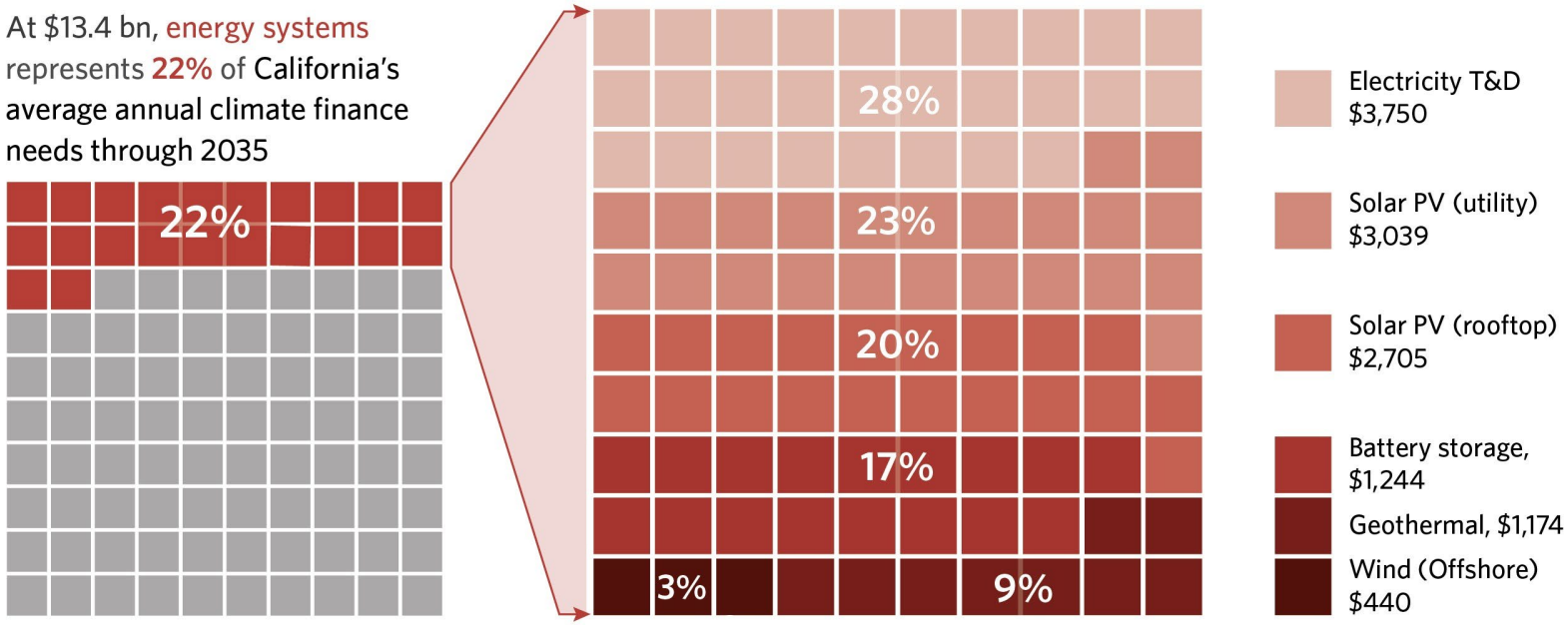
California has a goal of 90% clean electricity by 2035. In 2022, 59% of the state's electricity was clean.

Transmission and distribution, which includes addressing current challenges such as transmission bottlenecks and interconnection delays, will be the largest individual need at 28% of energy systems investment, as described in processes such as CAISO's 10-year and 20-year transmission plans.

Utility-scale and rooftop solar continue to be the largest renewable energy technology investment needs through 2035 (23% and 20% of energy systems, respectively).

Technologies that have not been deployed at scale in the last decade in California (e.g., geothermal and offshore wind) account for $1.5 billion of annual needs going forward.

Figure 3: Average Annual Energy Systems Investment Needs, 2023-2035 ($bn)



* The average annual need for in-state onshore wind is not included in this chart and is $131 million.

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Other sectors will require more proactive regulation, technology deployment, and public sector support to close the finance gap

Agriculture and land use requires $10.7 billion annually through 2035, including restoring the San Francisco Bay delta wetlands, installing tree cover, and implementing sustainable and low-carbon agricultural practices. This will require local, state, and federal financial support and coordination.

Buildings and infrastructure requires $6.7 billion annually through 2035 to decarbonize. This could be accelerated through households retrofitting incentives (like the IRA), targeted state support for low-income and disadvantaged communities, and building code regulations requiring all-electric new construction.

Methane requires $279 million annually through 2035 to reduce emissions from livestock, waste, and fossil fuel extraction and distribution.

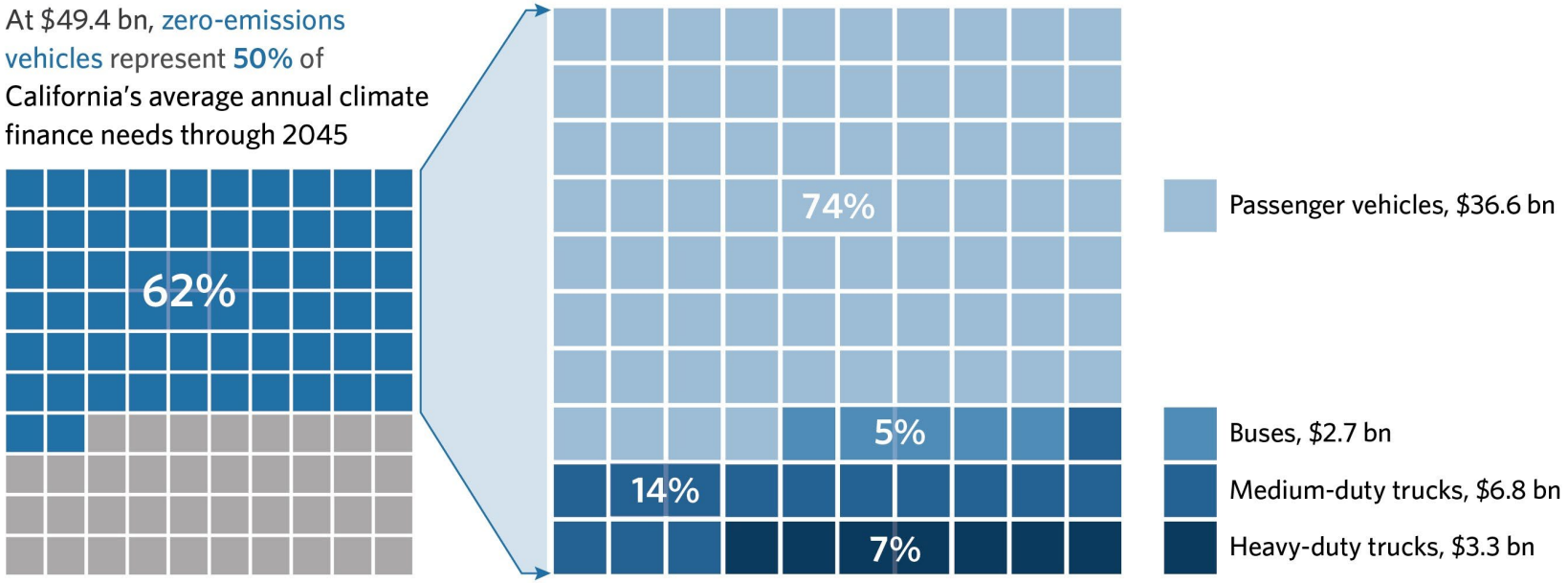
This analysis excludes sectors such as industry (steel, concrete, etc.), oil & gas, carbon capture or removal, active transportation, and mass transit due to data availability and uncertainty as to the decarbonization path and scale of these sectors.

Needs increase after 2035 as deployment ramps up

After 2035, annual needs increase from to $62 billion to $79 billion.

- **The increase is almost entirely from higher uptake of ZEVs,** including from CARB regulations requiring 100% ZEV sales for passenger vehicles and phasing in of ZEVs for medium- and heavy-duty trucking.
- At the same time, CA will need to continue deploying renewable energy ($8.5 bn average annual investment need from 2036-2045), new transmission lines and distribution upgrades ($5.2 bn), building electrification technologies ($5.6 bn), and low-carbon agriculture and land use solutions ($10.7 bn), in addition to technologies not included in this analysis such as decarbonization for steel and cement.
- Near-term action is crucial to enable these higher levels of investment in the future, unlock other pools of capital, and to avoid back-loading too many emissions reductions.

Figure 4: Average Annual Zero-Emission Vehicles Investment Needs 2036-2045 ($bn)



* The average annual needs for ZEV chargers (DC Fast and Level 2) are not included in this chart and are $19 million and $22 million, respectively, from 2036-2045.

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Future needs could be significantly higher if climate investment is deferred

Future costs of meeting California's climate goals are dependent on internal and external factors:

- If California defers investments in key sectors, future needs will increase as emissions will need to be reduced more dramatically in a shorter time period.
- Delay increases the risk of higher future costs for the same results; alternatively, earlier investment could create cost reductions, for example through technological breakthroughs.
- Other policy choices influence the cost of meeting our climate goals; for example, denser cities or better mass transit options might reduce the need to purchase new zero-emission vehicles.
- Earlier investment maximizes the real impact and co-benefits from climate solutions, including reduced air pollution, increased resiliency, and economic development.

Part 3:
Current Climate Finance

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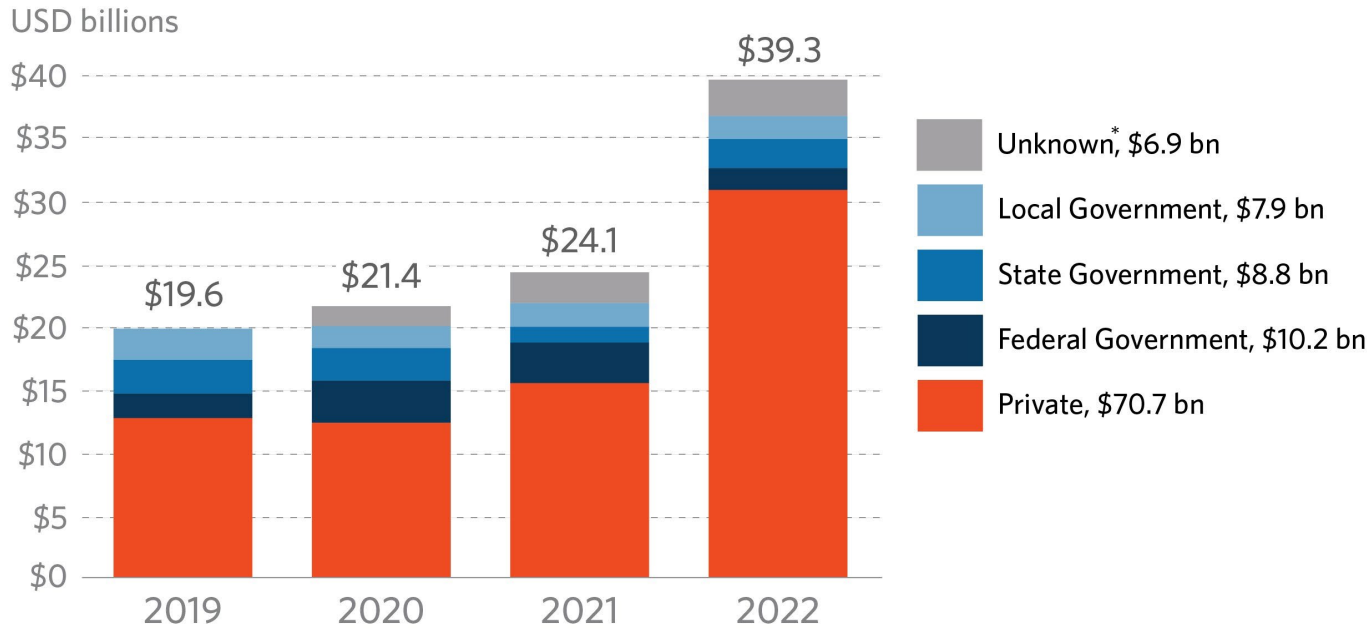
For this beta, we prioritized the largest sources of CA climate finance

Source	Data Included
Federal government	Climate-related federal grants and loans from relevant agencies, including: Departments of Energy, Transportation, Agriculture, Housing and Urban Development, Interior, Treasury, and Defense, and the Corps of Engineers, Environmental Protection Agency, and Federal Emergency Management Agency
State government	**California Climate Investments:** cap-and-trade proceeds, through November 30, 2022 **State grant programs:** Air Resources Board, Energy Commission Clean Transportation Program, Active Transportation Program, Transit and Inter-City Rail Capital Program
Local government	Bond proceeds for residential & commercial energy conservation improvement and public transit
Private	**Energy systems:** renewable energy (utility-scale and rooftop); utility-scale battery storage **Transport:** ZEV passenger vehicles, ZEV chargers

Data not included is in the Annex. CPI aims to expand this landscape in the future to include these data sources as is feasible.

CPI tracked $39 billion of spending in 2022, with an annual growth rate of 26% from 2019

Figure 5: California Climate Finance by Actor Type, 2019-2022



California has made substantial progress in increasing climate finance since 2019, primarily through increases in the private sector.

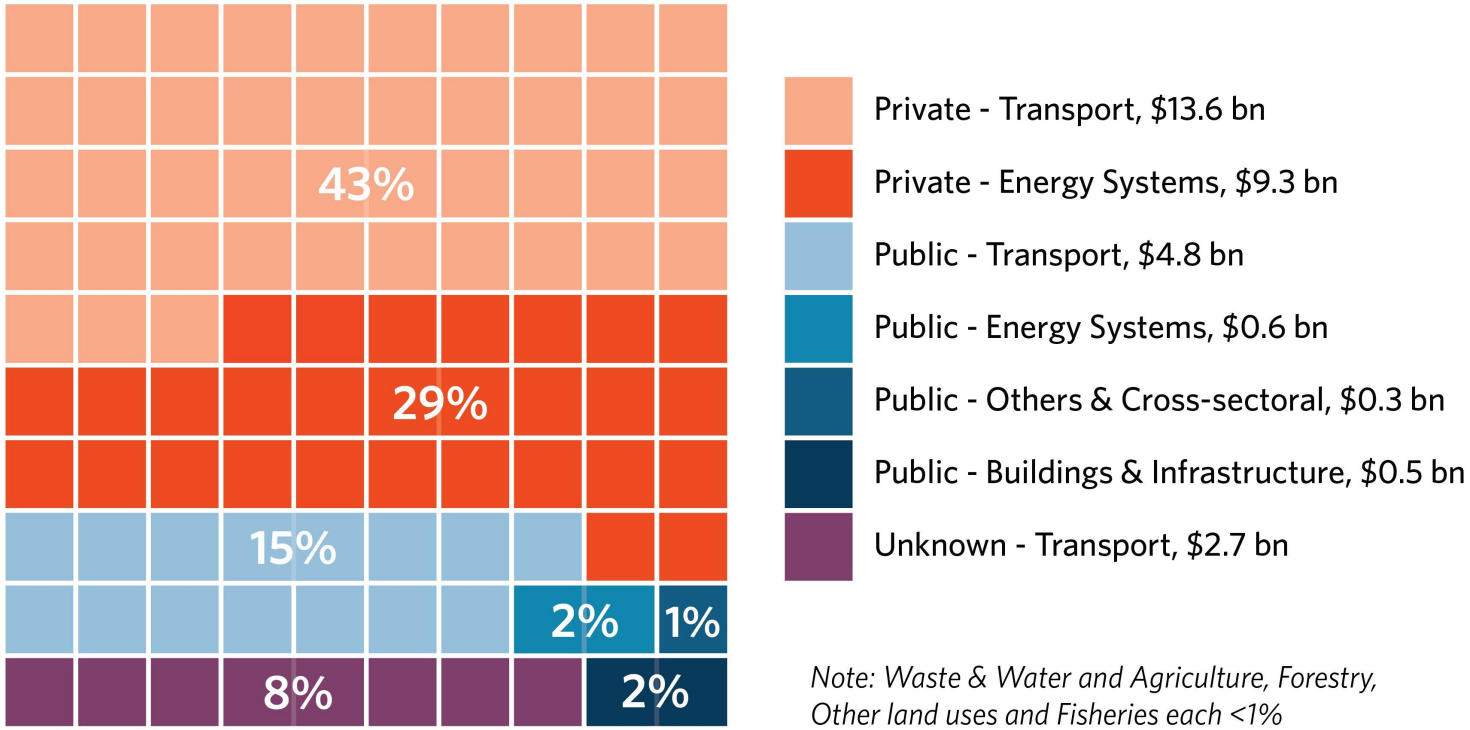
In 2022, CA reached 63% of its annual needs through 2035, while globally climate finance was only 9% of needs (in 2020).

Climate finance is expected to continue to increase with uptake of electric vehicles, the $51.4 billion state climate budget, and federal investment through the Inflation Reduction Act, CHIPS Act, and Infrastructure Investment and Jobs Act.

* "Unknown" is primarily zero-emission vehicle charger investment, as source data are not available.

For both public and private tracked sources of finance, transport is by far the largest destination sector

Figure 6: California Climate Finance by Actor and Sector, 2021-2022



Note: Waste & Water and Agriculture, Forestry, Other land uses and Fisheries each <1%

CPI only tracked private sector spending in transport and energy, which is why these are the only two sectors.

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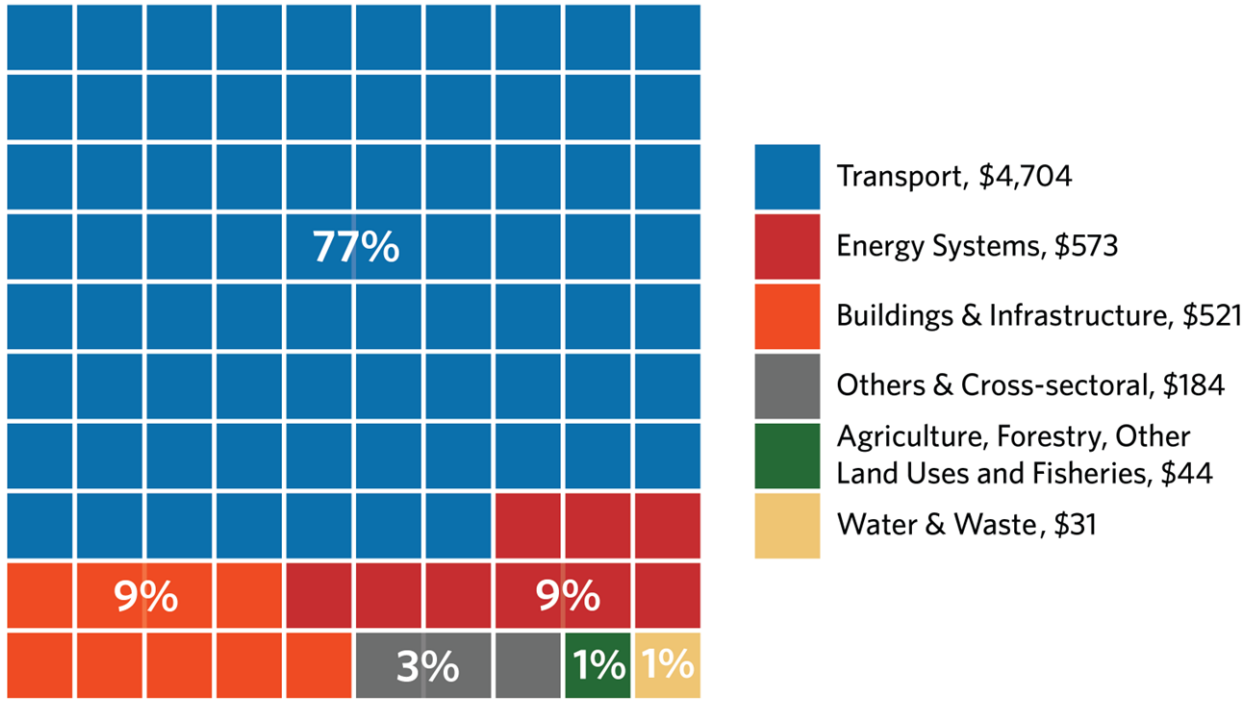
77% of tracked climate finance in 2022 came from private sources, which will continue to be the largest source given policy and regulatory drivers

Rising private sector climate finance is encouraging and will be a more sustainable method to scale investment in California given relatively scarce public funds. This trend has a few key drivers:

- **Commercial viability:** National trends of decreasing costs for renewable energy and zero-emission vehicles.
- **Regulatory environment:** CA laws and regulations requiring a rising share of clean electricity generation and phase-out of internal combustion engines.
- **Financial incentives**: Substantial investment in rooftop solar ($8.7 bn in 2022, a 42% increase from 2021) due to a rush to lock in net metering incentives before new rules took effect.
- **Consumer demand**: Customer interest in cleaner alternatives.

Public finance is heavily focused on clean transportation

Figure 7: California Public Climate Finance by Sector, 2021-2022 ($mn)



Transport. As passenger ZEVs become more viable without state support, CA grant programs have shifted from blanket support for all buyers to 1) supporting disadvantaged communities; 2) supporting less commercially mature technologies such as zero-emission heavy-duty trucking; and 3) funding mass transit and active transportation programs.

Energy. In energy systems, 73% of public climate finance is for purchasing distributed solar systems for public buildings, which can have the additional benefit of reducing costs longer-term.

Future public finance. Total public climate finance will likely increase in coming years through increased state budget allocations and federal legislation, although state budget constraints may limit the rate of growth.

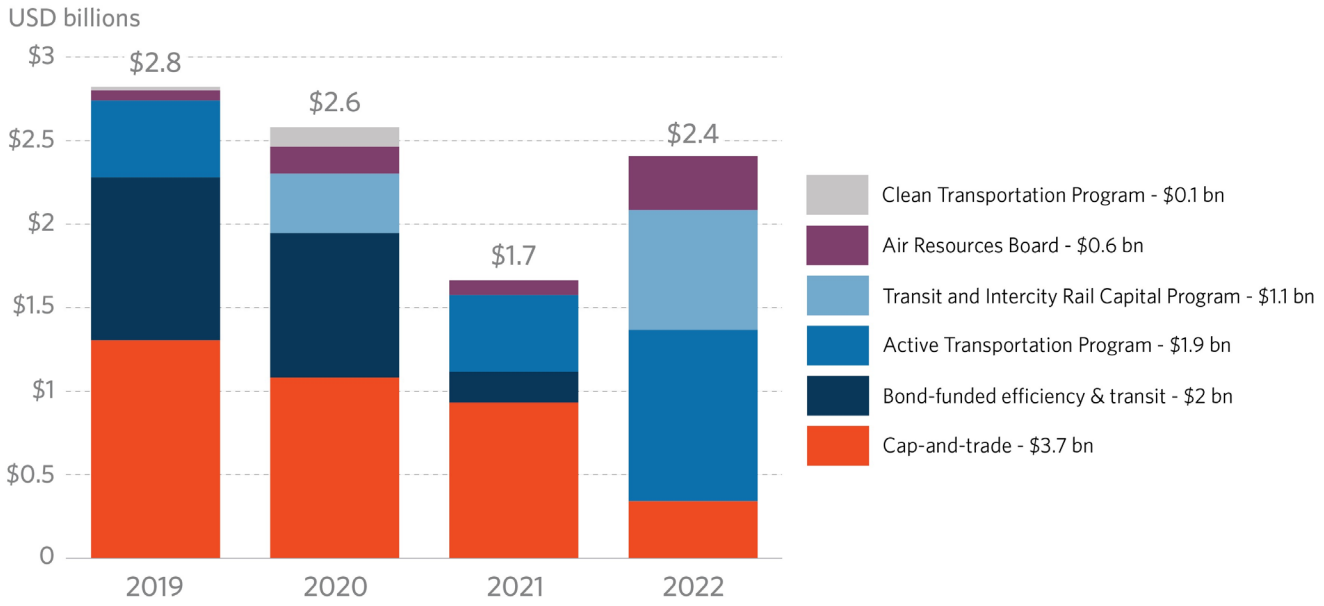
Cap-and-trade proceeds were the state's largest source of climate finance overall in 2019-2022

Cap-and-trade proceeds, which are distributed as grants by California Climate Investments (CCI), were the single largest source of state public climate finance we tracked:

- CCI-provided project financing declined in 2022 due to the lagged effects of a drop in cap-and-trade auction proceeds early in the COVID-19 pandemic but will likely increase in the next few years given a rebound in auction proceeds in 2021-2023.
- These funds are catalytic: according to CCI, $9 billion in cap-and-trade funding has catalyzed $37 billion of additional federal, state, local, and private funding since 2014.

General fund infusions to the Transit and Intercity Rail Capital Program and the Active Transportation Program in 2021 and 2022 led to a doubling of the scale of those programs, growth which will continue over the next five years.

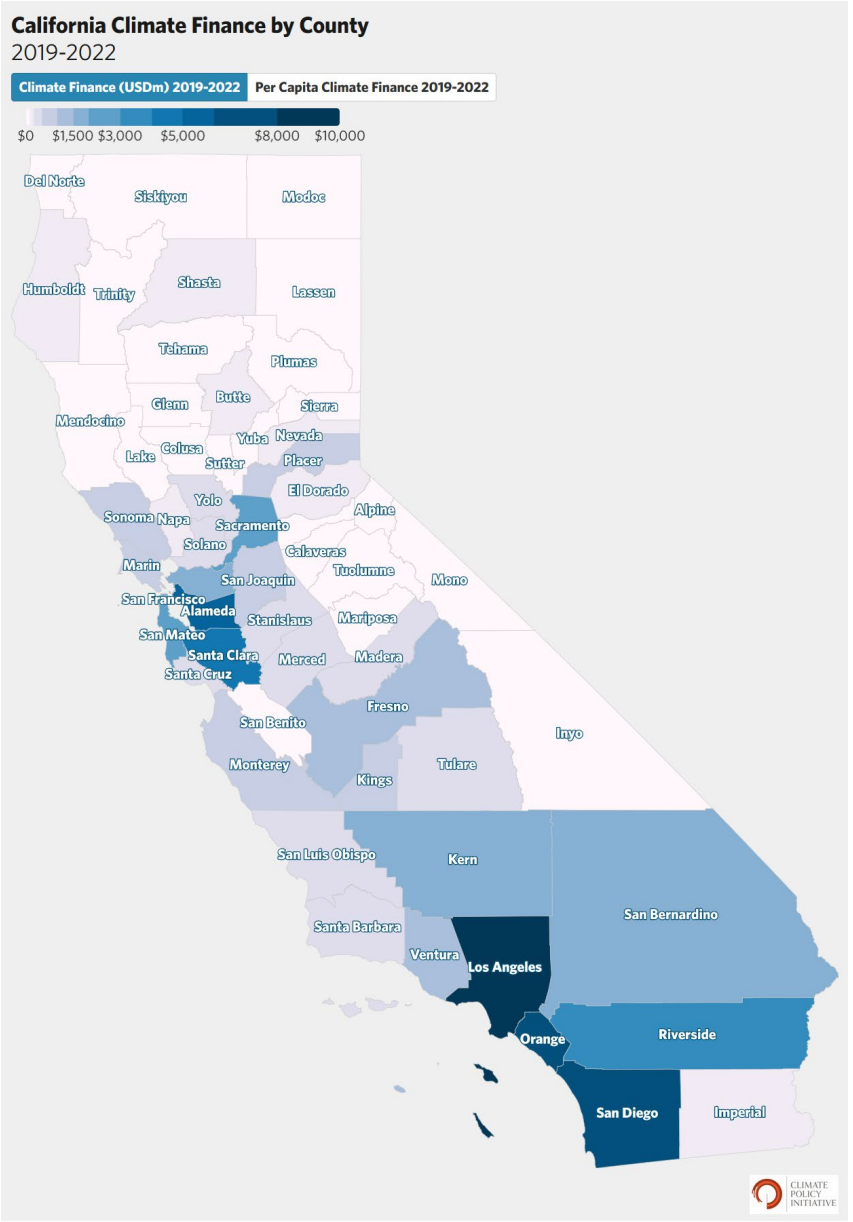
Figure 8: California State Climate Finance by Source



Climate finance is distributed relatively evenly per capita by county

- Although large counties, like Los Angeles, deploy more climate finance than smaller counties, on a per-capita basis climate finance is fairly evenly distributed across counties.*
- However, climate finance is not currently being channeled at a higher rate to those areas with worse current and historical pollution metrics.†
- This indicates further work is needed to ensure disadvantaged communities receive sufficient climate finance to address their needs.

An interactive version of this map is available on the CPI website.



* Due to data availability, county-level comparisons do not include distributed solar, the Active Transportation Program, or the Transit and Inter-City Rail Capital Program.

† Based on a comparison of average county-level CalEnviroScreen scores and per capita climate finance. Using a weighted average of census tracts by county, the correlation between CalEnviroScreen and per capita climate finance is -0.08.

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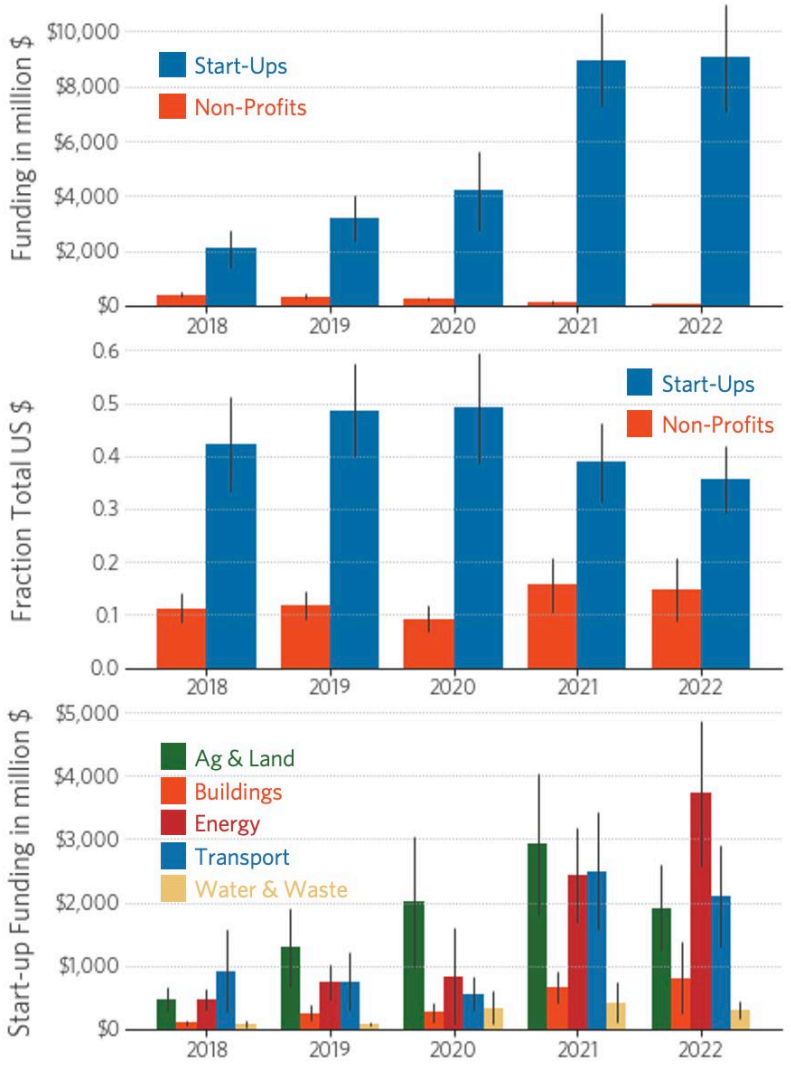
Venture capital to California climate companies reached ~$9bn in 2022, an average annual growth rate of ~50% since 2018

To complement the climate finance trends, we tracked funding to climate-related start-ups and non-profits.* While this funding was primarily venture capital and private philanthropy, ~22% of companies and ~12% of non-profits received at least one government grant.

- California climate venture grew >4-fold from 2018-2022 and matched the total public climate finance tracked in 2022 (~$9bn). Despite this growth, California's portion of total US climate venture fell from a peak of ~50% in 2019 and 2020 to ~36% in 2022.
- California climate philanthropy was at least an order of magnitude less than venture and declined 37% from 2018-2020.† It remained relatively constant as a percent of total US climate philanthropy at a level on par with California's % of the US population (~12%).
- By sector, ‡ California venture funding to Agriculture & Land Use matched or surpassed that to Transport or Energy Systems from 2019 to 2021 -- driven by large investments in plant-based foods (e.g. Impossible Foods). By 2022 Energy investments grew to almost double those in Agriculture & Land Use or Transport. Buildings was the fastest growing venture sector with an over 8-fold increase in funding from 2018-2022.



* Data were synthesized by Vibrant Data Labs and include pre-seed, seed, early venture, and late venture investments, philanthropic grants, and government grants to California-based, climate-related companies and non-profits. Post-venture funding was excluded. See ca.climatefinancetracker.com for data and methods. In all charts the bars are the median (and error bars the interquartile range) estimated from resampling the data 1,000 times.

† Sharper philanthropy declines were observed after 2020 likely due to tax filing delays at the time of data collection.

‡ Investments and grants were assigned to CPI sectors based on mentions of sector-relevant keywords in the descriptions of each funding recipient. If a recipient matched more than one sector, its total funding was evenly divided across those sectors.

Part 4: Conclusion

Recommendations for further action to achieve California's climate goals

Given CPI's findings on the growth and distribution of climate finance in California, policymakers, civil society, and the private sector can build on the state's progress.

1. **Develop a comprehensive roadmap** to close the climate investment gap in each sector, and implement policies to incentivize the transition to net zero and remove any remaining investment barriers.

2. **Track the impact of new policies** on climate finance trends, and adjust interventions accordingly.

3. **Identify opportunities where public and concessional funds can have the biggest impact** on increasing overall climate finance, including through pre-development, project preparation, and de-risking, especially for sectors or populations which are currently viewed as commercially unviable by the private sector.

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State government can play a catalyzing role in helping meet climate finance needs

Given current budget constraints, the state should continue to prioritize spending on programs that catalyze investment from the private sector and federal government, and that meet socio-economic policy priorities.

This can include funding for:

- **Pre-development to build capacity and develop projects** to a stage where they can access private sector or federal government funding, especially in less commercially viable sectors.
- **Bottleneck technologies** with relatively low overall needs compared to their benefits such as charging for electric vehicles ($44 million per year through 2035) and transmission for renewable energy ($1.1 billion per year).
- **Disadvantaged communities** which may not have the resources to make the energy transition on their own and are disproportionately impacted by current emissions.

The barrier to expanding finance is not always more money, as factors such as permitting, electric grid interconnections, coordination between different actors, and the existence of medium-term goals and plans can change the overall cost and risk profile of investments.

A full landscape of California climate finance could increase policy and investment effectiveness

A full landscape would build on this beta version to facilitate improved decision-making and prioritization for state policymakers, development banks, and philanthropies. Additional topics CPI could cover in a full landscape include:

- **Climate finance tracking**: Adding additional sectors and actors, such as private investment in building decarbonization and agriculture, climate finance through local budgets, and all state agencies and expenditures.
- **Needs assessment**: Identifying which actors are likely to play a role in each sector; adding sectors without clear decarbonization pathways; analyzing impacts of incorporating equity and economic priorities on climate finance needs.
- **Capacity building**: Identifying funds that can be used for matching federal funds, building local capacity through technical assistance, and facilitating project development.
- **Level of analysis**: Adding regional and sub-county climate finance tracking and needs assessment, including for specific disadvantaged and tribal communities.

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Learn more at:

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Annex

To provide data on progress towards CA's climate needs, we tailored CPI's existing methodology and prioritized the largest sources of finance for the beta version

- We tracked funding across different:
  - **Sectors** (CPI's definitions): Energy Systems, Industry, Waste, Water & Wastewater, Buildings & Infrastructure, Transport, Information & Communications Technology, Agriculture, Forestry, Other land uses & Fisheries, and Others & Cross-Sectoral
  - **Actor types**: Private, Federal Government, State Government, and Local Governments
  - **Financing instruments**: balance sheet-financing (equity and debt), project-level financing (equity and market-rate debt); and grants.
- The sectoral breakdown is slightly different from other sources (such as the CARB Scoping Plan), but there are only minor discrepancies in what would be categorized as climate finance in past spending. Future budgeted items may require deeper review between definitions, including for example funding for grid reliability and ratepayer support.

CLIMATE POLICY INITIATIVE

Notable data not included in this beta

Institution	Notable data not included in beta
State government	All **other non-CCI-funded climate-related state programs**, including for example: CEC's School Bus Replacement Program and Equitable Building Decarbonization Program, Safe and Affordable Drinking Water Fund, and flood plain and wetlands restoration programs State expenditures on climate-related activities, such as adaptation (e.g. wildfire fighting and prevention) and ZEV purchases for state fleets
Local government	Climate-related bond proceeds other than Residential & Commercial Energy Conservation Improvement and Public Transit City, county, MPO, and other sub-state entity budgets
Private	**Energy systems:** electric transmission & distribution; behind-the-meter battery storage **Transport:** ZEV medium- and heavy-duty trucks **Building energy efficiency / electrification:** heat pumps, heat pump water heaters, electric stoves, etc. **Agriculture and land-use**

CLIMATE POLICY INITIATIVE

Data inputs for needs assessment

Reference	Scope/coverage
Larson et al., 2021. Net-Zero America: Potential Pathways, Infrastructure, and Impacts.	Renewable energy, passenger ZEVs, ZEV Chargers DC Fast and Level 2.
California Air Resources Board, 2022. AB 32 Climate Change Scoping Plan.	Renewable energy, passenger ZEVs, medium- and heavy-duty zero-emission trucks, ZEV buses, Natural Working Lands, Buildings & Infrastructure, Methane.
California Public Utilities Commission, 2023. Fact Sheet: Decision 23-02-040 Ordering Supplemental Mid-Term Reliability Procurement (2026-2027) and Transmitting Electric Resource Portfolios to the California Independent System Operator for the 2023-2024 Transmission Planning Process.	Renewable energy.
California Independent System Operator, 2023. 2022-2023 Transmission Plan.	Electricity transmission.
California Independent System Operator, 2022. 2021-2022 Transmission Plan.	Electricity transmission.
California Independent System Operator, 2022. 20 Year Transmission Outlook.	Electricity transmission.
Kevala, 2023. Electrification Impacts Study Part I: Bottom-Up Load Forecasting and System-Level Electrification Impacts Cost Estimates.	Electricity distribution.
The Public Advocates Office, 2023. Public Advocates Office Study on the costs of upgrading the distribution grid for electrification.	Electricity distribution.
California Air Resources Board, 2022. Advanced Clean Cars II Regulation.	Passenger ZEVs.
California Air Resources Board, 2020. Advanced Clean Trucks Regulation.	Medium- and heavy-duty zero-emission trucks.

CLIMATE POLICY INITIATIVE

Data inputs for needs assessment

Reference	Scope/coverage
National Renewable Energy Laboratory, 2022. Annual Technology Baseline.	Renewable energy $/MW price.
California Energy Commission, 2017. Transportation Energy Demand Forecast 2018-2030 – Staff Report.	Passenger ZEV prices, medium- and heavy-duty zero-emission truck prices
Energy Information Administration, 2023. Annual energy outlook 2023.	Passenger ZEV prices.
Metropolitan Transit System, 2020. Zero-Emission Bus Fleet Transition Study.	ZEV bus prices.
National Renewable Energy Laboratory, 2020. Financial Analysis of Battery Electric Transit Buses.	ZEV bus prices.
World Resources Institute, 2019. Cost and Emissions Appraisal Tool for Transit Buses.	ZEV bus prices.
California Air Resources Board, 2021. Draft Advanced Clean Fleets Total Cost of Ownership Discussion Document.	Medium- and heavy-duty zero-emission truck prices.
International Council on Clean Transportation, 2023. Purchase costs of zero-emission trucks in the United States to meet future Phase 3 GHG standards.	Medium- and heavy-duty zero-emission truck prices.
California Energy Commission. CALeVIP DC Fast Chargers, Average Rebate, Unit Cost, and Total Project Cost per Charger.	ZEV Chargers DC Fast and Level 2.
U.S. Department of Energy, 2015. Costs Associated With Non-Residential Electric Vehicle Supply Equipment.	ZEV Chargers DC Fast and Level 2.
International Council on Clean Transportation, 2021. Charging Up America: Assessing the Growing Need for U.S. Charging Infrastructure Through 2030.	ZEV Chargers DC Fast and Level 2.