Cal-Adapt: Linking Climate Science with Energy Sector Resilience and Practitioner Need

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Cal-Adapt

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Linking Climate Science with Energy Sector Resilience and Practitioner Need

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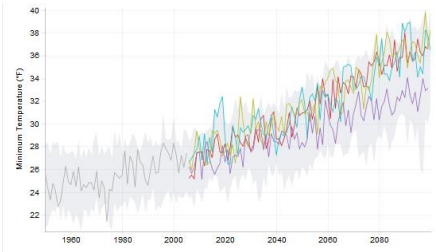
Our **Technical Advisory Committees** (past and present)
Stockholm Environmental Institute (prototype)
Amy Luers, then of google.org, key early collaborator

Cal-Adapt: A Tool for Energy Sector Resilience and Research

Cal-Adapt provides a scientific basis for exploring climate-related risks and resilience options for energy sector planning and adaptation.

- **Convey local climate risks** based on peer-reviewed science;
- Climate change projections presented in **easy-to-understand format** with plain English descriptions *and* scientific rigor;
- **Interactive maps and charts** provide a variety of approaches to explore different aspects of climate change;
- **Access to primary climate change data** for further analysis and research;
- Enable **development of custom tools** designed to manipulate climate change projections to support decision-making.



Cal-Adapt offers a variety of tools for exploring high-resolution projections of climate, including temperatures, precipitation, snowpack, sea level rise, and wildfire.

Cal-Adapt

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STATE OF CALIFORNIA ENERGY COMMISSION

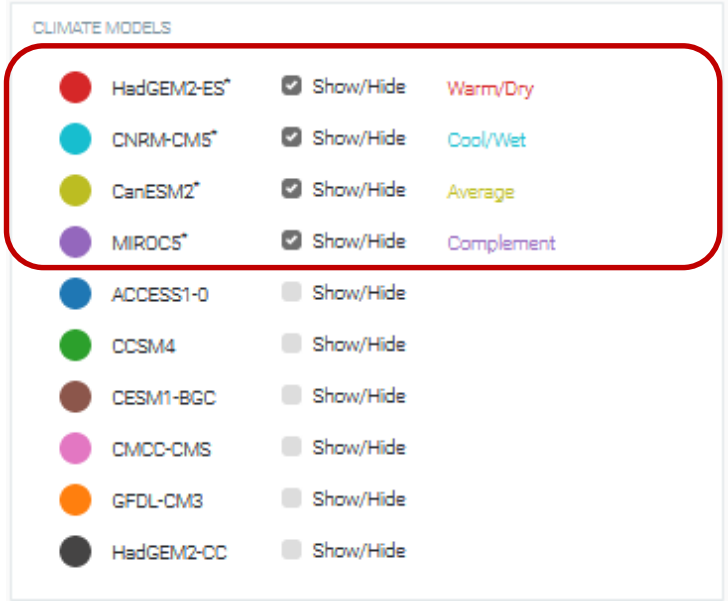
Cal-Adapt 2.0

- Higher resolution, higher fidelity data including:
  - Temperature and precipitation at daily time steps from LOCA (Localized Climate Analogues) downscaled CMIP5 data, Scripps Institution of Oceanography (Pierce et al. 2018)
  - Sea Level Rise inundation (Delta as well as open coast and bay)
  - Observed historical data (daily temperature, precipitation)
  - Wildfire projections
  - VIC hydrological variables
- Enhanced usability, including support for interpreting data and visualizations
- Built with modern and powerful data visualization libraries (e.g. D3, Leaflet)
- Public API* supports third-party tool development

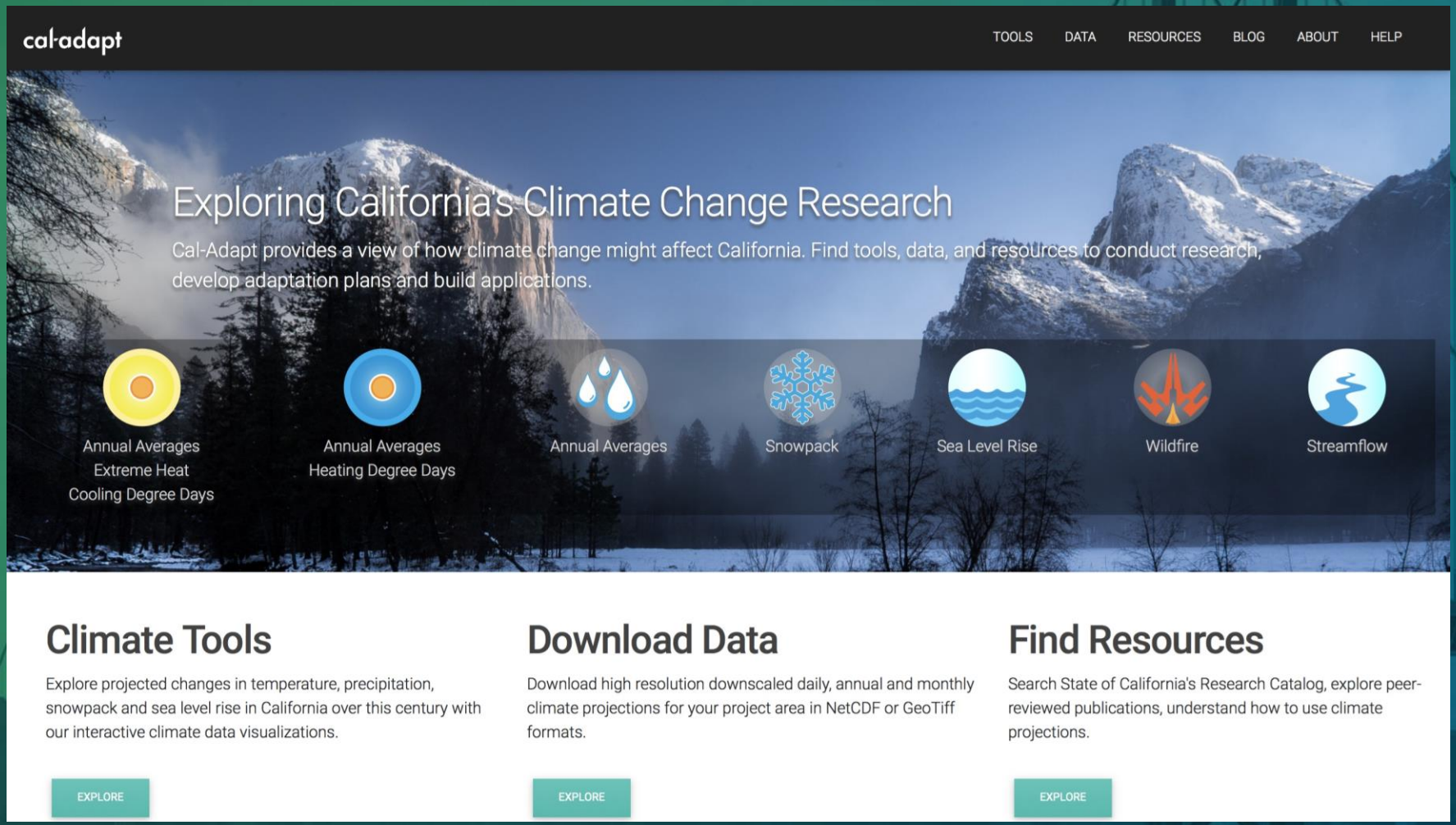
* Applications Programming Interface

Providing Scenarios Approved by State for Energy Sector Planning

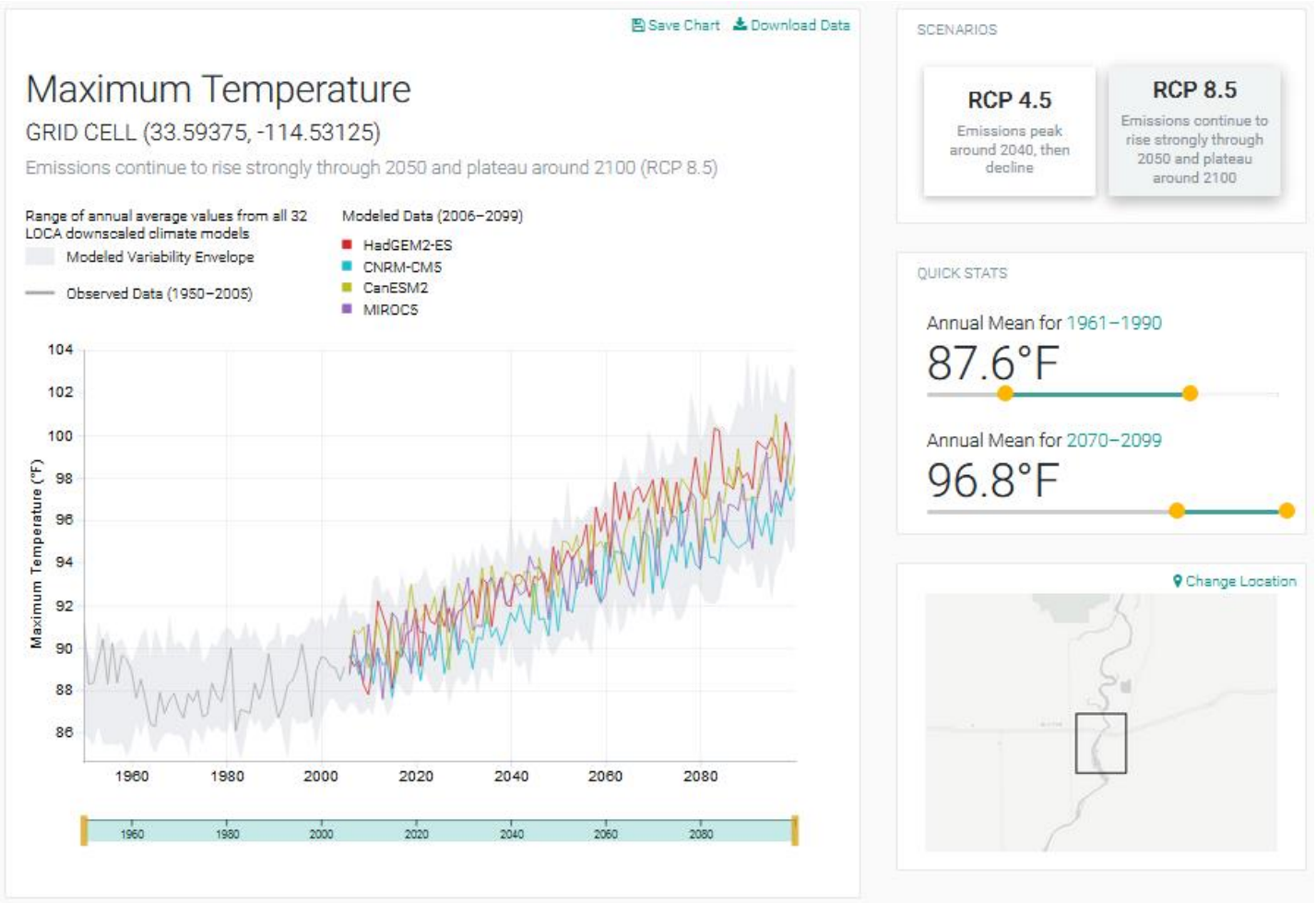
- **Recommended scenarios available via Cal-Adapt**, which defaults to the four "priority" models chosen to represent a range of possible futures.
- These scenarios are the **basis for California's Fourth Climate Change Assessment**.
- IOUs requested set of common standards, timeframes, and scenarios to rely on for planning.
- OPR's forthcoming guidance to state agencies will rely on these scenarios, too.



Cal-Adapt.org



Average Daily Maximum Temperatures in Blythe: Migrating Beyond Envelope of Historical Variability (*observed and modeled*)



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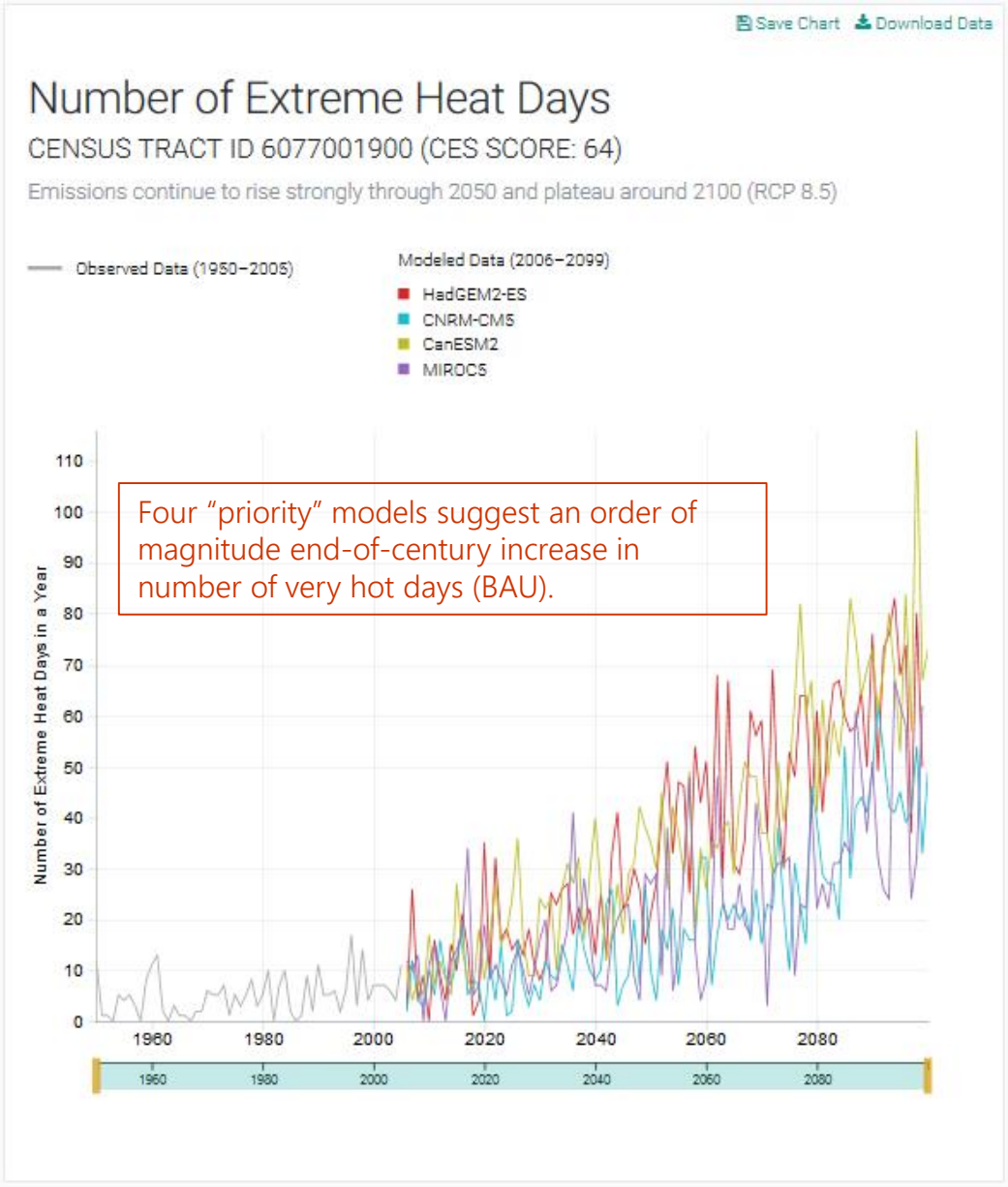
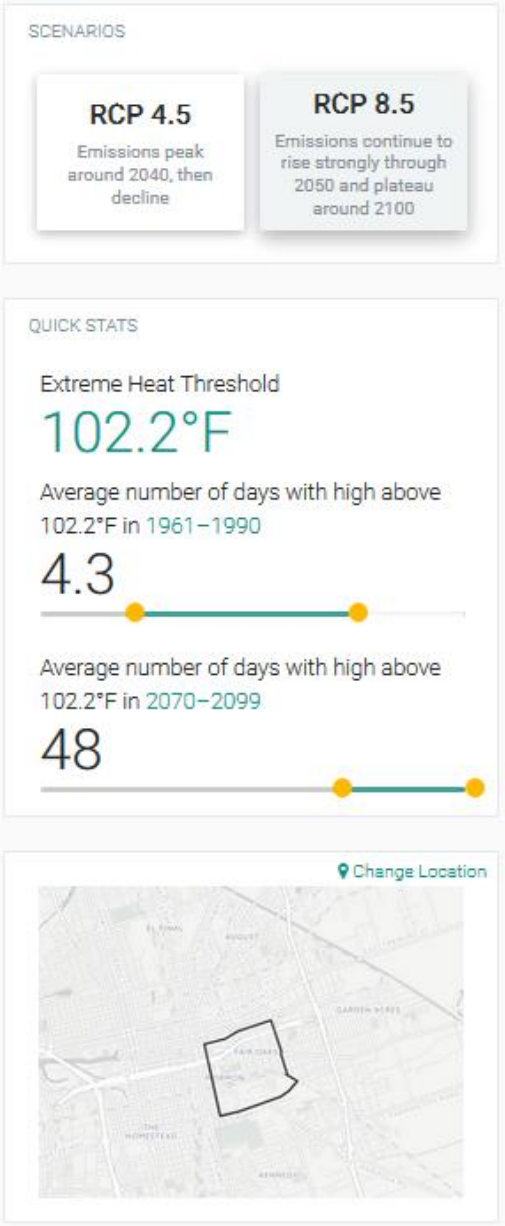
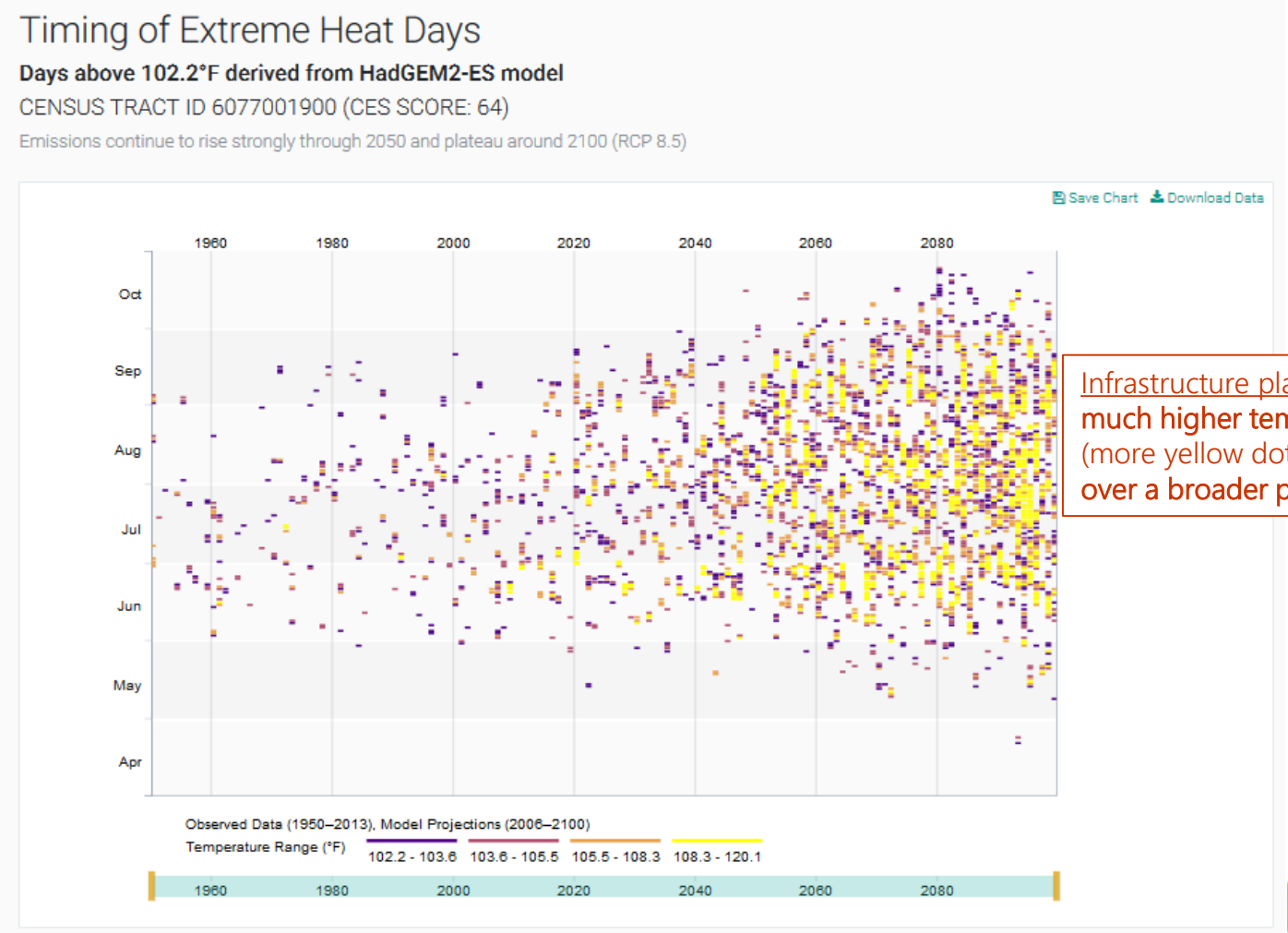
http://beta.cal-adapt.org/tools/annual-averages/#climatevar=tasmax&scenario=rcp85&lat=33.59375&lng=-114.53125&boundary=locagrid&units=fahren

Projected annual number of extreme heat days in a Disadvantaged Community in Stockton





Timing, Magnitude of Stockton's Extreme Heat Migrating Beyond Historical Bounds



Infrastructure planning: anticipate **much higher temperature extremes** (more yellow dots), which persist **over a broader portion of the year**.

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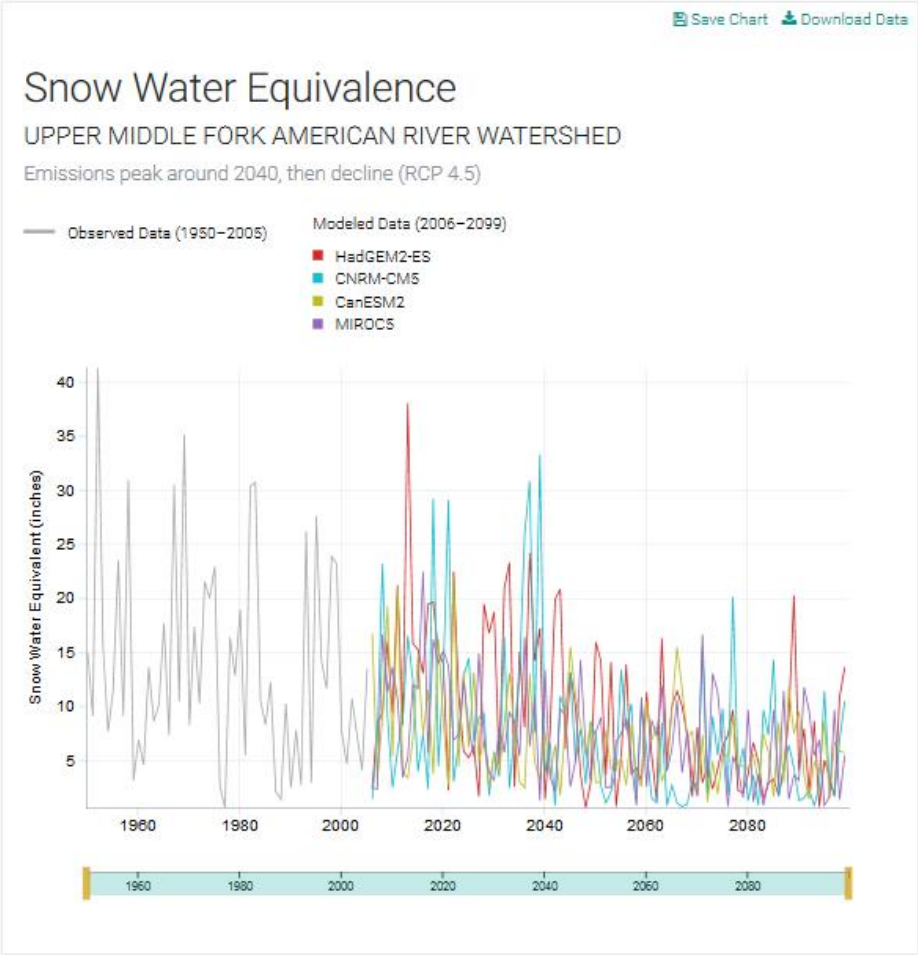
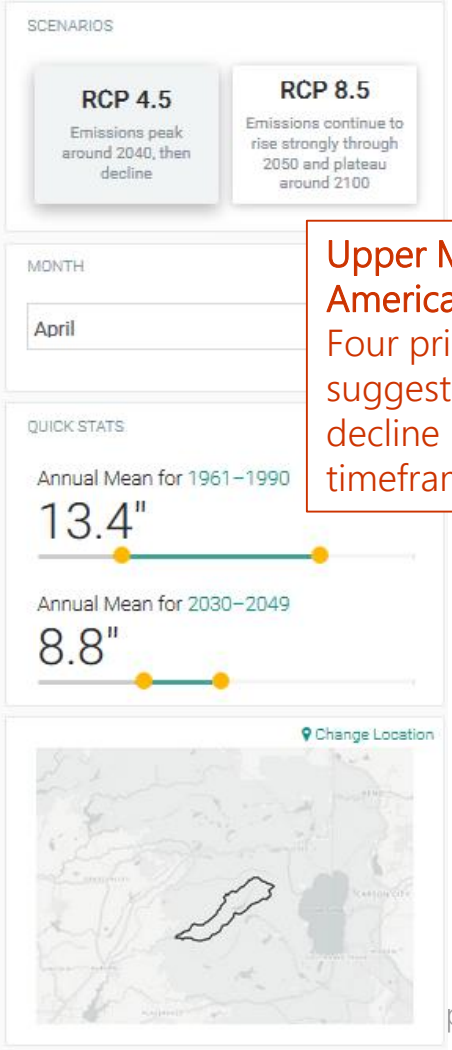
Upper Middle Fork of American River: Substantial Decline in Mid-Century Snowpack





Upper Middle Fork of American River Watershed: Four priority models suggest a 22% to 65% decline by the 2030-2049 timeframe (BAU scenario).

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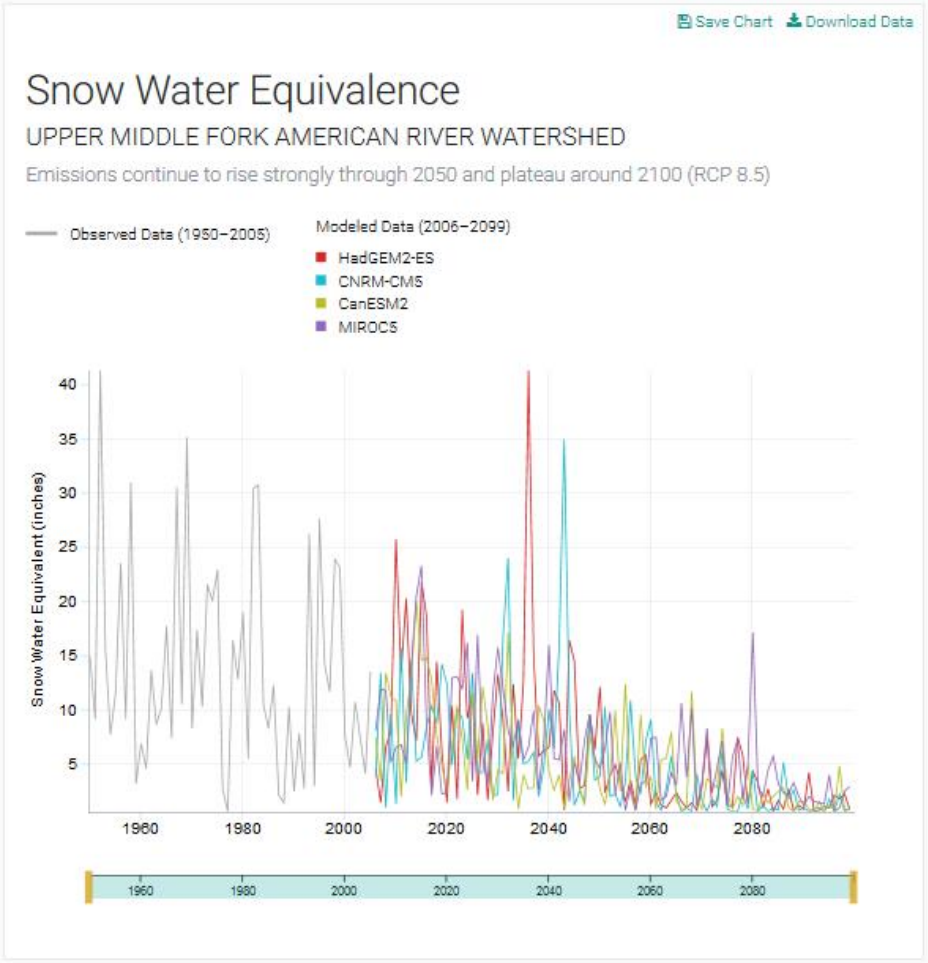
Upper Middle Fork of American River: Substantial Decline in End-of Century Snowpack



Upper Middle Fork of American River Watershed: Four priority models suggest 75% to 93% decline in April snowpack by end of century (BAU scenario).

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Cal-Adapt Use Cases: Energy Sector

California Investor-Owned Utilities participating in the **U.S. Department of Energy's Resilience Partnership** used Cal-Adapt tools and data to support vulnerability assessments:

- **PG&E**: used Cal-Adapt's extreme heat tool to explore intensity and duration of projected mid-century heat waves
- **SoCalEdison**: used Cal-Adapt in conjunction with spatial overlays of infrastructure and as a basis for exploring uncertainty.
- **SDG&E**: used Cal-Adapt to support a comprehensive GIS-based vulnerability study.

More about DOE's Resilience Partnership here: https://energy.gov/epsa/partnership-energy-sector-climate-resilience

Cal-Adapt Use Cases: Energy Sector

Moving beyond vulnerability assessments, California Investor-Owned Utilities participating have used Cal-Adapt to support **on-the-ground resilience efforts**:

- **SDG&E**: Used Cal-Adapt 2.0 to support climate-resilient design of a compressor station in Blythe, California, to investigate implications of climate re: SDG&E's Design Standards, and to explore climate dimensions of system hardening projects.
- **SoCalEdison** (SCE): Data available on Cal-Adapt 2.0 improved analyses regarding projected climate (e.g., Mesa Substation Project in Monterey Park, California); plans to integrate climate projections into existing planning models.

Ultimately, General Rate Cases that incorporate climate adaptation actions are envisioned, relying on data available on Cal-Adapt.

Cal-Adapt Use Cases beyond the Energy Sector

As an easy-to-use, free and publicly available tool that aligns with data endorsed by the state for research and planning, Cal-Adapt has been adopted by resilience initiatives beyond the natural gas and electricity sectors for which it was primarily developed:

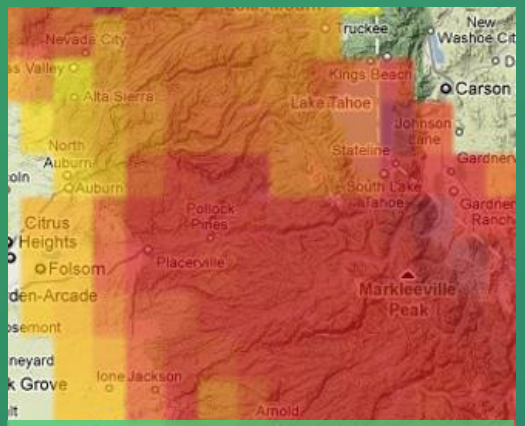
- The **California Department of Public Health** used climate risks portrayed by Cal-Adapt as the foundation of work to "Build Resistance Against Climate Effects" (BRACE) by preparing local and county-level public health departments for projected risks;
- The **California Government Operations Agency** (GovOps) **leveraged Cal-Adapt's publicly available Applications Programming Interface (API)** to develop an automated tool supporting incorporation of adaptation into Sustainability Roadmaps;
- The **United States Forest Service** (USFS) has already used Cal-Adapt for planning at least one **fuel treatment** (Tatham Ridge Project) with future climate conditions in mind;
- OPR's Adaptation Clearinghouse (a.k.a. **ICARP**, or Integrated Climate Adaptation and Resiliency Program), development of which was mandated by SB 246, **refers users to Cal-Adapt for exploration of local climate risks** through high resolution climate projections.

Cal-Adapt's Impact on Climate Adaptation Policy and Guidance in California

Cal-Adapt has already made a difference in adaptation and policy planning in California and has been explicitly recognized by California's legislature as a key recourse to support local hazard mitigation efforts:

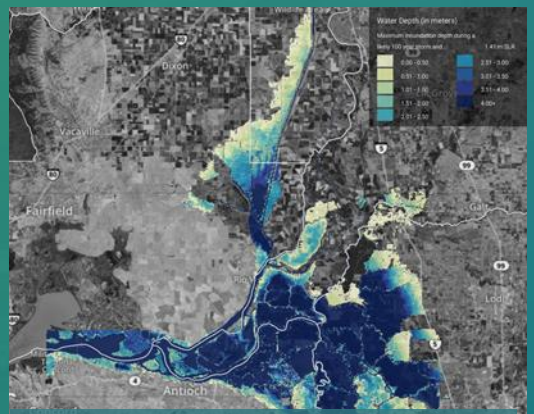
- Cal-Adapt is named as a resource by landmark legislation (SB 379) that requires the integration of climate-related risks into local hazard mitigation plans.
- General Planning Guidelines (2017 update) direct local governments to Cal-Adapt as resource to support assessment of climate -related vulnerabilities and development of adaptation policies.
- *Planning and Investing for a Resilient California* (January 2018) which provides adaptation guidance from the TAC established by OPR directs state agencies to Cal-Adapt as a source for peer- reviewed, state- sanctioned data depicting projected climate risks and for map overlays to facilitate planning and investment.
- In March 2017, the State Water Resources Control Board (SWRCB) approved a resolution (no. 2017- 0012) on "Comprehensive Response to Climate Change" directing staff to consult "the most current data available through Cal-Adapt."
- OPR's Adaptation Clearinghouse (the Integrated Climate Adaptation and Resiliency Program), development of which was mandated by SB 246, refers users to Cal-Adapt for exploration of local climate risks through high resolution climate projections.

Stakeholder Engagement is Critical!

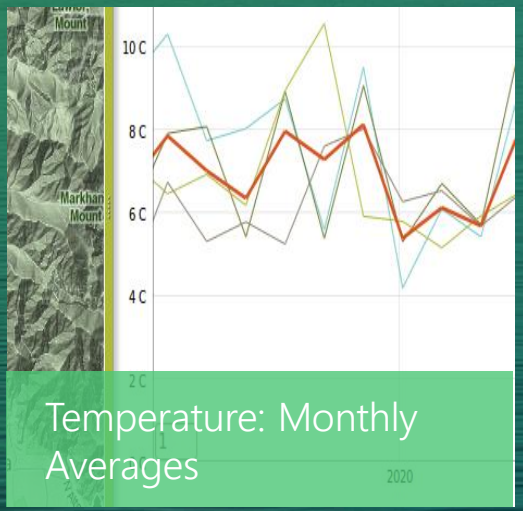


Wildfire Risk

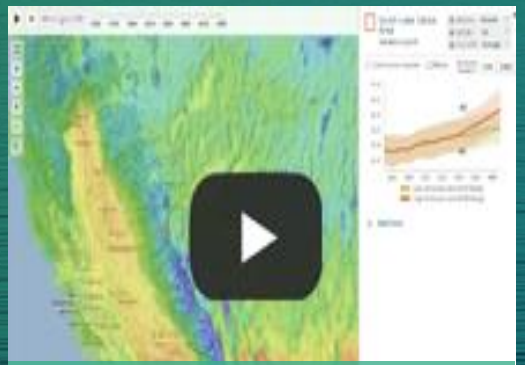
Local Climate Snapshots



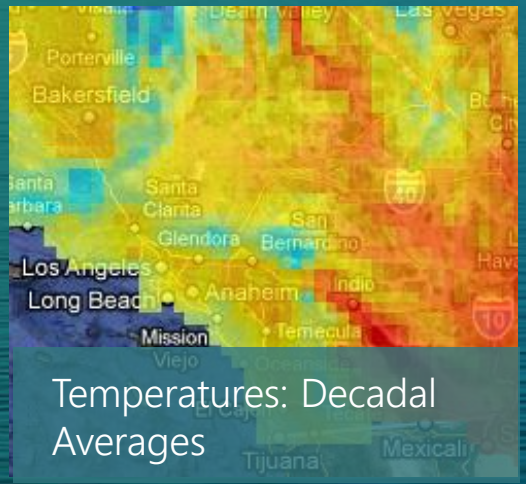
Comparative Sea-Level Rise



Temperature: Monthly Averages



Video Tour



Temperatures: Decadal Averages

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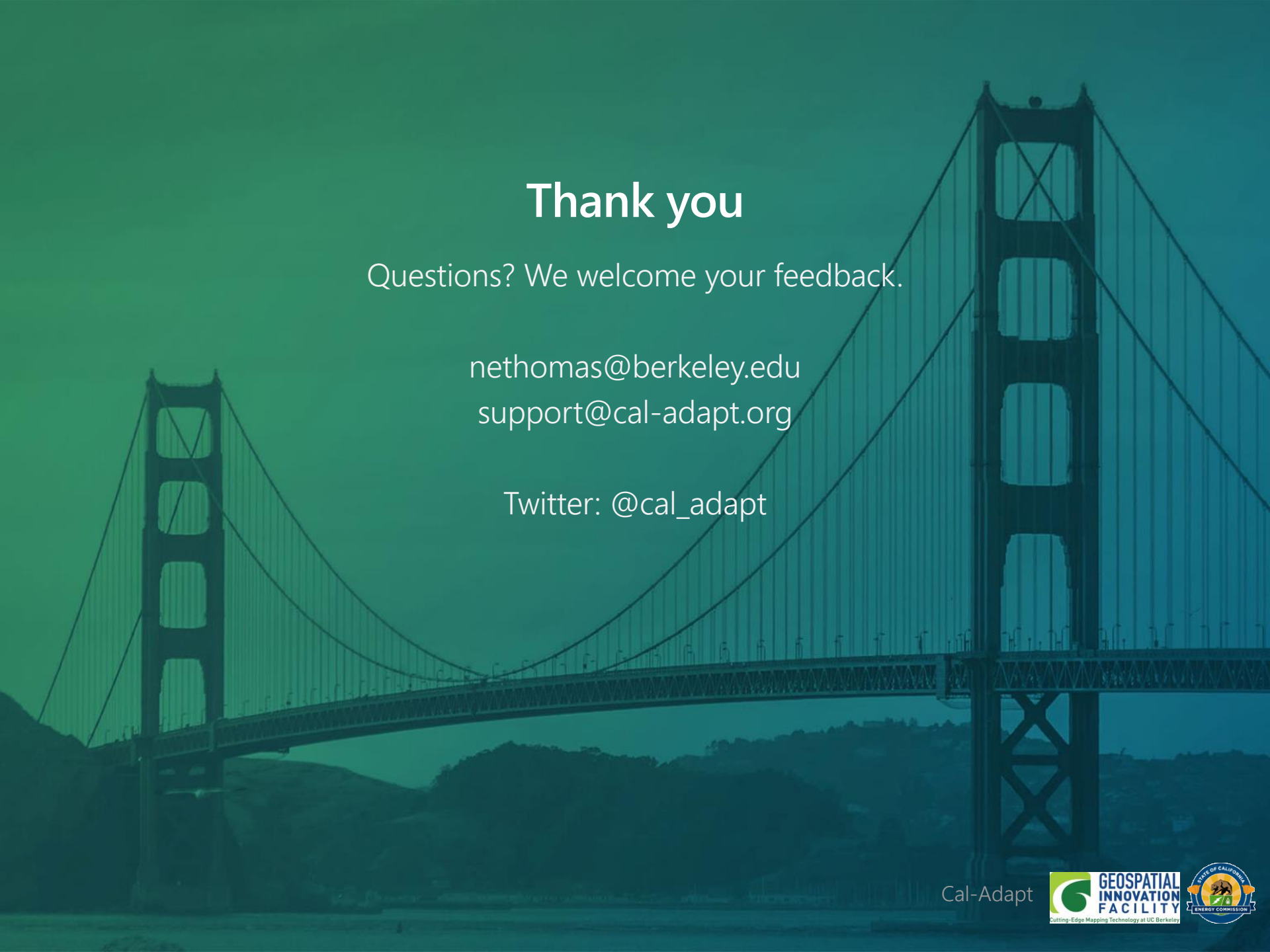

Thank you

Questions? We welcome your feedback.

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