PSE

psehealthyenergy.org

December 2020

Equity-Focused Climate Strategies for Colorado

Socioeconomic and Environmental Health Dimensions of Decarbonization

Findings, Conclusions, and Recommendations

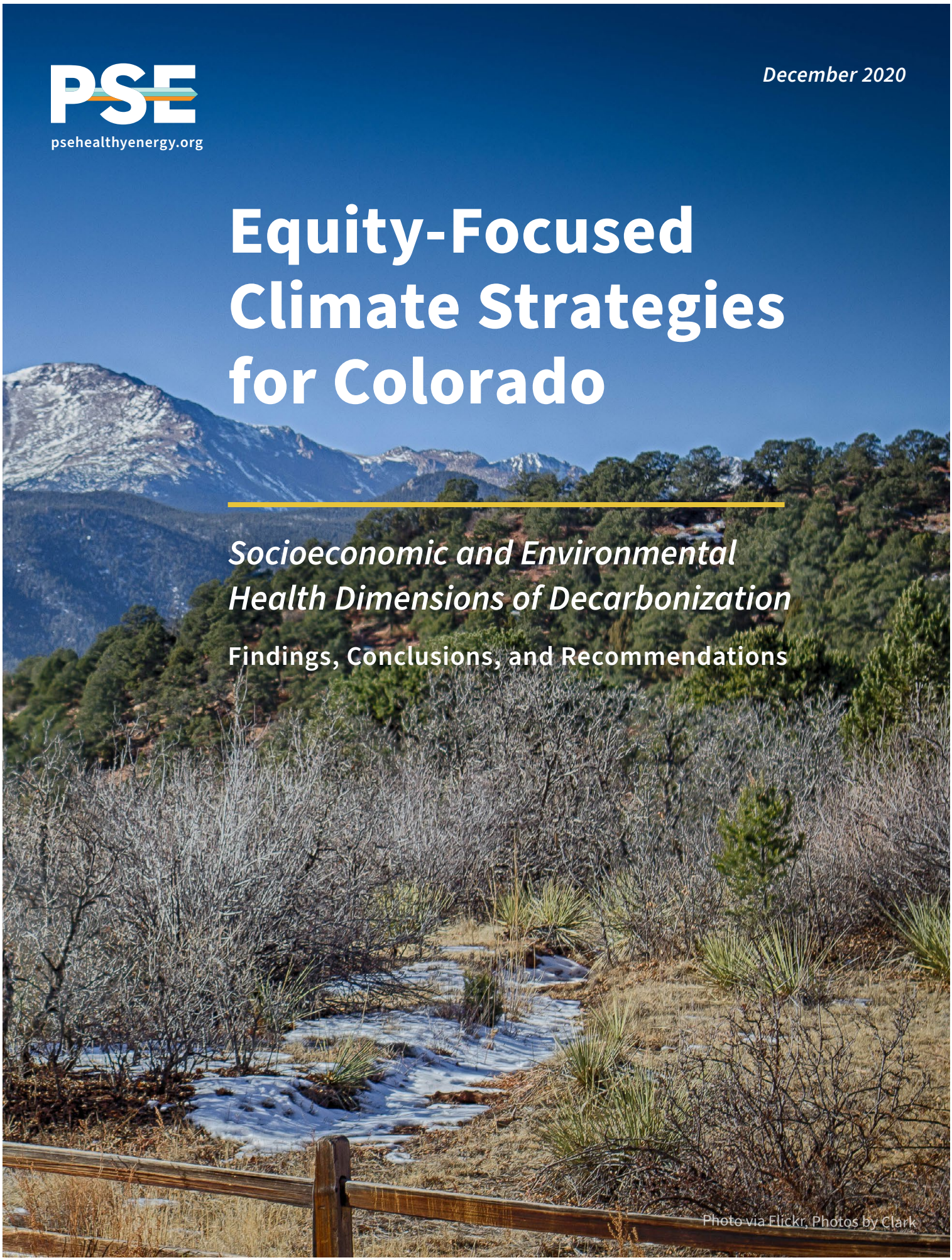


Photo via Flickr, Photos by Clark

Executive Summary

In the face of a warming climate and associated climate change impacts, the State of Colorado is embarking on an ambitious multi-decade effort to dramatically cut carbon emissions while confronting a growing need to build climate resilience. The State recently set targets to expand renewable electricity generation while slashing economy-wide greenhouse emissions. It is now developing pathways and policies to achieve these goals.

Colorado's current fossil fuel-based energy infrastructure, however, is not only a source of greenhouse pollutant emissions, but also releases emissions of health-damaging air pollutants across the state. Furthermore, low-income households in particular often struggle to pay for the electricity and fuels they rely on to power their homes and vehicles. As Colorado reshapes its energy system to reduce greenhouse pollutant emissions, it simultaneously has a unique opportunity to address the uneven environmental public health and economic burdens the current energy system places on the Colorado population.

In this analysis, we assessed opportunities and strategies to integrate pollution reduction, resilience to climate impacts (e.g. heat waves), and energy and environmental equity into the state's decarbonization plans, with a focus on Colorado's most environmentally overburdened and socioeconomically vulnerable communities.

To do so, we:

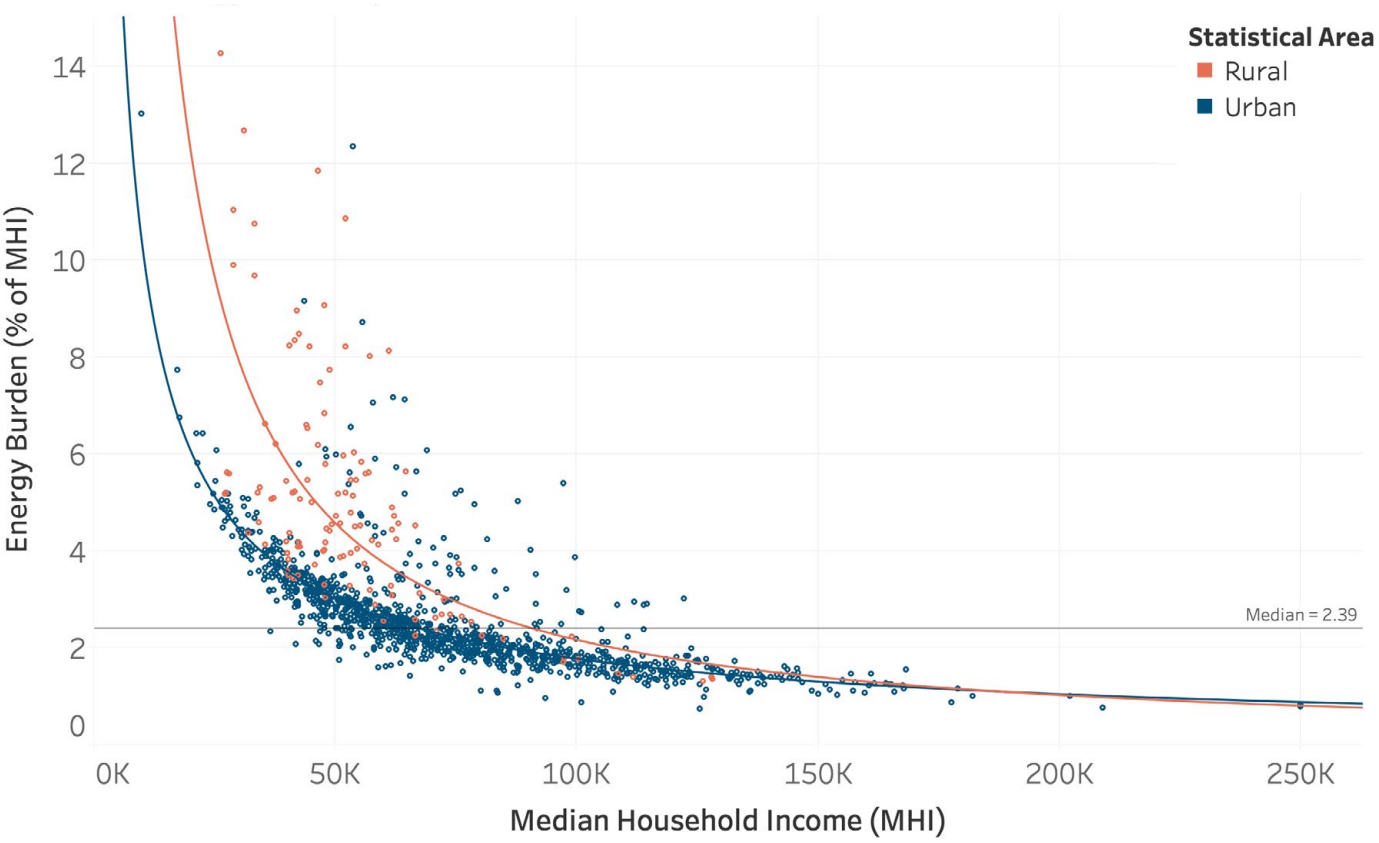
1. Identified regions and populations currently facing high cumulative emissions from fossil fuel production and use,
2. Characterized household and transportation energy cost burdens and clean energy access across the state, and
3. Identified decarbonization strategies that simultaneously reduce health-damaging air pollution and energy cost burdens while increasing climate resilience.

For this last component, we analyzed four 2020-2050 decarbonization pathways developed by Evolved Energy and outlined in the companion report *Committing to Climate Action: Equitable Pathways for Meeting Colorado's Climate Goals.*

The findings, conclusions, and recommendations that stem from our analysis are presented below for each significant energy-consuming sector of Colorado's economy. The development of integrated policy solutions will also require the full and ongoing engagement of impacted households and communities.

We find that decarbonization across Colorado has the potential to improve public health and reduce energy cost burdens. However, our analysis also suggests that these co-benefits may not accrue evenly across the state and that disparities in fossil fuel pollution and economic impacts may be exacerbated with a decarbonization strategy focused exclusively on carbon emissions. Instead, environmental and energy equity goals have to be built into decarbonization strategies from the beginning.

Residential Buildings



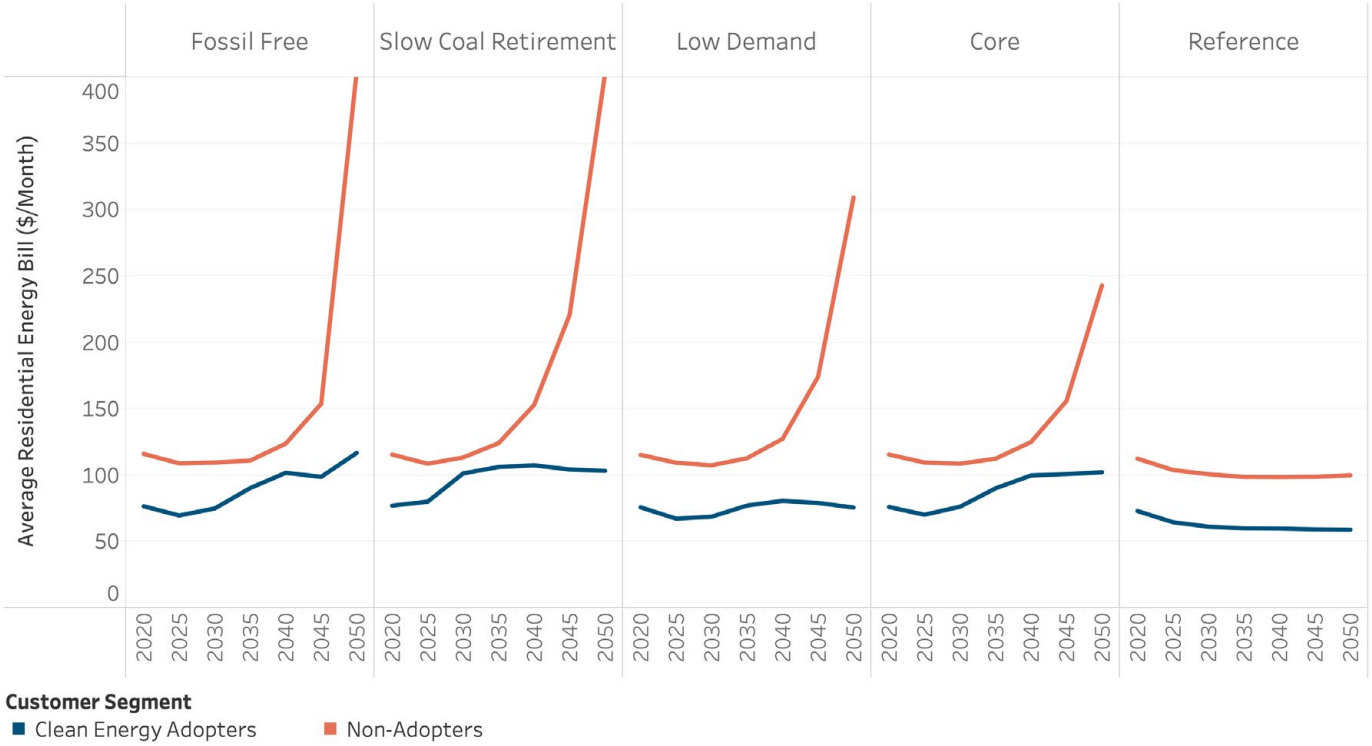
ES Figure 1. Energy cost burdens and median household income by census tract. Energy costs burdens—the fraction of household income spent on residential utility bills—are higher in rural areas and significantly higher in low-income communities.

1 Residential Energy Cost Burdens

Finding: Households in low-income census tracts use less energy than wealthier households but face exponentially higher *energy cost burdens*—meaning they spend larger fractions of their income on utility bills—and also lag in access to clean energy technologies such as rooftop solar.

Conclusion: Low-income households would significantly benefit from cost-saving energy measures such as energy efficiency, and bill stabilization measures such as rooftop solar, but face barriers to adopting clean energy technologies.

Recommendation: Ensure equitable access to the economic and health benefits of energy efficiency, distributed energy resources (e.g. rooftop solar + storage), and decarbonization. Potential measures include community outreach to identify barriers to adoption, provision of up-front financing rather than tax incentives, design of incentives for landlords to upgrade rental properties while protecting tenants, and development of clean energy programs, targets, and carve-outs to serve low-income households and historically underserved communities.



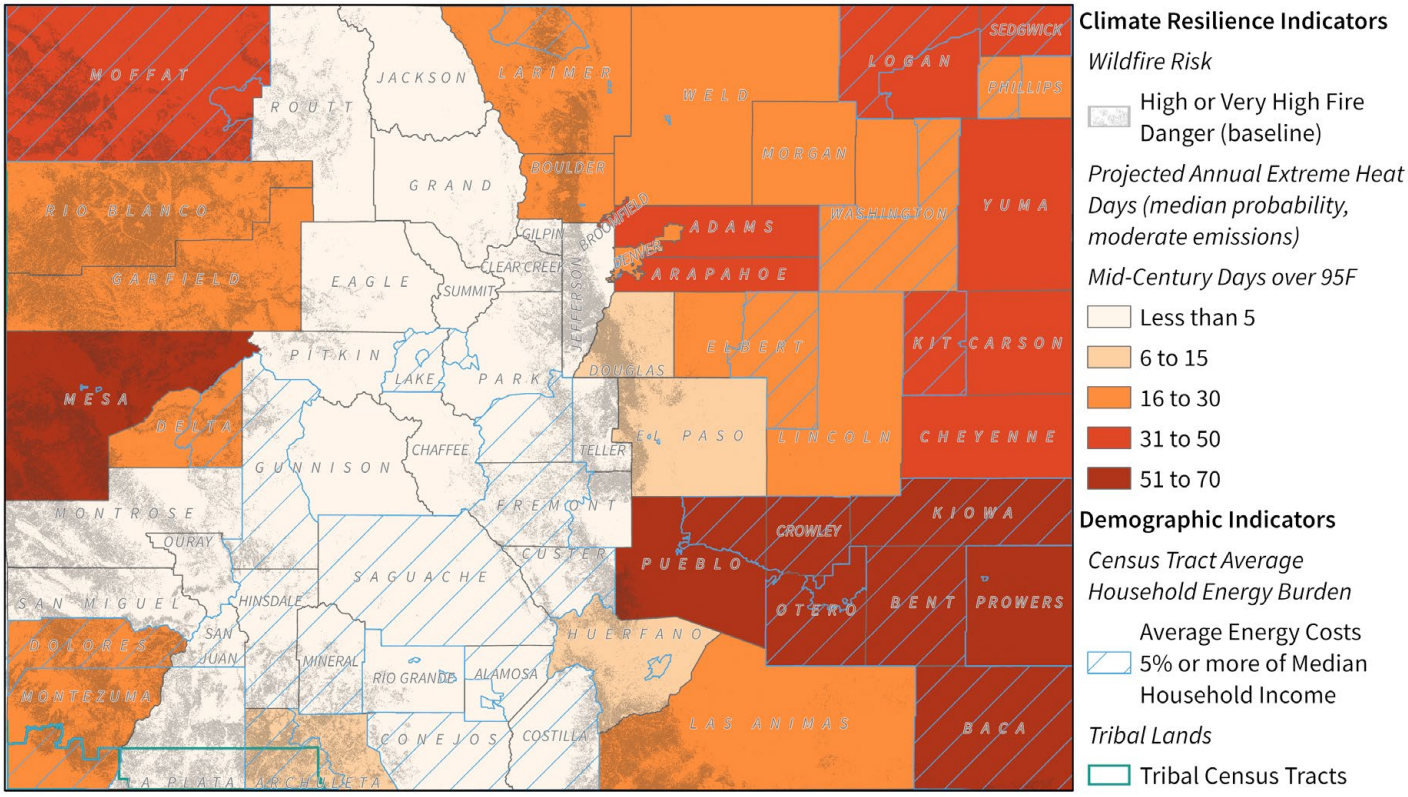
ES Figure 2: Residential energy bills for electrification and efficiency adopters compared to non-adopters. Scenarios include a Reference case compared to four decarbonization pathways: Core (rapid decarbonization of electricity), Low Demand (increased efficiency and public transit), Slow Coal Retirement (coal plants operate past 2030), and Fossil Free (elimination of fossil fuels by 2050). Unless mitigation strategies are taken, all four decarbonization scenarios result in escalating utility bills after 2035 for households that do not electrify their appliances and continue to use natural gas. This result is because fewer customers would be paying for upkeep of aging gas infrastructure.

2 Aging Gas Infrastructure Bill Impacts

Finding: Households that do not adopt clean energy technologies, including efficiency measures and the electrification of gas appliances, risk facing escalating utility bills in the 2035-2050 time period in order to cover the costs of an aging gas distribution system in transition.

Conclusion: Historically, low-income households in Colorado have significantly lagged behind wealthier households in adopting rooftop solar and electric vehicles because of barriers such as lack of access to financing and landlord-renter split incentive challenges (wherein landlords do not have the incentive to invest in efficiency measures that save their tenants money). These households are likely to lag behind in electrification measures as well; if so, their gas utility bills will grow as fewer households pay for maintaining an aging gas infrastructure.

Recommendation: Plan for a geographically targeted and complete phase-out of the natural gas distribution system, one area at a time, with targeted utility rate-stabilization for non- or late-electrification adopters.



ES Figure 3: Projected extreme heat days, wildfire risk, and average household energy cost burdens. Certain communities across Colorado face cumulative stressors from high energy cost burdens as well as climate impacts such as extreme heat and wildfires. These communities may benefit from resilience-focused and cost-saving energy measures.

3 Climate Resilience

Finding: Certain Colorado populations will face extreme heat, weather- and fire-induced grid outages, and other stressors related to climate change; many of these households are also low-income and have high energy cost burdens.

Conclusion: Efficiency measures, distributed solar + storage, and other clean energy measures may provide resilience and economic benefits to low-income households, individuals requiring reliable electrical equipment for medical care, and rural households facing high utility bills, extreme heat, and additional climate stressors.

Recommendation: Consider targeted incentives, clean energy carve-outs, and other distributed energy resource deployment strategies to maximize public health and climate resilience benefits. These include an expansion of residential solar + storage systems in high-risk areas to provide backup during grid outages. Efficiency upgrades and solar + storage may particularly benefit low-income households, sensitive populations such as medical baseline customers, and those facing extreme heat and other stressors related to climate change. The State should also consider shifting some utility-scale renewable energy and storage targets to smaller distributed energy resources throughout the community, including microgrids, in order to provide additional bill savings and resilience co-benefits.

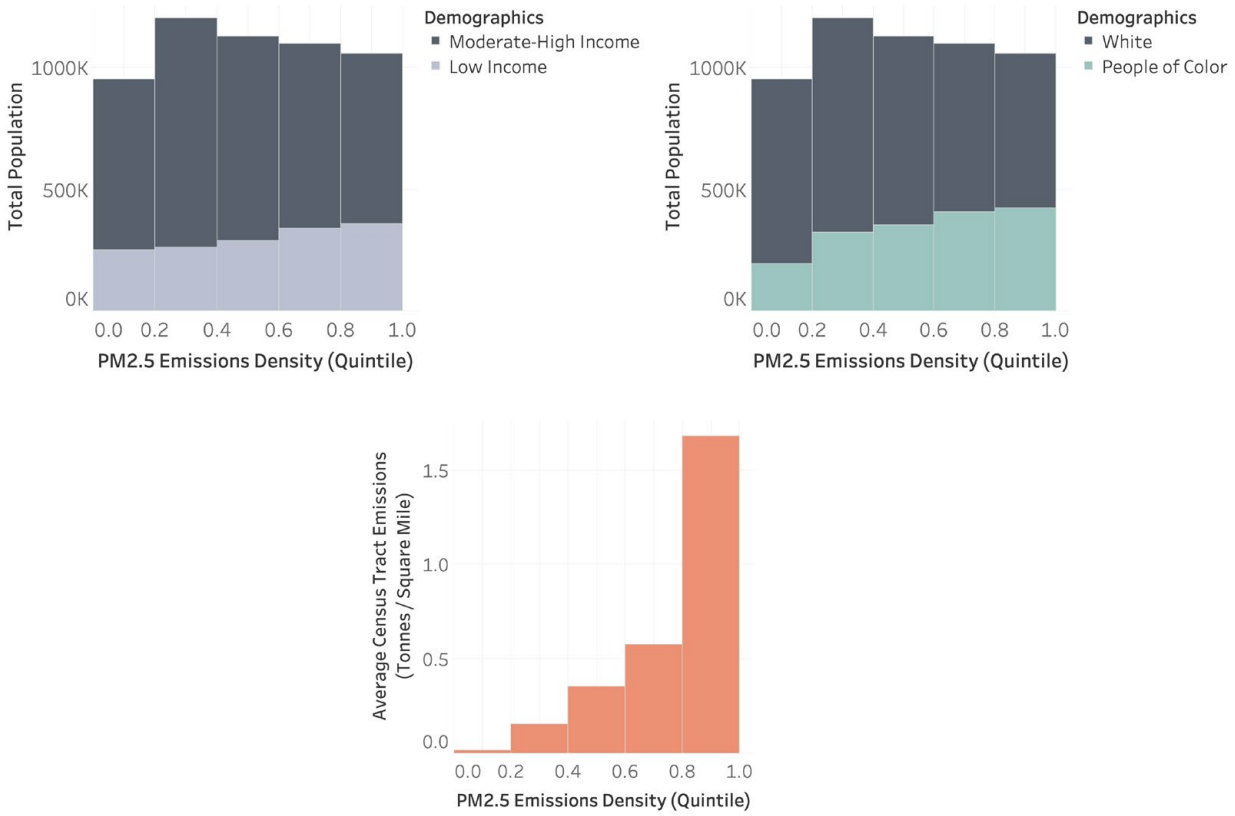
4 Residential Wood Burning

Finding: Nearly half of Colorado's residential air pollutant emissions—notably particulate matter and volatile organics, which can degrade indoor as well as outdoor air quality—come from burning wood; however, residential wood use is not included in decarbonization planning and models suggest this wood use will continue at current levels.

Conclusion: Decarbonization of residential buildings will help improve indoor air quality impacts of natural gas use but not impacts related to wood use unless additional measures are taken. This finding suggests indoor air pollution related to wood burning may persist, particularly in rural areas where it is most common.

Recommendation: Include buildings that burn wood in emission reduction strategies in order to help improve health outcomes in rural areas.

Transportation



ES Figure 4: 2017 particulate matter emissions from on-road vehicles and demographics of nearby populations. On average, census tracts with higher particulate matter emission densities have a greater fraction of low-income households and people of color. The density of particulate matter emissions from on-road vehicles increases exponentially across quintile brackets.

1 Health-Damaging Pollutant Emission Disparities

Finding: Particulate matter emissions from on-road vehicles are more dense, on average, in census tracts where low-income people and people of color make up a greater fraction of the population. Emissions are greatest per unit area along urban highway corridors, where trucks, particularly those of older vintages, contribute disproportionately to nitrogen oxides and particulate matter emissions.

Conclusion: As older models of heavy-duty and medium-duty trucks have much higher emission factors for particulate matter and nitrogen oxides, prioritizing their retirement will have a significant impact on emission reduction rates along urban highway corridors and other trucking routes in the coming decade.

Recommendation: Accelerate medium- and heavy-duty truck electrification and emission reductions by 1) prioritizing the retirement of old, high-emitting heavy and medium-duty trucks 2) providing sufficient financial incentives for small businesses to convert their trucks, 3) rerouting trucks away from dense, urban areas with high cumulative environmental burdens, 4) limiting truck idling, and 4) creating enforceable in-state targets to support interstate trucking electrification goals.

2 Transportation Fuel Cost Burdens

Finding: Low-income households in Colorado pay a higher share of their income towards transportation fuels than higher-income households, but lag behind them in electric vehicle adoption rates.

Conclusion: Low-income households stand to benefit the most from financial savings associated with electrification, but will likely be late adopters of electric vehicles in the absence of targeted policies.

Recommendation: Design financial incentives to support low-income adoption of electric passenger vehicles, such as up-front financing, point-of-sale rebates, low-interest loans, and rebates for trading out inefficient vehicles. Incorporate community input to guide electric vehicle charging infrastructure investments that can facilitate electric vehicle adoption among households facing access barriers.

3 Public Transit

Finding: The Low Demand decarbonization scenario, which prioritizes public transportation and efficiency, yields the lowest costs and most significant public health benefits by reducing overall vehicle travel and associated emissions.

Conclusion: Public transit expansion, which results in co-benefits such as increased transit accessibility, can promote broader public health and economic benefits.

Recommendation: Coordinate efforts by local, regional, and state governments—with outreach to local communities—to expand electrified public transit, where appropriate, to reduce overall vehicle travel while improving transit access for mobility-limited households.

Electricity Generation

1 Coal Retirements

Finding: The decarbonization pathway that leaves coal online while reducing carbon dioxide emissions through electrification and efficiency measures in other sectors results in higher overall emissions of criteria air pollutants (e.g. particulate matter, nitrogen oxides, and sulfur dioxide) compared to pathways that prioritize coal retirement.

Conclusion: Coal should be retired quickly to ensure the greatest criteria air pollutant reduction benefits from decarbonization.

Recommendation: Accelerate power sector coal retirements in decarbonization plans through measures such as renewable portfolio standards and criteria air pollutant emission caps.

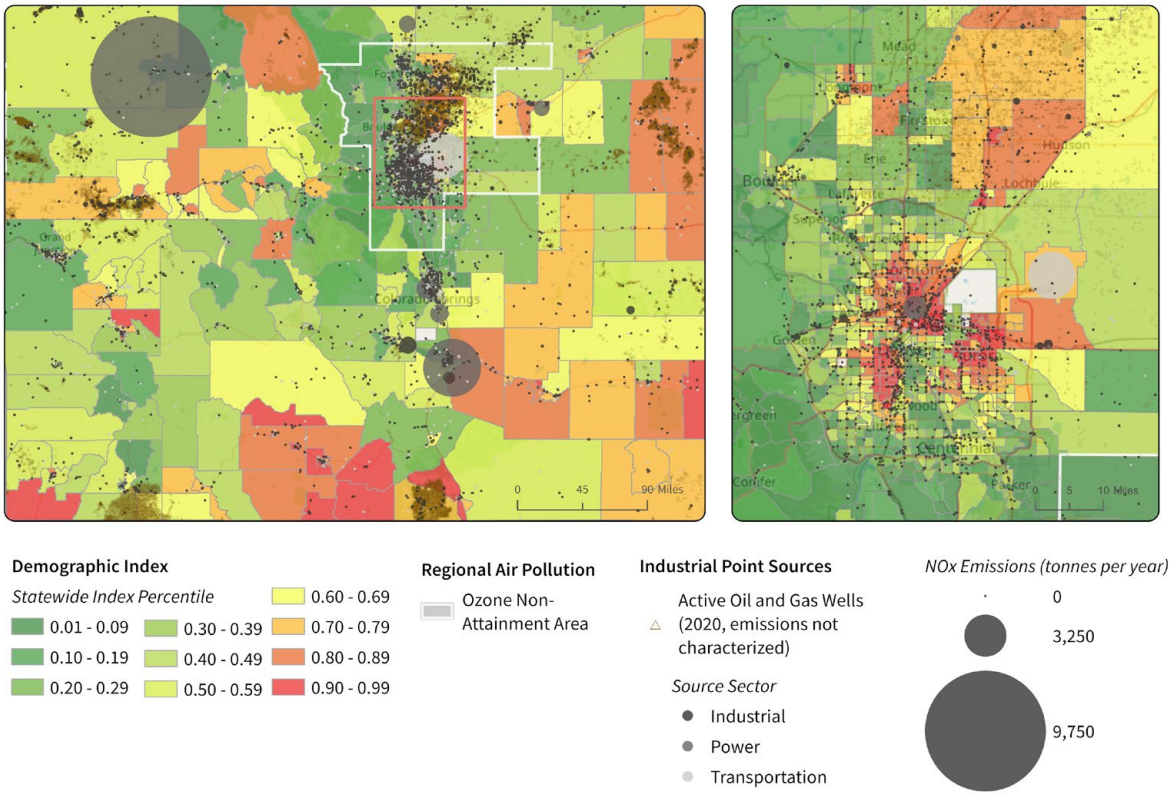
2 Gas Plants in Disadvantaged Communities

Finding: Colorado's power plants, particularly its natural gas plants, are disproportionately located in communities with a higher share of populations of color and low-income households than the median for the state; this trend holds within the Denver metropolitan area ozone nonattainment region.

Conclusion: Most of the decarbonization scenarios rely on some remaining natural gas plants for reliability. The state therefore runs a risk that these gas plants will disproportionately be those in urban, low-income communities and communities of color, particularly in the Denver area.

Recommendation: Ensure that power plants left online for reliability are not disproportionately those in socioeconomically disadvantaged communities with high cumulative environmental burdens. Some of these plants may be feasibly replaced in the near term with a suite of large-scale energy storage systems and distributed energy resources targeted at reducing peak demand requirements in urban load pockets.

Oil and Gas and Other Industry



ES Figure 5: Pollutant emission point sources and Demographic Index. Many communities with high socioeconomic burdens (as reflected in the Demographic Index) are also impacted by high cumulative criteria air pollutant sources.

1 Cumulative Socioeconomic and Environmental Burdens

Finding: Certain Colorado communities face numerous socioeconomic burdens and simultaneously are overburdened with a disproportionate share of pollution from industrial facilities and other sources.

Conclusion: Failure to address the problem of spatially clustered polluting facilities risks leaving disproportionate residual pollution burdens in pollution-overburdened communities.

Recommendation: Prioritize fuel switching and decarbonization in communities with high cumulative environmental burdens and sensitive populations. Include outreach to address community concerns, and ensure funding is set aside to remediate polluted sites.

2 Oil and Gas Production

Finding: Four percent of Coloradans live within half a mile of an oil or gas well, including many people living in rural areas.

Conclusion: If oil and gas production continues while the rest of the state decarbonizes, these populations will continue to face related pollution even as it declines in other areas.

Recommendation: Implement increased setbacks between oil and gas development and places where people live, work, play, and learn. In addition, deploy the best available emission control and monitoring technologies as soon as possible, and fully phase out in-state oil and gas production, extraction, and processing by 2050 at the latest.

About PSE Healthy Energy

Physicians, Scientists, and Engineers for Healthy Energy (PSE) is a multidisciplinary, non-profit research institute that studies the way energy production and use impact public health and the environment. We share our work and translate complex science for all audiences. Our headquarters is located in Oakland, California.

Contact: info@psehealthyenergy.org

Full report available at:
www.psehealthyenergy.org/our-work/western-states-deep-decarbonization/

PSE Bringing science to energy policy