psehealthyenergy.org

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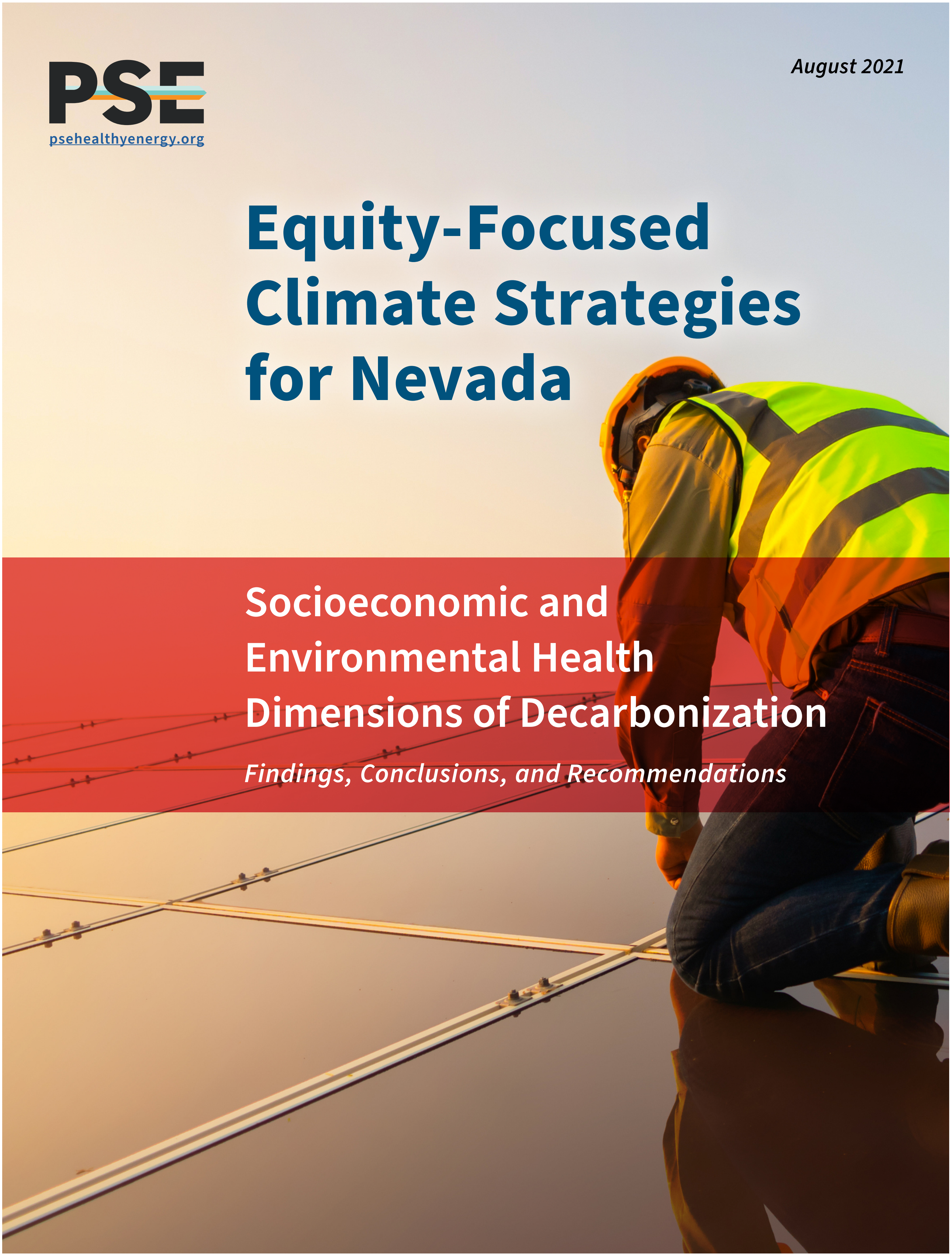
Equity-Focused Climate Strategies for Nevada

Socioeconomic and Environmental Health Dimensions of Decarbonization

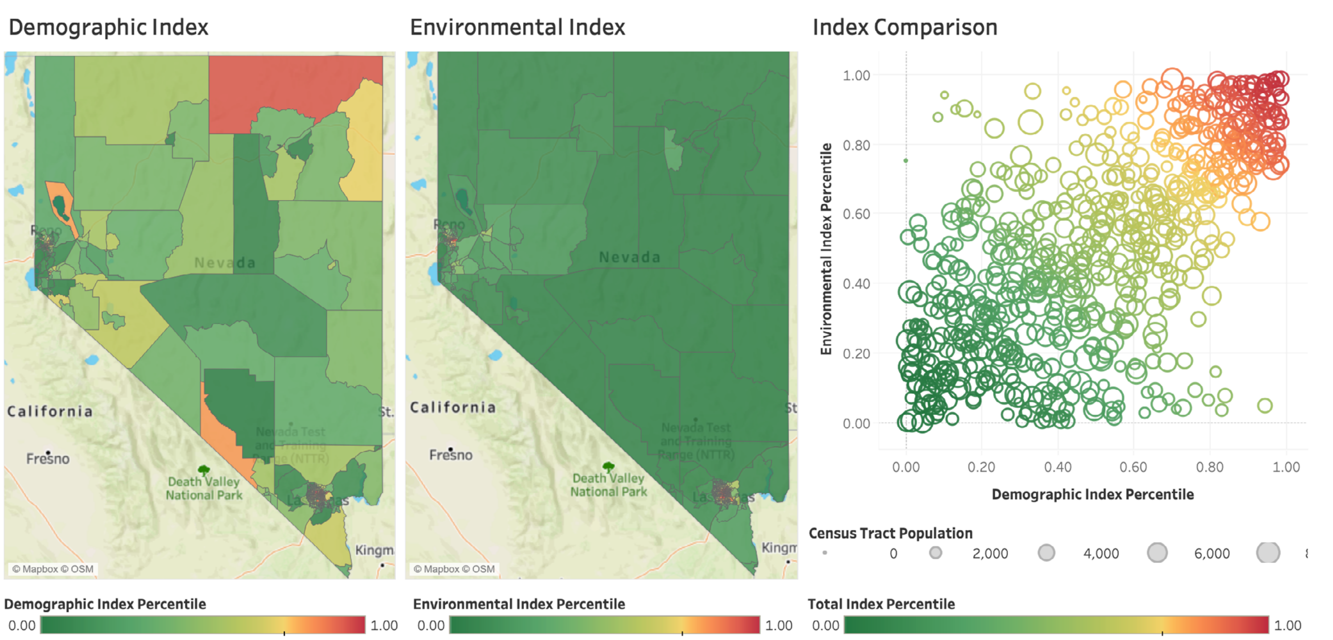
Findings, Conclusions, and Recommendations



Executive Summary

In the face of a warming climate and associated impacts, the State of Nevada is embarking on an ambitious multi-decade effort to dramatically cut carbon emissions while confronting a growing need to build climate resilience. In 2019, the State set targets to expand renewable electricity generation while slashing economy-wide greenhouse emissions. It is now developing pathways and policies to achieve these goals.

Nevada's current fossil fuel-based energy infrastructure, however, is not only a source of greenhouse gas emissions, but also releases emissions of health-damaging air pollutants across the state. Furthermore, low-income households and populations of color often struggle to pay for the electricity and fuels they rely on to power their homes and vehicles—further exacerbated in 2020 by the economic impacts of the COVID-19 pandemic. These and many other social inequities impact every sector of the economy, and decarbonization efforts should consider these existing disparities in order to develop clean energy transition strategies that distribute benefits more evenly across the Nevada population.



ES Figure 1. In the Demographic Index on the left, neighborhoods that are orange or red have a higher share of combined low-income, racial minority, limited educational attainment, linguistically isolated, elderly, and very young populations than other Nevada census tracts. In the Environmental Index (middle), neighborhoods that are orange or red have high concentrations of pollution or polluting facilities, or high excess health risk associated with pollution from numerous sources.The plot on the right shows a strong correlation between communities with high cumulative pollution and socioeconomic burdens.

In **Figure ES 1**, we created a Demographic Index to identify socioeconomically overburdened populations and an Environmental Index to identify high cumulative environmental burdens; the plot on the right shows a strong correlation between communities with high cumulative pollution and socioeconomic burdens, motivating the need to develop clean energy pathways that simultaneously reduce environmental health burdens and increase resilience and economic security.

To *decarbonize* Nevada's economy and reduce greenhouse gas emissions, Nevada will need to implement a suite of clean energy strategies, including the adoption of widespread energy efficiency, the electrification of all fuel use (e.g. electric vehicles and home appliances), and the expansion of renewable energy such as solar power to provide clean energy for buildings, transportation, and industry statewide. 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 Nevada's most environmentally burdened and socioeconomically vulnerable communities.

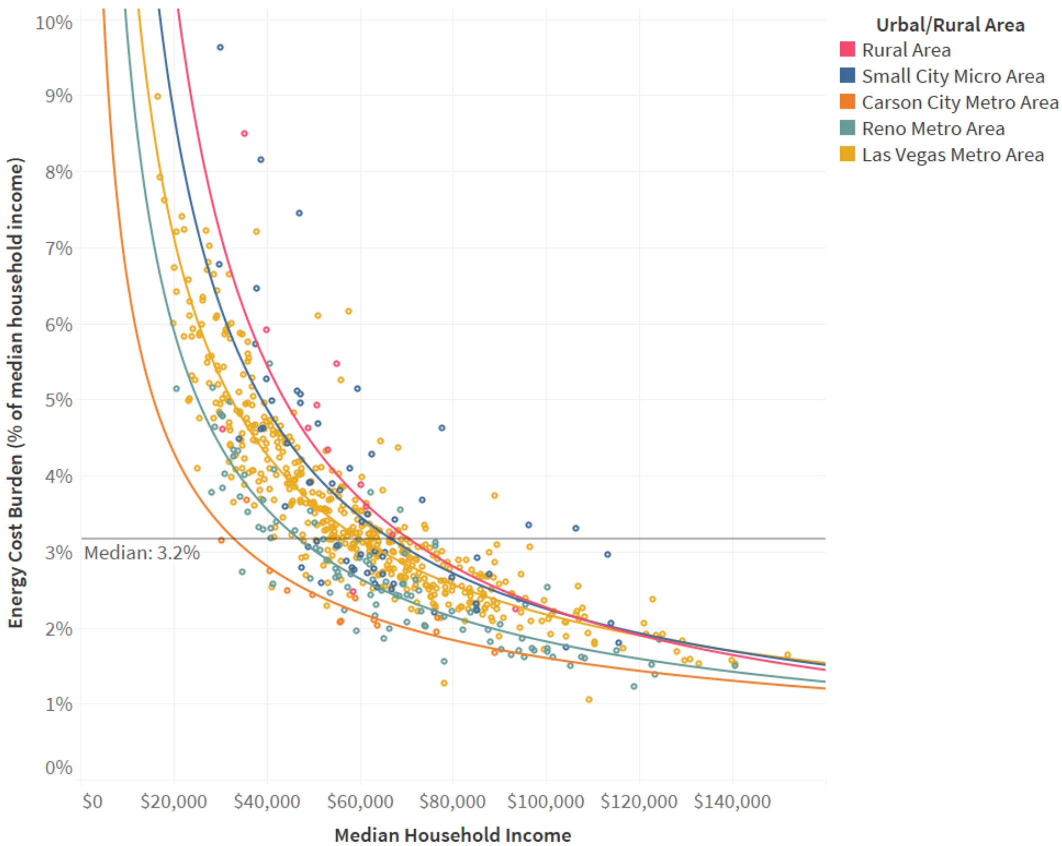
To do so, we:

1. Identified regions and populations currently facing high cumulative emissions (i.e. multi-source, multi-pollutant 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 *Pathways and Policies to Achieve Nevada's Climate Goals: An Emissions, Equity, and Economic Analysis.*

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

Residential Buildings

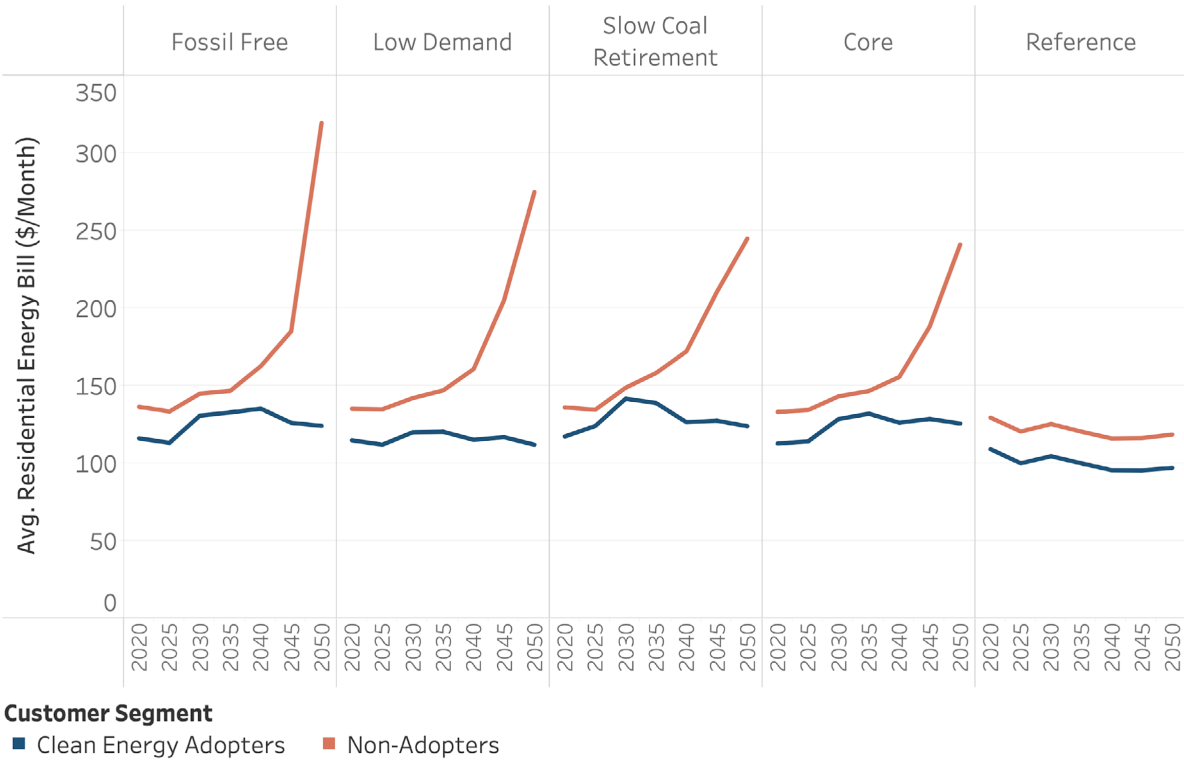


ES Figure 2. Energy costs burdens—the fraction of household income spent on residential utility bills—are higher in rural areas and substantially higher in low-income communities. Similar analyses of other demographic indicators found that burdens are also high in neighborhoods with high concentrations of renters and people of color.

Finding 1: Households in census tracts with more low-income households, populations of color, and renters use less energy on average than census tracts with wealthier and whiter households, but face higher *energy cost burdens*—meaning they spend larger fractions of their income on utility bills. Low-income households also lag in access to clean energy technologies such as rooftop solar.

Conclusion 1: Low-income households, communities of color, renters, and other households with high energy cost burdens would significantly benefit from cost-saving energy measures such as energy efficiency, and bill stabilization measures such as rooftop solar, but often face barriers to adopting clean energy technologies.

Recommendation 1: Ensure equitable access to the economic and health benefits of energy efficiency, distributed energy resources (e.g. rooftop solar + storage), and electrification, beyond home- and landowners. Potential measures include community outreach to identify barriers to adoption, provision of up-front financing rather than tax incentives, incentivization for landlords to upgrade rental properties while protecting tenants, and development of targeted clean energy programs to serve low-income households and historically underserved communities.

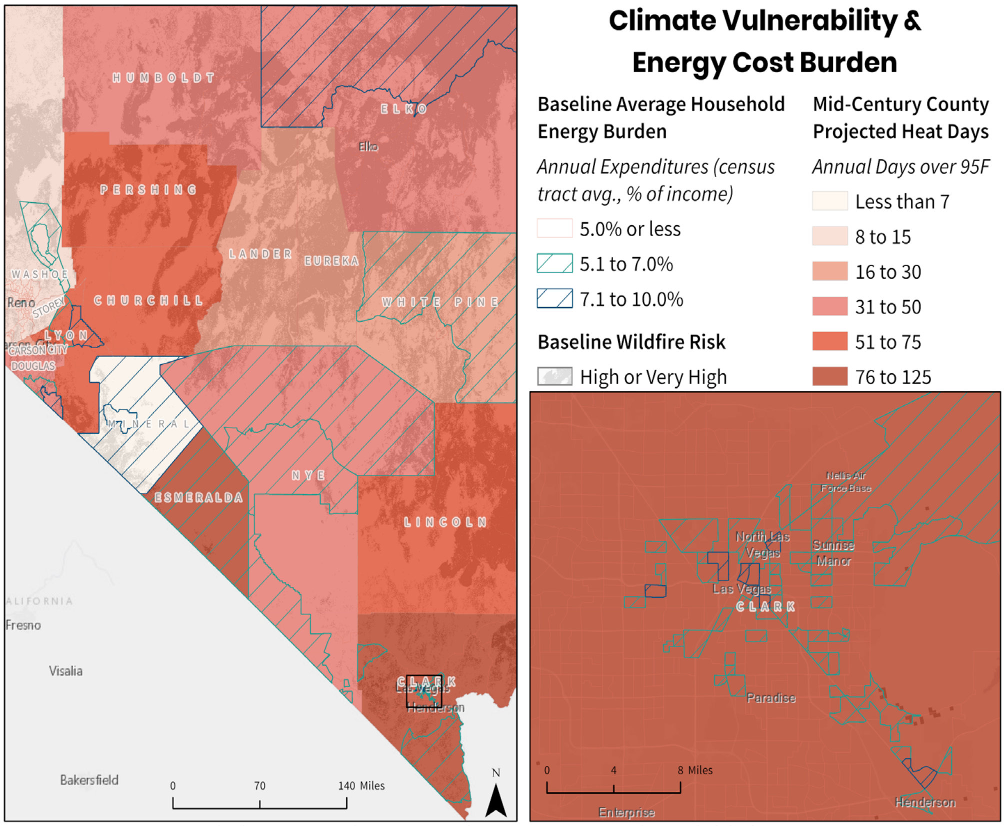


ES Figure 3. Unless mitigation strategies are taken, all four decarbonization scenarios (outlined in the companion report) result in escalating utility bills after 2035 for households that do not electrify their appliances and continue to use natural gas. This result is because fewer customers would be paying for upkeep of aging gas infrastructure.

Finding 2: 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 2: Historically, low-income households in Nevada have significantly lagged behind wealthier households in adopting rooftop solar 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 which save their tenants money). These households are likely to lag behind in electrification measures as well; and if so, their utility bills will grow as fewer households pay for maintaining an aging gas infrastructure.

Recommendation 2: 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. Additionally, provide bill-stabilization measures such as capping utility bills as a percentage of income for households who may otherwise experience adverse bill impacts during the transition to an electrified energy system.



Source Data: Kopp Group & Rhodium - Projected Days over 95F (2040-2059, RCP4.5, Median Probability), US Census Bureau & IPUMS NHGIS - Average Household Income, EIA SEDS - Fuel Prices, Min et al. & PSE - Residential Energy Modeling, USDA - Fire Risk

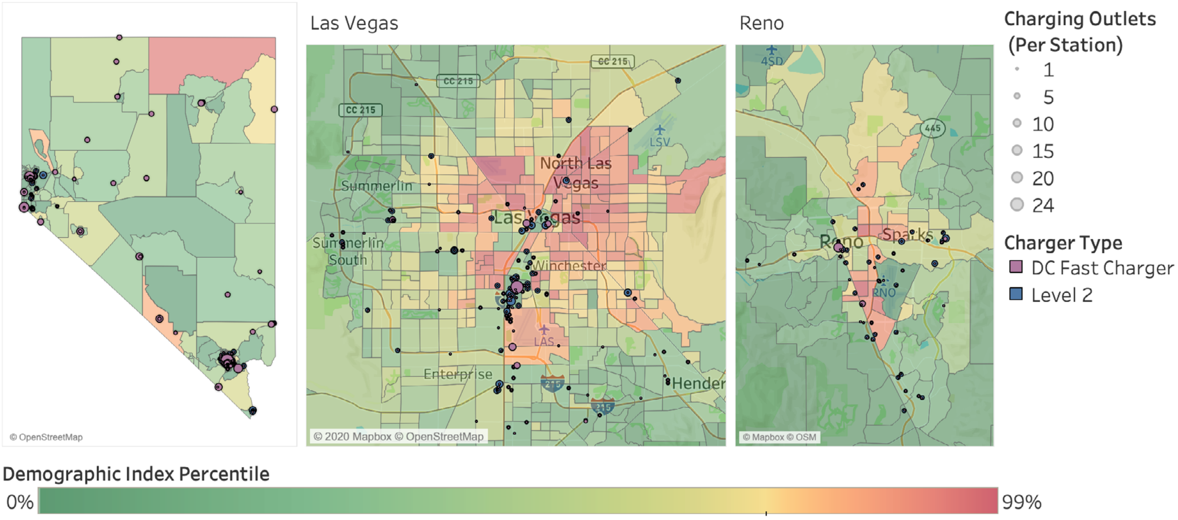
ES Figure 4. Certain communities across Nevada face cumulative stressors from high energy cost burdens as well as climate impacts such as extreme heat and high wildfire risk. These communities may benefit from resilience-focused and cost-saving energy measures.

Finding 3: Certain Nevada populations will face extreme heat, high wildfire risk, weather-induced grid outages, and other stressors related to climate change; many of these households are also low-income and have high baseline energy cost burdens.

Conclusion 3: 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 households facing high utility bills, extreme heat, and additional climate stressors.

Recommendation 3: Consider targeted incentives, clean energy deployment 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.

Transportation



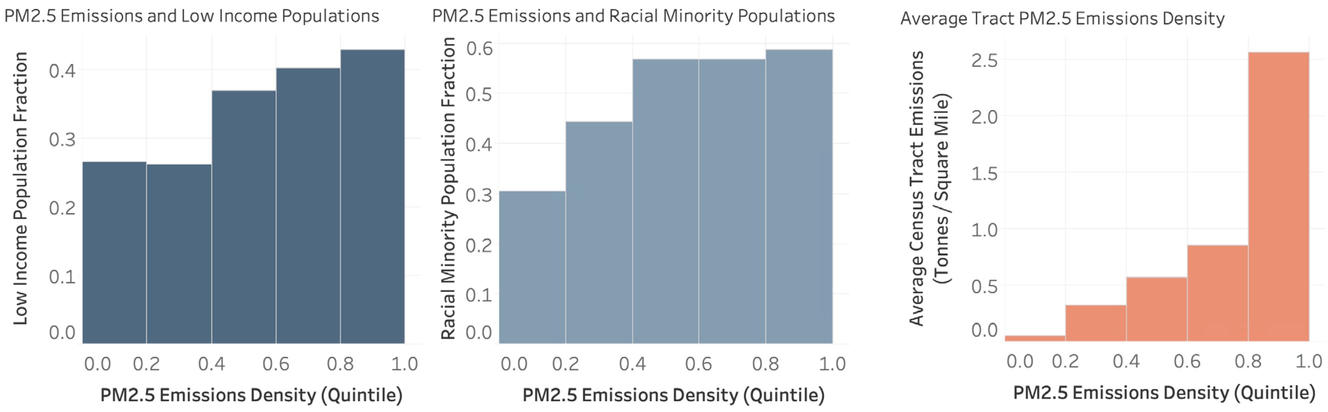
ES Figure 5. Public electric vehicle charging stations and demographic index in Nevada.[1] Each dot represents an electric vehicle charging station, while the bubble size reflects the number of charging outlets per station. In the Las Vegas metropolitan region, electric vehicle charging stations are primarily located at large venues such as shopping malls and casinos in census tracts with low Demographic Index rankings. Stations are particularly concentrated in commercial neighborhoods near the Arts District and the Las Vegas Strip.

Finding 1: Although higher-income households drive more and consume more vehicle fuel on average, lower-income households in Nevada pay a higher share of their income towards vehicle fuel. Accounting for public transit costs, as well as the costs of vehicle ownership and maintenance, would likely result in even higher average transportation cost burdens for households across income levels.

Conclusion 1: Low-income households stand to benefit the most from financial savings associated with passenger vehicle electrification and affordable or free public transit. Due to the high upfront cost of electric vehicles as well as other barriers, however, these households will likely be late adopters of electric vehicles in the absence of targeted policies.

Recommendation 1: In addition to building affordable and accessible electrified public transit, design upfront financial incentives to support adoption of electric passenger vehicles in communities of color and low-income communities, who suffer from disproportionally high vehicle fuel cost burdens. Incorporate community input to guide electric vehicle charging infrastructure investments that facilitate electric vehicle adoption among households facing access barriers.

1 The map includes AC Level 2 (240v) and DC fast charging outlets, the latter of which provides electric vehicles with a higher travel range per unit of time charging.

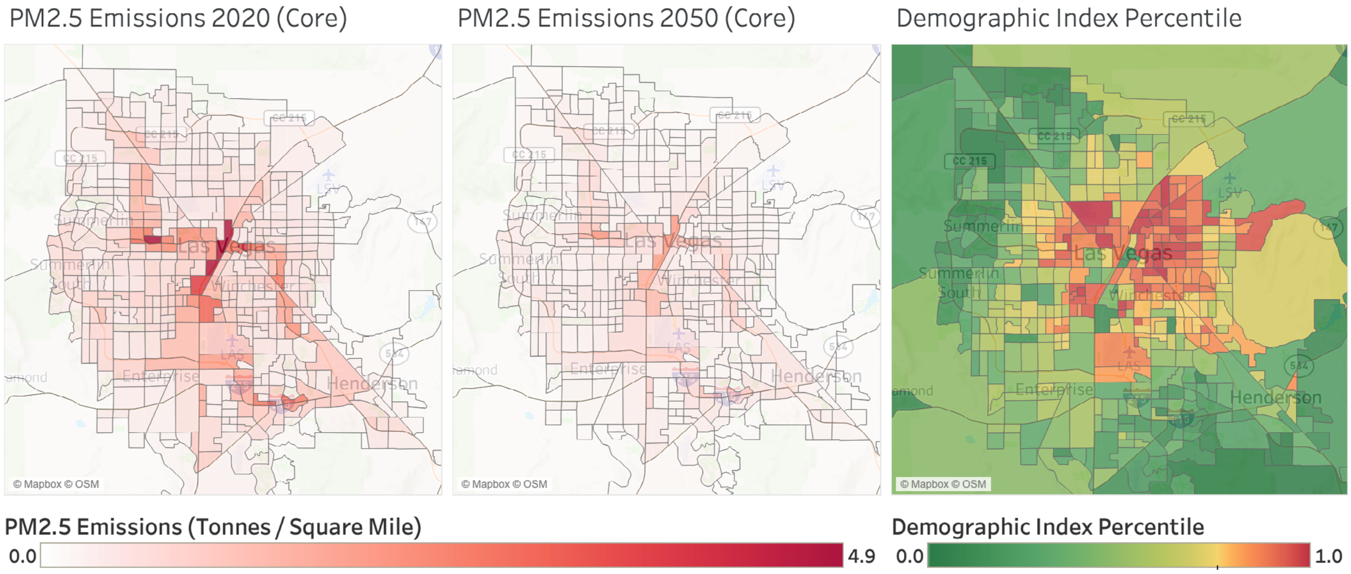


ES Figure 6. 2017 fine particulate matter emissions from on-road vehicles and demographics of nearby populations. Particulate matter emissions from on-road vehicles are more dense, on average, in census tracts where low-income people and people of color make up a greater fraction of the population. The density of particulate matter emissions from on-road vehicles increases exponentially across quintile brackets of census tracts.

Finding 2: 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 interstate corridors, where trucks, particularly those of older vintages, contribute disproportionately to nitrogen oxides and particulate matter emissions.

Conclusion 2: As older models of medium-duty and heavy-duty trucks emit much more particulate matter and nitrogen oxides per mile traveled than newer models, prioritizing their retirement will be critical to reducing emissions along urban interstates in the coming decade. Reducing pollution along these routes is particularly relevant to environmental equity concerns, as many of the census tracts surrounding these urban interstates are majority people of color and majority low-income.

Recommendation 2: Accelerate medium- and heavy-duty truck electrification and emission reductions by 1) prioritizing the retirement of old, high-emitting heavy-duty 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 diesel truck idling, and 5) creating enforceable in-state targets to support interstate trucking electrification goals.



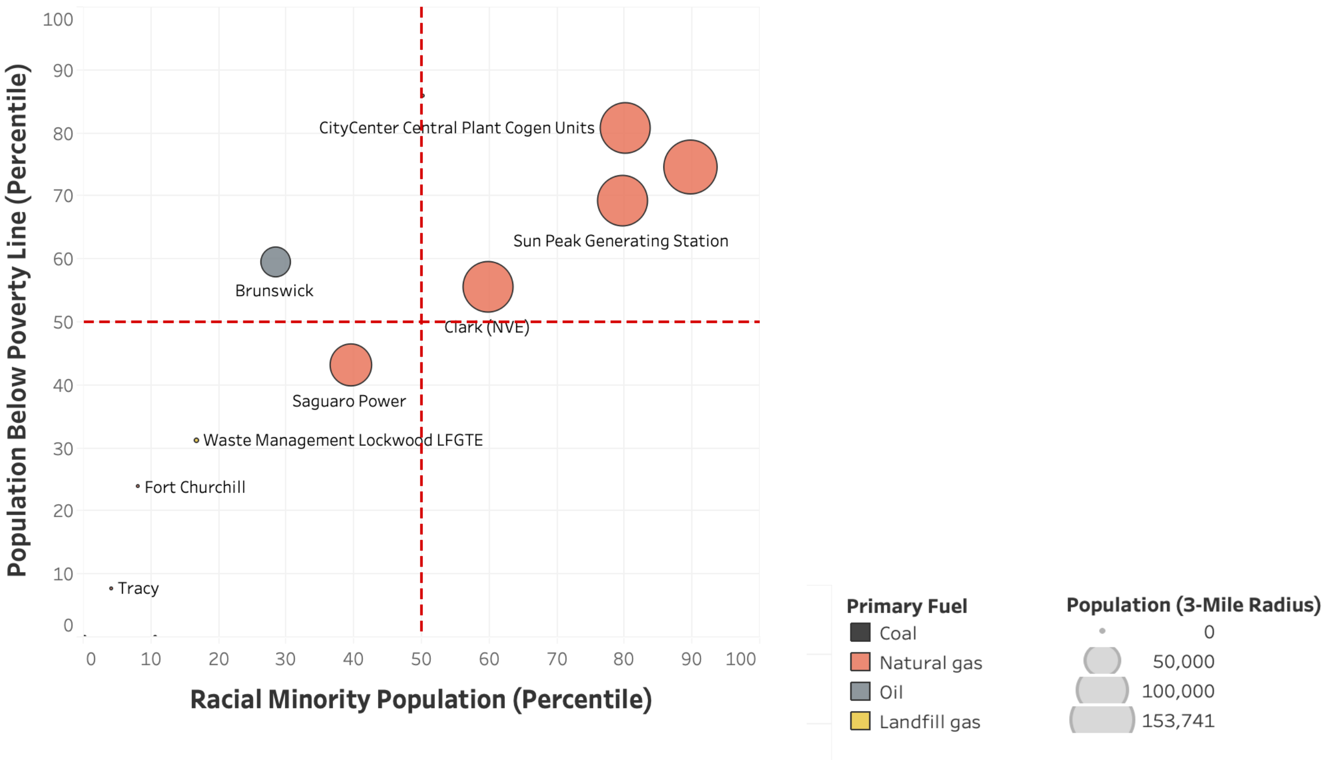
ES 7. On-road vehicle PM$_{2.5}$ emissions in 2020, residual PM$_{2.5}$ emissions in 2050 (middle), and Demographic Index percentile in the Las Vegas metropolitan region (right). PM$_{2.5}$ emissions are most concentrated in census tracts along urban interstate and highway corridors, and remain in these areas in 2050 due to continued emissions from vehicle tire and brake wear. Many of the census tracts adjacent to urban interstates and highways in the Las Vegas metro area have high scores on the Demographic Index.

Finding 3: 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 3: Public transit expansion, which results in co-benefits such as increased transit accessibility, can promote broader public health and economic benefits.

Recommendation 3: Coordinate efforts by local, regional, and state governments—with outreach to local communities—to expand electrified low- or zero-fare public transit, where appropriate, to reduce transit-related pollution and overall vehicle travel while improving transit access for mobility-limited households.

Electricity Generation



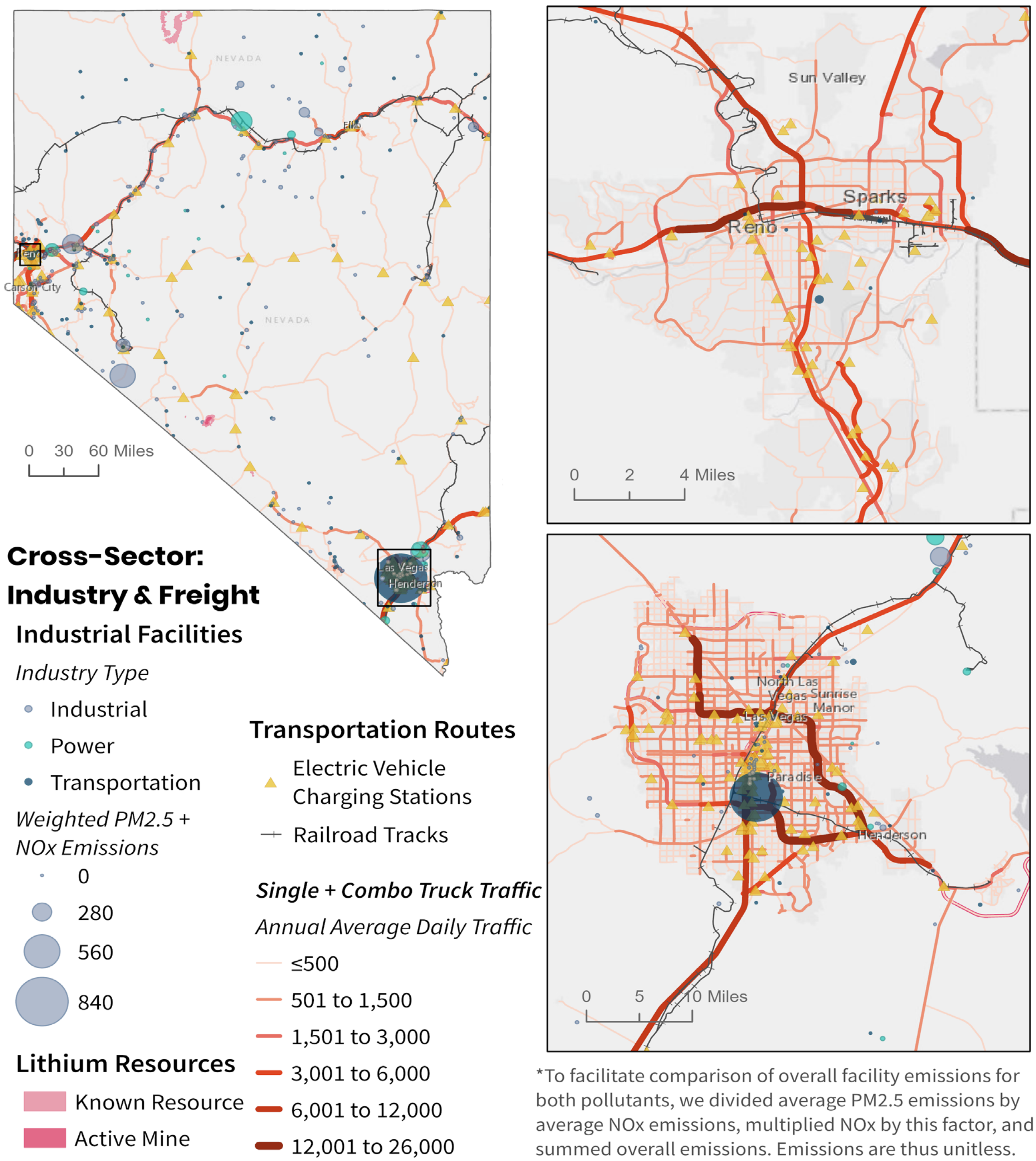
ES Figure 8. Income and racial demographics of populations living within a three-mile radius of Nevada power plants. The urban plants (those represented by larger bubbles) are disproportionately located in the state's low-income communities and communities of color. Approximately half of the state's plants are not shown because no one lives within a three-mile radius of these facilities.

Finding 1: Many of Nevada's fossil fuel power plants are in rural areas, but its urban power plants—which burn natural gas—are disproportionately located in communities with a higher share of populations of color and low-income households than the median for the state, including within the broader Las Vegas area ozone nonattainment region.

Conclusion 1: 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 Las Vegas area.

Recommendation 1: 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.

Industry



*To facilitate comparison of overall facility emissions for both pollutants, we divided average PM2.5 emissions by average NOx emissions, multiplied NOx by this factor, and summed overall emissions. Emissions are thus unitless.

ES Figure 9. Many of Nevada's highest emitting industrial facilities sit along major trucking routes, including mining and manufacturing facilities along Interstate 80 and military facilities in Hawthorne. Assuring that electric vehicle charging stations along these routes are suitable for trucks and incentivizing fleet electrification for industrial facilities may be useful for reducing cumulative environmental burdens along these routes.

Finding 1: The metal mining industry is the largest energy consumer of Nevada's industrial subsectors, and is responsible for a significant portion of industrial criteria air pollutant emissions. Metal mining facilities are primarily located in northern Nevada along Interstate 80, a major trucking route. As Nevada hosts one of the country's largest reserves of lithium, the state's mining industry may expand to meet the growing demand for lithium, a critical material for clean energy technologies.

Conclusion 1: The majority of energy currently used in the mining industry in Nevada is electricity, which will become less emissions-intensive as the power sector decarbonizes. However, combustion of fossil fuels still makes up a substantial portion of energy use at these facilities. In addition, new lithium mines and lithium battery recycling facilities may present ecological and public health hazards, such as threats to local biodiversity and soil and groundwater contamination. Fossil fuel combustion at mining sites, as well as the use of heavy-duty trucks and nonroad equipment, present opportunities for decarbonization and pollution reduction at these facilities.

Recommendation 1: Prioritize energy efficiency and decarbonization of fuel use at energy-intensive industrial facilities such as mining facilities, and electrify the non-road industrial equipment and heavy duty trucks that serve them. Mitigate the potential ecological impacts of lithium mining and recycling by protecting threatened species and protecting water resources. Include outreach to nearby communities, and ensure funding is set aside to remediate polluted sites.

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.

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