

Understanding and Assessing Climate Change: Preparing for Nebraska's Future

2024 Climate Change Impact Assessment Report

Chapter 12 - Climate Justice and Equity



Chapter 12

Climate Justice and Equity

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Key messages

1. Social systems are changing the climate with inequalities in harms and benefits to different social groups.
2. Low-income people of all racial groups and communities of color in Nebraska are likely to face greater exposure to increasing risks from climate change and be more vulnerable to negative climate-related impacts.
3. Climate change-related impacts are likely to reproduce or expand social inequalities in Nebraska without new policy interventions related to housing, workplace protections, and energy.
4. Climate justice requires that all communities be meaningfully and equitably involved in planning for the transitions necessary to adapt to unstoppable climate changes underway and reduce emissions to prevent more extreme future changes.

Introduction

Social systems are changing the climate and distributing the impacts inequitably, making social science and humanities research essential for understanding how different forms of adaptation and mitigation (Box 1.2) will promote or undermine climate justice. Climate justice recognizes this unequal distribution of burdens and benefits of climate change. It is based on the idea that countries and people contributing the most to climate change should help those affected the most.

The Fifth National Climate Assessment (NCA5) states that scientists have very high confidence (Box 1.3) that social systems are driving climate change, primarily through how they shape fossil fuel use (Marino et al., 2023; see also Chapter 1). Experts are confident in their understanding of how social systems distribute both the benefits of energy consumption driving climate change and the consequences of climate change in an inequitable manner within societies. Governance processes—policies and procedures—create inequalities today but can also help reduce them in the future.

Scientists also have high confidence that social systems shape how people understand and talk about climate change via their personal history, culture, education, and ethical beliefs. Differences in these understandings combined with the complexity of climate politics can create challenges for effective governance. However, research shows that including multiple forms of knowledge in climate decision-making, such as views from Indigenous communities (See Chapter 11), can help promote justice (Marino et al., 2023).

Climate justice is important for Nebraska policymakers both for normative (deciding what ought to be done) and practical (what can be done) reasons. If we don't actively address existing social inequalities, climate change adaptation and mitigation efforts will likely be less successful. Climate justice is relevant for both the drivers and the impacts of climate change within Nebraska and for the connections between drivers within the state and climate impacts to communities outside the state and across the world. In other words, climate justice concerns how Nebraska's

role in causing climate change affects both its residents and communities outside its borders. For instance, greenhouse gas emissions from Nebraska's agriculture and energy industries contribute to rising global temperatures, which can worsen droughts in distant countries already facing water shortages.

Well-established evidence shows that developed nations, particularly the U.S., have historically contributed the most to climate change (Marvel et al., 2023). A range of global policy agreements recognize that, based on those contributions and their greater capacity to act, climate justice requires developed nations to contribute more to climate change mitigation and adaptation efforts (United Nations, n.d.). These principles of "common but differentiated responsibilities" can also be applied to communities within a developed nation like the U.S. For example, those communities, corporations, or sectors that are more responsible and capable also have greater responsibility to act.

Limited peer-reviewed research specifically addresses climate justice in Nebraska. However, findings from studies across the country and worldwide offer important lessons about likely threats to climate justice within Nebraska and stemming from it, as well as actions that help promote greater justice.¹ Communities that have contributed the least to climate change often suffer the most negative human and ecological health impacts from its effects (Schaefer Caniglia et al., 2021). These climate impacts can interact with and worsen existing social inequalities related to race, class, gender, sexual orientation, age, and religious or ethnic background (Marino et al., 2023).

Principles of climate justice

The Intergovernmental Panel on Climate Change (IPCC) (Chapter 1, Box 1.1) describes climate justice as justice "that links development and human rights to achieve a human-centered approach to addressing

¹ *The Keystone XL Pipeline has been the most common focus of research using a climate justice lens (Derman 2020; Ordner 2018).*

climate change, safeguarding the rights of the most vulnerable people and sharing the burdens and benefits of climate change and its impacts equitably and fairly” (IPCC, 2023b, p. 2913).

The IPCC’s Sixth Assessment Report and the Fifth National Climate Assessment (NCA5) address how different responses to climate change align with the three principles of justice: distributional justice (who gets what and how much?), procedural justice (who decides and how?), and recognition justice (why does it matter?) and how this impacts the effectiveness of mitigation and adaptation (do they work?). Climate justice involves “the recognition of diverse values and past harms, equitable distribution of benefits and risks, and the procedural inclusion of affected communities in decision-making processes” (Marino et al., 2023, p. 14).

Climate justice builds upon the broader concept of “environmental justice,” focusing specifically on the causes and consequences of climate change. The field of environmental justice originated from social science scholarship in response to the social movement advocating these issues.

Distributional justice

Distributional justice examines how the benefits and harms of different environmental processes affect different social groups. These processes can include intentional discrimination and unintentional inequalities caused by existing structures and systems. This aspect considers fairness among individuals, communities, states, and future generations.²

A related principle is “common but differentiated responsibilities,” which appears in all major international climate negotiations and treaties. This principle recognizes that all nations are responsible for acting on climate change. However, those who have contributed more to the problem and possess greater resources should assume a larger share of the responsibility. This principle highlights that the “uneven distribution of wealth and power between (and within) countries is a key driver of climate injustice” (IPCC, 2023b, p. 160). This relationship can be applied within the U.S. and in Nebraska.

² Other species or ecosystems themselves are also part of distributional considerations under some cultural and political frameworks, such as in many Indigenous societies or “rights of nature” legal frameworks adopted in some nations.

Procedural justice

Procedural justice examines whether affected groups have meaningful participation in decisions that affect the environment. Achieving procedural justice requires not only avoiding discrimination but also addressing the capabilities and vulnerabilities of marginalized groups. This ensures that they have access to the appropriate resources and decision-making processes that allow them to shape collective political processes and outcomes effectively.

According to the IPCC (2023c, p.1368),

Consensus-building institutions should avoid reducing normative questions to technical ones, recognizing that values, interests, and behaviors are all shaped by ongoing climate governance. Additionally, communities affected by low-carbon transition may face challenges in articulating their understandings and experiences, which need to be addressed in the design of climate institutions.

In other words, groups such as community planning councils, government committees, and organizations tasked with addressing complex policy issues such as climate change should assist communities in discussing which values and practices are threatened or protected by climate impacts or responses. For example, planning for energy infrastructure with procedural justice would include not only technical questions of emissions or costs but what impacted communities consider to be fair or just, and what kinds of benefits (e.g., new jobs or reduced illness) or drawbacks (e.g., lost jobs or changes to the landscape or type of livelihood) concern them most. There are often multiple technical pathways to achieving a goal, and communities’ attitudes about them can change upon reflection and consideration of what they value. Meaningful participation allows for both to occur.

Recognitional justice

Recognitional justice asks whether impacted groups' perspectives, values, and cultures are represented in policymaking, particularly during agenda setting at the start of policymaking processes. Although this aspect is less prominent in the climate literature, scientists warn that without recognitional justice, "actors may not benefit from the two other aspects of justice" (IPCC, 2023b, p.160).

Indigenous and local knowledge are crucial for understanding and adapting to climate risks. Therefore, it is important to include these perspectives when setting climate action goals rather than just gathering input after goals have been established (IPCC, 2023b). In contrast to these scientific findings, many state governments oppose using Indigenous Knowledge and environmental justice in environmental regulation (U.S. District Court, 2024).

Distributional, procedural, and recognitional justice must be considered together. Recognitional and procedural processes are key in determining distributional outcomes. Policymaking and implementation frameworks that address only two of the three dimensions without explicitly recognizing limitations or connections can be ineffective (Baker et al., 2023). "Critically, social systems define who is seen as deserving of local, state, and federal interventions to address climate impacts" (Marino et al., 2023, p. 4).

For instance, the Environmental Protection Agency (EPA) uses a measure known as the social cost of carbon to estimate the economic damage resulting from climate change. Because this measure is tied to gross domestic product per capita, it places different monetary values on lives in different countries. Using this assessment, each U.S. life is equal to about nine lives in India, but only half as much as a life in Qatar. This approach affects the amount of spending justified to protect different communities from harms related to environmental carbon emissions (Hersher, 2023). Although this practice follows a common method used in environmental economics, it also reflects political and social value decisions that shape the selection of that method. As noted in the NCA5, "If climate change is understood as an outcome of socioeconomic and ethical arrangements

that resulted in exploitation and discrimination, then reexamining those arrangements also becomes necessary" (Marino et al., 2023, pp. 9–10).

Unequal drivers and consequences

Globally, scientists have high confidence that prioritizing climate justice and implementing just transition processes improves mitigation and adaptation outcomes. Viable options exist for improving social well-being and resilience while reducing emissions (Calvin et al., 2023; Marino et al., 2023). To achieve climate justice, we must first recognize and address the uneven distribution of decision-making power and responsibility for emissions that drive climate change. Also, we must understand how these emissions' benefits and negative impacts are spread unevenly across society.

Social drivers of climate change

Responsibility for emissions can be assessed from the production or consumption side of the same interconnected processes. Production-based and consumption-based accounting are two different ways of accounting for responsibility for the same emissions. Globally, 70% of historical production-side carbon dioxide emissions have been traced to just 78 contemporary corporate and state-owned entities, with Chevron and ExxonMobil leading among investor-owned entities (Carbon Majors, 2024).

When looking at individuals or households, studies generally find that the responsibility for emissions is concentrated among the upper class. This is mainly due to their disproportionate influence on production through ownership and leadership roles and their higher consumption-related emissions from their lifestyles. In the U.S., 40% of emissions are associated with the income sources of the richest tenth of households. The richest 1% contributes to 15% to 17% of total emissions—more than the bottom 50% of households combined—mainly due to the emissions from their investment income (Starr et al., 2023). One analysis shows that "15 days of income for a top 0.1% household generates as much carbon pollution as a lifetime of income for a household in the bottom 10%.

Household CO₂e emissions in 2019 per income group (within United States and across countries)

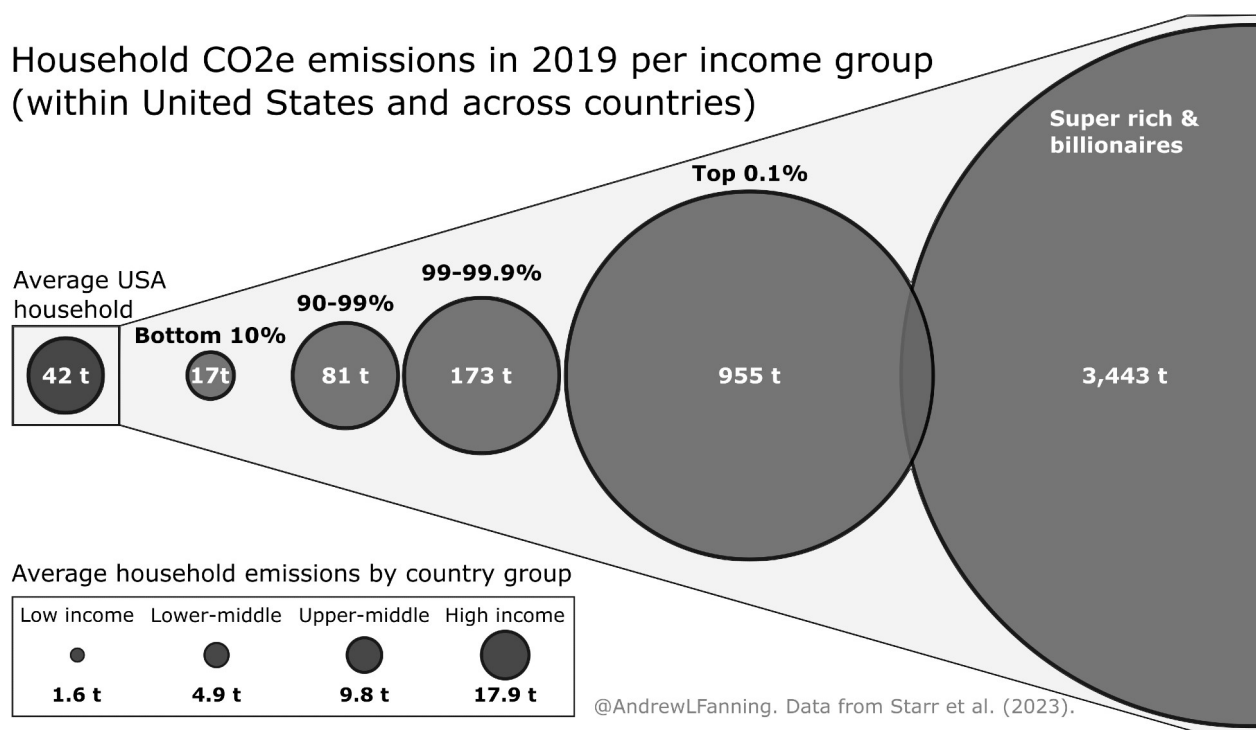


Figure 12.1. Household CO₂ emissions in 2019 per income group, within the United States and across countries. The circles are scaled by household emissions, with larger circles representing more emissions. Based on data from Starr et al. (2023; Table 4). (Credit: Andrew Fanning. CC-BY)

An income-based lens highlights who is profiting the most from climate-changing carbon pollution and designs policies to shift their behavior” (Miller, 2023).

Figure 12.1 shows the differences in average emissions based on income groups in the U.S. compared to averages from other countries.³ The top 1% of earners in the U.S. have increased their emissions, while most other households have reduced theirs. Racial disparities are also evident. White non-Hispanic households have emissions linked to their income that are 1.3 to 1.7 times higher than that of other racial groups (Starr et al., 2023).

Research indicates that increasing social inequality is associated with increasing emissions. U.S. states with increasing concentrations of income among the top 10% of earners also have higher overall emissions (Jorgenson et al., 2017). Nebraska has a lower level of income inequality when compared to the national average. However, the gap between the rich and the poor is widening, placing it among the top three

states with the most increase in income inequality in recent years (Useful Stats, 2024). Nebraska also has higher-than-average wealth inequality (Suss et al., 2024). Despite having low unemployment and lower-than-average income inequality, Nebraska has high rates of the working poor (Nixon, 2023). These individuals often work long hours and multiple jobs to meet basic needs (Lozano, 2024). Research links longer working hours to higher emissions (Fitzgerald, 2022), distinct from working hours’ influence on household income. Therefore, understanding the links between inequality, working hours, and emissions could be significant for policy in Nebraska.

Consumption-based calculations attribute emissions from the goods and services to those who consume them rather than produce them. For example, a production-side accounting of a hamburger would attribute associated emissions to the financiers, farmers, processing facilities, retailers, and so on, who produced the commodity. In contrast, a consumption-side accounting attributes them to the individual

³ The poorest 10% of the population in the U.S. has a slightly lower income-based footprint than the average for all income groups across other high-income countries (in contrast to consumption-based footprints discussed below), while the top 1% in the U.S. have a footprint roughly 10 times larger than the average of other high-income countries.

Average Household Carbon Footprint

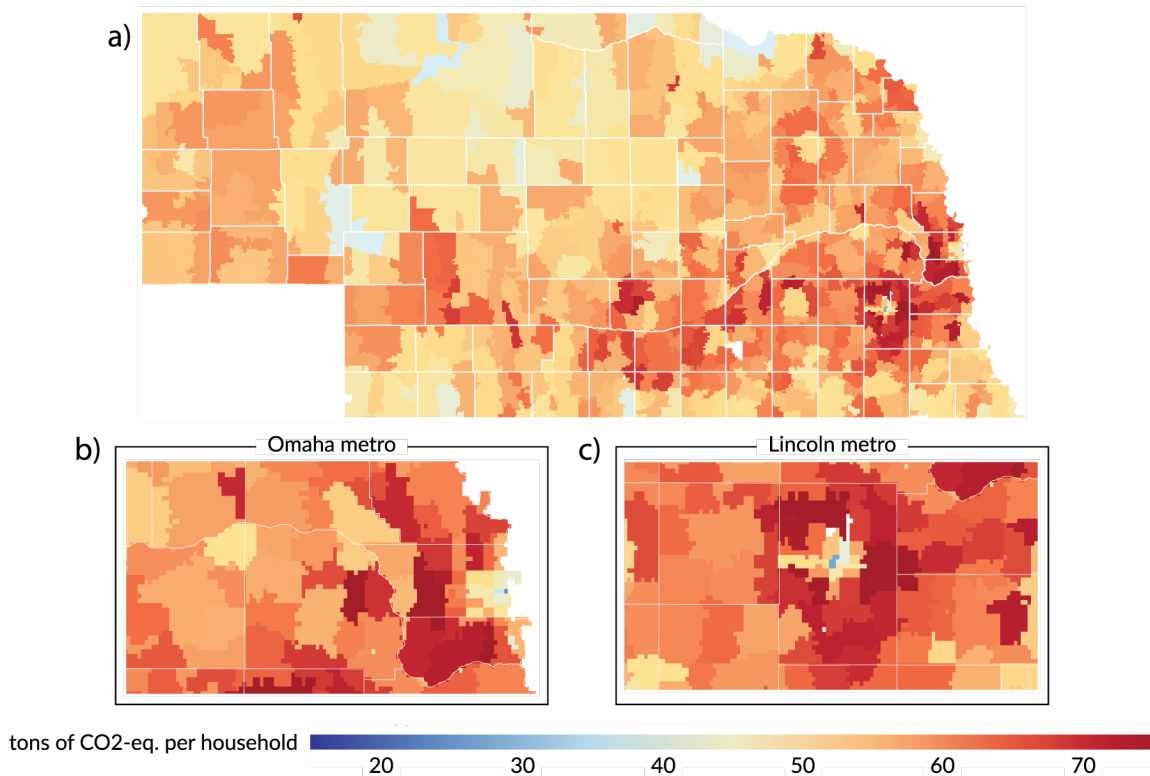


Figure 12.2. Average household consumption-based emission footprints for (a) the state of Nebraska, (b) the Omaha metro area, and (c) the Lincoln metro area. (Source: U.C. Berkeley Network, 2013)

or household that purchases the burger. These measures show similar but less extreme patterns of inequality to production-side calculations.

In the U.S., households earning over \$200,000 a year have an average consumption footprint about 2.6 times larger than those earning less than \$15,000 (Feng et al., 2021). “Most contributors of high carbon footprints across income groups in the U.S. are heating, cooling, and private transport, which reflects U.S. settlement structures and lifestyles, heavily reliant as they are on cars and living in large houses” (IPCC, 2023c, p. 1747). For instance, households in denser urban areas of Nebraska have lower average emissions than those in suburbs and exurbs, as shown in Figure 12.2. Even the lowest-income group in the U.S. (earning less than \$15,000) has a carbon footprint higher than those in other wealthy countries—more than double the global average. Due to U.S. energy and transportation policies and investments, they also spend a larger share of their income on modes of daily living that are more polluting than global averages (Feng et al., 2021). Without attention to these inequalities, policies risk

failing to change the behavior of the most influential people and undermining the support and legitimacy for climate action. As the most recent IPCC concludes:

Redistributive policies across sectors and regions that shield the poor and vulnerable, social safety nets, equity, inclusion, and just transitions at all scales can enable deeper societal ambitions and resolve tradeoffs with sustainable development goals. Attention to equity and broad and meaningful participation of all relevant actors in decision-making at all scales can build social trust, which builds on equitable sharing of benefits and burdens of mitigation that deepen and widen support for transformative changes. . .

The design of regulatory instruments, economic instruments, and consumption-based approaches can advance equity. Individuals with high socioeconomic status contribute disproportionately to emissions and have the highest potential for emissions reductions. Many options are available for reducing emission-intensive consumption while improving societal well-being. Sociocultural options,

behavior, and lifestyle changes supported by policies, infrastructure, and technology can help end-users shift to low-emissions-intensive consumption, with multiple co-benefits. (Calvin et al., 2023, p. 31)

Social consequences of climate change

Unequal exposure and impacts of heat and extreme weather

Increased exposure to extreme weather is shaped by social inequalities within and between communities (Chapters 9, 10, and 11). For example, low socioeconomic status groups are more likely to be exposed by living in floodplains, urban heat island zones, or working in outdoor occupations. Social inequalities also result in different climate change impacts on individuals and households, even when they face similar exposure to climate-related dangers. For example, within floodplain and urban heat island neighborhoods, some people are more severely impacted by the same flood or heat wave due to social factors such as lack of savings or air conditioning and healthcare access. Assessing climate vulnerability effectively requires understanding how environmental and social systems interact. In the U.S., certain groups—like racial minorities, low-income families, rural communities, people with limited English-language skills, the unhoused, and agricultural workers—are more affected by environmental hazards and climate change (Marino et al., 2023). Some households and individuals may face multiple, overlapping forms of vulnerability. For example, in Nebraska, low-income immigrant families—particularly those from racial minority groups with limited English skills—may experience intersecting and compounding forms of unequal exposure to climate change and greater vulnerability to its impacts.

Academic researchers and federal authorities have made efforts to prioritize vulnerable communities in Nebraska due to past governmental neglect, exposure to pollution, and social disruption from energy transitions. For example, the priority climate action plans for the state of Nebraska and the Omaha Metro

area were developed using maps of low-income and disadvantaged communities. Federal designations such as “Energy Communities” (energycommunities.gov, 2024) and “Disadvantaged Communities,” as identified by the Environmental and Climate Justice Program allowed Nebraskans access to targeted funding and technical assistance for these plans (US EPA, 2024d).⁴

Improving how we measure community risks and needs, together with community members, is a priority for social scientists, community organizations, and policymakers (National Academies of Sciences, Engineering, and Medicine, 2024). This ensures that distributional justice (are outcomes fair?) is understood while also promoting the local community involvement needed for achieving procedural and recognition justice (do impacted people have a meaningful say in what “fair” means?). For example, New York State’s Climate Act created a climate justice group that brought together researchers and environmental justice organizations to create mapping criteria for disadvantaged communities (New York State, 2024). This group included community organizations from across the state to better understand what aspects of climate justice issues their data models captured well, what these models missed, and how they could be improved. Applying similar methods in Nebraska could help highlight the unique climate challenges and opportunities faced by rural and urban communities. Additionally, rural communities may face greater procedural justice challenges due to a lack of existing community organizations and capacity.

Heat Inequalities

Nationally, more than 2,300 deaths from heat-related illnesses occurred in 2023—three times previous annual averages (Davenport & Weiland, 2024). In Nebraska, increased temperatures are one of the main threats posed by climate change (Chapters 3 and 4). The risk and impacts of heat exposure are not evenly distributed along the lines of class, race, gender, age, and (dis)ability. Between 2018 and 2022, Nebraska saw over 2,000 emergency room visits and nearly 200 hospitalizations due to heat-related illness (Chapter 9).

⁴ The Trump administration rescinded many executive orders relating to environmental and climate justice in early 2025. However, many of these tools and databases are being preserved by other institutions for continued reference, see <https://eelp.law.harvard.edu/tracker/ceqs-climate-economic-justice-screening-tool-removed>.

Heat and workplaces

Extreme heat disproportionately affects laborers in working-class jobs, workers of color, and immigrants. These groups are more likely to work outdoors or indoors without adequate cooling, leading to higher rates of heat exposure. For example, laborers on farms, construction sites, warehouses, commercial kitchens, and meatpacking plants are particularly vulnerable. Low-income workers are also more likely to suffer from chronic health conditions that can increase the impact of exposure. Chapter 9 covers heat-related health impacts and vulnerabilities.

Nationally, there are insufficient policies in place to protect workers and vulnerable groups from heat-related risks, and existing regulations often lack effective enforcement. In Nebraska, the federal Occupational Safety and Health Administration (OSHA) oversees the protection of private sector and federal employees. Recently, OSHA proposed updated heat protection measures for workers. However, the State of Nebraska does not appear to have any specific environmental heat-related protections in place for its workers. Representatives from the Nebraska Department of Labor and public employee union representatives, who were contacted for this report, were unaware of any temperature-specific protections for state employees. Some states have responded to the rise in extreme heat with laws to protect workers. California, Washington, and Colorado protect outdoor workers, while Minnesota's laws focuses on protecting indoor workers. Oregon's regulations protect both. Maryland and Nevada are also developing heat protection regulations. These regulations generally require that workers have access to shade, cool water, and rest breaks to prevent heat illness (LGEAN, n.d.).

New and existing temperature-related worker protection policies are being opposed by business groups (particularly in agriculture and construction), as well as by some political leaders despite research findings and a widely agreed upon undercounting of heat-related injuries and deaths. Nebraska has many counties with large agricultural and construction workforces exposed to weeks of high heat index days (Phillips et al., 2024). Furthermore, a history of violating existing law has led to serious heat-related injuries and deaths among vulnerable workforces (Shipley, 2021). In Nebraska,

more than 30% of Black and an even greater percentage of Hispanic/Latinx workers are estimated to be in occupations with risks associated with climate change (Christman, 2023). Increased heat conditions can cause additional and disproportionate occurrences of injury and death on working class and minority populations. Increased heat conditions can reduce labor productivity and threaten livelihoods (Adrienne-Arsht Rockefeller Foundation Resilience Center, 2021; Behrer et al., 2021). The limitations of adapting outdoor labor, through strategies such as adjusting work hours or providing cooling mechanisms in extreme heat, emphasize the need for effective mitigation strategies to address climate-change-induced warming (Licker et al., 2022).

In addition to a lack of heat protection from current policies in Nebraska, other state laws may further decrease climate resilience among workers. Unionized workplaces typically provide a safer environment, with some benefits extending to non-unionized workers in the same sector. Additionally, right-to-work states such as Nebraska (with a private sector unionization rate of 7%) have higher worker injury rates. Workers face greater risks due to job instability and often struggle to understand, negotiate, and enforce protections; and more vulnerability via social determinants of health are linked to lower wages and benefits (American Public Health Association, 2023; Han et al., 2024; Johnson, 2020; Leigh & Chakalov, 2021; Zoorob, 2018).

Homes and housing

Many issues affecting climate justice stem from racial and social class inequalities in housing location and quality. For example, the historical practice of explicit racial discrimination in housing, known as redlining, has been shown to predict current health vulnerabilities to pollution and increased heat impacts caused by climate change. Ongoing forms of racial inequality in housing access also contribute to these vulnerabilities (Graetz & Esposito, 2023; Greiner & McKane, 2022; Manware et al., 2022). Homes belonging to minorities are often more exposed to pollution and heat island effects from transportation infrastructure decisions that have disproportionately benefited White communities, as seen in Omaha (Greenberg et al., 2024).

Additionally, older populations are especially vulnerable to heat and, nationwide, have seen

increased mortality over the past decade. Social isolation or lack of social support can increase these risks, especially among marginalized groups and those in rural areas (Chapters 9 and 10).

Energy burdens on low-income households depend on three key factors: income relative to energy costs, the efficiency of household systems, and household energy needs. In Nebraska, climate change is causing households to need more cooling but less heating, which might lower overall energy demand. However, efforts to mitigate and adapt to climate change could also raise energy prices, increasing uncertainty in how these changes will affect households' energy burdens. Consequently, improving energy efficiency for vulnerable households is a priority for achieving distributional justice (fair distribution of harms and benefits).⁵

Households are considered energy burdened if they spend more than 6% of their income on energy costs, like electricity and natural gas bills. Those that spend more than 10% are deemed extremely burdened (Graff et al., 2021; Sovacool et al., 2024). Racial minorities often face discriminatory housing and lending practices, resulting in higher average energy burdens compared to White households with similar incomes (Brown et al., 2020). Energy-burdened households are also at a greater risk for food insecurity and health issues due to poor home conditions. These challenges can also harm mental health and contribute to economic disadvantages (Drehobl et al., 2020; Jessel et al., 2019).

On average, Nebraska households that earn less than 60% of the median income are energy burdened. The U.S. Department of Energy (DOE) estimates that nearly 182,000 Nebraska households are energy burdened, with approximately 89,000 of these households severely burdened (DOE LEAD Tool, n.d.). To help these vulnerable households, various programs have been set up across the country authorizing or requiring governments and utilities to act.

Nebraska could implement similar initiatives through action by its legislature or public utility districts. Nebraska's federally funded Weatherization Assistance

Program (WAP) provides efficiency upgrades to low-income households. The state also authorizes public utilities to assist with home efficiency upgrades. These improvements reduce pollution from power production, contributing to climate change, and lower residents' utility bills and demand-related costs.

Nationally, households that are energy insecure, have lower income, are neither White nor Asian, or are renters pay higher energy bills (20 cents or more per square foot of the residence, compared to other demographic groups) (EIA, 2023b). This is due to barriers to obtaining and maintaining energy-efficient homes and appliances. Research shows that low-income and minority populations have less access to energy-efficient options. For example, energy-efficient lightbulbs are more expensive and less available in high-poverty areas than in more affluent neighborhoods, and African American female-headed households appear to face greater barriers in accessing the benefits of energy efficiency (Adua et al., 2022).

Other federally funded programs, such as the Low-Income Home Energy Assistance Program (LIHEAP), local programs like the Omaha Public Power District (OPPD) Customer Assistance Program, or charities help low-income households pay their energy bills or repair their heating or cooling systems in emergencies. While these payment assistant programs are important, they do not address underlying causes of energy burden in the way that efficiency programs do.⁶

Nebraska residents receiving LIHEAP struggle with much higher energy burdens than the average household. On average, these residents spend about 20.5% of their income on energy bills before assistance, the third highest in the nation, and 14% after receiving aid, the fifth highest in the nation. Unfortunately, only 20.4% of those eligible for LIHEAP receive it (Cleveland & Wang, 2022). Figure 12.3 contrasts the extent of low-income energy efficiency assistance and the amount of households in need by displaying the number of households reported assisted by the state WAP from 2018 to 2024 (dark

⁵ *Climate projections in Nebraska show increases primarily in cooling needs, but more periods of volatile weather and energy costs, such as extreme cold associated with polar vortex behavior (see Chapters 2 and 3) could interact with changing heating sources and costs as well (e.g., heat pumps inefficient in extreme cold or methane gas price volatility).*

⁶ *Nebraska state agencies have struggled to implement a directive to use LIHEAP funds for home efficiency improvements (Legislative Performance Audit Committee, 2023).*

green, bottom bar) with DOE estimates of energy-burdened households in each WAP service area (Figure 12.4) who earned below 200% of the federal poverty line, the eligibility threshold for WAP assistance in 2022 (red, top bar).⁷ The ratio of energy-burdened households in 2022 to households assisted by WAP over six years runs from a low of 22 burdened households per home assisted in the Northwest Community Action Partnership region to a high of 149 in Douglas County.

Climate-driven increases in energy bills and housing costs can compound the affordable housing crisis. When considering investments in energy efficiency for existing and new housing, evaluating these costs against the lifetime energy expenses for residents and the overall life-cycle costs to the public is essential. Despite having favorable public utility structures and recent updates to efficiency building codes, Nebraska lacks statewide energy efficiency mandates (MEEA, n.d.). Additionally, some municipalities have weakened the new state code through amendments. Utility efforts have been limited, spending only \$3.20 per residential customer on electrical efficiency and nothing on gas efficiency in 2021 (MEEA, n.d.). In 2022, OPPD estimated that existing federal, state, and local programs addressed only 25% of residents' electrical energy burden needs (i.e., excluding gas) in their 13-county district. They aim to increase this percentage to 31% by 2026. Increased fixed utilities fees in Nebraska have disproportionately raised energy bills for low-income customers (Sanderford, 2019), making it more difficult for them to reduce their energy burden through conservation and efficiency efforts (OPPD, 2021a; OPPD Board of Directors, 2021b).

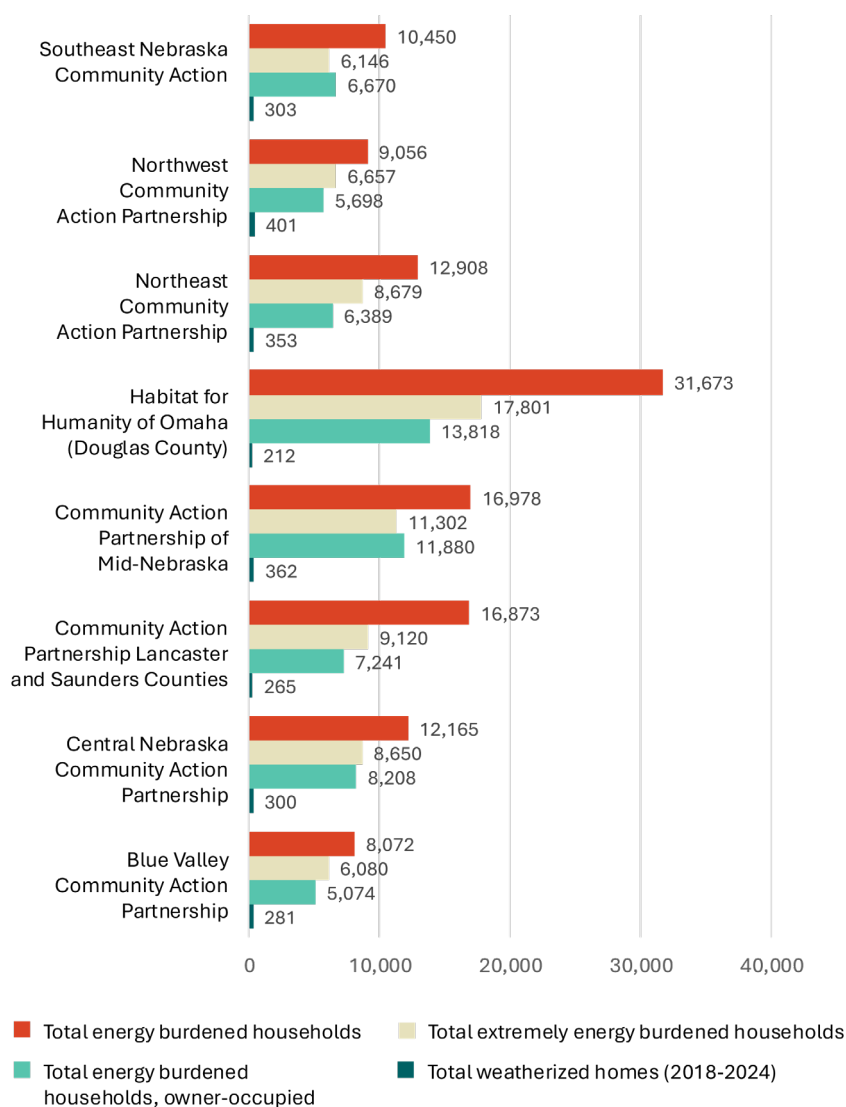


Figure 12.3. The number of weatherized homes (dark green bars) from 2018–2024 compared with the number of income-eligible, energy-burdened households in 2022 (red, tan, and light green bars). Data are presented by weatherization assistance service area (Source: DOE LEAD Tool, n.d.)

Figure 12.5. shows the regional proportion of WAP spending (dark green), households assisted (light green), and households in need (tan, orange, and red bars). Douglas County has the highest number of households in need, especially among non-White households (dark red bars). However, it receives a somewhat lower share of funding and assists significantly fewer households. Figures 12.3 and 12.5 suggest two main points. First, state weatherization assistance programs are vastly smaller than the need

⁷ Not all energy-burdened households would meet other non-income-based criteria for WAP eligibility or necessarily have energy burdens caused by lack of home weatherization. However, such a comparison is a valuable starting place.

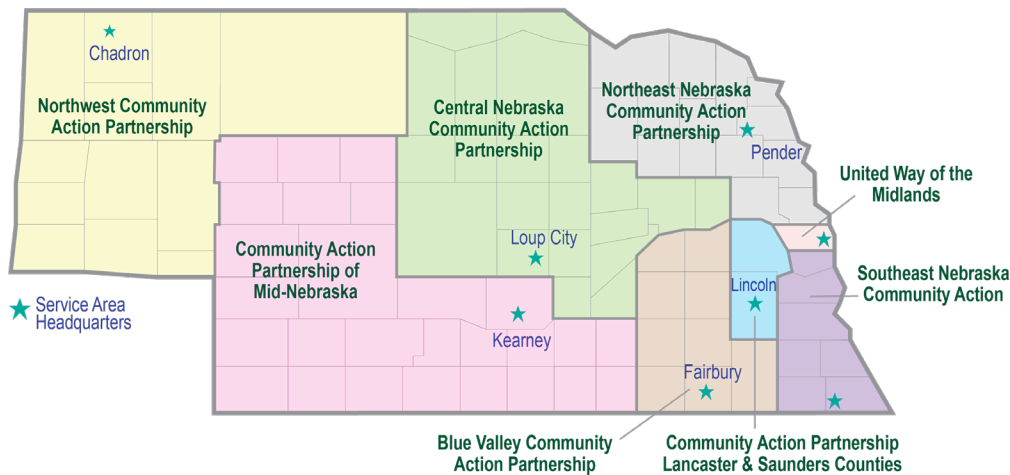


Figure 12.4. Weatherization service areas in Nebraska.
(Source: NDEE, 2024e)

across the state, and second, assistance may be disproportionately distributed relative to household need and potential benefits from weatherization, including along racial lines.

Further research is needed to assess how the WAP program aligns with energy and climate justice principles, the role of current state policies, and factors related to service providers' capacity. For example, cost limitations may negatively impact urban areas where wages and expenses exceed state averages. Additionally, stricter building codes, which are important for climate resilience, may raise costs for home upgrades. Language barriers could also hinder participation in diverse communities, especially where program materials and staff may not speak the necessary languages. Analysis of the demographics of WAP and related program recipients in comparison with the populations vulnerable to energy burdens is essential to evaluate distributive justice outcomes.⁸

⁸ Current state policies prioritize funding allocation between regions by, in order of importance, counties' share of Nebraska's elderly, impoverished, low income, and total population. Funding priorities are, first, households with elderly members, followed by disabled individuals, children under six, and finally households with higher-than-average energy bills or a higher-than-average energy burden. It is likely better metrics for household vulnerability and potential benefit from weatherization service could be developed (ACEEE, 2023).

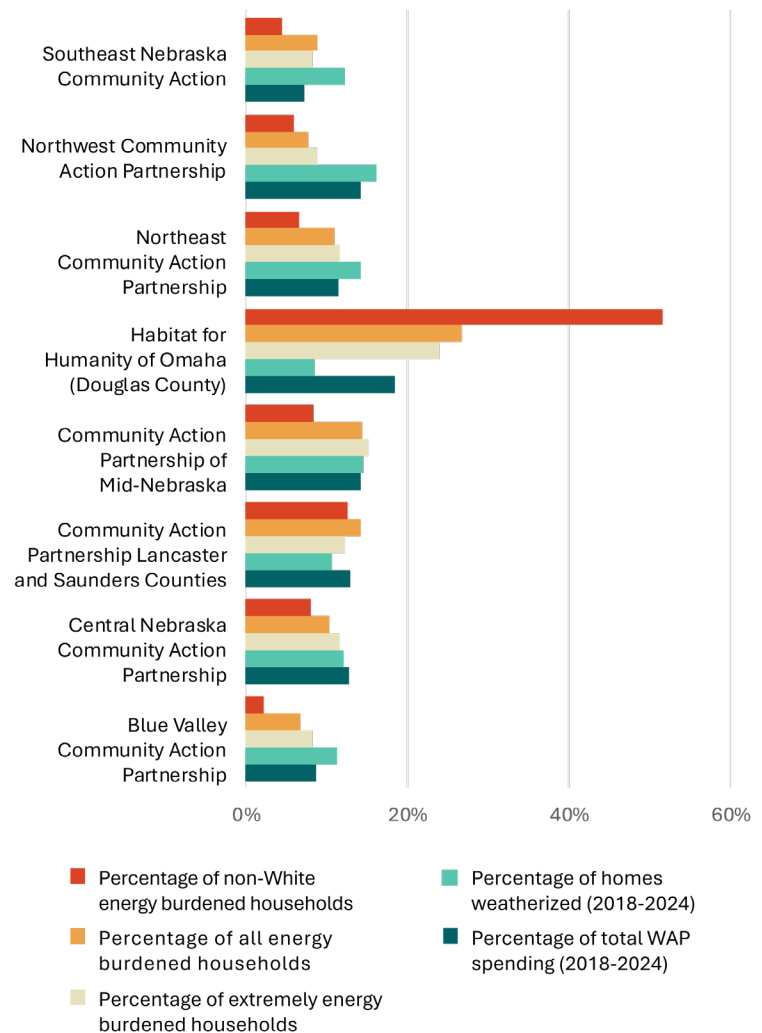


Figure 12.5. The regional percentage of total WAP spending (dark green bars) from 2019–2024. The percentage of income-eligible homes weatherized (light green bars), categories of need (orange and tan bars), and percentage of non-White energy burdened households (red bars). Data are presented by weatherization assistance service area (Source: DOE LEAD Tool, n.d.)

Renters face increased climate-related vulnerabilities that differ from homeowners. A key issue is the “split incentive” problem, where landlords lack financial incentives to invest in energy-efficient upgrades, even though these upgrades could lower utility bills and improve tenants’ health (Melvin, 2018). Although renters are eligible for state WAP and OPPD efficiency programs designed for low-income households, these households are more difficult to reach due to the split incentive problem and the technical challenges of upgrading multifamily housing. Data show (Figure 12.3) that Nebraska has a higher total number of energy-burdened households when accounting for renters, as opposed to just burdened homeowners.

Additionally, landlords might use climate-related investments as an opportunity or pretext to increase rent or displace tenants. Renters often lack the ability to pay upfront costs needed to invest in efficiency improvements themselves or face retaliation from landlords for asking for improvements or enforcement of regulations.

New policies can help ensure that renters benefit from government funding and regulations aimed at reducing emissions through efficiency improvements (Gourevitch, 2024). Some federal funding sources have required states to adopt such policies to qualify for assistance (energycommunities.gov, 2024). Furthermore, existing rules that require landlords to provide heating but not cooling or that limit utility shutoffs in cold weather but not during extreme heat may not properly address the climate-driven health risks renters face. In Nebraska, state-level protections exist against gas shutoffs during the winter for private utilities. However, for public utilities, shutoff protection policies related to public health risks, such as extreme temperatures, are set by individual utilities.

Expansion of green space and tree cover can help reduce vulnerable populations’ exposure to extreme temperatures, among other benefits. This approach is part of the proposed strategy in the Draft Climate Action and Resiliency Plan for the city of Omaha (City of Omaha, 2024, pp.57–60). However, research

also indicates that intentional policy design is needed to prevent increases in green amenities from displacing low-income residents. Entities such as the Nebraska Department of Environment and Energy (NDEE) can create implementation plans for federal funds to address these threats and achieve decarbonization without displacement or green gentrification (Gourevitch, 2024; Rice et al., 2020).

As the projected electrification of homes increases, fixed costs are likely to increase for those still using methane gas. This situation poses a risk that vulnerable households will disproportionately bear the rising cost of gas infrastructure (Davis & Hausman, 2022). Proposed policy responses include halting the expansion of new methane infrastructure and geographically prioritizing electrification (Gold-Parker et al., 2024) with attention to low-income households. However, Nebraska gas utilities are not pursuing these policies, and state laws now prevent local governments from implementing methane infrastructure restrictions that other regions have adopted. This leaves the responsibility of coordinating efforts to avoid higher overall costs and disproportionate impacts on vulnerable populations primarily with the state or utility boards, despite the lack of current climate policies to facilitate these actions.

While public utility commissions in other states are addressing these issues, in Nebraska, the responsibility largely falls to elected public utility boards. Coordination between gas and electric utilities is crucial for success. Currently, only electric utilities actively pursue beneficial electrification (LES, 2024b), while some gas utilities work against these efforts by offering ratepayer-funded rebates to switch from electric to gas appliances without regard for efficiency or climate impacts (MUD, 2024).⁹

Implementing energy efficiency policies in new and existing buildings can improve climate resilience, reduce energy consumption, and address social inequalities related to housing and energy costs. Policymakers should be cautious of

⁹ For example, Metropolitan Utilities District’s rebate offers contractors \$100 to replace a heat pump with an air conditioner, removing it as a heat source competing with methane. The contractor is incentivized to recommend replacement without regard to efficiency. The homeowner is eligible for a \$100 rebate when a low-efficiency furnace is replaced with a higher-efficiency one in the process.

adaptation strategies that undermine emissions reductions and increase risks for others.

For example, while air conditioning is a seemingly simple adaptation strategy for coping with extreme heat, it should not be viewed as a substitute for reducing emissions. Air conditioning increases energy demand and can strain power grids, making it harder to transition to lower-carbon energy sources and reduce greenhouse gas emissions. Air conditioners contribute to urban heat island effects by expelling warm air outdoors, further increasing the demand for cooling. Its potential to leak refrigerants, which have a high global warming potential, leads to more warming. Finally, air conditioning is not equally accessible to all, with low-income and vulnerable populations around the world often lacking access due to cost. Air conditioning is also not a solution for those who work outdoors, where people are at a higher risk of heat-related illness and death.

Prisoners

Research shows that racial minorities and low-income populations are not only facing greater climate-related threats at work, school, and home, but they are also more likely to be incarcerated. Within prisons, these individuals may face additional climate-related threats such as pollution, vulnerability to disasters like flooding, water contamination, and extreme heat (Gribble & Pellow, 2022). Nebraska prisons have a history of water quality violations, overcrowding, and lack of adequate healthcare, leading to legal actions and federal investigations (Nebraska Advisory Committee to the U.S. Commission on Civil Rights, 2020). Climate change may compound these health risks for prisoners. More research is needed to evaluate these risks.

Extreme weather and flooding

Planning and policy

In disasters like the 2019 floods (Chapters 2, 10, and 11), the impact on residents facing displacement due to evacuation orders and damage to homes and infrastructure varied according to social factors and government policy. Apart from how social class and disability affect the ability to evacuate, residents' ability to navigate requirements for aid, access savings and credit while waiting for aid and reimbursement, and social support impacted their

ability to meet basic needs immediately after a disaster.

In the 2019 floods, rural and Tribal communities faced more severe impacts due to their distance from key services (see Chapters 10 and 11). Strains on marginalized communities within rural areas can be worsened by poorly aligned policies.

Government policy can reduce or increase social inequalities. For example, when cost-benefit analyses prioritize more population-dense and high-value housing in allocating hazard mitigation funding before and rebuilding assistance after disasters can increase inequalities. NCA5 points out the need to develop new methods for calculating costs and benefits. These new approaches should consider the unique lifestyles and community values at stake while also addressing the historical devaluation of property in marginalized communities. As noted, "Even when all citizens are treated the same under the law, differential outcomes may result if the law ignores structural inequalities" (Marino et al., 2023, p.7; Graetz & Esposito, 2023).

Climate justice is crucial when it comes to investing in flood prevention and managed retreat, which means relocating people from new flood zones caused by climate change, as the city of Beatrice has done. On a national scale, some natural disaster risk-reduction strategies can unintentionally increase disaster risks, and disaster relief can lead local governments to make poor land-use decisions (Marino et al., 2023). In Nebraska, the eastern third of the state faces the highest flood risk (Figure 2.12), making it important to include both recognition (perspectives of the most vulnerable are included) and procedural (inclusiveness in the decision-making process) justice in local government planning. This includes focusing on risk management strategies like zoning and infrastructure investments in this part of the state. Hispanic and Latinx communities in Nebraska are especially vulnerable in many communities (Chapter 10).

Planning for climate justice requires collecting data relevant to disparate impacts and exposure to better predict how policies will affect social inequalities. Rural communities are more at risk because they often depend on a single economic sector, have aging infrastructure, and lack financial resources and expertise for climate planning. Surveys show that

those employed in agriculture have seen their income decrease due to extreme weather (see Chapter 14). In addition, higher levels of skepticism regarding climate change in these areas may mean more resources are needed for effective communication and planning to ensure equal protection for those populations from increasing climate impacts (Chapter 14).

Insurance

Extreme weather events are driving up home insurance costs in Nebraska (Flavelle & Rojanasakul, 2024; Gentzler, 2023). Severe storms that bring hail and high winds are causing more damage but have been considered by the insurance industry as “secondary perils,” along with wildfires and floods, in contrast to catastrophic events like hurricanes. However, parts of Nebraska face overlapping risks from these types of perils (Chapters 2 and 3), and insurers and reinsurers are expanding their modeling of such risks. As has been done for Minnesota, analysis of overlapping risks and their effects on social inequalities could help Nebraska (Birss et al., 2024). Rising home insurance costs can worsen the affordable housing crisis by driving up home and rental prices. Without state regulation vulnerable communities in Nebraska are likely to face higher costs as insurers seek profits.

The 2014 Nebraska state climate assessment expressed hopes that the insurance sector could promote adaptation to climate change (Bathke et al., 2014). However, higher prices may not lead people to leave dangerous areas. Instead, they could result in a higher rate of uninsured properties, unless the government intervenes. Assuming people will relocate to places with a low risk of climate disaster is incorrect (Seebauer & Winkler, 2020). Also, there is little evidence that insurance premium prices are correlated with disaster risk as a signal to residents. Finally, communities that face the greatest number and severity of climate risks tend to have fewer resources to adapt or relocate (Birss et al., 2024).

Lack of adequate planning can increase the exposure of low-income residents to overvalued floodplain properties, where insurance may be unaffordable or unavailable. Around 10,000 Nebraska renters live in floodplains and typically do not have flood insurance (Liska & Holley, 2014). Evidence from states

like Florida suggests private insurers’ speculative activities are abetted by poorly designed public programs and regulations and, more broadly, failing to produce risk reduction. When major disasters strike, uninsured and underinsured residents look to state and federal disaster relief programs for help. The costs are shared in unplanned irrational ways reflecting and reinforcing social inequalities, rather than being managed through state-coordinated risk prevention measures (Birss et al., 2024).

Higher insurance costs can lead landlords to increase rents for tenants and limit the resources available for investing in risk reduction through retrofits. These higher insurance costs also strain the financing for new affordable housing. Manufactured homes built before the passage of federal regulations enacted in 1976 are particularly vulnerable to extreme weather. While new federal efforts are improving manufactured housing’s energy efficiency and resilience, all manufactured homes are more vulnerable to damage from high winds. Proper anchoring can help reduce some of this risk.

Nebraska has 394 mobile home parks, and manufactured homes account for 1.4% of the housing stock (Edgell & Thayer, 2024). Mobile and manufactured homes often face higher flood risks but have limited insurance protection since they are classified as personal property located on land not owned by the resident.

Lower-quality housing may be harder to insure or repair, which can increase impacts for low-income households. However, it is unclear if building more disaster-resistant homes will result in lower insurance costs without state intervention (Chen, 2024; Flitter, 2024). In some cases, the most effective climate adaptation measures, such as stormwater management, can only be undertaken through collective action. Aggressive climate change mitigation is the most effective way to reduce long-term risk.

Because states are primarily responsible for insurance regulation, and state and local authorities are most closely linked to policymaking relevant to reducing climate risk, some researchers propose establishing a state housing resiliency agency. This agency would prioritize and implement local risk reduction activities using state-level funding resources and public disaster

insurance to provide fairer and more equitable protection (Birss et al., 2024). Expanding Nebraska's existing Fair Access to Insurance Requirements provision plans may help create a more robust and comprehensive public disaster insurance program that pools risk effectively and prevents private insurers from taking only the most profitable policies.

Human migration

The impacts of climate change will affect human migration patterns at national and regional levels. Some parts of Nebraska could benefit from gaining migrants, while other areas may face social stresses resulting from population decline due to environmental and economic pressures. Nationally, population migrations caused by rising sea level are likely to have direct and indirect effects on Nebraska counties (Robinson et al., 2020). Migration-related population growth is higher in low-risk than high-risk areas of the Midwest, likely for economic reasons, with Nebraska among the highest-risk states in the region (Indaco & Ortega, 2024). This trend raises questions for future research as to whether more vulnerable populations, such as the elderly, remain at higher rates in high-risk areas (e.g., the more rural western areas of the state).

A recent study of rural outmigration in Nebraska found dissatisfaction with environmental conditions (e.g., pollution, green spaces) to be one of the most significant predictors of residents' desire to leave rural areas, similar in effect to satisfaction with job opportunities and larger than satisfaction with medical facilities (Decker et al., 2024). Negative local environmental impacts, like air and water pollution, often accompany the release of greenhouse gases. On the other hand, improvements like increased green spaces provide opportunities for climate change mitigation and adaptation. Reducing pollution that harms rural residents and enhancing environmental amenities can strengthen climate resilience and support adaptive migration on broader scales.

Just transitions

The concept of a "just transition" toward environmental sustainability began in the labor movement during the

1980s. At the time, it focused on protecting workers impacted by changing energy systems. Today, scientists and policymakers use this concept to include equitably sharing the new benefits of the broader environmental and social transition that climate action entails while also protecting or enhancing the well-being of those economically relying on fossil sectors.

The transition to low-carbon development is wired in issues of justice and equity: how do you align carbon reductions to meet the needs of humanity? Distributive justice calls for a fairer sharing of the benefits and burdens of the transition process, while procedural justice is essentially about ensuring that the demands of vulnerable groups are not ignored in the pull to the transition. The impacts of climate change and the mitigation burdens are experienced differently by different social actors, with Indigenous communities facing multiple threats and being subjected to unequal power dynamics. (IPCC, 2023b, p.1746)

National climate justice policy, such as the Justice40 initiative, reflected just transition goals. This initiative prioritized benefits for communities that have historically experienced harm, have been underinvested in for benefits, or were threatened by transitions related to climate change. Justice40 priorities also included decreasing the energy burden and pollution for disadvantaged communities and increased access to clean energy and related jobs, energy democracy, and ownership (White House, n.d.; see footnote 4 on p. 137). Note: The Justice40 initiative was rescinded by the Trump administration's Executive Order 14148, "Initial Rescissions of Harmful Executive Orders and Actions," issued on January 20, 2021.

To achieve these goals, state and local policymakers were required to address equity issues when applying for many types of federal funding. This includes opportunities such as the Nebraska Priority Climate Action Plans, developed by NDEE (2024b), and the Omaha Metro for Environmental Protection Agency (EPA) funding or various grants pursued by Nebraska's public power districts. Seven states have created policies and tasked agencies with just transition planning (NCEL, 2023).

Just transition planning requires attention to three components of environmental justice (Figure 12.6). First, distributional justice requires identifying which groups have been disproportionately harmed by the existing systems that produce climate pollution. This includes considering how those current and past harms can be redressed or minimized and how benefits from new systems can be distributed equally to these groups. Distributional justice also requires recognizing which groups could face disproportionate negative impacts—economically, culturally, or environmentally—due to the shift toward cleaner production systems and helps determine how to avoid these negative impacts. Second, recognitional justice requires plans for how communities’ values and priorities will effectively shape the goals and strategies of the climate transition. Third, procedural justice ensures stakeholders with different capacities can participate equitably in the planning process.

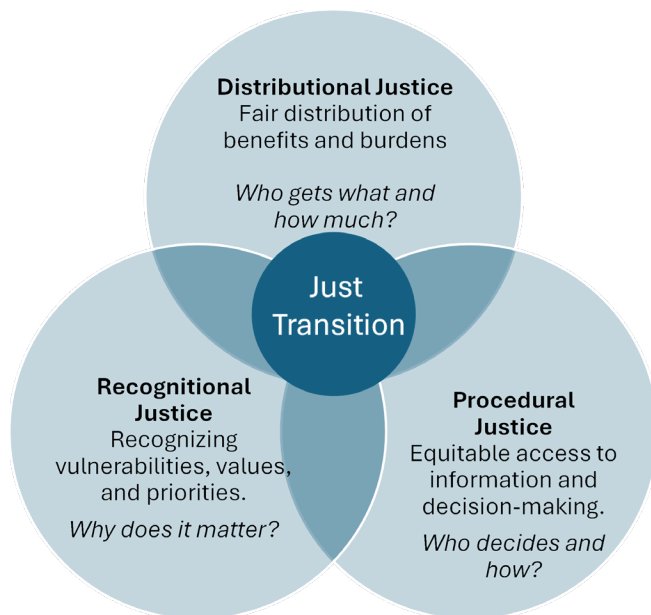


Figure 12.6. The three core components of a just transition framework. Just transition planning requires consideration of: (1) Who receives what and in what amount? (distributional justice), (2) Why does it matter? (recognitional justice), and (3) Who makes decisions and through what processes? (procedural justice).

To achieve just transitions, it is important to consider the environmental goods and amenities created by mitigation and adaptation, such as green space, and the environmental risks or harms, such as pollution. Several frameworks and toolkits have been developed for distributive justice concerns in just transition planning. Energy and just transition policies focus on three key areas: health impacts (positive or negative), access (who can benefit), and livelihoods (growing or declining economic opportunities) (Kime et al., 2023).

Tools, such as green infrastructure equity indices or the Climate and Economic Justice Screening Tool (2022), have been created to assist in assessing and pursuing distributional justice (Marino et al., 2023). These types of tools can assist in identifying important groups to consider in the recognitional and procedural justice process. They can be improved through community feedback from stakeholders. Increased public funding for analysis and planning is widely recognized as necessary to achieve just transitions.¹⁰

Just transitions in Nebraska

Much of the just transition research has focused on the energy sector. Although Nebraska has comparatively low employment in fossil fuel production, measures of employment carbon footprints indicate the need for just transition planning in many parts of the state with currently carbon-intensive production—for example, in manufacturing and agriculture, as well as fossil-fueled electricity production (Graham & Knittel, 2024). Researchers find that “all low-carbon energy technologies create more jobs per unit of energy than their coal and natural gas counterparts.” However, the new jobs are not necessarily in the same geography or with similar quality or wages as fossil jobs (Kime et al., 2023, p. 13). Thus, policy interventions are necessary to achieve climate justice by equitably sharing the benefits of the transition to low-carbon economies.

Fossil and clean energy and efficiency

In 2022, the energy sector in Nebraska provided 56,351 total jobs, which was 5.7% of the state’s total employment. Of these jobs, 58% were in the clean

¹⁰ “The implications for a Just Transition in climate finance are clear: expanding equitable and greater access to climate finance for vulnerable countries, communities and sectors, not just for the most profitable private investment opportunities, and a larger role for public finance in fulfilling existing finance commitments” (IPCC 2023c, p. 1559).

energy sector (including electrical transmission and corn ethanol).¹¹ The largest area of employment in the clean energy sector was energy efficiency, with 13,345 workers. Other areas included renewable energy (3,189), clean transportation (2,178), electric grid and storage (560), and clean fuels (211). Some jobs in polluting energy-related jobs can transition to clean energy jobs, such as moving away from making and repairing gasoline vehicles to electric vehicles. This transition requires training and investment for workers and communities.

The electrical power sector employed 7,894 workers in Nebraska in 2022, with 567 jobs in coal-fired generation and 497 in gas generation, 1,902 in solar, 750 in nuclear, and 676 in wind. Fuels-related employment was dominated by corn ethanol with 2,299 jobs, followed by natural gas with 762, petroleum with 732, and 24 in coal. Motor vehicles accounted for 18,100 jobs in 2022, with 7,387 in repair and maintenance and 6,011 in manufacturing (USEER, 2023). Nebraska's expected growth in clean energy jobs in areas such as energy efficiency and electric utility generation and transmission was below the national average. Future research could identify policy differences with other states contributing to this slower growth.¹²

According to scientific consensus, phasing out coal use in the power sector is widely considered the top priority for climate action (Clarke et al., 2022). Coal is the most carbon-intensive fossil fuel, and rapidly reducing its use is critical to mitigating climate change. Nebraska does not produce coal but imports it for its eight coal-fired electrical power plants, several of which are the largest generation sources in the state (Chapter 6). Nebraska ranks 13th nationally in carbon intensity of electrical generation and 8th in share of electricity from coal. It is one of only 15 states where coal remains the dominant electrical source (EIA, 2024).

Greenhouse gas emissions threaten life and health as well as threatening global climate justice goals. The EPA's Co-Benefits Risk Assessment Health Impacts Screening and Mapping Tool estimates that eliminating fossil fuel electrical generation air pollution would

prevent 15-23 deaths annually in Nebraska, and prevent \$230 to 360 million dollars in negative health effects (including the statistical value of lives lost). These health costs are not accounted for in the low comparative price of electricity in Nebraska but are important to consider when making energy transition policies.

Nebraska's sizeable agricultural industry contributes to the state having the nation's third-largest share of industrial electricity consumers (Chapter 6). We rank sixth in per capita electrical use, driven by both industrial demand and residential consumption. Nebraskans use more residential electricity per capita than all but 16 other states (EIA, 2024). The state benefits from the fifth-lowest electrical prices, partly due to our unique nonprofit public power system that provides cheaper and more reliable power than investor-owned utilities. However, these low prices also come at the expense of environmental and health costs related to energy production (Epstein et al., 2011; Sovacool et al., 2021).

Reducing energy demand through efficiency has already become the largest green job sector in the state. Given Nebraska's relatively high per-capita consumption, targeted policies and investments to expand efficiency and conservation could create good jobs and lessen energy burdens in disadvantaged communities. Most energy efficiency jobs are currently found in the construction industry, which highlights the connection to building codes and affordable housing policy, as well as efforts to retrofit existing buildings.

The growing electrical demand in Nebraska, driven by beneficial electrification that displaces dirtier fossil fuel energy sources, and new industrial growth, creates opportunities for re-employing current fossil fuel workers and new jobs for communities historically burdened by pollution from energy production. However, policies are needed to ensure that clean energy jobs are of good quality.

Fewer than 14% of hiring energy sector employers in Nebraska reported no difficulty in hiring, while almost 37% reported hiring to be very difficult (USEER, 2023). Policies that support and expand Nebraska's unionized

¹¹ *Transmission and distribution jobs include workers across current energy sources, and corn ethanol, woody biomass, large hydropower, and nuclear but are excluded for reasons of environmental pollution by some analysts such as Clean Jobs America (E2, 2024).*

¹² *For example, Nebraska does not supplement federal energy efficiency funds with other state funding sources as Colorado does.*

public power jobs could facilitate a just energy transition. Nationally, 48% of non-union firms reported that hiring was very difficult compared to only 29% of unionized firms. Unions also increased the likelihood of recruitment of women by 50% and people of color by 200% (USEER, 2023).¹³ Union support for apprenticeship and other training programs is a potential explanatory factor that can contribute to these outcomes.

Publicly owned utilities are more likely to implement policies focused on equity and the environment (Homsy, 2020). Nebraska's public power model is well-positioned to pursue just transition goals by creating good jobs within public utilities, setting fair terms in project labor agreements, and ensuring proper wages and working conditions in contracts with private sector partners.

Public power may also provide advantages in expanding renewable energy, grid infrastructure, and energy storage. Procedural justice requires meaningful community involvement in the siting of energy infrastructure. Distributional justice requires that communities be fairly compensated for negative impacts and share in energy projects' benefits. Examples of this can be seen in the workforce and community benefits agreements (DOE, n.d.) that are shaped through inclusive and deliberative processes.¹⁴ Recognition justice requires that communities are able to determine their priorities for such agreements. Procedural justice ensures that they have access to expertise to represent those priorities. For example, the Omaha and Iowa Tribes likely have specific sovereign interests related to utility policies and planning.

Studies show that opposition to wind and solar energy development projects tends to diminish when there is some form of community ownership and with perceived fairness and equity (particularly in local decision-making processes) (Caggiano et al., 2024; Stokes et al., 2023).

Nebraska's public power system offers forms of community ownership and democratic decision-making.

However, due to historical tax-based incentives, the predominant approach to renewable energy has been private development, ownership, and operation through power-purchase agreements. Nebraska utilities could take a more proactive role in the development process by helping create community benefit and project labor agreements with private developers or using new federal financing programs to develop and own projects themselves. The latter may pose procedural justice benefits, but to meet distributive justice goals policymakers should ensure the structure of Payments in Lieu of Taxes allow tax-exempt public power districts to provide appropriate community benefits.

In contrast to evidence on the location of polluting energy sources, analysis of wind energy placement shows little evidence of distributional injustice via higher placement in disadvantaged counties (Mueller & Brooks, 2020). However, the authors note that within individual counties, communities with higher income, employment, population density, and levels of education tend to have lower rates of wind energy development. This suggests that further research is needed to determine the distribution of burdens and benefits (Mueller & Brooks, 2020). Nationally, analysis also shows

small groups of wealthier and whiter wind energy opponents in North America are slowing down the transition to clean energy by opposing wind projects in their backyards. This opposition represents a form of energy privilege that has dramatic air pollution impacts on low-income communities and communities of color. . . as it slows down the transition away from fossil fuel electricity sources overwhelmingly placed in their backyards. (Stokes et al., 2023, p. 6)

Aesthetics tied to project size, visibility, and noise are the most common drivers of wind project opposition nationally. Further research is needed to understand opposition sources to renewable energy development, particularly in Nebraska, and their

¹³ Nebraska has the second-fewest minorities employed in the clean energy sector of 12 midwestern states (77.6% White, regional average 74.2%) (Clean Jobs Midwest, 2023).

¹⁴ The webpage for the DOE resources cited has been deleted but an archive of the CBA toolkit is available here <https://web.archive.org/web/20231004122057/https://www.energy.gov/diversity/community-benefit-agreement-cba-toolkit>.

procedural and distributional justice implications.¹⁵

Policymakers could pursue procedural justice through decision-making processes that ensure distributional and recognition justice in infrastructure planning while preventing vocal minorities (often funded by fossil fuel interests) from perpetuating broader distributional injustices (Crawford et al., 2022).

Biofuels and regenerative agriculture

Corn ethanol is a major economic industry in Nebraska, but its implications for climate justice remain unclear. Improving access to renewable energy and adopting regenerative agriculture could improve livelihoods while reducing climate emissions and providing co-benefits. These co-benefits include reducing negative health impacts, such as cancer risks related to groundwater quality stemming from current agricultural practices (Kulcsar et al., 2016; Ouattara et al., 2022; Xu, 2022).

The state's recently awarded EPA Priority Climate Action Plan grant (NDEE, 2024b) emphasizes measuring and reducing emissions linked to commodity agriculture, biofuel production, and expanding new technologies and regenerative agriculture. Farmers may encounter policy-related barriers to adopting these practices. For example, crop insurance policies can fail to benefit climate-adaptive farms and even penalize farmers for adopting climate-friendly strategies (Evaretnam, 2024).

Currently, ethanol is mainly used as an additive in gasoline. A shift toward electric vehicles and alternative transportation options (Chapter 6) will likely reduce that source of demand. Changes in the industry's climate impact will shape other potential future ethanol uses, such as aviation fuel.

Many federal agencies and researchers have found that ethanol's life-cycle emissions are lower than gasoline's. However, the impact of land-use changes due to the ethanol policies is still being debated, with some studies suggesting that ethanol is more carbon-intensive than gasoline (Alarcon Falconi et al., 2022; Hill, 2022; Scully

et al., 2021a, 2021b; Spawn-Lee et al., 2021).¹⁶ Studies generally agree that U.S. ethanol policies increase global food prices, domestic agricultural pollution, and habitat loss (Chen et al., 2021; Smith et al., 2023).

Continued research into the life-cycle emissions of various forms of ethanol production, whether corn-based or other cellulosic sources, will likely influence policy debates to ensure climate justice. In addition to efforts to reduce emissions from current agricultural practices, diversifying the economy could help rural areas adapt to changes in biofuel markets and support just transitions.

Renewable energy offers rural communities a way to diversify their economy while lowering life-cycle emissions from agricultural products. For example, an acre of photovoltaic electrical panels (Mathewson & Bosch, 2023) provides more than 60 (potentially up to hundreds of times) vehicle miles as an acre used for corn ethanol. Research is also exploring "agrivoltaics" to combine solar energy production with farming to boost land productivity.

While using corn as a fuel source seems to be a path toward renewable energy, research shows that it is relatively inefficient as an energy source (Richardson & Kumar, 2017; Hill, 2022). Research shows that increasing both food and energy production on existing agricultural lands is possible, with increased economic benefits for landowners (Turnley et al., 2024). For instance, one proposed solar project in York County was projected to generate over \$5,000 more revenue per acre than growing corn and soybeans. This project could result in a net impact of \$12,000 in labor income for every 100 acres converted and create one additional job for every 500 acres converted (Thompson, 2022).

Effective just transition planning requires consideration of how these benefits may be distributed among various actors within and outside the community and how they interact with existing social inequalities. For example, good community standards, such

¹⁵ Previous research on community perceptions of economic benefits with environmental costs around the biofuel industry as a green energy source in the Midwest have found that environmental harms were typically discounted and economic benefits overestimated (Kulcsar et al., 2016). Research on how perceptions related to electric renewable energy infrastructure in the region are similar or different would be valuable.

¹⁶ Another key question is how much domestic ethanol production reduces fossil fuel consumption, versus displacing production to the export market.

as community benefit agreements and plans with renewable energy companies (DOE, n.d.), could help ensure that local workers reliant on rented land affected by these projects benefit from energy projects.

The NDEE has proposed strategies for more sustainable agricultural production to lower carbon emissions from crops and biofuels (NDEE, 2024b). For these strategies to be effective, it is essential to increase clean energy production to lower the emissions from farming inputs and biofuel plants. More research and practical guidance are also needed on precision and regenerative agricultural practices. Studies that include just social impacts like economic, food security, and sovereignty and their broader ecosystem benefits are crucial to ensure the adoption of these practices and help maximize their positive impacts on society.

Similarly, plans to reduce the climate impacts of animal agriculture, such as using biodigesters linked to confined feeding operations or animal processing operations, should also consider ways to reduce the negative health and social impacts unequally distributed along lines of socioeconomic status and race/ethnicity (Donham et al., 2007; Son & Bell, 2024; Son et al., 2024).¹⁷ Though these health and social issues are well-documented, they are less understood. Climate justice in Nebraska's agricultural communities is linked with energy justice in decision-making and outcomes for new infrastructure.

Distributional, procedural, and recognitional justice in energy infrastructure

Climate responses and energy transitions in Nebraska are leading to increased proposals for large-scale infrastructure projects across the state. These projects include renewable energy installations, electric transmission lines, and carbon dioxide pipelines that aim to reduce or eliminate emissions from industrial processes. Procedural justice is important when siting all forms of energy infrastructure.

Recognitional justice requires that communities have a say in the types of development they want, not just under what terms they will accept a predetermined outcome. Distributional justice involves evaluating who benefits and who is harmed by proposed infrastructure changes. Increasing state and local capacity for energy and climate infrastructure planning that meets all three aspects of environmental justice is an urgent priority for achieving climate justice. Multiple organizations have created policy guides and recommendations on just and sustainable energy infrastructure to assist communities and policy makers. Examples include guidance from the Center for Rural Affairs (2024) and legislation from other states (NCEL, n.d.).

More research on past Nebraska energy infrastructure decision making could benefit climate justice efforts in the future. The political conflict surrounding the Keystone XL pipeline captured international attention as Indigenous nations and local communities in Nebraska raised concerns about recognitional and procedural justice related to treaty rights. Local White residents also raised concerns about potential threats to their local environments and property rights (Derman, 2020; Ordner, 2018). Analyzing the state and local processes and outcomes in the pipeline decision could provide valuable insights into how to enable impacted communities, including Native tribes, to meaningfully deliberate and consider their rights to a healthy environment, property rights and the equitable distributions of benefits and costs related to Nebraska's energy and climate-related infrastructure.

¹⁷ Further research on how cattle animal agriculture may be distinct from impacts associated with swine and poultry could be helpful for Nebraska policy-making. For example, an analysis of Tyson's environmental impacts found Nebraska to be most impacted, with Winnebago and Omaha Tribes downstream from the largest source of pollution (Goswami & Woods, 2024).

Conclusion

Existing inequalities in Nebraska are at risk of worsening due to climate change. However, climate action can create opportunities to reduce these inequalities. For example, creating good jobs, retrofitting, and building new efficient and climate-resilient housing can help improve income and housing inequalities. Vulnerable populations who can benefit from climate action and new opportunities for just transitions exist throughout the state, both in rural and urban communities. The success of climate adaptation and mitigation efforts in these communities is interconnected. Steps taken help build communities' capacity to participate in the decisions that affect them across many issues and foster social connections and trust. Nebraska has benefited from national resources dedicated to pursuing climate justice goals and can continue to do so. Nebraska can accelerate its progress by learning from other states and communities that have already developed useful tools and policies.

Gaps and needs

- » Research to fill in gaps in our understanding of climate threats to vulnerable populations, including those in the workforce, criminal justice system, and minority and rural communities in Nebraska.
- » Research quantifying climate justice outcomes of different regenerative agricultural practices and climate-related energy infrastructure, including how communities perceive and understand the distribution of benefits and harms, could inform improvements in recognition and procedural justice.
- » Research that systematically analyzes how established climate and environmental justice concepts and principles are incorporated into Nebraska's existing climate and energy policy. For example, evaluate distributional justice outcomes in state programs (such as WAP) and collect and analyze data on public participation in policy planning and implementation in other climate-related programs. Determining whether vulnerable communities identified by social science research are effectively included in the decision-making process is essential.