

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

2024 Climate Change Impact Assessment Report Executive Summary



Executive Summary

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Nebraska stands at the crossroads of experiencing and addressing the challenges climate change brings. Tackling the far-reaching impacts of climate change on agriculture, water resources, energy systems, ecosystems, and vulnerable populations requires collaboration, knowledge sharing, and coordinated strategies. Leveraging the deep environmental knowledge held by Indigenous communities, mobilizing the power of faith-based organizations, and drawing upon the experience of localized adaptation initiatives are key to fostering resilience and advancing fair and just solutions. This report provides a comprehensive analysis of critical insights across key sectors, emphasizing the urgency of implementing proactive strategies to mitigate risks, adapt to ongoing changes, and build a sustainable future for all Nebraskans.

Climate

Nebraska's climate has become notably warmer and slightly wetter, with distinct seasonal shifts. This warming has been most pronounced in June, September, and November. Since 2000, every location in Nebraska has experienced at least one record-setting warm month, and many have experienced multiple record-warm months. While annual precipitation trends show a slight increase since the late 19th century, eastern Nebraska faces declining summer precipitation. Variability in moisture has led to record dry and wet months across the state. Warmer winters have reduced snow cover days and decreased heating degree days, altering energy demands and ecosystem dynamics.

Nebraska's future climate will undergo substantial transformations through the 21st century. Statewide annual temperatures are expected to rise by 5°F to 6°F by 2050 and by 7°F to 11.5°F by the end of the century, relative to the 1950 to 2014 historical period. Summer and fall will warm slightly more than winter and spring, leading to more frequent and prolonged heat extremes. Extremely hot days (greater than or equal to 90°F) will multiply two to four times, while extremely warm nights (greater than or equal to 70°F) could increase more than tenfold. Extremely cold days (below 0°F) will diminish significantly, occurring only four to seven days annually by the century's end. Seasonal precipitation patterns will diverge, with winter and spring precipitation projected to increase by 10% to 35%, while summer precipitation may decline by 10% to 20%. Extreme precipitation events, particularly the most intense ones, are expected to rise in frequency and magnitude.

Under a high-emission trajectory, parts of Nebraska could face over 50 days annually with temperatures exceeding 100°F by the end of the century.

Water Systems

The impact of climate change on water systems is deeply interconnected with Nebraska's economy, communities, and environment. Changes in precipitation patterns, type, and timing influence water availability, affecting energy, health, and agriculture. Properly managing Nebraska's groundwater is crucial for irrigation and drinking water, making it essential for the state's ability to cope with climate change.

However, climate change is expected to complicate water issues in Nebraska, impacting both the amount and quality of ground and surface water. These changes will have far-reaching implications for the state's economy, communities, and environment. Longer growing seasons and increased evapotranspiration will increase the demand for irrigation, putting more pressure on water resources.

Groundwater levels closely follow precipitation trends, making them sensitive to climate change. Intensifying droughts could stress ground and surface water systems, potentially harming the state's agricultural productivity and environmental stability.

Energy

Energy consumption and emissions play a pivotal role in Nebraska's climate future, shaping opportunities for mitigation and adaptation. Energy-related activities, including fossil fuel combustion for electricity, transportation, heating, and fertilizer production, contribute to Nebraska's greenhouse gas emissions. Nebraskans consume energy directly (fuel and electricity) and indirectly (through goods and services), presenting opportunities for efficiency improvements at all levels. Reducing emissions through energy efficiency and fuel switching offers significant financial and environmental benefits, including reduced energy and fertilizer costs. Effective emissions reduction strategies should address residential, commercial, and transportation sectors and policies at local, state, and national levels. Balancing emissions reduction efforts with reliability goals is essential to ensure sustainable transitions.

Ecosystems

Nebraska's ecosystems are undergoing rapid transformations driven by climate change, presenting risks and opportunities. Accelerated shifts in ecosystems impact species distribution and biodiversity, intensifying the loss of species diversity. These changes threaten the resilience of ecological networks, which provide essential services such as pollination, water purification, and carbon storage. Changes to ecosystem services create risks and potential benefits for communities and industries reliant on these systems. Proactive ecosystem management is essential to mitigate risks, preserve biodiversity, and harness opportunities from changing environmental conditions.

Agriculture

Agriculture, a cornerstone of Nebraska's economy, faces escalating challenges from climate change. Shifts in temperature and precipitation trends threaten field crops and rangeland productivity. Key risks include rainfall variability, shifts in rainfall seasonality, more rapid drought development and intensification, rising temperatures, fewer very cold days, and heightened risks of wildfires and hail. These

factors could significantly reduce agricultural output if unaddressed. Strategies to maintain productivity include advancements in plant genetics, diversification of crops and cropping systems, and improved soil and water management practices. Effective rangeland management, such as heterogeneity-based approaches and adjusting livestock species and classes, can help mitigate climate-related challenges.

Health

Due to climate change, Nebraskans' health is increasingly at risk, with disparities in vulnerability across populations. Rising temperatures, extreme weather, and shifting environmental conditions contribute to physical and mental health challenges. Vulnerable groups, including senior citizens, children, low-income populations, and those with pre-existing health conditions, face heightened risks of climate change. Proactive efforts to address health risks, such as public health interventions, climate-resilient infrastructure, and community-based programs, can safeguard public well-being and reduce disparities among vulnerable populations.

Communities and the Built Environment

Nebraska's communities and infrastructure are increasingly vulnerable to extreme weather and climate-related events. Urban and rural areas face more frequent and intense extreme events, resulting in prolonged disruptions, widespread impacts, increased costs, and more profound social consequences. Physical infrastructure and social systems are at elevated risk, with implications for long-term safety, equity, and economic stability. Effective responses include land-use planning incorporating climate risk assessments, protecting ecosystems to buffer against extreme events, strengthening infrastructure to enhance resilience, and fostering inclusive dialogue and collaboration across communities and regions.

Indigenous Peoples

Indigenous communities face heightened vulnerabilities to climate change but are also leading in innovative adaptation efforts. Weather and climate events disproportionately affect Indigenous populations, exacerbating existing challenges. Local adaptation initiatives led by Tribal communities exemplify resilience and self-determination in addressing climate impacts. Advancing Indigenous climate adaptation hinges on recognizing sovereignty, upholding rights, and enabling cultural reclamation and innovation. Supporting these efforts is essential to fostering equitable and effective climate resilience strategies.

Climate Justice and Equity

Climate change exacerbates social inequalities, disproportionately impacting vulnerable populations in Nebraska. Low-income individuals and communities of color face higher exposure to climate risks, including extreme weather and environmental degradation. Without targeted policy interventions in housing, workplace protections, and energy, climate-related impacts will likely deepen social inequities. Ensuring equitable participation in climate planning and action is essential to address ongoing changes and reduce future risks. Meaningful engagement and resource allocation for marginalized communities are critical to achieving climate justice.

The Response of the Faith Community

Faith communities have a unique opportunity to contribute to climate action, though their potential remains untapped. Religious leaders in Nebraska have not widely integrated climate issues into their teachings, advocacy, or institutional practices. Political affiliations often overshadow religious imperatives on climate action. Programs such as the federal Inflation Reduction Act and Nebraska's ONE RED Non-Residential Solar Program offer financial pathways for faith-based organizations to implement greenhouse gas emissions reduction projects. Religion can inspire societal action by aligning climate advocacy with moral and spiritual values, unlocking a powerful avenue for addressing climate change.

Nebraskans' Perceptions of Climate Change

Public perceptions in Nebraska are pivotal in shaping the state's response to climate change. Most Nebraskans agree that climate change is happening and acknowledge that human activities play a role. However, political views heavily influence these perceptions, creating a spectrum of opinions about the urgency and nature of climate action. Younger Nebraskans are more likely to view climate change as human-caused and to support proactive measures to address it. Local experiences, such as extreme weather events, further shape perceptions, underscoring the importance of connecting broader climate trends to tangible, community-level impacts. This highlights the need for inclusive communication strategies that bridge generational and political divides while encouraging collective action to manage and mitigate climate risks.