Climate Change in South Dakota

Science, Impacts, & Solutions

South Dakota Green Project

Combating Climate Change, Building a Sustainable Future

Climate Science 101

The science is clear: climate change is happening right here, right now. With rising global temperatures and stronger and more frequent extreme weather disasters, the impacts of climate change are already affecting daily life everywhere. Scientists have known for decades that human activities are causing what many experts consider a crisis. The good news is we have the power to solve the problem and ensure a healthy and livable future for everyone.

It's warming

Earth has always had natural cycles of warming and cooling, but never as rapid or as extreme as the changes we're seeing now. **The last 10 years have been the hottest years on record, and each of the last four decades has been successively warmer than any decade that preceded it since 1850. Not only was 2024 the hottest year since record keeping began in 1850, but it likely was the hottest for the planet in 125,000 years.** For the first time, the annual average temperature for that year was more than 1.5˚C hotter than pre-industrial levels. Studies show that exceeding the 1.5˚C threshold long-term could trigger dangerous "tipping points" for our climate systems, and that "these changes may lead to abrupt, irreversible, and dangerous impacts with serious implications for humanity."

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- Climate change is real; it's us; we're sure; it's bad; we can fix it!
- Transitioning to a renewable future will require all of us to work together, including our communities and our elected leaders.
- We need to act urgently; the impact of climate change is significant; the opportunities if we transition to a renewable future are enormous!

It's us

Human activities are causing climate change, largely by burning fossil fuels like coal, oil, and methane (also known as "natural gas"). Burning fossil fuels releases greenhouse gases, which trap heat in the atmosphere. Rising global temperatures correlate almost exactly with human releases of greenhouse gas emissions.

By taking millions of years worth of carbon, once stored beneath the earth as fossil fuels, and releasing them into the atmosphere in the form of

What's in this resource?

There are plenty of resources available for learning about climate change, but most of them focus on the global or national level. In these pages, you can learn about the ways that climate change is specifically impacting South Dakota's environment and economy. We also explore positive solutions to help our state minimize climate impact and adapt to changing weather patterns. South Dakota is a unique state with its own unique needs, values, and strengths – that's why we need solutions that work for us!

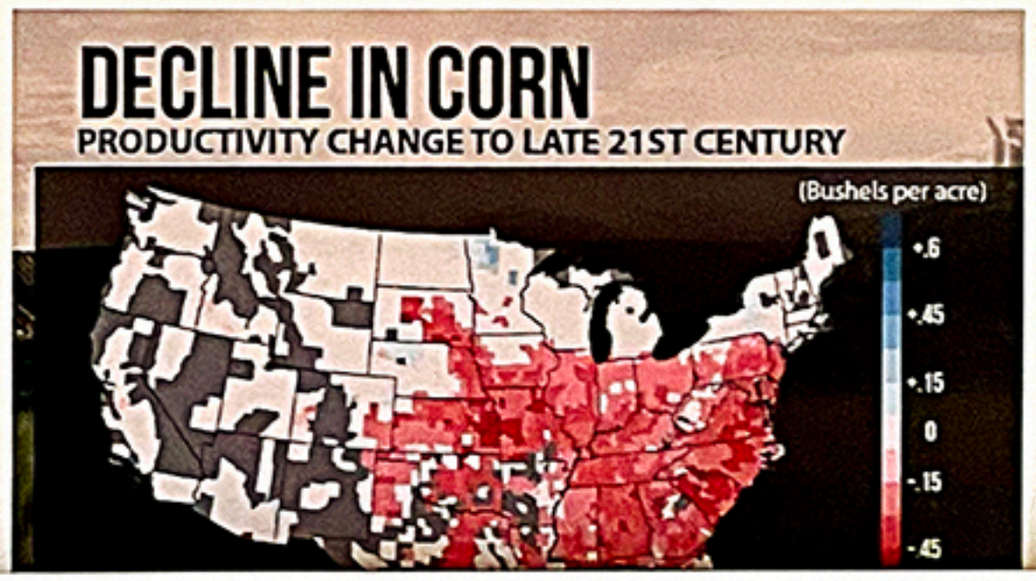
Economic Impacts & Opportunities

The Cost of Inaction

While it's hard to predict the exact cost of climate change on individual areas, we know that climate change is fueling more frequent and more intense extreme weather events like flooding, severe storms, and wildfires that cause costly damage to human health and property. Weather-related disasters cost the U.S. upwards of $150 billion in damage every year, and that number is only increasing.

In 2024, there were 27 weather disasters in the United States that caused at least $1 billion in damages. The average number of annual billion-dollar disaster events has skyrocketed from 3 per year to 23 per year since the 1980s, even adjusting for inflation. This strains state and federal emergency response resources and limits the ability of communities to respond and recover after disasters.

Besides extreme weather, there are other ways these costs trickle down to individuals and households:



- From damaging storms to rising costs of living, climate change packs a big price tag for South Dakotans.
- While some climate solutions can be expensive up front, they also improve economic efficiency and bring long-term opportunities for local economic growth.

drought will more than offset any potential benefits of climate change to agriculture in the United States, resulting in a net decline in agricultural productivity. Researchers estimate that across the U.S., climate change may cause total yields to decline by 7% for corn and 9% for soybeans. In the Midwest and Great Plains, those losses may be as high as 10 to 20%.

- **Threats to livestock.** Ranchers will face challenges managing livestock health due to increasing heat stress, parasites, and pathogens. Changing weather patterns are already shifting the ranges of forage species and increasing the spread of invasive weeds, leading to less nutritious rangelands.
- **Higher crop insurance payouts.** South Dakota is one of the top states in the nation for receiving insurance payouts for crop losses due to extreme weather disasters, with nearly $10 billion paid out to farmers in the state over the past two decades. Nationally, federally-subsidized crop insurance losses have increased by 19% due to climate change and are

South Dakota Green Project (formerly SoDak 350) is a grassroots movement working to mobilize South Dakotans to help address the climate crisis. We have taken care to cite all sources for the information presented here, and we encourage you to scan the QR code that will connect you to a list of those sources. A PDF version of these pages can also be found there.

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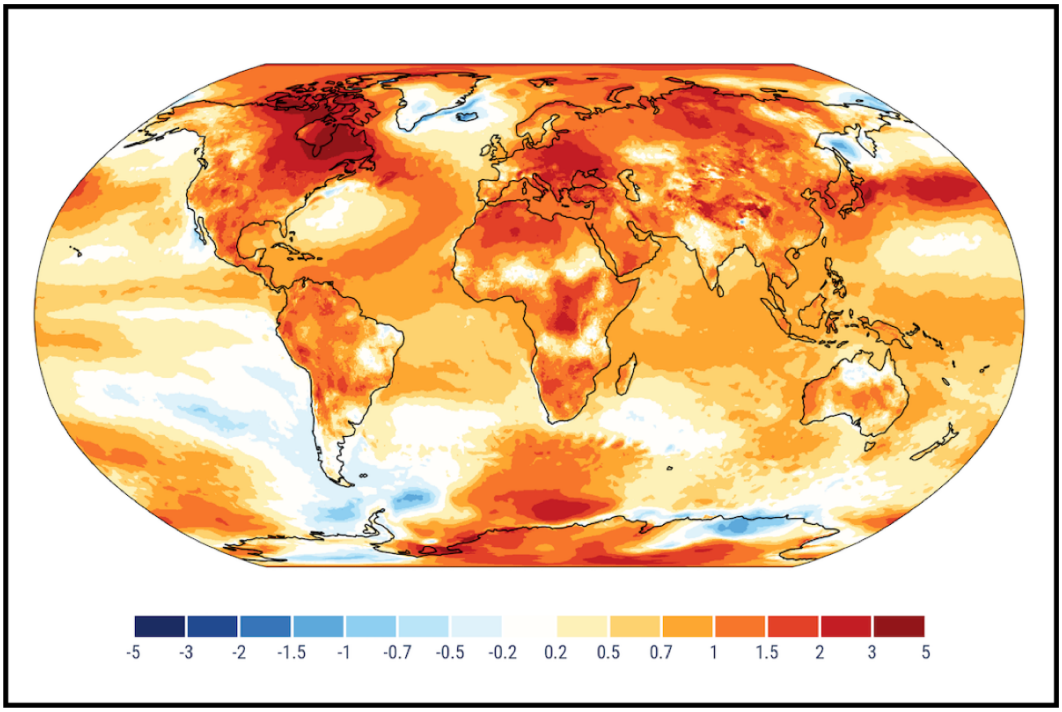


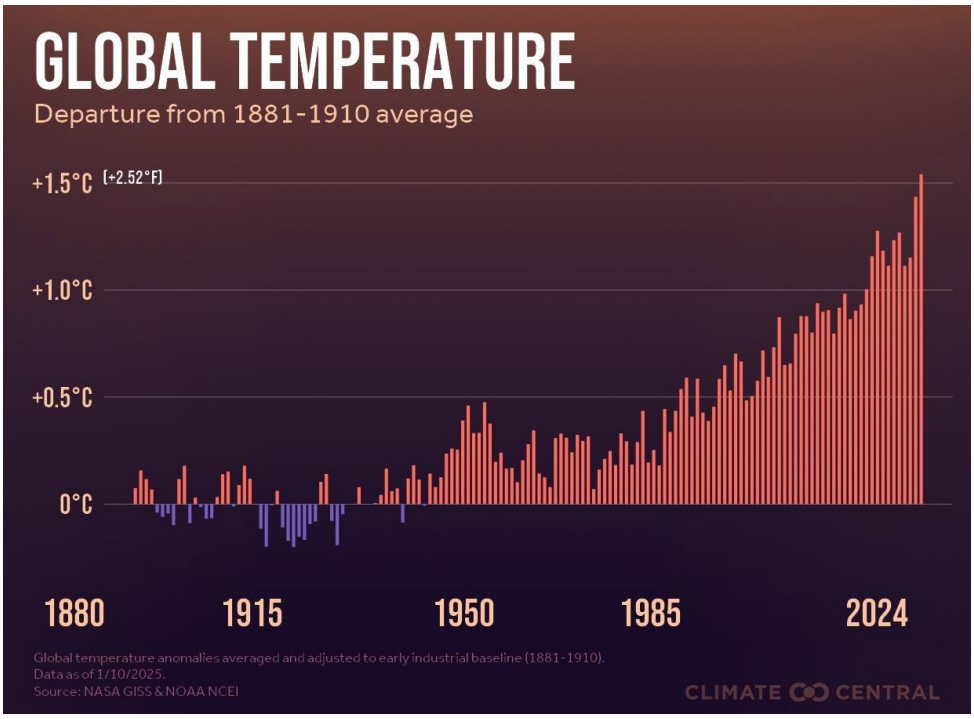
The difference in temperature, in degrees C, between 2024 and the preindustrial era. *Source: Copernicus Climate Change Service*

By taking millions of years worth of carbon, once stored beneath the earth as fossil fuels, and releasing them into the atmosphere in the form of carbon dioxide and other greenhouse gases, humans have super-charged the Earth's natural cycles. Present-day levels of greenhouse gases in the atmosphere are higher than they have been at any time in the last 800,000 years.

We're sure

An overwhelming 99% of scientists agree that climate change is being caused by human greenhouse gas emissions. There is no

legitimate scientific uncertainty about the basic science of climate change. Scientists, including staff scientists at fossil fuel companies like Exxon, have known that humans are causing climate change since the mid-twentieth century. Attacks on the credibility of climate science are perpetuated by vested interests, including the fossil fuel industry, which continue to pump money into creating uncertainty about our understanding of climate change.



Global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910). Data as of 1/10/2025. Based on data from NASA GISS & NOAA NCEI.

It's bad

Climate change is not just a problem for future generations — it's here and has already resulted in devastating impacts for millions of people.

Rising temperatures don't only mean it's getting hotter. Earth's climate is complex — even a small increase in average global temperature means big changes across the planet's entire weather system. Climate change is driving increasingly frequent and increasingly severe wildfires, heatwaves, hurricanes, flooding, droughts, and other disasters. Modern attribution science can now estimate how much climate change contributed to worsening these disasters.

In 2024, there were 27 weather disasters in the United States that caused at least $1 billion in damage. Together, these disasters resulted in an estimated 568 deaths and $182.7 billion in damages. The average number of annual billion-dollar disaster events has skyrocketed from 3 per year to 23 per year since the 1980s, even adjusting for inflation.

Around the globe, extreme weather events and unpredictable seasons are contributing to water shortages, disrupting food production, and contributing to humanitarian crises, conflict, and displacement. Vulnerable social groups, including low-income individuals, women, young people, the elderly, ethnic and religious minorities, Indigenous People, and refugees are likely to suffer more from the impacts of the climate change — despite having contributed the least to rising greenhouse gas emissions.

We can fix it

The good news is that there's so much that can still be done to lessen the worst impacts of warming. Though past emissions mean some warming is already locked into our climate system, every tenth of a degree of warming we can prevent will help achieve a safer environment for the people and places we love.

We know what we need to do to solve this crisis— including transitioning to renewable energy sources, enhancing energy efficiency, developing sustainable transportation systems, and investing in regenerative agriculture and land management practices. Most of these solutions are available right now, and many of them are actually cheaper than fossil fuels — but they must be implemented rapidly and equitably in a way that puts people and communities first.

The Impact of Climate Change in South Dakota

Climate change is already changing weather patterns in South Dakota. Small changes in global average temperature lead to big changes across the climate system.

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Key Impacts Areas

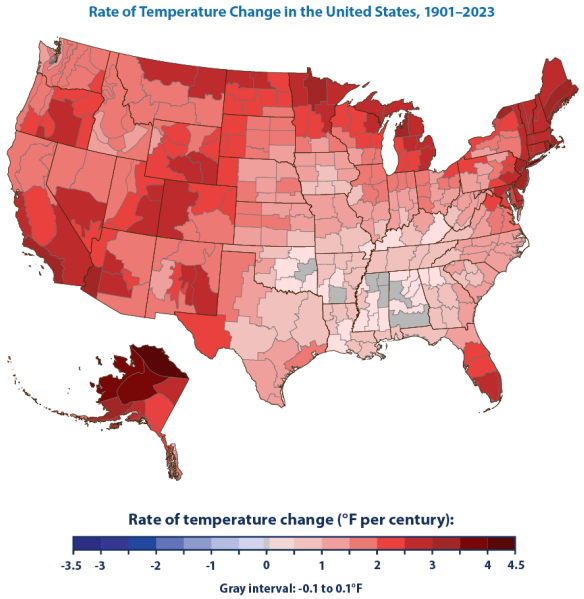
Statewide annual average temperatures have risen by almost 2°F since the beginning of the 20th century. And changes in average temperature lead to big changes in extremes. Here are some of the ways that South Dakota's climate patterns are changing:

Shorter, warmer winters

Milder winters can be beneficial for the growing season, but reduced snowpack may harm the ability for groundwater resources to recharge and shorten the season for winter sports tourism.

Changes in rainfall

Total annual precipitation is increasing overall, but the timing and intensity of rainfall events is changing. Extreme rainfall events are becoming more frequent in spring, increasing the risk for spring runoff and widespread flooding, especially in East River communities. Since 1990, South Dakota has experienced 22% more frequent extreme precipitation events compared to the long-term average. Meanwhile, warmer, drier summers will increase the intensity of summer droughts, especially in the western part of the state.



Climate Impact By the Numbers

2°F Average annual temperature increase in South Dakota	**22%** Increase in frequency of extreme rainfall events
2.2 Average annual billion-dollar disasters hitting SD since 2020	**36** Billion-dollar weather disasters hitting South Dakota since 1980

Extreme weather disasters

Across the board, droughts, floods, wildfires, and severe storms are becoming more frequent. From 1980-2024, South Dakota experienced 36 confirmed extreme weather disasters with losses exceeding $1 billion (adjusted for inflation). The frequency of billion-dollar disasters in the state has increased to more than two per year on average since 2020.

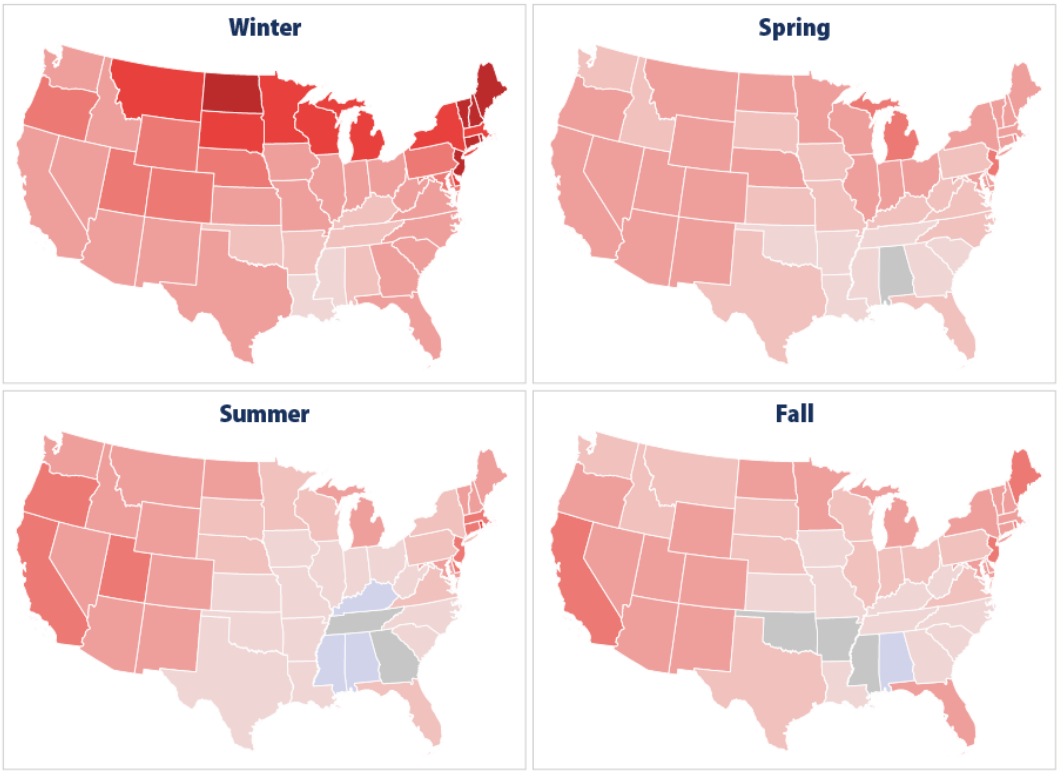
Economic damage

Agriculture is the bedrock of South Dakota's economy. Changing climate patterns and extreme weather events can reduce crop productivity, introduce new pests and diseases, disrupt pollination, and result in crop failure. As warming increases, these risks will outweigh any potential benefits from longer growing seasons and increased carbon dioxide concentrations. Climate stressors also threaten the health and resilience of wildlife and natural ecosystems, threatening the hunting, fishing, and tourism industries that depend on them.

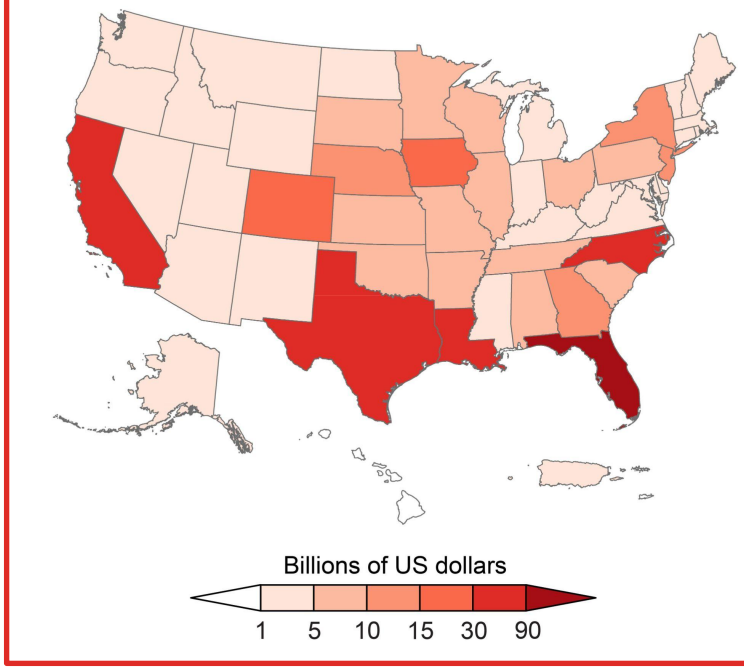
Community vulnerability

Climate change will impose new or higher costs on most households as healthcare, food, insurance, building, and repair costs become more expensive. These costs will be felt most intensely by low-income families and rural and Indigenous communities that lack fair access to resources and emergency services.

Change in Seasonal Temperatures by State, 1896–2023



Damages by State from Billion-Dollar Disasters (2018–2022)



Scan QR code for sources

South Dakota's Greenhouse Gas Emissions

South Dakota industries and citizens emitted approximately 43.5 million metric tons of carbon dioxide in 2022.

This is equivalent to:

- Driving 10,146,604 gasoline-powered cars for one year
- Annual energy use from 5,841,917 homes
- Annual emissions from 11.5 coal-fired power plants

It would take 43.6 million acres of forestland—an area roughly the size of Missouri—to absorb the same amount of carbon as South Dakota emits in one year.

How much does South Dakota contribute to climate change?

South Dakota's total emissions in 2022:

43.5 MMT CO_2e*

*Million metric tons of carbon dioxide equivalent

Due to its small population (less than one percent of the total United States), South Dakota makes up a very small percentage of total national emissions. However, our emissions per person are higher than the U.S. average.

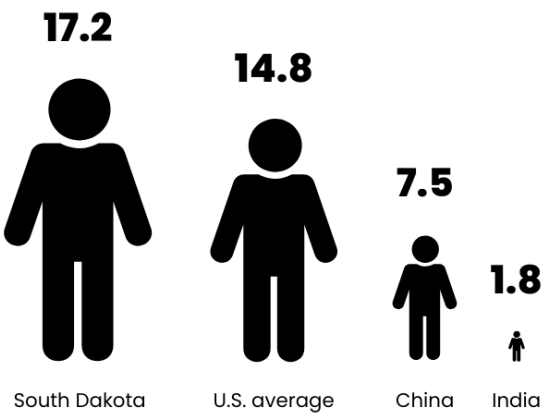
Where do our emissions come from?

The majority of South Dakota's greenhouse gas emissions come from agriculture, the state's largest economic sector.

Agriculture

Agricultural emissions primarily come from soil management practices and livestock management. Ruminant livestock such as cattle emit methane as part of their normal digestive process. Methane is a potent greenhouse gas that is 80 times more powerful than carbon dioxide over a 20-year period. Certain manure management practices also emit methane and nitrous oxide, another potent greenhouse gas.

Per capita energy-related greenhouse gas emissions, 2022 (metric tons CO2 equivalent)



Transportation

The second-highest source of emissions is transportation. Low population density means that many South Dakotans have to travel long distances to access jobs, grocery stores, health care, and other services. A lack of public transportation options, electric vehicle charging stations, modern fuel efficiency standards, or low-carbon vehicle incentives put low-emissions transportation options out of reach for most South Dakotans.

Power Production

Electric power generation makes up a relatively small proportion of South Dakota's greenhouse gas emissions. About 77% of electricity generated in South Dakota comes from renewable sources, primarily wind and hydroelectric power. Renewables account for 36% of total energy consumed in the state. South Dakota's position as a leader in renewable generation should be celebrated, but there is always more progress to be made. Further investments in energy efficiency and other renewable sources like solar

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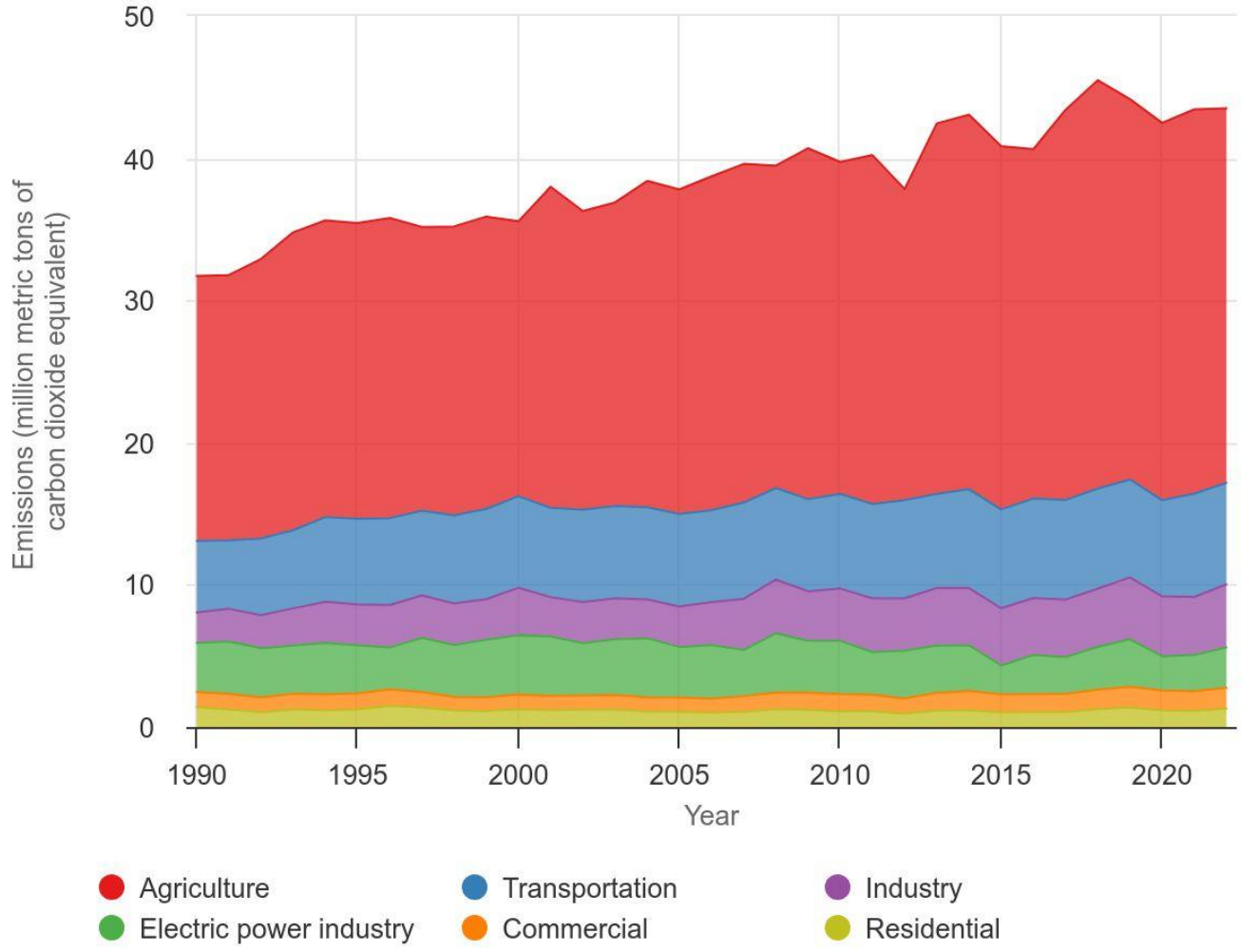
power can help bring down both emissions and energy costs.

South Dakota's emissions might be small compared to the U.S. as a whole, but every fraction of a percentage counts towards preventing the worst impacts of climate change.

Implementing climate solutions can not only help protect South Dakotans from a changing climate, but can also contribute to improved health, environmental, and economic outcomes at home.

South Dakota Greenhouse Gas Emissions by Economic Sector, 1990–2022



Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990–2022. https://www.epa.gov/ghgemissions/state-ghg-emissions-and-removals

Climate & Health

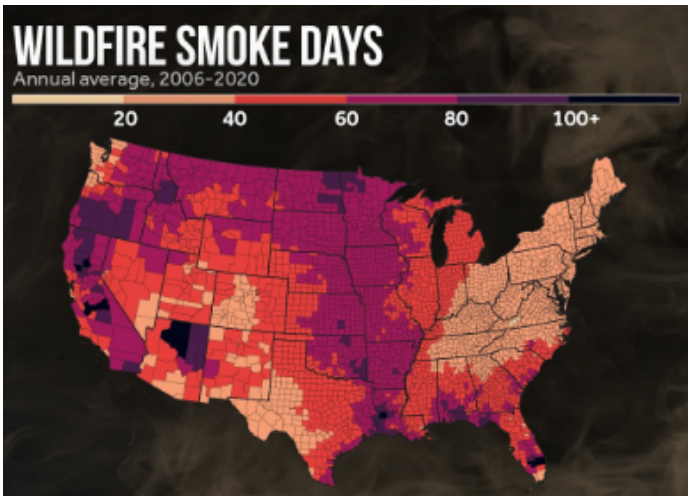
The effects of climate change on health are real and are already impacting South Dakota. The following three areas are just a few examples:

Extreme Heat

Extreme heat is the deadliest weather-related hazard in the U.S. An estimated 12,000 Americans die prematurely of heat-related causes every year, more than hurricanes, wildfires, and tornadoes and about the same as annual deaths from gun homicides. As our climate continues to warm, bouts of extreme heat become longer, more frequent, and more intense, increasing the risk of heat-related illness and mortality. The number of extremely hot days and high heat index warning days per year are increasing in locations across South Dakota: Sioux Falls experiences 10 more heat warning days per year now than in the 1970s, and Mitchell experiences 16 more.

Air Quality & Health

Exposure to air pollution and poor air quality can lead to asthma attacks, respiratory infections, long-term lung and cardiovascular conditions, and developmental issues in children. Climate change worsens air quality in multiple ways.



Source: Climate Central

Wildfire smoke is one of the biggest threats to air quality in South Dakota. South Dakota's wildfire hotspot is in the Black Hills, but smoke traveling hundreds or thousands of miles from wildfires in Canada and the Western U.S. is affecting air quality across the entire state. *All five East River cities that publicly track air quality data have suffered their worst recorded daily Air Quality Index value sometime during the last four years, and poor air quality days are increasing in severity in Rapid City.*

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- Climate change has a real and measurable impact on the health of South Dakotans.
- Heart disease, lung disease, kidney disease, and mental health are just a few of the areas that can affect the health of people in South Dakota and across the northern Prairie.
- There are definitive actions that individuals and communities can take to decrease the impact of climate change on our lives.

Health & Changing Seasons

Climate change is altering the length and timing of seasons, which in turn affects our health. Longer growing seasons give plants more time to grow and release allergy-inducing pollen. Across the U.S., *allergy season has lengthened by more than two weeks* on average since 1970, arriving earlier in the spring and lasting later into the fall. Additionally, higher carbon dioxide concentrations in the air prompt plants to produce even more pollen and also promotes mold growth, both of which increase allergy risks. Longer, more intense exposure to seasonal allergies means more than just itchy noses — it can bring serious risks for people with respiratory illnesses and results in more asthma attacks and emergency room visits.

Earlier springs and warmer falls also create more favorable conditions for disease-carrying pests like mosquitos and ticks. Shorter, warmer winters also result in less winter die-off of these insects. Longer pest seasons increase the risk of transmission of diseases like Lyme, West Nile, and Zika virus. *The Dakotas have already seen a higher incidence of West Nile Virus in recent years.*

Climate Change Impacts Health Across the Full Life Cycle

It is easy to understand how members of the community might assume that the impact of climate change has no real effect on their personal health but rather is related to

systemic issues like water quality, heat, vector borne disease, etc. **Scientists are finding more and more evidence that climate change affects people at every stage of life. It can impact health starting in pregnancy, through childhood and the teen years, and as we get older and face chronic diseases.**

The graphic on this page from the Journal of Global Health (May 24, 2024) summarizes the impact of climate change on human health across the life stages. For each age group highlighted in the inner light orange circle, acute and chronic health conditions are identified—impacting individuals and families in communities across this country, and certainly in South Dakota.

Impacts of Climate Change Across the Life Stages

Examples of Climate Change's Impact on the Health of Specific Groups in South Dakota

Climate Change Impact on Children

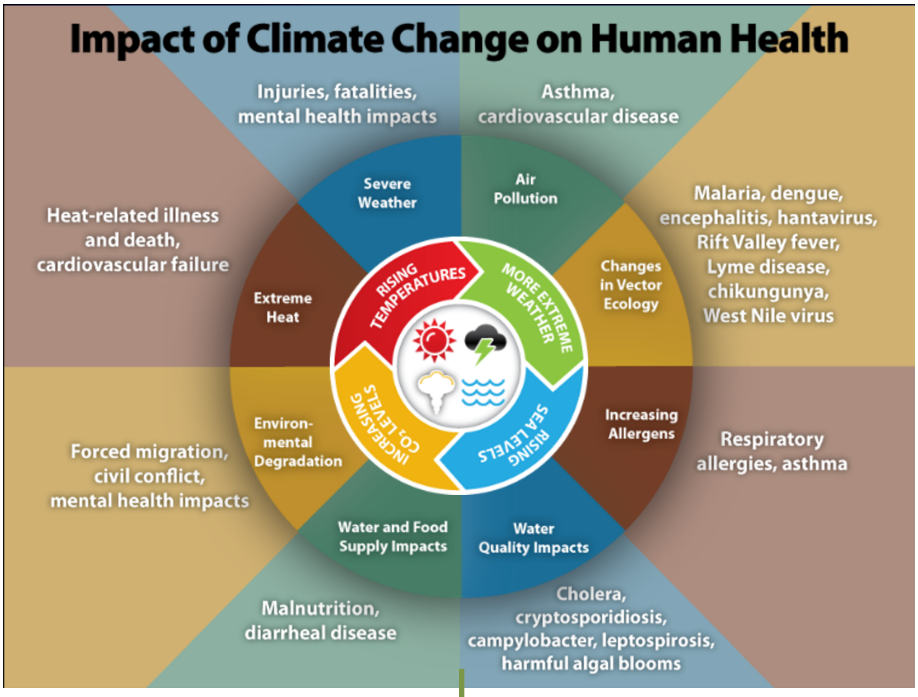
Heat: Children—especially babies, younger kids, and kids who play sports—are among those most vulnerable to heat-related illness. Babies and younger children don't regulate their core body temperature or acclimate to heat as well as adults, and kids may ignore or miss symptoms of heat stress. Extreme heat affects children's health and development, disrupting sleep, affecting mood, and impacting the ability to concentrate and learn at school.

Air pollution can have lifelong impacts on children's health. Infants and children are especially sensitive to air pollution because they breathe faster and take in more air per pound of body weight, and because their lungs, brains, and other organs are still developing. Poor air quality increases risks of respiratory infections and can trigger asthma, which affects about 6.5% of children (4.7 million) in the U.S. Childhood exposure to air pollution can cause long-term health consequences, including effects on lung and brain development, as well as greater risks of other diseases as adults. Exposure to wildfire smoke is also related to higher risk of preterm birth, as well as worse learning outcomes for school-aged children.

Allergies: One in five children in the U.S. experience seasonal allergies, and they will experience more serious symptoms as allergy seasons lengthen and become more

intense. Research estimates that 2 degrees Celsius of global warming could cause a 17% increase in asthma-related emergency room visits among children in the U.S. Seasonal allergies and asthma affect children's quality of life, including school performance, mood, and sleep.

Mental Health: Climate change related disasters are especially traumatic and formative for children, with long-lasting consequences on their mental health. Children who experience multiple adverse childhood events — like damage to their homes, schools, and communities in weather disasters — *are three to six times more likely to develop anxiety, depression, and substance abuse disorders later in life, and thirty times more likely to attempt suicide*. An increasing number of children and adolescents also experience "eco-anxiety," or anxiety due to concerns about a potentially uninhabitable world. One study of U.S. teens found that nearly 60% reported anxiety about climate change, and nearly half believe that "humanity is doomed." Eco-anxiety can inhibit daily functioning like the ability to eat, concentrate, work, sleep, have fun, and form healthy relationships.



Workers

Heat: Weather-exposed workers like construction workers, farmworkers, and landscaping workers, as well as people working indoors in kitchens or factories with limited cooling or air circulation, all experience risks from extreme heat and humidity. Altogether, extreme heat impacts one-third of all U.S. workers. Heat exposure on the job can cause heat-related illness, injury, or death, and impacts livelihoods through lost labor hours and wages—which are projected to increase as the climate continues to warm. From 2011 to 2020, there were *33,890 work-related heat injuries and illnesses* resulting in days away from work. These kinds of injuries and illnesses are preventable, but currently only five states have workplace safety standards for heat exposure.

Air quality: Outdoor workers, particularly wildland firefighters and emergency first responders, face higher risks of exposure to wildfire smoke.

Athletes

Heat: Exercising and playing sports outdoors during extreme heat is risky for athletes of all ages. Exercising outdoors in extreme heat increases stress on the body and can lead to dehydration, heat exhaustion, or heat stroke. According to the CDC, heat-related illnesses are a leading cause of death or disability among high school and college athletes.

Elders

Heat: Heat and dehydration stress older people, especially those with chronic medical conditions like heart disease and diabetes. As people's bodies age, they don't control their body temperature as well. Research has found that more than 80 percent of people who die from heat-related illnesses are over the age of 60.

Tribes, Low-Income Communities, and Communities of Color

Heat: Low-income households may be more vulnerable to extreme heat exposure, especially if they live in urban areas without access to green space or in older, lower-quality housing with less insulation or lack of access to air conditioning. Schools with high proportions of low-income students and students of color are also less likely to have air conditioning, putting those students at disproportionate risk.

Disaster: Tribes in South Dakota and in the Great Plains region face some of the highest rates of poverty and

unemployment, and many rely directly on natural resources to meet basic needs. Disasters like wildfires can disrupt food and water supplies and further strain Tribal resources, livelihoods, health and well-being.

Members of the Community with Chronic Disease

Key Impacts of climate change on chronic disease include:

- **Cardiovascular Disease:** Increased heatwaves lead to higher rates of stroke and heart attacks, as the body struggles with thermoregulation.
- **Respiratory Illness:** Increased wildfire smoke, ground-level ozone, and longer pollen seasons worsen asthma and chronic obstructive pulmonary disease (COPD).
- **Kidney Disease:** Rising temperatures increase risks of dehydration and heat-related renal failure.
- **Mental Health:** Extreme events and natural disasters cause anxiety, depression, and PTSD, with some mental health medications increasing heat sensitivity.
- **Vector-Borne Diseases:** Shifting climates expand the range of diseases like malaria and dengue.
- **Healthcare Disruptions:** Extreme weather events (floods, storms) damage infrastructure, limiting access to care and necessary medications.

The point: climate change is real; there are measurable impacts on our health throughout the lifecycle; it is happening now; it will get worse before it gets better. Every community in South Dakota must urgently address the impact of climate change on health—beginning with our elected officials and public health leaders.

Communities therefore must have an active, robust, surveillance program to measure the impact of climate change on health—to track severity and to assess the effectiveness of initiatives developed to protect the community health.

Recommended indicators to assess the impact of climate change on health are available from multiple sources including the National Academy of Medicine, the American Public Health Association, the CDC, the National Association of County and City Health Officials, and others. Indicators must be specific to each community, must be easily available and collected on a regular, ongoing basis, and must be a priority for elected leaders. Examples of indicators include:

Environmental & Physical Indicators

- **Temperature & Precipitation:** Surface air temperature, humidity, and annual/seasonal precipitation levels.
- **Water & Ice:** Changes in sea levels, groundwater levels, and snowpack water content.
- **Extreme Events:** Number of heatwaves, floods, droughts, and wildfire frequency/intensity.
- **Land Use/Cover:** Changes in local land use, such as impervious surfaces that intensify heat.
- **Air Quality (Ozone and Particle Pollution):**Sioux Falls ranked 29th worst in the nation for ozone pollution in 2025 and also received a concerning score of 3.8 unhealthy days per year, driven by wildfire smoke and heat.

Community Health & Social Vulnerability Indicators

- **Heat-Related Illnesses:** Emergency department visits and hospitalizations due to extreme heat.
- **Respiratory Illnesses:** Asthma exacerbations or respiratory issues related to wildfires and poor air quality.
- **Disease Vectors:** Changes in mosquito or tick populations and diseases.
- **Socioeconomic Risk:** Percentage of low-income residents, vulnerable populations, and those with limited access to resources.
- **Infrastructure Impact:** Disruption to transportation, energy, and water services.

The Way Forward

As noted in Section 1, let there be no doubt: climate change *is happening right now; it's us; we're sure; it's bad;* ***we can fix it!***

It will take vision and leadership; it will take bipartisan community commitment; and it will take reliance on science and objective data—made increasingly difficult by the current effort to impede federal agencies like the CDC, the EPA, FEMA, and NOAA, from fulfilling their congressional mandate to protect and defend the American people.

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Economic Impacts & Opportunities

The Cost of Inaction

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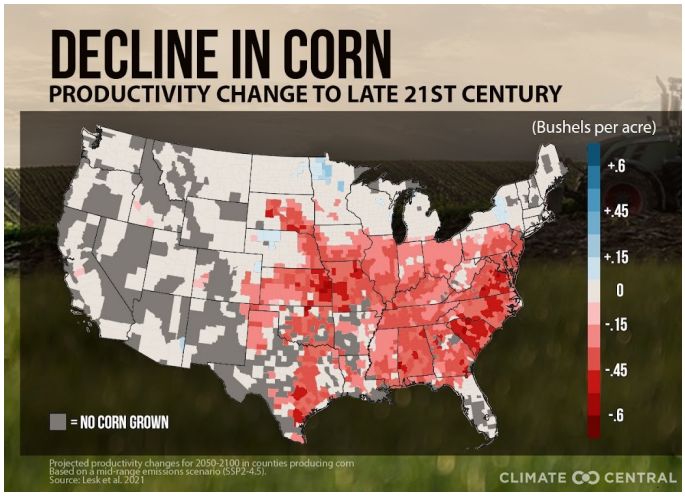


- **Lost agricultural productivity.** Climate skeptics often point out that growing seasons will be longer and that rising concentrations of carbon dioxide in the air help stimulate crop growth. While this is true, most studies show that heightened threats from extreme heat and drought will more than offset any potential benefits of climate change to agriculture in the United States, resulting in a net decline in agricultural productivity. Researchers estimate that across the U.S., climate change may cause total yields to decline by 7% for corn and 9% for soybeans. In the Midwest and Great Plains, those losses may be as high as 10 to 20%.
- **Threats to livestock.** Ranchers will face challenges managing livestock health due to increasing heat stress, parasites, and pathogens. Changing weather patterns are already shifting the ranges of forage species and increasing the spread of invasive weeds, leading to less nutritious rangelands.
- **Higher crop insurance payouts.** South Dakota is one of the top states in the nation for receiving insurance payouts for crop losses due to extreme weather disasters, with nearly $10 billion paid out to farmers in the state over the past two decades. Nationally, federally-subsidized crop insurance losses have increased by 19% due to climate change and are projected to continue to increase, imposing higher and higher costs on both farmers and American taxpayers who fund the program.
- **Tourism impacts.** South Dakota's protected lands are threatened by increased risk of wildfire, drought, pest infestations, and flooding, which will impact the state's all-important tourism industry. Shorter winters will decrease revenue from winter sports enthusiasts, while

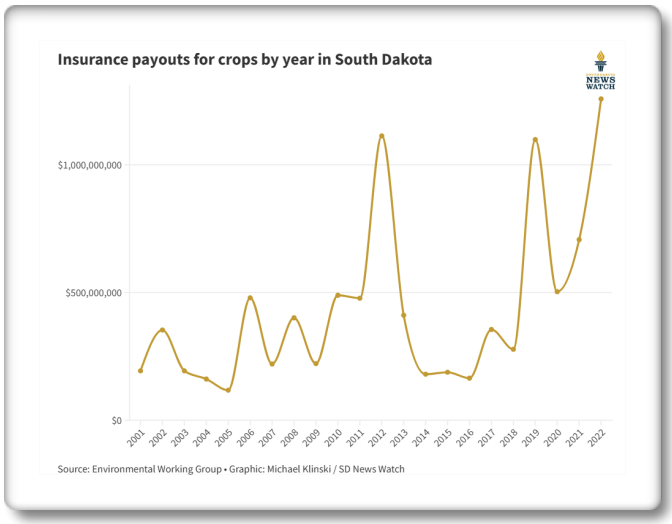
- From damaging storms to rising costs of living, climate change packs a big price tag for South Dakotans.
- While some climate solutions can be expensive up front, they also improve economic efficiency and bring long-term opportunities for local economic growth.

South Dakota Climate Change Impacts

$456 Projected average cost per year to every individual in South Dakota from climate-fueled extreme weather events	**36** Billion dollar weather disasters hitting South Dakota since 1980	**#2** South Dakota ranks as the second most at-risk U.S. state in terms of expected annual damage costs from climate change per capita

hotter summers could increase health risks to outdoor recreationalists. Wildfire smoke from the Black Hills and elsewhere will make air quality dangerous, keeping people indoors.

- **Lost wages.** Dangerous weather like extreme heat and wildfire smoke can be costly, *especially for outdoor laborers like farmers and construction workers, due to healthcare expenses and lost work hours*. The U.S. currently experiences average annual costs of $14 billion in lost work hours due to extreme heat, and this could rise to as high as $80 billion per year by 2090 (in 2015 dollars).
- **Rising insurance premiums.** Private insurers like State Farm are already ceasing coverage in areas with high risks from flooding and wildfires. As more and more homes are put at greater risk of extreme weather events, insurance premiums will continue to increase for everyone.
- **Higher costs for consumers.** All of these impacts combine to create higher costs of living for the average consumer. Decreases in global agricultural yields will lead to even higher food prices. Higher summer temperatures will lead to increased energy demand for air conditioning. Property values in high-risk areas will decrease while insurance costs rise. Uninsured and low-income South Dakotans will experience the worst impacts.



Climate Solutions = Economic Opportunity

Transitioning to a clean economy is no small endeavor, but the price of implementing solutions pales in comparison to the monumental cost of inaction. Globally, reducing greenhouse gas pollution could save the world up to $4.2 trillion per year by 2030.

Fortunately, most climate solutions offer win-win opportunities to create local jobs and help spur economic growth. Here are just some of the ways climate solutions can benefit South Dakota's economy:

Job opportunities in homegrown industries. Investments in clean energy and electric vehicle manufacturing were major drivers of job growth in the U.S. in 2023. For every dollar invested, renewable energy creates three times as many jobs as the fossil fuel industry. In 2023, South Dakota clean energy jobs grew 40% faster than the state's overall economy. Across the U.S. as a whole, clean energy jobs grew at more than double the rate (4.9%) of job growth in the rest of the economy (2.0%), adding 149,000 new jobs. Clean energy jobs also paid 25% more than the national median wage and were more likely to include health care and retirement benefits.

Greater efficiency. Investing in more efficient technologies and reducing waste of both energy and resources is a powerful way to reduce costs for local governments, businesses, and consumers alike. In a clean and energy-efficient economy, American families are projected to save up to $2,000 in energy costs annually per household by 2035.

Lowering energy costs. Globally, renewable energy is a more affordable source of power than fossil fuels in most areas. Over 90 per cent of new renewable projects are now cheaper than fossil fuel alternatives and can help keep electricity prices stable for consumers. U.S. states like South Dakota that have invested in wind and solar have seen electricity rates rise at a lower rate than inflation, while states most reliant on natural gas have seen some of the biggest retail electricity price increases since 2020. Producing renewable energy like wind and solar here in South Dakota increases energy independence, reduces price volatility from global market swings, and keeps money circulating in local economies. When paired with batteries, residential and community cooperative renewable energy projects can also improve local resilience during power outages and ease strain on the grid during times of peak energy demand.

Check out our pages on Energy, Agriculture & Transportation to learn more about the benefits of climate solutions for different economic sectors!

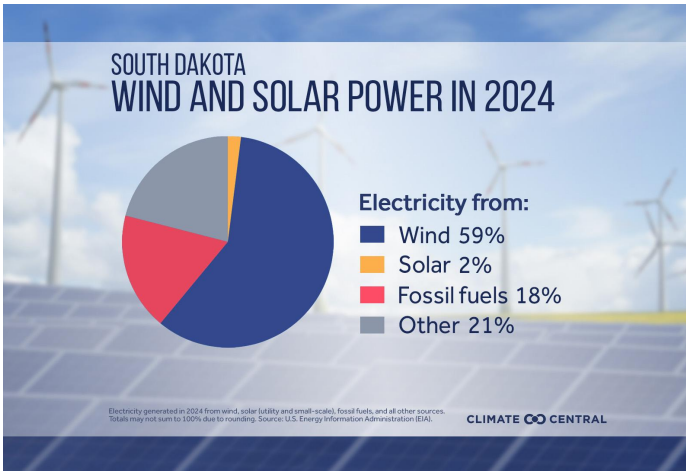
Renewable Energy in South Dakota

Renewable energy is an economic boon

Clean energy is a rapidly growing industry with big benefits for South Dakota's economy. In 2023, South Dakota clean energy jobs grew to 12,333, a 2.8% increase over the previous year. Clean energy jobs grew 40% faster than the state's overall economy. Of these new jobs, 64% were at small businesses, and 11.4% of South Dakota's clean energy workforce are veterans.

Across the U.S., clean energy jobs grew at more than double the rate (4.9%) of job growth in the rest of the economy (2.0%), adding 149,000 new jobs in 2023. Clean energy jobs also paid 25% more than the national median wage and were more likely to include health care and retirement benefits. The growth of the clean energy industry is already creating many more jobs than will be displaced by transitioning away from fossil fuels.

Clean energy projects also help lower electricity ratepayer costs, as they have much lower operating costs over the long term than fossil fuels. In South Dakota, these projects benefit local communities by generating up to $28.7 million per year in state and local taxes that fund public services, as well as $20.6 million in annual land lease payments to rural landowners—steady income backed by long-term contracts that provides stability for farmers.



Wind Energy

South Dakota has some of the best onshore wind resources in the nation. In 2023, wind provided 55% of the state's total electricity generation, a larger share than any other state except Iowa.

Thanks to the growth of wind energy, South Dakota now produces twice as much electricity as it uses, exporting the rest to nearby states.

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South Dakota is emerging as a renewable energy leader. Renewable resources produced:

- **77% of SD's electricity in 2023**
- **7,643 energy efficiency jobs**
- **1,167 clean vehicle jobs**
- **2,821 renewable energy jobs**

(2024 U.S. Energy & Employment Jobs Report)

Despite these great strides, there is still so much more South Dakota can do to harness its vast wind resources. South Dakota's current installed wind capacity captures only a tiny fraction of a percent of the state's full technical wind energy potential, which measures the maximum amount of energy that is technically possible to derive from an area accounting for factors like land use, topography, and technological capability. Capturing just a few percentage points of that huge potential would help transform South Dakota's energy system while powering states across the nation with clean, homegrown energy.

Solar Energy

Despite having fair to good solar energy potential, especially in the southwestern part of the state, less than 2% of the state's electricity consumption comes from solar. South Dakota ranks 47th in the nation for installed solar energy generation, underperforming compared to other states that have even less sunlight throughout the year. But the cost of installing solar has fallen dramatically over the last ten years, and there is huge potential for growth in the industry.

Solar power comes with big savings. A 346 kW solar array above the parking lot at Mount Rushmore saves the park $40,000 a year by providing low-cost electricity. For households and businesses that install rooftop solar panels, solar energy can save tens of thousands of dollars in electricity costs. When paired with battery storage, solar boosts resilience and self-reliance by providing ongoing power during grid outages.

Wind Energy in South Dakota

How much wind energy currently is installed in South Dakota?

3,618 MW

Installed wind energy capacity, 2024
U.S. Department of Energy, Land-Based Wind Market Report

How much wind energy could South Dakota potentially produce?

2,902 TWh per year

Total technical wind energy potential
National Renewable Energy Laboratory

Solar Energy in South Dakota

How much solar energy currently is installed in South Dakota?

209 MW

Installed utility-scale solar energy
SD Renewable Energy Laboratory

How much solar energy could South Dakota potentially produce?

10,016 TWh per year

Total technical solar energy potential
National Renewable Energy Laboratory

How can South Dakota accelerate its clean energy transition?

Elected officials:

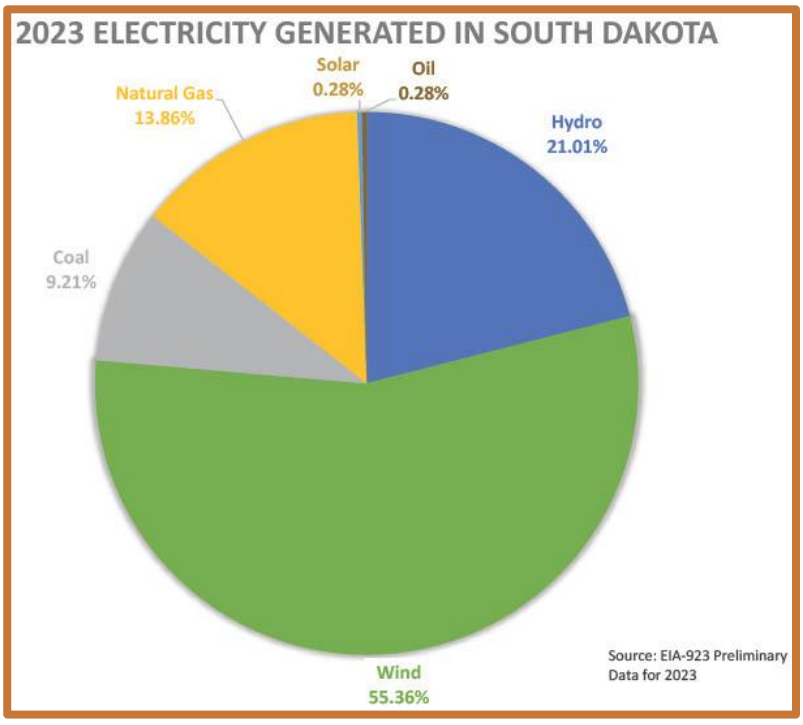
- Prioritize investing in energy transmission & storage so that renewable energy produced throughout the state can reach the places it needs to go and can be harnessed at all times of the day.
- Support net metering policies to allow owners of distributed renewable energy resources to sell their excess electricity back to the grid. Net metering makes projects like rooftop solar more economical for households, and is available in most other states in the U.S. A 2023 economic impact study for Black Hills Power found that full net metering would be cost-effective in South Dakota and that greater penetration of distributed solar would actually lower costs for ratepayers.

Individuals & consumers:

- Explore options for installing rooftop solar at your home. Online resources like EnergySage and the Homeowner's Guide to Going Solar can help you estimate your energy savings from solar, find contractors, and learn about the installation process.
- Take advantage of any renewable energy tax credits and property tax exemptions that remain in effect.
- Contact your elected officials to express support for renewable energy expansion and to reject policies and local ordinances that restrict renewable energy development.

Scan QR code for sources

southdakotagreenproject.org



Agriculture

The majority of South Dakota's greenhouse gas emissions come from agriculture. South Dakota emitted **26.334 million metric tons** of carbon dioxide equivalent from **agriculture** in 2022 — the same as driving **6.1 million** gasoline-powered cars for one year. Fortunately, regenerative and sustainable agricultural practices offer ready solutions that not only reduce emissions, but improve soil health, protect natural resources, boost local resilience, and enhance farmers' bottom line.

Agricultural emissions primarily come from soil management practices and livestock production.

Over-application of fertilizers and certain irrigation practices can cause agricultural soils to emit nitrous oxide, a powerful greenhouse gas. Synthetic fertilizers, pesticides, and other agricultural chemicals are also very energy-intensive to manufacture, resulting in high carbon emissions from fossil fuel combustion.

Ruminant livestock such as cattle emit methane as part of their normal digestive process. Methane is a potent greenhouse gas that is 80 times more powerful than carbon dioxide over a 20-year period. Certain manure management practices, particularly in confined animal feeding operations (CAFOs), also emit methane and nitrous oxide.

Other agricultural emissions come from activities like burning fossil fuels to run farm machinery and to transport food long distances.

Sustaining Soil Health

South Dakota can reduce these emissions by supporting resilient **local food systems** and encouraging farming practices that follow the **5 Principles of Soil Health**:

1. **Keep soil covered** using cover crops or crop residues to prevent soil erosion.
2. **Minimize soil disturbance** to allow the soil to build up organic matter and develop a healthy biology and aggregate structure.
3. **Maintain living roots**. Keep plants growing year-round to help feed the soil and hold it in place.
4. **Increase biodiversity** to better mimic a healthy natural system. Rotate or intercrop diverse crops or grassland species and incorporate native species to support pollinators and beneficial insects.
5. **Integrate livestock and crops** to improve nutrient cycling and increase biological activity in the soil. Grazing animals instead of raising them in CAFOs reduces emissions from manure management.

Innovative producers across the state are already embracing these principles and adopting better practices for soil health. Multiple long-term studies here in South Dakota and throughout the Great Plains region have found that these practices can deliver a host of benefits for farmers, their land, and their communities:

- **Improving profit margins for farmers.** Regenerative practices that improve soil health reduce the need for fuel, fertilizers, pesticides, and herbicides — significantly reducing producers' input costs while maintaining yields. North Dakota State University found that switching to no-till for at least five years will generate **savings of $22.50 to $30 per acre** on fertilizer costs alone.
- **Boosting resilience to extreme weather.** Healthier soils absorb more moisture during wet periods and hold onto it longer during dry periods, reducing the need for irrigation and creating a system that is more

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- **Agricultural is vitally important to South Dakota and to the nation.**
- **Agriculture does play a significant role in the creation of greenhouse gases.**
- **Fortunately, there are real economic opportunities for farmers, ranchers, and communities that transition to sustainable agricultural practices.**

Agriculture accounts for:

30% of South Dakota's economic output	**$32 billion** in annual contributions to South Dakota's economy	**60%** of South Dakota's greenhouse gas emissions

stable in the face of weather and precipitation extremes that come with a changing climate.

- **Capturing carbon.** Improving soil health not only reduces emissions, but can actively capture carbon dioxide from the atmosphere and store it in the soil. Regenerative farming can be a net benefit for fighting climate change, and farmers can cash in on the benefits by participating in carbon markets that pay for carbon sequestration.
- **Protecting natural resources.** Better soil management practices improve all-around environmental quality for local communities, from improving water quality through reduced chemical runoff and soil erosion to providing habitat for the many birds, bees, and pollinator species that call South Dakota home.

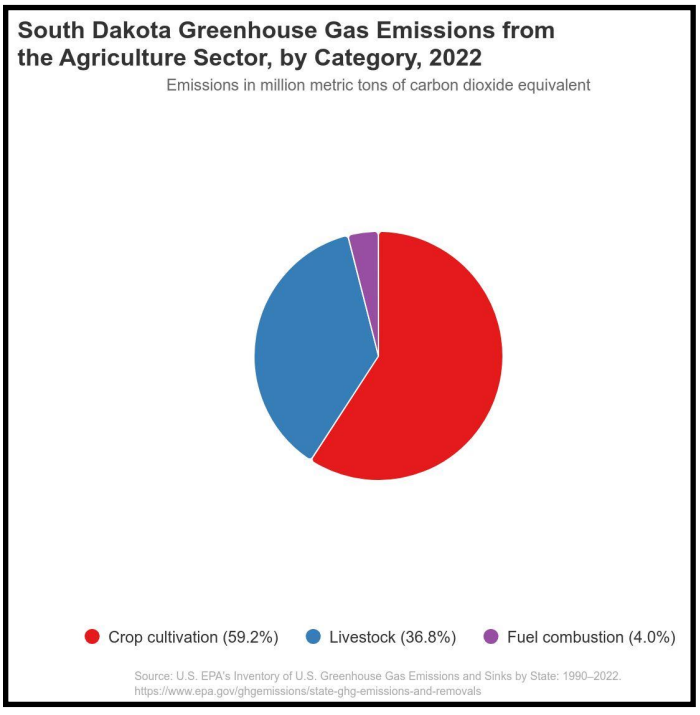
Practices to Sustain Soil Health

- Cover crops
- No-till or low-till farming
- Diverse crop rotations
- Intercropping
- Rotational grazing
- Multi-species grazing
- Organic agriculture
- Composting
- Integrated pest management
- Perennial crops
- Agroforestry & silvopasture

What can South Dakotans do?

Farmers, ranchers, & producers:

- **Learn more** about improving soil health on your farm with resources from the South Dakota Soil Health Coalition, the Natural Resources Conservation Service, and Dakota Rural Action.



- **Connect** with farmers and ranchers across the state who are taking action to build soil health. Listen to some of their stories here: https://www.sdsoilhealthcoalition.org/educational-resources/our-amazing-south-dakota-resources/

Elected officials:

- **Prioritize policies** that support small- and mid-sized producers, family farms, and beginning farmers instead of large corporate factory farms. Instead of giving handouts to big agribusinesses, support policies that level the playing field for small farmers who are good stewards of the land and who are feeding local communities and strengthening rural economies here in South Dakota.
- **Halt the unchecked expansion of CAFOs** and uphold strong standards to maintain local property values, water quality, public health, and quality of life for rural communities neighboring these facilities. Consider policies to incentivize mitigation practices like anaerobic digestion, composting, or dry manure management at existing CAFOs.

Individuals & consumers:

- **Eat locally!** Shop at your local farmers' market, join a community-supported agriculture initiative (CSA), look for foods with the SoDak Grown label, or use resources like Dakota Rural Action's local foods directory (https://www.dakotarural.org/local-foods-directory/) or the South Dakota Soil Health Coalition's South Dakota Fresh Connect website (https://sdfreshconnect.com/) to find and support local producers who are stewarding the land.
- **Contact your elected officials** and urge them to support resilient, regenerative local food through initiatives like Farm to School programs.

southdakotagreenproject.org

Scan QR code for sources

Transportation

Low population density in the Mount Rushmore State means that many South Dakotans travel long distances to access jobs, grocery stores, health care, and other services. Higher miles traveled correlates with higher greenhouse gas emissions. But there are strategies South Dakota can follow to grow a cleaner transportation sector:

- Replace high-emitting vehicles with more efficient options like electric vehicles
- Reduce vehicle miles traveled
- Remove the need for travel altogether with investments in rural broadband.

Smart Development & Multimodal Transportation

Expanding **public transit**, like trains and buses, and **active transportation**, like cycling and walking, as alternatives to driving are among the best ways to reduce transportation emissions. About 30% of South Dakota's population live in urban areas — namely Sioux Falls, Rapid City, and the Sioux City metro area. Here, higher population densities make investments in public transit and projects to encourage active transportation more practical. But smaller towns and rural areas are limited by low population densities, long travel distances, and lack of public resources, putting low-emissions transportation options out of reach for most South Dakotans.

Fortunately, there are still ways to make active and multimodal transportation options work for rural communities. Implementation will just look different than it does in cities. Smart growth strategies can preserve the rural character of a small town while allowing alternative options for people to get around:

- *Revitalizing town centers and main streets*. Reinvesting in historic downtowns and main streets attracts economic activity and provides residents with more opportunities to work, shop, eat, and access services close to home.
- *Carefully planned development and zoning reform* to reduce sprawl. Siting new developments on the outskirts of a town not only increases driving times and emissions but also eats up valuable farmland and raises infrastructure and service costs for local governments as they extend roads, utilities, and emergency services further and further out. Research shows that encouraging growth near existing infrastructure and adopting zoning codes or local policies that allow for more compact and mixed-use development is much more cost-effective for local governments.
- *Public-private transit partnerships*: Some small towns that are dominated by a major employer, like a hospital or a factory, have successfully created public-private partnerships to fund local transit lines between employment centers and residential areas.

Beyond reducing emissions, these investments create more opportunities for residents to live active, healthy lifestyles, while opening up more mobility options for folks that may not be able to get around by car, such as youth, the elderly, and people with disabilities.

Electric Vehicles

While we can do much to make alternate forms of transportation more practical for some trips, these changes will take time to implement and will not make

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- **Transportation accounts for 16.4% of SD's statewide emissions.**
- **Only agriculture exceeds transportation in greenhouse emissions.**
- **As a rural state, SD faces unique transportation challenges.**
- **Targeted, locally-informed solutions are essential.**

Transportation's Climate Impact in South Dakota

South Dakota transportation emitted **7.133 million metric tons** of carbon dioxide equivalence in 2022	That's like driving **1,663,810 gas-powered cars** for one year

sense everywhere. For the foreseeable future, most South Dakotans will need to continue to rely on personal vehicles to get around.

Electric vehicles (EVs) cut down pollution emissions while achieving long-term cost savings for households. Though EVs may cost more up front for now, lower fuel and maintenance costs typically **save drivers a net total of $7,000 to $11,000 over the lifetime of a vehicle**. Studies have even found that rural drivers have the potential to save up to twice as much money from switching to EVs as city dwellers, due to their longer driving distances.

Why are electric vehicles a good choice for South Dakotans?

- The high efficiency and lower fueling costs of EVs translates into much lower operating costs. Nationwide, EV drivers tend to spend **60% less on fuel costs**. South Dakotans can **save $26 to $43 per fill up** by switching to an EV. And even though tax credits for EV's were lost after September, 2025, an electric car purchase still makes economic sense. On efficiency alone: 15% to 20% of a gallon of gas turns the wheels on a conventional car – the rest is lost in heat. Compare that to 80%+ power efficiency in an EV. Gasoline possesses an impressive amount of energy but the internal combustion engine just wastes most of it while emitting harmful gasses.
- Average EV **maintenance and repair costs are 50% lower** than a conventional vehicle. According to Consumer Reports, EV drivers can save between $1,800 and $2,600 per year on maintenance.
- Plugging into an existing garage outlet or installing a home charging station enables off-peak overnight electricity rates, further lowering costs.
- Gas prices are inherently volatile but EVs run on electricity, which is cheaper and more price stable.

EV's make sense on so many levels. While challenges certainly exist, they did with the evolution of the internal combustion car, too. Think of the Model T car compared to the automobiles of today.

Garretson Public Schools in southeastern SD were awarded a federal grant to add three electric school buses to their fleet in 2023. The buses have a range of 125 miles and can handle snow and ice better than conventional buses, and help reduce children's exposure to harmful air pollutants in diesel exhaust. Switching to electric helped the school district cut fuel costs by over $15,000 per year. Source: Center for Rural Affairs

Rural Broadband

South Dakota has already made great strides in expanding access to rural broadband. Broadband access cuts down on transportation emissions by allowing people to access vital services at home — like telehealth services and remote work — instead of traveling long distances. South Dakota should continue to prioritize broadband access and affordability until we achieve our goal of 100% coverage.

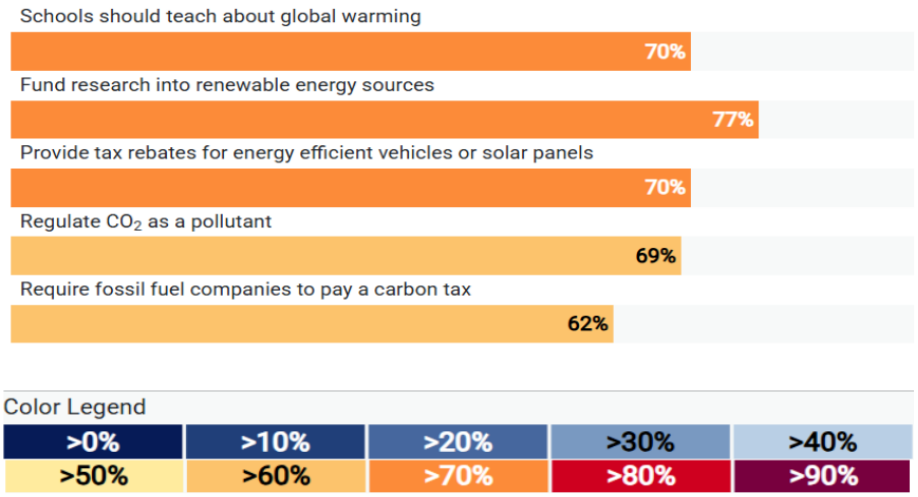
Climate Action in South Dakota

Many climate solutions already have broad support in South Dakota, and individuals, businesses, and communities across the state are stepping up to seize the opportunities of climate action.

South Dakotans Support Climate Solutions

According to one of the longest-running studies on climate change opinions in the United States, **65% of South Dakotans understand that global warming is happening** and 54% are somewhat or very worried about global warming. Many policy solutions to address climate change enjoy popular support.

Policy Support Among South Dakota Residents



Source: Yale Program on Climate Change Communications Climate Opinion Factsheets

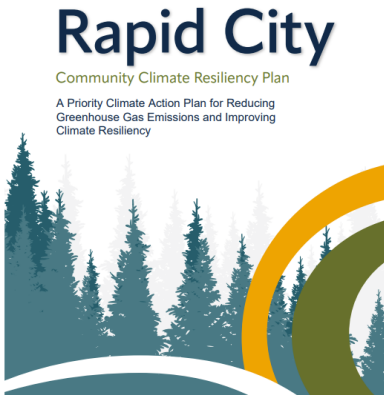
Towns, cities, schools, universities, businesses, and organizations across the state are taking action to advance homegrown climate solutions. With greater support from local and state governments, we can build a sustainable future that delivers for all South Dakotans.

Climate Resilient Rapid City

South Dakota's second-largest city is charting a course for a sustainable future. Rapid City's Standing Committee on Sustainability has been advising City departments on sustainability matters since 2012, and the city has incorporated sustainability principles into its Comprehensive Plan with several long-term goals related to energy efficiency and multimodal transportation.

In 2023, Rapid City was awarded a Climate Pollution Reduction Grant (CPRG) from the U.S. Environmental Protection Agency. The $1 million planning grant funded the creation of the Rapid City Community Climate Resiliency Plan, which was released in 2024 and identified 34 priority actions for the city to reduce climate pollution and improve resilience to climate impacts, based on input from local stakeholders. These priority measures include:

- **Weatherization and energy efficiency improvements** in public schools and other city buildings to improve the learning and working environment and lower energy costs
- **Renewable energy pilot projects** at City facilities and the SD School of Mines campus
- **Planting trees and improving stormwater infiltration** along the Rapid Creek Greenway to boost community resilience
- **Piloting landfill gas capture and a community composting program** to reduce methane emissions from food and yard waste



The City is currently working through the next phase of the CPRG to draft a Comprehensive Climate Action Plan of long-term actions for the Rapid City Metropolitan Statistical Area. Rapid City's CPRG planning process has sparked community-wide conversations on climate change and laid out a clear roadmap for achievable, high-impact climate progress at the local level.

Climate Leadership on Rosebud Indian Reservation

South Dakota's nine Federally Recognized Tribes, like other Indigenous groups, face disproportionately high impacts from climate change, though they have contributed very little to the problem of greenhouse gas emissions. However, Tribal governments like the Rosebud Sioux Tribe are at the forefront of advancing climate solutions in South Dakota.

Recognizing the inherent risks climate change poses to their community's health, the Sicangu Lakota Oyate (Rosebud Sioux) developed a Climate Adaptation Plan, released in June 2022. The Sicangu Climate Crisis Working Group partnered with the Tribal Data Sovereignty Initiative and Lark Environmental, Inc., with technical support from the North Central Climate Adaptation Science Center and South Dakota State University to assess current and expected impacts from climate change and prioritize actions for the Rosebud Sioux. The report drew on a combination of climate data, traditional knowledge, and the experiences of elders and Tribal members to develop four key recommendations:

Establish a permanent tribal department to coordinate climate-relevant actions for the Oyate

Protect life and property for the Oyate by weatherizing homes, investing in small-scale renewable energy, and improving public health and emergency response infrastructure

Ensure responsible management of water resources

Establish a Sicangu Climate Center to collect and disseminate information on how climate change is affecting Sicangu people and to use this information to directly support tribal decision-making

Reflecting the importance of these priorities, the Rosebud Sioux Tribe has already begun to seize opportunities to implement climate solutions. In 2024, the U.S. Environmental Protection Agency awarded the Tribe a $7.88 million Climate Pollution Reduction Grant to install electric vehicle charging stations, purchase electric buses for public transit, and to purchase and operate an electric garbage truck. The Tribe also received $11.8 million from the Bureau of Indian Affairs' Tribal Electrification Program to install electricity hook-ups at homes that don't have them and to fund home repairs and retrofits to support zero-emissions energy.

The Sioux Falls Story

South Dakota's largest metro area has had a complicated relationship with climate action. In 2012, the City of Sioux Falls released its first Sioux Falls Sustainability Master Plan. The plan was a thorough and locally-specific document, developed with considerable community input, that provided cost-benefit analyses on all major recommended actions. However, over the next decade of city planning and development decision-making, little of the plan was implemented.

In 2022, a revived effort to draft a new Sustainability and Climate Action Plan for the city was met with resistance from City Council, which took issue with perceived "mandates" within the draft plan, though none existed. A new Steering Committee was formed at the request of the Mayor's office to collaborate on a revised plan that would fully include all of the city's major stakeholders, including representatives from affordable housing, environmental organizations, the healthcare sector, education, academia, businesses, electric and gas utilities, and the homebuilding industry. Despite representing a diverse range of personal and political perspectives, these committee members found common ground. The Sioux Falls Office of Sustainability conducted extensive public engagement meetings, and the Committee worked to draft a plan that reflected community voices and priorities.

In December 2022, the Committee achieved consensus on a realistic plan consisting of 71 actions to be taken by City government, community members, organizations, and businesses. But, in February 2023, the Mayor's Office replaced the Committee's comprehensive plan with a "framework" that eliminated half of the proposed actions and weakened the remaining language, removing all deadlines, concrete actions, and accountability measures.

Nonetheless, as the polling data presented above demonstrates, there remains broad community support in South Dakota to address climate change impacts. This a remarkable opportunity which requires vision, leadership, and community engagement committed to a renewable economy and a sustainable future for Sioux Falls and all of South Dakota!