

# Climate Risks and Resilience in Cumberland County: A Summary

Neil Leary, Center for Sustainability Education, Dickinson College  
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*This summary was prepared for [Building Climate Resilience at Dickinson and in Central Pennsylvania](#), an initiative of Dickinson College, the Borough of Carlisle, and Cumberland County, PA. The more detailed report with references and links to over 100 information sources can be downloaded here: [Full Report](#).*

Climate hazards have long posed risks to people, communities, infrastructure, natural systems, and economies in Cumberland County, as they have throughout the world. Now the risks are changing and growing as the Earth's climate warms and changes in other ways in response to emissions of greenhouse gas pollutants that are accumulating in the atmosphere. The risks to our present wellbeing and the wellbeing of our children and future generations are substantial but can be reduced significantly. Success will require strong and urgent actions by public and private sector actors working locally, nationally, and internationally.

Needed actions include sharply reducing emissions of greenhouse gases, capturing carbon dioxide and removing it from the atmosphere, adapting to changes in the climate, and building resilience to climate hazards. Progress is being made across the United States and globally. But action needs to be scaled up and accelerated if climate risks are to be managed successfully. Locally, Cumberland County, Carlisle Borough, and Dickinson College have each adopted climate action plans that focus on reducing emissions of greenhouse gases. Largely unaddressed by the current plans are the challenges of adapting to climate change and building resilience. [Building Climate Resilience at Dickinson and in Central Pennsylvania](#), a joint initiative of the County, Carlisle, and Dickinson, is intended to address this gap. Launched in 2023, the initiative is working to assess climate related risks in the region, identify and evaluate strategies for building climate resilience, and catalyze planning and action for a more resilient present and future.

Building climate resilience is a holistic approach to adaptation that focuses on increasing capacities of people, organizations, and communities to prepare for, limit, withstand, manage, and recover from the impacts of climate hazards and transform to thrive in an uncertain future. Resilience building gives emphasis to strategies that are inclusive and prioritize benefitting those who are highly vulnerable, disadvantaged, and marginalized.

This report synthesizes findings from the first phase of the initiative during which climate risks and resilience were assessed. It draws from peer-reviewed literature, national and international scientific reports, research of Dickinson College students, and other sources to assess changing climate risks in Cumberland County. The risks include threats to human health and wellbeing, infrastructure, utility services, ecosystems, ecosystem services, the economy, livelihoods, and cost of living. The report also presents examples of strategies for building resilience to climate hazards in Cumberland County. Selected strategies will be examined and evaluated in the next phase of the initiative. Previous reports from the initiative [Building Climate Resilience at Dickinson and in Central Pennsylvania](#) can be found online at [https://www.dickinson.edu/info/20052/sustainability/4371/climate\\_resilience/2](https://www.dickinson.edu/info/20052/sustainability/4371/climate_resilience/2).

## *Changing Climate Hazards*

Resilience strategies are needed because the climate is changing in ways that are amplifying climate hazards. For the past 70 years, global average surface temperatures increased, with each passing decade recording higher average temperatures than preceding decades. The speed of warming since 1970 has been greater than in any other 50-year period over the last two-thousand years. The ten years from 2015 through 2024 set records as the 10 warmest years since instrumental recordkeeping began in 1850 and 2024 was the warmest year on record. The rising temperatures have been accompanied by increasing frequencies, severities, and impacts of many types of extreme weather, exposing people and valued resources to greater climate-related hazards. Observed changes in extreme weather include hotter,

more frequent, and longer heat waves, more frequent and more intense heavy rain events, and hurricanes in the North Atlantic that intensify more rapidly, reach high levels of intensity more frequently, and generate heavier rainfall.

Looking to the future, as atmospheric concentrations of greenhouse gases continue to increase, Cumberland County's climate is virtually certain to get hotter on average and is very likely to experience more frequent and hotter extreme heat events, become wetter on average, and have more frequent and more severe heavy rain events with each passing decade. Also possible, but projected with less confidence, are increases in flood risks in our region, storms with greater windspeeds and rain volumes, more frequent and severe droughts, and more severe compound events such as the simultaneous occurrence of long duration heat waves, droughts, and hazardous air quality conditions.

### *The Risks*

Human health and wellbeing are affected by climate in a variety of ways, many of which are expected to be made worse by climate change. Extreme heat events, which are very likely to become more frequent and severe in Cumberland County, already cause tens-of-thousands of people to be treated and hospitalized for acute heat-related illnesses each year, exacerbate chronic cardiovascular, pulmonary, renal, neurologic, and psychiatric diseases for even more people, and kill more people in the U.S. than floods, hurricanes, and tornados combined. Extreme heat and other forms of severe weather can cause surges in demands for physical and mental healthcare that can overwhelm emergency rooms while simultaneously disrupting the ability of healthcare facilities to provide services. Poor air quality that currently causes 60,000 to 260,000 premature deaths each year in the U.S. may be worsened by climate change, a serious concern for our region which was recently identified as one of the ten most polluted regions in the nation. Climate change can increase incidences of infectious diseases such as Lyme disease, a tick-borne disease that afflicts an estimated 100,000 people in Pennsylvania every year. Additionally, food security can be decreased by impacts of climate change on food production, prices, processing, storage, and distribution, while housing affordability can be impacted by climate change reducing housing supply and increasing costs of cooling, maintaining, repairing, and constructing housing.

As the climate becomes warmer, wetter, more variable, and more extreme, existing infrastructure will become increasingly mismatched between the climate conditions for which it was designed and the conditions to which it will be exposed. This will reduce the performance and useful lifetimes of nearly all types of infrastructure, increase repair and maintenance costs, and increase risks of failures and disruptions of services that can endanger people, their property, and their livelihoods. At risk are homes, buildings, hospitals, roads, railways, bridges, transportation depots, natural gas pipelines, and infrastructure for drinking water, wastewater, stormwater, telecommunications, electric power generation, transmission, and distribution. Infrastructure located in and even outside of floodplains will be threatened by more frequent and more severe damages from river, flash, and stormwater floods. The reliability of electric power and telecommunications are likely to decrease as storms become stronger, the health of trees near power lines and telecommunication cables degrades, and peak power demands rise during more frequent and more severe heat waves.

County residents benefit tremendously from extensive, diverse, and high-quality streams, wetlands, forests, and other ecosystems. But these valued resources are at risk from changes in climate that are adding to existing pressures on ecosystems from land development, fragmentation of wildlife habitats, pollution, overuse, and invasive species, pests and pathogens. Impacts of climate change interacting with other pressures include changes in the health, resilience, and productivity of ecosystems, the populations, geographical ranges, reproductive success, survival, and diversity of plant and animal species that inhabit the county, and the abilities of ecosystems to provide clean air, clean water, flood protection, wildlife habitat, recreation opportunities, and healthy soils and pollination for farms and food production. Ecosystems that are particularly vulnerable are those that are currently stressed and in poor condition. Of special concern are eastern brook trout, a culturally and recreationally important fish species that is highly sensitive to climate and environmental changes and is at high risk.

All the effects of changing climate hazards detailed in the report will impact the economy of Cumberland County, the livelihoods of people living and working in the county, the cost of living, and local governments' revenues and expenses. Some of the economic impacts will be beneficial, but many will be harmful. National studies estimate that

the harms are likely to dominate the benefits, causing net losses of economic wellbeing for most Americans that will grow as the climate continues to warm. The economic harms are expected to be most burdensome for low-income households and others who are highly vulnerable and who lack resources to be resilient. These national patterns are likely to be replicated in Cumberland County.

The pathways by which climate change can impact the county's economy and the economic wellbeing of its residents are multiple. For example, impacts on human health will impact worker productivity, labor supply, healthcare costs, insurance premiums, insurance payouts, and workers' out-of-pocket health expenses. Changes in worker health and worker productivity will impact costs, prices, incomes, and profits in all economic sectors. The farm sector and economies of rural communities are particularly vulnerable. Impacts on the productivity of farm workers, farmland, and livestock will impact operating costs of farms, crop yields, farmers' incomes, food supplies, food prices, and food security. Spillover effects will impact economic opportunities in rural communities where farming is an important local source of income and spending power. More frequent and possibly longer interruptions in electric power and telecommunications services due to severe weather would negatively impact many businesses. As would increases in maintenance, repair, and replacement costs for infrastructure that is degraded prematurely or damaged by severe weather. As impacts ripple through the economy, local governments' tax revenues, spending, and borrowing costs will be impacted, placing pressures on their finances.

### *Who is Vulnerable?*

Climate change will not impact all people and all communities equally, even when they are exposed to the same climate hazards. People and communities with limited financial and other resources can struggle with accessing affordable quality healthcare, childcare, food, housing, energy, transportation, and other basic needs. Consequently, they can have less capacity to cope with, respond to, and recover from the impacts of climate hazards, making them less resilient to and more vulnerable to climate change. The elderly, children, people with chronic health conditions, people with disabilities, and people with limited English language skills often face challenges in responding to climate hazards and can be more vulnerable than others. Also, some can be vulnerable because of where they live, the type of home they live in, or working in outdoor occupations or sectors that are sensitive to climate.

Applying the Social Vulnerability Index, a tool developed by the Centers for Disease Control for measuring the vulnerability of places to natural hazards, census tracts in Cumberland County are mapped with respect to the proportions of households with social, economic, and other characteristics associated with vulnerability to natural hazards. Of the 49 census tracts in the county, 18 are ranked as being among the 25% least socially vulnerable locations in Pennsylvania. These include Dickinson, Monroe, and parts of North Middleton and South Middleton townships in the center of the county and, in the eastern part of the county, Lemoyne and parts of Mechanicsburg, Camp Hill, Hampden, East Pennsboro, and Lower Allen. Seven census tracts are ranked as being among the 25% most socially vulnerable locations in Pennsylvania. These include Shippensburg Township and Borough, Enola, central areas of Carlisle, and parts of East Pennsboro.

### *Strengths and Weaknesses*

Cumberland County has many strengths that help make our communities and residents resilient to climate and other stresses. The county's economy is a diverse one that generates significant financial resources and provides strong employment opportunities, a median income that is the 6<sup>th</sup> highest among Pennsylvania's 67 counties, an unemployment rate that is the 8<sup>th</sup> lowest in the state, a percentage of households with incomes below the federal poverty line that is the 4<sup>th</sup> lowest in the state, and a tax base sufficient to support quality schools, public infrastructure, and public services. We have a strong healthcare system that includes the Sadler Health Center, a federally qualified health center that serves people who are uninsured, underinsured, or insured through Medicaid and the Children's Health Insurance Program. We have extensive and varied infrastructure that includes mostly reliable interstate and state highways, roads, bridges, public drinking water, wastewater, and stormwater systems, and electric power and telecommunications systems. We have abundant water for farming, drinking, and commercial uses and streams, forests, and other natural systems that support wildlife and provide exceptional recreation opportunities.

Importantly, the county has numerous community organizations, faith groups, environmental organizations, businesses, educational institutions, and public agencies that provide for community needs and that have histories and relationships of working together on community problems. County resources are supplemented by state and federal resources to assist people in need through programs such as the Supplemental Nutrition Assistance Program (SNAP), the Women, Infants, and Children (WIC) program, housing choice vouchers, and the Low-Income Energy Assistance Program (LIHEAP). Businesses, organizations, and agencies in the county can access state and federal grants for economic development that help build community resilience through Community Development Block Grants, the Inflation Reduction Act, the Infrastructure Investment and Jobs Act, and other programs. Farmers and landowners can get technical assistance for adapting land management practices to the changing climate from the County Conservation District, the US Department of Agriculture's Natural Resources Conservation Service, Penn State Extension, and other sources.

We also have weaknesses that detract from our resilience. While the majority of county residents earn family supporting incomes and are able to meet their needs, nearly 8% of people in the county have incomes below the poverty line and too few resources to cope with impacts from climate hazards. Others who are working and have incomes above the poverty line can still struggle to meet basic needs, making them vulnerable to climate change. Twenty-four percent of households in the county are housing cost burdened, with housing costs that exceed 30% of their incomes. Over 26,000 people in Cumberland County, including nearly 7,000 children, were food insecure in 2022. Many struggle to pay for electric and other utilities and over 5% of the population is still not covered by private or public health insurance. Additional weaknesses include a housing stock and infrastructure that are aging and in poor condition, significant numbers of residences and other infrastructure located in floodplains, heavy use of roadways by trucking and warehousing activities, very limited public transit services, air quality that is among the worst in the nation, 786 miles of streams (30%) that are degraded and fail to meet water quality standards, and land development that converts forests and farms to other uses and place pressures on the Kittatinny Ridge, an important migration corridor for birds and other wildlife. Finally, continuation of many of the federal programs noted above that provide funds and assistance to the county is uncertain in the current environment of deep cuts to federal programs and the federal workforce.

### *Resilience Strategies*

Taking actions and investing resources in building climate resilience in Cumberland County are important for limiting our risks to climate change. Resilience strategies that are appropriately selected, designed well, and implemented effectively can simultaneously advance climate resilience and community goals for economic development, healthcare, health outcomes, affordable housing, equity, clean air and water, and other community priorities.

The report identifies numerous resilience strategies for consideration in the next phase of the initiative, including:

- Integrate climate resilience and mitigation into the county's economic development strategy and county and municipal comprehensive plans, hazard mitigation plans, ordinances, and plans for continuity of operations.
- Maintain and enhance programs that support low-income households to access affordable healthcare, childcare, food, housing, energy, transportation, education, and job training.
- Promote heat action plans for healthcare facilities, schools, employers, and others to protect people from heat stroke and other illnesses in extreme heat events.
- Improve air quality by supporting public transit, active transportation, electric vehicles, and other means.
- Promote development that is compact, limits sprawl and encourages mixed uses of land.
- Discourage building new infrastructure in floodplains and encourage use of floodproofing measures.
- Invest in creating an electric grid that is cleaner, more reliable, smarter, and more efficient.
- Protect, preserve, and restore valued ecosystems in the county.
- Maintain and improve programs that provide technical assistance and funding to farmers and forest landowners for climate resilient agriculture and forestry.