DELAWARE'S
Climate Action Plan

Executive Summary

Delaware's Climate Action Plan was prepared by the
Delaware Department of Natural Resources and Environmental Control

November 2021

Recommended Citation:
Delaware Department of Natural Resources and Environmental Control, *Delaware's Climate Action Plan*, by Jennifer de Mooy, Margaret Pletta, and Ian Yue (Dover, DE, November 2021).




Executive Summary

Climate change is affecting Delaware and will continue to influence our state going forward. From increased temperatures and rising sea levels to heavy precipitation and flooding, our residents are experiencing the impacts of climate change in their daily lives. Acting on climate change is necessary to protect the people, places and resources we love in the First State.

For more than a decade, Delaware has taken steps to address the causes and consequences of climate change. But we need to do more. The state will benefit from a strategic, streamlined plan for the decades ahead, which is why we created Delaware's Climate Action Plan.

Delaware's Climate Action Plan will guide state efforts to:

- **Minimize greenhouse gas emissions**, which drive the climate change we see today, and
- **Maximize resilience to climate change impacts.**

Implementing the strategies in this plan will help Delaware meet its greenhouse gas emissions goals and better prepare for climate change impacts. Taking these actions can also build economic opportunities and improve public health.

Climate Change in Delaware

Modern research has shown that the climate is changing more rapidly than it has in the past, and it is extremely likely that human activities are the major driver of that change. In particular, the burning of coal, natural gas and oil for energy and heat has raised atmospheric carbon dioxide to record levels. Carbon dioxide is a "greenhouse gas," a type of gas with the ability to trap heat around the Earth. Increased emissions of carbon dioxide — in addition to other greenhouse gases released from human activities, such as methane, nitrous oxide and fluorinated gases — are correlated with temperature increases and other changes in our Earth and climate.

The impacts of climate change look different depending on where you are in the world. In Delaware, the most prominent climate change impacts are sea level rise, increased temperatures and changes in precipitation patterns (including extreme weather and flooding). Delaware is already feeling these effects, which are projected to worsen in the future.

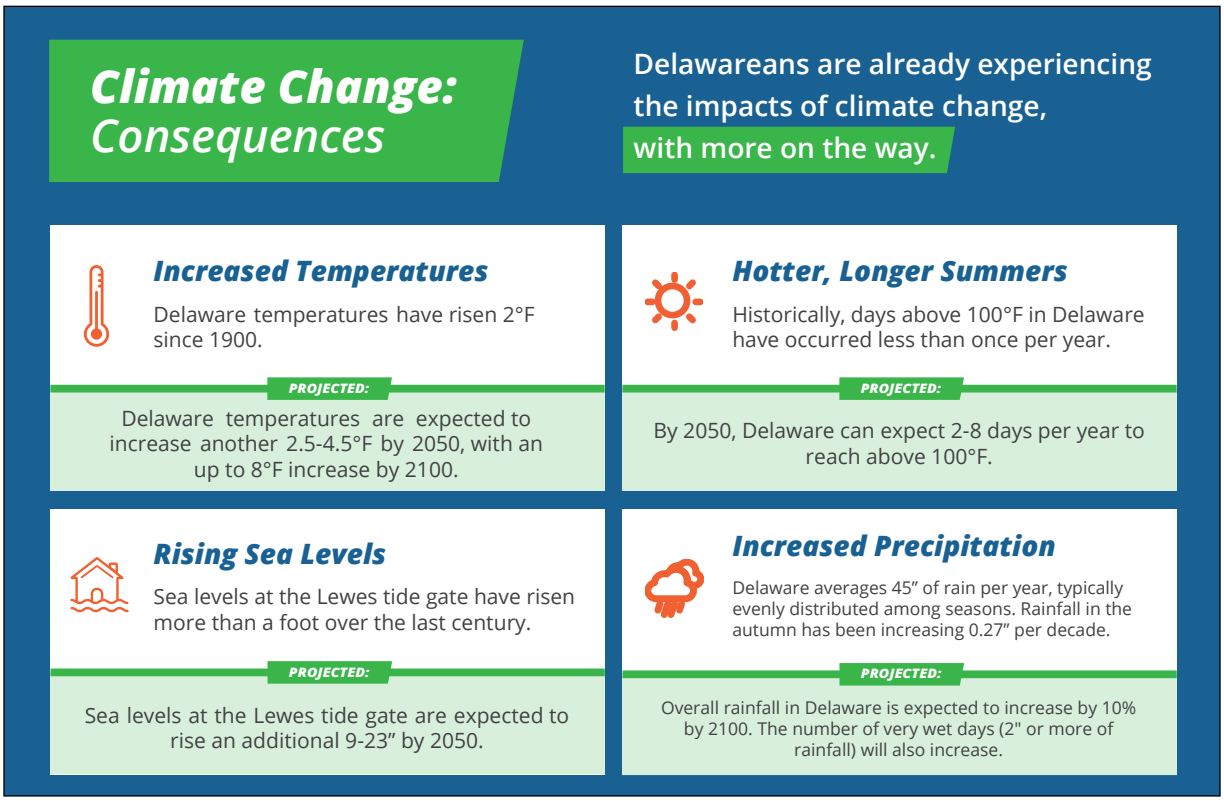

Figure 1: An illustrated depiction of the causes of climate change Source: DNREC

Sea Level Rise. Delaware has already experienced over 1 foot of sea level rise at the Lewes tide gauge since 1900. By midcentury, sea levels are projected to rise another 9 to 23 inches and, by 2100, up to an additional 5 feet. This will result in both the permanent inundation of low-lying land and an increase in high-tide flooding. Inundation and flooding affect the integrity and usability of infrastructure, including roads, wastewater systems and electricity transmission systems. Sea level rise can also increase the salt content of ground water and surface water, making them unusable for human consumption and irrigation. Additionally, sea level rise could disrupt natural habitat for important species and reduce the availability of parkland for outdoor recreation.

Increased Temperatures. Average temperatures in Delaware have increased approximately 2 degrees F since 1895, and temperatures are projected to continue increasing. Compared to the period of 1981 to 2010, Delaware's average temperatures could be 2.5 to 4.5 degrees F warmer by midcentury and 3.5 to 8 degrees F warmer by 2100. Additionally, the number of days above 95 degrees F in Delaware is projected to increase from an average of 5 to more than 10 days per year over the next two decades. Increased temperatures and high heat events can impact human health, elevating the risk of heat exhaustion and heat stroke, various respiratory issues and diseases such as West Nile virus and Lyme disease. Higher temperatures also affect both natural resources and agriculture by shifting growing seasons, increasing plant and crop susceptibility to pests and invasive species, and triggering biological stress for wildlife and domesticated animals. High temperatures also put infrastructure at higher risk, due to heat damage and potential overloading of the electrical grid.

Changes in Precipitation Patterns. Annual average precipitation in the state is projected to increase by 10% by 2100. The

number of very wet days — periods with 2 inches or more of rainfall in 24 hours — is also projected to increase. Such impacts can result in more flooding events, which are further amplified by sea level rise. These impacts affect human health due to potential increased mold production, exposure to more waterborne diseases and contamination, and risk of septic failure. Changes in precipitation, including more intense rainstorms, can also affect the quality of water resources, agricultural crop yields and natural habitat for wildlife. Additionally, infrastructure can be impacted due to increased pressure on water control structures and a greater potential for erosion of banks, pavements and structural supports.

Climate Action in Delaware

Climate action means preparing people, property and economies for climate change. By taking climate action, we acknowledge that climate change impacts can negatively affect Delawareans and recognize the benefits of proactively addressing those impacts. Maximizing resilience and adapting to climate change impacts now better prepares us for extreme and unexpected events, including avoiding property damage and loss, direct and indirect business interruptions, and human deaths and injuries. Minimizing emissions now links us to a worldwide effort to avoid some of the most highly damaging climate change impacts, while also allowing us to reap health benefits and spur innovation for low-carbon technology development.

Recognizing the importance of proactive action, the state created Delaware's Climate Action Plan for three primary purposes:

- **To help meet a commitment the state has already made:** In 2017, Governor John Carney committed Delaware to reducing greenhouse gas emissions by 26% to 28% from 2005 levels by 2025. Delaware's Climate Action Plan provides information on our state's emissions reduction progress and lays out strategies for meeting or exceeding our goal.
- **To set a course for the decades ahead:** Delaware's Climate Action Plan looks at past and present work and uses this work as the launching point for continued climate action.
- **To integrate actions for *both* minimizing greenhouse gas emissions *and* maximizing resilience to climate change impacts:** A climate action plan that specifically focuses on just reducing emissions *or* enhancing resilience misses out on the opportunity to link these action types to create a stronger, more effective strategy. Delaware's comprehensive response to climate change requires both minimizing emissions and maximizing resilience, as these actions are inherently interrelated.

Developing the Plan

Climate action can be most effective when it expands and builds upon existing policies, programs and initiatives. As such, developing this plan first involved accounting for the state's past and present actions to minimize emissions and maximize resilience; then, it required determining strategic areas for continued action. Staff from Delaware's Department of Natural Resources and Environmental Control (DNREC) led these plan development efforts.

Delaware's past and present actions to minimize emissions have focused on the areas of clean and renewable energy, energy efficiency, transportation and reducing "high global warming potential" greenhouse gases. Examples include:

- **Delaware's Renewable Energy Portfolio Standards Act:** A 2005

law, updated in 2021, requiring the state's utilities to get an increasing percentage of electricity from renewable sources
- **Regional Greenhouse Gas Initiative:** An 11-state carbon dioxide cap-and-trade program for carbon dioxide emissions from power generation facilities
- **Code for Energy Conservation:** Statewide building codes, updated in 2020, that aim to improve energy efficiency and cost savings
- **Renewable Energy and Energy Efficiency Incentive Programs:** Including DNREC programs such as the Green Energy Program and Energy Efficiency Investment Fund that provide incentives to deploy renewable energy and reduce energy use
- **DNREC's Clean Transportation Incentive Program:** Individual and business rebates to offset the cost of purchasing zero-emission vehicles and related charging infrastructure
- **DNREC's "Cool Switch" Low Impact Refrigerant Program:** Incentives to switch from hydrofluorocarbon refrigerants to those with more limited climate change impacts

Delaware's past and present actions to maximize resilience and adapt to climate change have focused on the areas of policy, planning and regulations; capacity-building for state and local governments; and developing research, data and tools. Examples include:

- **Sea Level Rise Planning:** A 5-year effort, started in 2009, that provided a vulnerability assessment, recommendations for adapting to climate change impacts, and planning scenarios for the state
- **Climate Framework for Delaware:** A 2014 report that outlined state agency actions to adapt to climate change; a related output was a flood avoidance guide for state assets
- **Technical Assistance and Funding:** Initiatives such as the Resilient Community Partnership, Coastal Training Program, Strategic Opportunity Fund for Adaptation, and Sustainable Communities Planning Grant that support local or state government climate action
- **Delaware Climate Change Impact Assessment:** A 2014 report that provided an overview of climate change impacts in Delaware, along with projections for heat and precipitation to the year 2100
- **Coastal Inundation Maps:** Developed by the Delaware Geological Survey in 2017 to inform infrastructure, facility, land-use and capital spending planning for sea level rise

To determine areas for continued climate action, DNREC identified where greater knowledge was needed to inform next steps.

In terms of minimizing emissions, DNREC identified the need for a comprehensive model of state greenhouse gas emissions. To address this need, DNREC contracted with ICF, a consulting firm with extensive experience in conducting technical analyses to support climate planning. ICF modeled projections of Delaware's greenhouse gas emissions over the next three decades, with and without further action to reduce emissions. Modeling indicated that, with no further action, Delaware's net emissions would decline by 25% from 2005 levels, falling just short of the state's goal of 26% to 28% emissions reduction by 2025. Furthermore, emissions would start rising again around 2032. However, if Delaware were to implement the suite of 20 emissions reduction actions modeled by ICF, Delaware's net emissions would decline by 31% by 2025, achieving and exceeding the

Information gathered at public workshops helped shape Delaware's Climate Action Plan. Photo credit: DNREC

state's 2025 goal and setting the state up for further reductions going forward. Additional reductions beyond this are also possible because these 20 actions are not the only actions Delaware could implement.

In terms of maximizing resilience, DNREC identified the need to better understand what climate action state agencies have pursued over the last few years. To address this need, DNREC interviewed staff from 10 state agencies to review the status of previously identified, agency-driven climate change resilience actions. These interviews served as a baseline for identifying climate change adaptation actions that these agencies would like to implement over the next 5 years.

Finally, to complement the above efforts, DNREC also engaged an array of public and technical stakeholders to gather ideas and input for the Climate Action Plan.

DNREC hosted two rounds of public workshops. The purpose of the first round, held in March 2020, was to brainstorm ideas for climate action. Input gathered informed the emissions reduction strategies ICF modeled in its technical analysis as well as the questions DNREC asked during its state agency interviews. The second round, held in September and October 2020, focused on reviewing strategies being considered for the Climate Action Plan. Input gathered helped DNREC gauge public support for actions for near- and long-term implementation.

DNREC paired these public workshops with two rounds of technical expert input. The first round, a "technical advisory workshop" held in March 2020, sought stakeholder feedback on the viability of possible actions that could help Delaware meet its 2025 emissions reduction goal. Input gathered informed the emissions reduction strategies ICF modeled in its technical analysis. DNREC followed this up with sector-specific "technical expert conversations" in September 2020 to review the results of ICF's technical analysis and to generate input on opportunities and barriers for implementing the modeled strategies.

Strategies to Minimize Greenhouse Gas Emissions

Based on the results of the greenhouse gas emissions modeling analysis and stakeholder input, DNREC identified four overarching

A fully electric DART bus passes a fully electric passenger vehicle parked near a solar canopy at the Delaware Technical Community College Terry Campus in Dover. Photo credit: DNREC

"action categories" for minimizing emissions:

1. **Clean and renewable energy** expansion, which has the greatest potential to reduce emissions in the long term
2. **Energy efficiency** measures, which can be put in place relatively quickly and implemented through existing programs
3. **Transportation** sector transitions to zero-emission vehicles and more efficient transportation systems
4. **"High global warming potential" greenhouse gas** emissions reductions and management of greenhouse gases other than carbon dioxide

Below is the list of emissions reduction strategies, by action category, that Delaware can implement to meet its climate goals. Actions linked to each strategy are outlined in Chapter 3 of the Climate Action Plan.

Clean and Renewable Energy. Increasing the amount of renewable and clean energy that runs our electrical grid and powers our homes and businesses has the greatest potential to reduce emissions in the long term. Shifting away from fossil fuels to produce electricity also accelerates the impact of other actions, such as the transition to zero-emission vehicles. These strategies also provide co-benefits, including job creation and economic development in clean energy technologies and improved air quality with related health benefits, particularly for communities near power generation facilities. Strategies Delaware can implement:

- Strengthen Delaware's Renewable Energy Portfolio Standards
- Increase the number of on-site renewable energy systems in residential and commercial buildings
- Increase the number of on-site renewable energy systems in industrial buildings
- Ensure that Delaware is prepared for offshore wind energy opportunities
- Address equity challenges in access to renewable energy
- Increase commitment to renewable energy in state agency operations

Energy Efficiency. Using less energy in our homes, offices and manufacturing centers through energy efficiency measures is an

effective way to reduce greenhouse gas emissions. Energy efficiency measures can be particularly useful for reducing emissions in the near term, given they can be put in place quickly and implemented through existing programs. These strategies also provide co-benefits, including job development and training in energy efficiency technologies, cost savings to consumers and homeowners, and improved air quality. Strategies Delaware can implement:

- Strengthen building energy codes
- Expand energy efficiency programs for residential and commercial buildings
- Expand energy efficiency opportunities for low- and moderate-income residents and small businesses
- Improve industrial energy efficiency
- Support the long-term transition to building electrification

Transportation. Transportation is currently the largest in-state source of greenhouse gas emissions. Delaware can reduce emissions in the transportation sector by shifting to low-carbon technologies, improving fuel efficiency and increasing opportunities for transportation choice, such as walking and biking. These strategies also provide co-benefits, including economic and job opportunities in low-carbon transportation technologies and vehicle sales, cost savings to drivers, and improved air quality, particularly in urban areas with high traffic congestion. Strategies Delaware can implement:

- Strengthen consumer adoption of electric vehicles to achieve a goal of 17,000 electric vehicle sales per year in Delaware by 2030
- Capitalize on the transition to zero-emission vehicles to stimulate innovation and provide jobs
- Expand charging infrastructure for electric and plug-in hybrid electric vehicles
- Improve accessibility of low-carbon transportation options for all Delawareans
- Ensure electric and plug-in hybrid electric vehicles contribute to grid stability
- Reduce vehicle miles traveled by 10% by 2030
- Improve the efficiency of freight delivery
- Partner with other states to implement market-based mechanisms to reduce greenhouse gas emissions from transportation
- Promote increased vehicle fuel efficiency
- Lead by example in state government operations to reduce transportation emissions

High Global Warming Potential Greenhouse Gases. Each type of greenhouse gas has a different ability to trap heat in the atmosphere. "High global warming potential" greenhouse gases trap heat in the atmosphere more effectively than carbon dioxide; even small emissions of these gases can have a large warming effect. In Delaware, the focus is on two such gases: hydrofluorocarbons and methane. Strategies to reduce emissions include transitioning to the use of lower global warming potential gases or capturing, diverting and reducing leakage of gases. These strategies also provide co-benefits, including improved air quality and potential gains in energy efficiency. Strategies Delaware can implement:

- Reduce emissions from hydrofluorocarbons
- Reduce methane emissions through expanded methane capture
- Reduce methane leakage from natural gas transmission and distribution pipelines
- Increase renewable natural gas production and incentivize markets for its use as a fuel

- Reduce methane emissions by diverting waste from landfills through increased recycling and waste diversion

Offsetting Carbon Emissions. Delaware's forests, croplands, wetlands and urban greenspaces can play an important role in responding to climate change. The plants and soils in these "natural and working lands" have the ability to absorb (or sequester) carbon dioxide from the atmosphere. This provides a cost-effective, temporary or long-term carbon storage solution. Capitalizing on natural carbon storage can help offset a portion of emissions released by human activities. Strategies Delaware can implement:

- Support best management practices on agricultural lands that provide greenhouse gas emissions co-benefits
- Support conservation and restoration of forest lands
- Support local communities' enhancement of urban greenspaces
- Improve methods for measuring and tracking carbon sequestration

Strategies to Maximize Resilience to Climate Change Impacts

Based on input gathered from state agency interviews and stakeholder input, DNREC identified seven overarching "action categories" for state agency action to maximize resilience and adapt to climate change impacts:

1. **Updated or new state regulations** that address protection and conservation of vulnerable and impacted resources
2. **Support for communities and stakeholders** in the form of trainings, resources and technical assistance
3. **Management plans** for natural resources, emergency response, state facilities and agency equipment
4. **Facility design and operation** that accounts for future climate conditions
5. **Research and monitoring** that studies the impacts of climate change and methods of adapting
6. **Outreach and education** on climate change impacts and adapting to climate change
7. **Agency support** that provides the resources to implement resilience actions

Below is the list of strategies, by action category, that state agencies can take to best prepare Delaware for climate change impacts. Specific actions linked to each strategy are outlined in Chapter 3 of the Climate Action Plan.

Updated or New State Regulations. Many state regulations and procedures were written and enacted prior to the current understanding of climate change and its impacts. These strategies focus on the periodic review, updating and possible creation of new regulations under current and future climate conditions. Strategies Delaware can implement:

- Update regulations to reduce risk to properties from climate change
- Update regulatory processes to allow for greater inclusion of climate change impacts in permit decisions
- Develop a comprehensive regulatory strategy to conserve and restore ecosystem services under future climate conditions

Support for Communities and Stakeholders. Many of Delaware's municipalities depend on state agencies and other organizations for planning and implementation support. These strategies address how the state can support the transfer of knowledge and effective resilience action implementation to sub-state entities. Strategies Delaware can implement:

Emergency response plans will require updates to consider the impacts and incorporate actions to deal with climate change impacts, like flooding from extreme weather events. Photo credit: Army National Guard

- Increase grant opportunities for climate change adaptation projects, and prioritize the funding of projects that incorporate climate change impacts in project design and implementation
- Assist local governments, homeowners, industries and utilities in increasing their resilience to climate change
- Support programs and initiatives that help frontline communities adapt to climate change
- Provide training, tools and technical assistance on climate change impacts and accompanying resilience actions

Management Plans. State agencies use various planning documents to manage natural resources, emergency response, state facilities and agency equipment. These strategies look at incorporating future climate conditions and resilience action opportunities into planning documents for effective management and use of resources. Strategies Delaware can implement:

- Incorporate climate change impact and adaptation considerations into strategic plans
- Update emergency response and hazard reduction plans to incorporate future climate projections
- Update or create management plans to incorporate future climate projections

Facility Design and Operation. State-owned facilities are already being impacted by climate change and will continue to be affected as the rate of change increases. These strategies look to improve the resilience of state-owned facilities to climate change impacts and to reduce future management costs. Strategies Delaware can implement:

- Update facility construction guides and standards to increase resilience to

climate change impacts
- Prepare state facilities and equipment for climate change impacts

Research and Monitoring. While national and international research can support local and regional decisions, Delaware-specific research may provide increased clarity on the most effective solutions to issues the state is facing. These strategies look at research and monitoring of climate change impacts within state agencies and a continued push towards climate change solution-making. Strategies Delaware can implement:

- Continue and expand research on climate change impacts in Delaware
- Increase the number of resilience pilot projects and demonstration sites in Delaware

Outreach and Education. The more that individuals get involved in the conversation about climate change — and start taking climate action — the healthier Delaware's communities and economy can become. These strategies outline how the state can incorporate climate change information and resilience actions into outreach activities for stakeholders. Strategies Delaware can implement:

- Develop targeted communication tools and messages about climate change
- Increase the availability of climate change educational programming
- Provide outreach to businesses to help them understand and build resilience to climate change impacts

Agency Support. Support from agency and state leadership will be necessary to implement many of the actions in the Climate Action Plan. These strategies address how Delaware can be a leader in resilience by providing resources, conducting employee trainings and promoting cooperative efforts between all levels of government. Strategies Delaware can implement:

- Increase the capacity of all state agencies to build resilience to climate change
- Improve information sharing across state agencies to support regulatory and policy decisions
- Act as climate change adaptation leaders

Next Steps

Delaware's Climate Action Plan outlines strategies for addressing climate change that can be implemented through a variety of actions over time, as resources, data and partnerships develop. It is intended to be a living document. As our collective understanding of climate impacts, emissions reduction strategies and resilience and adaptation measures grows, actions to advance strategies can evolve and change.

Implementing Delaware's Climate Action Plan requires setting guiding principles for climate action, outlining a framework for moving from planning to action, and defining equitable climate action.

How climate action is implemented can be just as critical as what is implemented. Three principles should be applied when implementing Delaware's Climate Action Plan:

Principle No. 1: Ensure Climate Action is Ambitious yet Adaptable. The Intergovernmental Panel on Climate Change asserts that swift and concerted climate action is necessary to avoid the most damaging climate change impacts. Ambitious climate action must be taken now. However, strategies must also remain adaptable enough so they can be adjusted over time.

The City of Wilmington is incorporating resiliency strategies and green space into redevelopment plans for the east bank of the Christina River. Photo credit: Adobe Stock

Principle No. 2: Ensure Climate Action Accounts for All Costs and Benefits. Decision making on climate action should consider the full costs and benefits (including co-benefits) of taking such action and assess the opportunity costs and the cost-effectiveness of alternative action options.

Principle No. 3: Ensure Climate Action is Engaged, Empowering and Equitable. Engaging early and often with key stakeholders and community members is critical — as is empowering local governments to take climate action. Additionally, careful attention must be paid to inequities in climate action design, as actions could potentially favor some people over others. It would be particularly problematic if climate action inadvertently compounds inequities or further hinders communities already facing adverse environmental, social or economic conditions.

Many of the strategies outlined in this plan focus on steps that can be taken specifically by state agencies. Cooperation across state agencies and leadership within those agencies — coupled with stakeholder partnerships — will help facilitate and motivate the transition from climate planning to climate action. This can be assisted by a framework for accountability and transparency:

Accountability. Statewide emissions reduction targets and climate change impact planning scenarios can help drive accountability for taking climate action in Delaware. By establishing mid- and long-term greenhouse gas emissions reduction targets in statute or executive order, the state can set a common goal and expectation for statewide planning and future operations.

Climate planning scenarios are also needed for preparing our infrastructure and communities for climate change impacts. The state should, on a regular schedule, formulate, update and disseminate a standard set of planning scenarios that provides state-specific climate change impact projections for sea level rise, precipitation, and temperature. Mechanisms should also be put in place to ensure that state agencies use these scenarios consistently in their respective planning processes.

Taking proactive climate action can help preserve Delaware's unique places for future generations. Photo credit: DNREC

Transparency. Tracking and reporting are necessary to evaluate progress on emissions reduction and resilience actions. To evaluate progress over time, a suite of key metrics to track climate action should be identified. These metrics should be monitored and reported on a consistent timeline.

Finally, for climate action to benefit all Delawareans, the state must dedicate efforts to both understand and address the needs of residents — particularly those who may be disproportionally impacted by climate change or climate action. This can be accomplished by:

Understanding Vulnerable Communities. It is vitally important to improve our understanding of, and contact with, communities that may be most immediately affected by climate change impacts or climate action. Authentic community engagement is necessary to leverage local knowledge of impacts and to better understand the obstacles and issues these communities face.

Partnering with Communities to Build Equity. Collaborations and partnerships with communities can help build equity into climate action. Early and continued engagement is essential, as residents can speak first-hand to community-specific climatic and economic impacts. It should be noted that productive partnerships with communities are only possible if trust is established. This trust can be built over time, in part, by openly working with communities to evaluate whether climate actions have the intended effects once implemented.

Proactive climate action can save lives, reduce costs and preserve Delaware's unique places for future generations. Delaware's long history of climate action, established partnerships, and technical knowledge position the state well to address climate change. By engaging Delaware's governments, businesses and residents in coordinated climate action; guiding action to be ambitious yet adaptable; and ensuring climate action is engaged, empowering and equitable, we can realize a future where the First State is a leader in climate action.

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