ELEMENT L

Climate Change, Resiliency & Hazard Mitigation

L. Climate Change, Resiliency, and Hazard Mitigation

Element Defined

Climate change is and will continue to impact the daily lives of everyone in New Castle County, from downtown Wilmington to rural farms and everywhere in between. Greenhouse gases released into the atmosphere are trapping heat on the surface of the earth, causing rising temperatures and other changes in our weather and climate. As stated in the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report:

> It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. Observed increases in well-mixed greenhouse gas (GHG) concentrations since around 1750 are unequivocally caused by human activities. Each of the last four decades has been successively warmer than any decade that preceded it since 1850. The scale of recent changes across the climate system as a whole—and the present state of many aspects of the climate system—are unprecedented over many centuries to many thousands of years.

In Delaware, heat waves are expected to become longer, and more frequent, intense storms will be more frequent with more precipitation, and sea levels are projected to continue to rise. These changes will affect New Castle County resident's daily lives, the economy, ecosystems, and overall quality of life in Delaware and New Castle County.

It is important to understand the potential impacts and effects of climate change to plan for a resilient New Castle County. Transportation and land use, including industry and economic development, are major sources of greenhouse gas emissions, and we must take a balanced approach to address effects of climate change while also developing a vibrant economy and supporting our communities. We need to understand and identify the best practices on how to mitigate and adapt to these effects and protect the well-being of our people and our infrastructure under these changing conditions.

Beginning in 2020, the State of Delaware engaged residents, businesses, and organizations around the state, including New Castle County, to help develop a statewide Climate Action Plan. According to the results of surveying conducted by the State during the process, most Delawareans support taking some action to address the causes and consequences of climate change. This sentiment was reflected in the NCC2050 public engagement process as well. Some strategies favored by survey respondents include increased conservation of undeveloped, forest, and agricultural land; stronger air pollution controls; and revised building codes and regulations in flood prone areas. See ***Figure L-1*** for additional strategies that received public support in survey responses.

The Delaware Climate Action Plan (2021) puts forth the following areas for action:

Action Areas to Minimize Greenhouse Gas Emissions:

- Clean and renewable energy expansion which has the greatest potential to reduce emissions in the long term.
- Energy efficiency measures which should be put in place relatively quickly and implemented through existing programs.
- Transportation sector transitions to zero-emission vehicles and more efficient transportation systems.

- High global warming potential emissions which include greenhouse gas emissions reductions and management of greenhouse gases other than carbon dioxide.
- Offsetting carbon emissions by preserving forests, croplands, wetlands and urban greenspaces that absorb (or sequester) carbon dioxide from the atmosphere, providing a cost-effective, temporary or long-term carbon storage solution.

Action Areas to Maximize Resilience to Climate Change Impacts:

- Update or create state regulations that address protection and conservation of vulnerable and impacted resources.
- Support communities and stakeholders in the form of trainings, resources and technical assistance.
- Create management plans for natural resources, emergency response, state facilities and agency equipment.
- Update facility design and operation that accounts for future climate conditions.
- Promote research and monitoring that studies the impacts of climate change and methods of adapting.
- Engage in outreach and education on climate change impacts and adaptation.
- Provide agency support that provides the resources to implement resilience actions.

New Castle County recognizes that addressing climate change will take action at all levels, including through local planning, land use policy and regulations, and strong coordination with stakeholders and the broader community. Taking part in implementing this statewide action plan will protect and strengthen agriculture, tourism, the economy, natural and recreation areas, infrastructure, and, moreover, our people and communities.

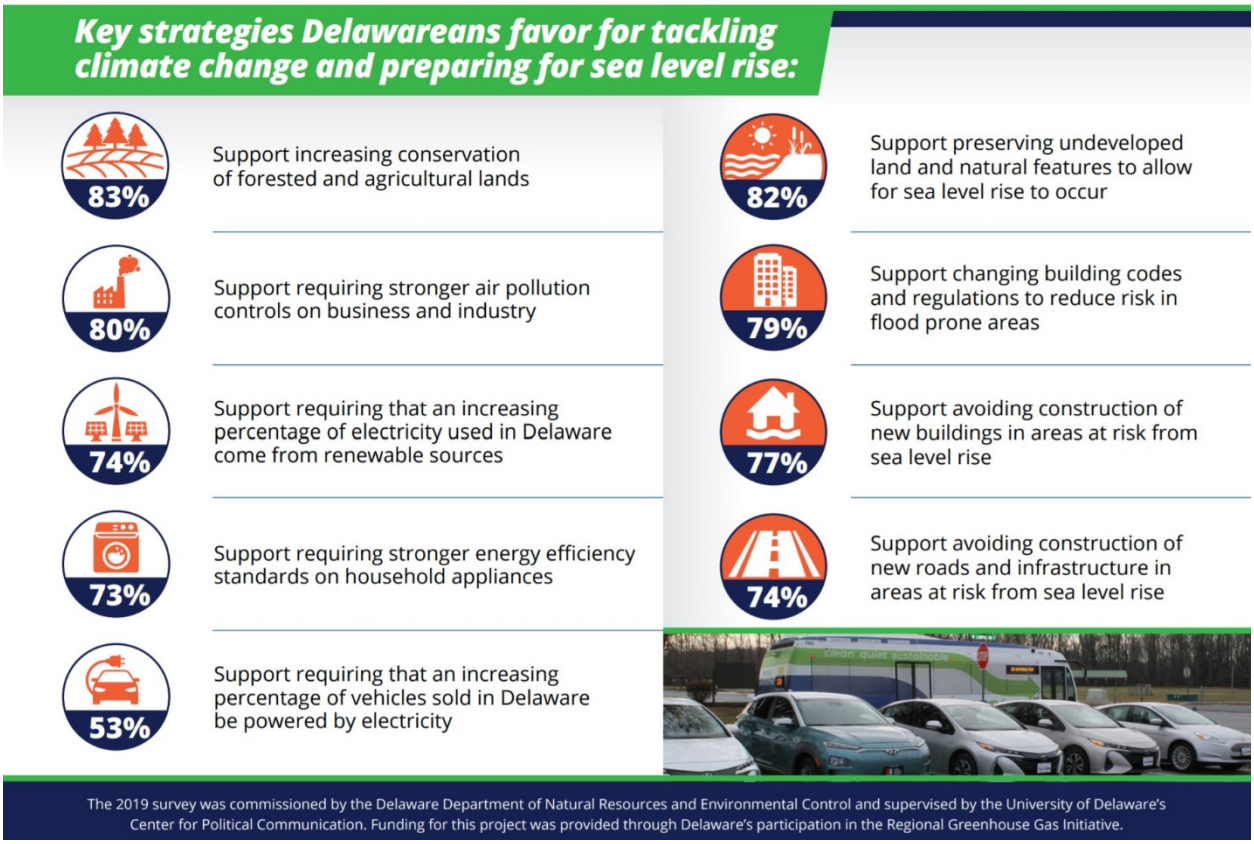


Figure L-1: Key Strategies Delawareans Favor For Tackling Climate Change and Preparing for Sea Level Rise (Source: Delaware Dept. of Natural Resources and Environmental Control/Delaware Climate Action Plan)

What We Heard

"It's also important to reclaim and conserve former industrial and/or brownfield properties along Rivers for climate adaptation purposes." – Public Participant, Let's Talk Workshop: Our Environment and Nature, November 9, 2020

What's the possibility of keeping residential development out of places expected to be in the way of sea level rise and storm surge? – Public Participant, Let's Talk Workshop: Our Environment and Nature, November 9, 2020

I am concerned about many things, but one big concern is the impact of climate change on agriculture, land use planning, redevelopment, and infrastructure. I don't have a sense that these large subject areas have aggressive plans in place to account for rapid climate change. – Public Participant, Let's Talk Workshop: Our Environment and Nature, November 9, 2020

"Recreation and all of our spaces provide benefits whether you live near them or not: filtering water, clean air, storing carbon in trees and soils, all of these things have value even if you do not interact with a parcel on a daily basis, including private parcels." – Susan Love, DNREC Division of Climate, Coastal and Energy, Deep Dive Session 1: Open Space, Conservation, Recreation, Environment, February 3, 2021

NCC Today

Sea Level Rise Analysis

According to the Delaware Department of Natural Resources and Environmental Control (DNREC), there are three major causes of sea level rise affecting Delaware:

- **Melting Ice**: Warmer global temperatures cause ice sheets on land to melt and drain into the ocean.
- **Subsidence**: The land in Delaware has been sinking since the end of the last ice age about 11,000 years ago, through a process called glacial isostatic adjustment.
- **Thermal Expansion**: As water warms, it expands and takes up more space, resulting in an ocean with greater overall volume.

Delaware is located in the mid-Atlantic coastal region, which is considered a sea level rise hotspot where levels are rising faster and higher than elsewhere. This is attributed to a combination of rising seas, subsiding land, and ocean currents. The Delaware Sea Level Rise Technical Committee estimated in 2017 that sea levels in Delaware could rise an additional 9-23 inches by 2050.

The Delaware Sea Level Rise Advisory Committee 2013 report, *Preparing for Tomorrow's High Tide*, reports that statewide, between 8% and 11% of the state's land area (including wetlands) could be inundated by a sea level rise of 0.5 meters to 1.5 meters (approximately 1.5 to 5 feet), respectively. Inundation is the overland flooding of saltwater that happens during big storms or by tiny, incremental increases brought by daily tides. Saltwater inundation is also occurring more frequently due to sea level rise. Inundation of low-lying land and structures occurs when the sea level rises faster than natural forces are able to build up land or where shoreline protection structures are not constructed resulting in dry land

becoming flooded and cause wetlands to convert into open water. Additional detail is found in the Conservation element.

DNREC and the Delaware Sea Level Rise Advisory Committee published recommendations for adapting to sea level rise in 2013. New Castle County has identified local adaptation strategies to coordinate and partner with statewide efforts.

The Salt Water Table and Effects on Environment and Agricultural Lands

As sea levels rise, salt water will make its way further inland and into the underground aquifers that supply water for drinking and agricultural uses. This is called saltwater intrusion, or the process of saltwater moving underground into areas of freshwater in an aquifer where water is present, as defined by DNREC.

The salt line is the location where a stream or river is no longer considered to be salty (contains less than 250 milligrams per liter of chloride). It fluctuates each year depending upon tidal inputs and freshwater inflows from rain, snow melt, and dam releases. The line is moving farther upstream and affecting habitats as far inland as Route 1, according to DNREC.

As sea levels rise, shallow coastal groundwater aquifers and drinking water sources could be penetrated by salt water and become saline. Drinking water needs across Delaware are met in part through the use of surface waters in New Castle County. Increased salinity of the water near these water supplies could affect access to clean drinking water for residents across the County and the State. While impacts to drinking water are not anticipated at this time, monitoring is important.

Forests and wetlands in areas where intrusion is occurring are also affected. The existing plants and trees typically die, resulting in 'ghost trees' like those seen when crossing the bridges on Route 1 where trees stand along, bare of leaves or greenery. These freshwater plants and trees are replaced by plants that are more salt-tolerant. DNREC reports that in many cases, the invasive reed phragmites is moving in before native salt-tolerant species take root, leading to poor quality habitat. In other cases, the rising water has drowned all plants. DNREC wetland maps and aerial imagery suggest that many coastal wetland habitats are changing from freshwater wetlands to brackish or saltwater wetlands over time.

Changes in salinity also affect habitat for various aquatic animals. For example, native fish species like American shad, river herring, and striped bass live in salt water but return to freshwater rivers to spawn, and increased salinity reduces the available freshwater habitat and spawning areas, leading to population declines. Commercial fisheries may need to seek out alternative sources of freshwater in their processing operations, which could negatively affect production and the livelihood of the surrounding communities. This is also likely to affect natural resources tourism industry.

Data in the Sea Level Rise Vulnerability Assessment report show that approximately two to four percent of the state's highly productive soils will be exposed to sea level rise in the three studied scenarios. It notes that these impacts may vary across the state and could be significant in localized areas.

Increased salinity in groundwater could impact agricultural activities by decreasing crop yield, eliminating the capacity to grow certain crops, and impacting the health of livestock. The potential loss of productive agricultural areas and related losses in employment may cause farmers and farm workers to relocate, causing losses to the local agricultural economy and heritage as well as the population of some farming communities. While NCC's agricultural industry does not match that of the other two counties, its importance lies not only in its contributions to the local economy, but also its role in local food supply, land preservation, and rural community character and heritage.

The state Department of Agriculture currently uses two strategies to preserve farmland: agricultural preservation districts and agricultural conservation easements. (Additional information about these two initiatives are found in the Economic Development element of this plan.) Based on the scenarios studied in

the Sea Level Rise Advisory Committee report, approximately 8-11% of statewide agricultural preservation districts (in place at the time of the study, 2012) would be exposed to sea level rise, and the largest percentage of that impact will be felt in New Castle County, where 14-16% of preservation district land could be inundated. Similarly, 13-17% of the conservation easements could be exposed, and 25-31% of the easements in New Castle County could be inundated.

The University of Delaware Cooperative Extension is conducting studies related to salt water impact on agricultural land and crops. Part of these studies includes an investigation into a new salt-tolerant crop: seashore mallow. The crop has marketable products from the seeds and stems, and the plant is a valuable part of the coastal ecosystem.

Case Study: Port Penn Flooding Mitigation and Sea Level Rise Adaptation Study

In 2016, New Castle County received a grant to study flooding mitigation and adaptation to sea level rise in the Port Penn Area. The town is at risk of flooding during storm events and during high tides, which will increase as sea levels rise. The southern area of Port Penn will feel the largest impact of increased flooding. This area, shown in ***Figure L-2***, is located near the marsh inland from the dike and features low-lying buildings, including residences and the sewage treatment plant.

The flood risk and vulnerability assessment showed that the existing dike system built in 1954 is not high enough to protect against the 10% and 1% annual chance storm events under current or future conditions. The dike system has not been maintained and, at the time of study, was covered in heavy vegetation.

The study concluded that "action must be taken to protect residents and structures in the town of Port Penn." Some solutions proposed include reconstruction of the existing dike system and tide gates and structural mitigation measures such as elevation of buildings—including the sewage treatment plant—above base flood elevation, dry floodproofing buildings, retreat, and relocation of buildings outside the floodplain.

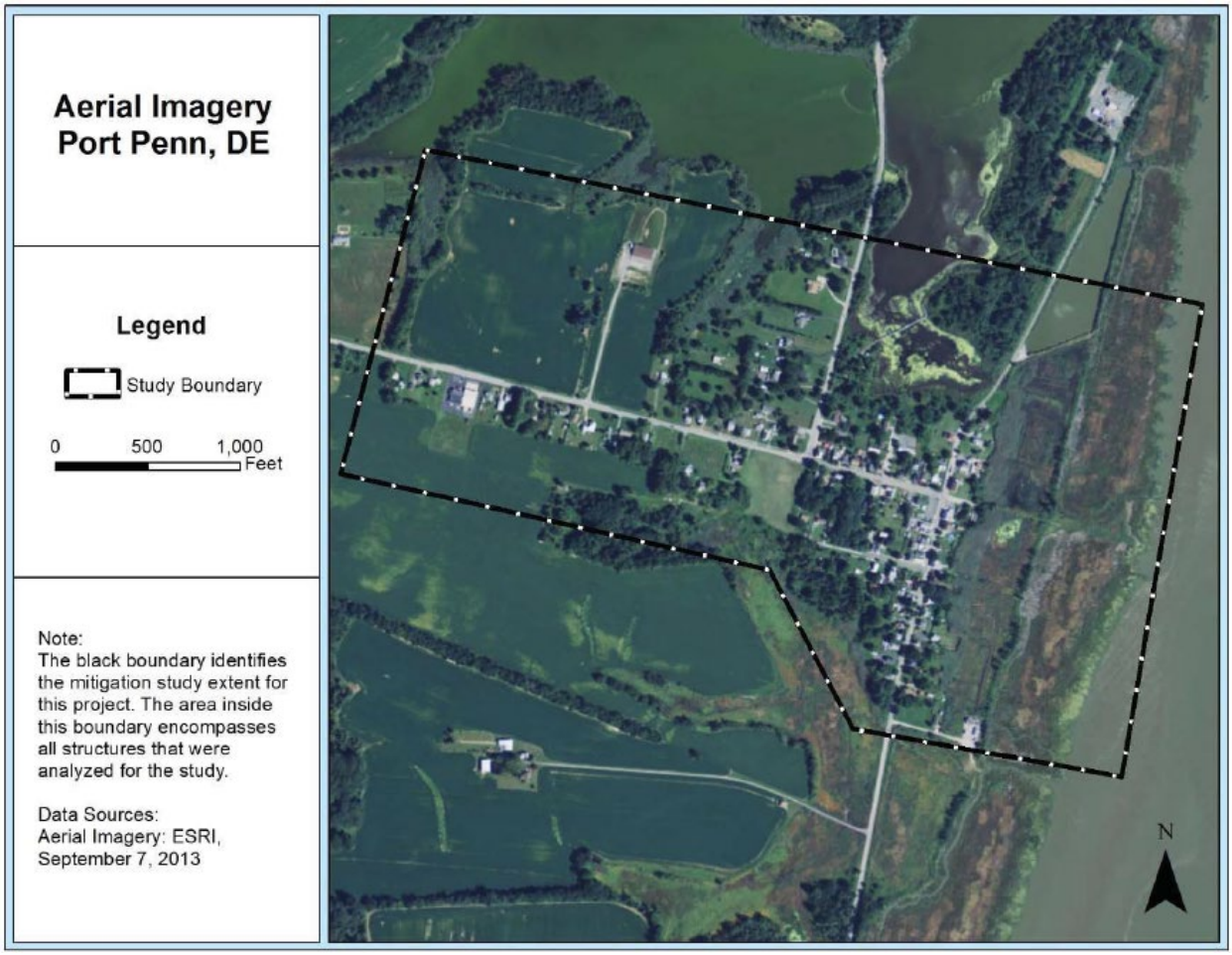


Figure L-2 Port Penn Study Area; Source: Michael Baker International, Port Penn Flooding Mitigation and Sea Level Rise Adaptation Study

Coastal Land Cover

As noted above, our coastal resources are at risk from sea level rise and inundation. These resources include rural coastal plains and tidal wetlands, especially in the southern portion of the county. Delaware's important coastal resources are preserved, protected, developed, and enhanced through the Coastal Programs Section of the DNREC Division of Climate, Coastal and Energy, the Department's research, education, and policy lead for coastal and ocean issues. It manages Delaware's coastal zone through the integrated efforts of the Delaware Coastal Management Program (DCMP) and the Delaware National Estuarine Research Reserve (DNERR).

Following the Coastal Zone Management Act of 1972, the DCMP was approved in 1979 with the intent of balancing coastal resource use, economic development, and conservation. DCMP addresses a variety of issues including coastal hazards, habitat protection, coastal development, water quality, public access, energy facility siting, and ocean planning.

The DCMP collaborates with state, federal, and local agencies to develop policies to manage and protect all of our coastal ocean resources. The team also supports research and monitoring projects to provide those agencies the best quality science to use in decision making.

The DNERR is one of 29 National Estuarine Research Reserves across the country whose goal is to establish, protect, and manage natural estuarine habitats for research, education, and coastal stewardship.

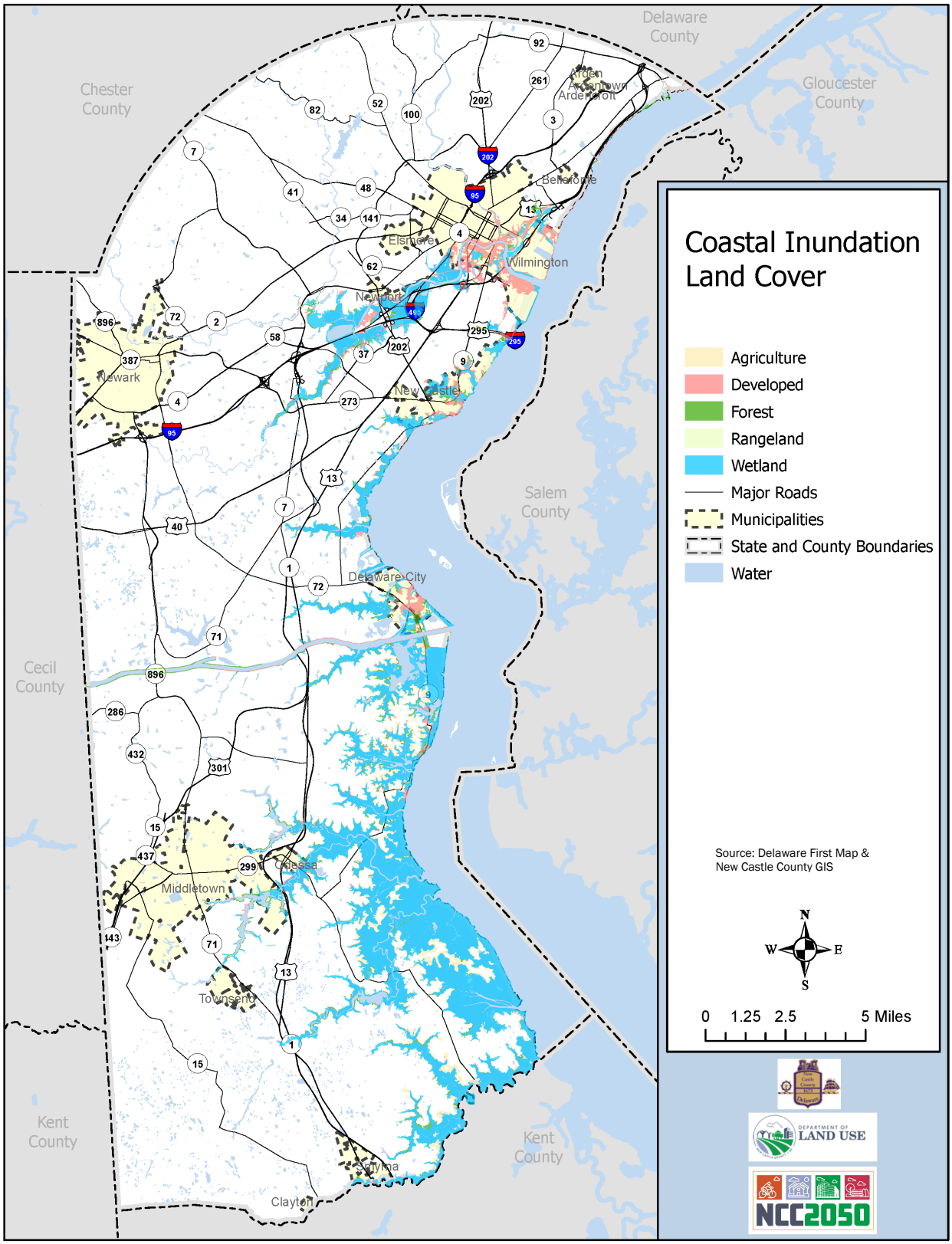
The DNERR has two main components, the Blackbird Creek Reserve in Townsend and the St. Jones Reserve in Dover. These sites include both brackish and freshwater estuaries, and represent the diverse estuarine ecosystems found throughout the Mid-Atlantic region. The mission of the DNERR is to preserve and manage natural resources through coastal stewardship within the Reserve as a place for research, and for providing education and outreach programs that promote better understanding of Delaware's estuarine and coastal areas, and to promote informed coastal decision-making.

Table L-1 shows that nearly 78% of the land area within the five-foot inundation area consist of wetlands. Approximately 7% of the area is developed, and the remainder of the area is made up of agriculture, rangeland, and forested areas. ***Map L-1*** illustrates these general categories, while the table below provides more detailed land cover categories. Please refer to the Conservation element for more information.

Table L-1: Land Cover within 5-Foot Inundation Areas

Land Use Categories	Acres	Percent of Total
Agriculture	345	7.0%
Commercial	30	0.6%
Forest	63	1.0%
High Density Residential	19	0.4%
Industrial	77	1.0%
Institutional	37	0.7%
Low Density Residential	14	0.3%
Medium Density Residential	21	0.4%
Other	110	2.0%
Rangeland	86	2.0%
Transportation	375	7.0%
Wetland	4,095	78.0%
Grand Total	**5,271**	

Map L-1: 5-Foot Inundation Land Cover Map



Climate Change & Public Health

A changing climate affects the whole world, but it also has huge effects on the local level, including on the health of individuals and communities (see *Figure L-2*).

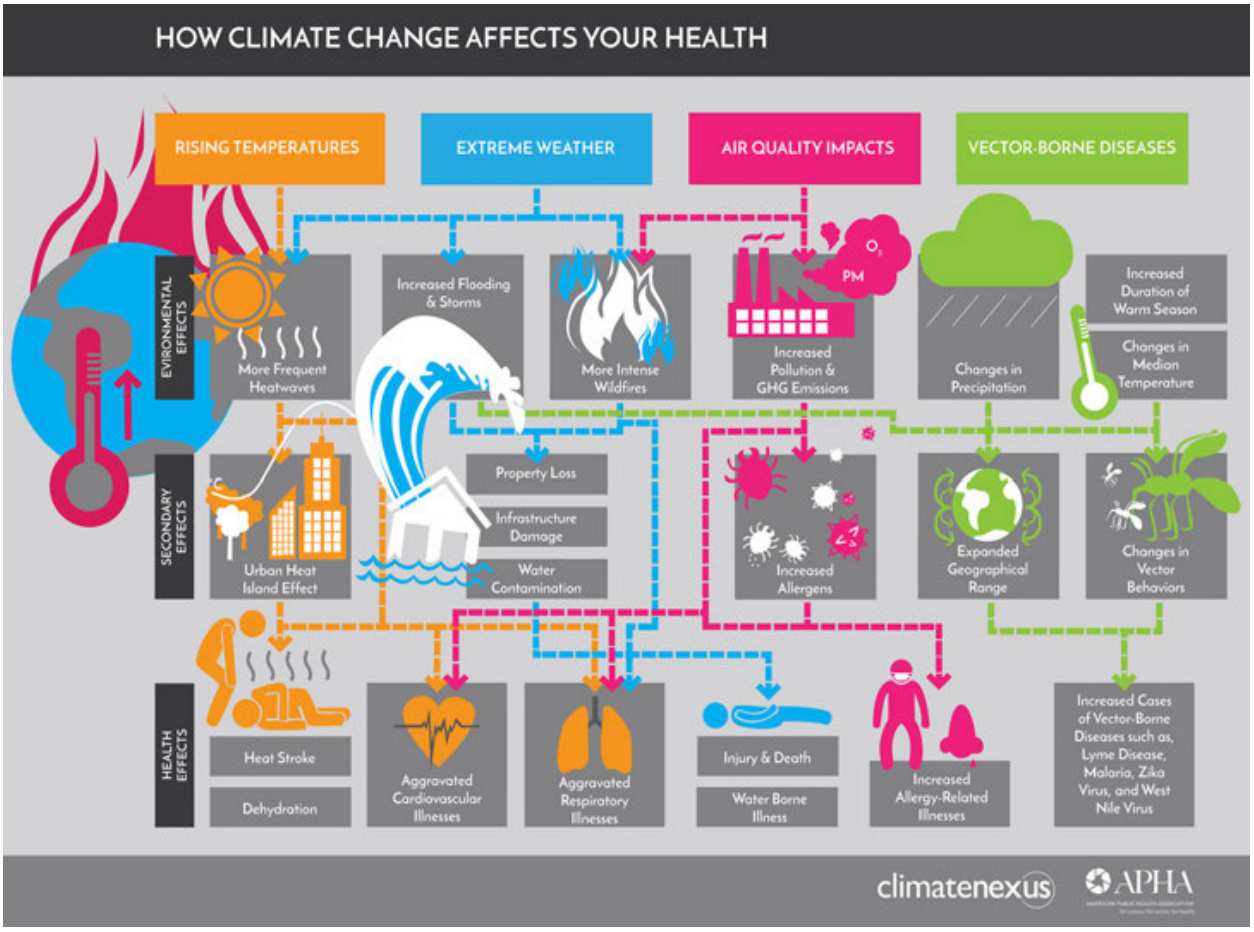


Figure L-2: Climate Change Effects on Health (Source: American Public Health Association)

According to a presentation by Susan Love, DNREC Division of Climate, Coastal and Energy, at the 2017 Delaware Climate + Health Conference, the two effects of climate change which have the largest impact on health are also the effects which are the most significant for Delaware: increasing temperatures and changes in precipitation.

Direct impacts of increasing temperatures are increasing heat-related illnesses, hospitalizations, and deaths, especially for vulnerable populations. Indirectly, increasing temperatures result in worsening air quality exacerbated by conditions that produce ground-level ozone, and longer warm seasons which increase the populations of disease-bearing insects, like mosquitos and ticks.

Increasing precipitation contributes to rising groundwater levels, which leads to failure of infrastructure like septic drain fields, and in combination with increased salinity of groundwater as noted above, impacts water quality and access to safe drinking water. Other infrastructure like roads and bridges may become impassable with rising water levels, which may prevent access in an emergency, including access for fire and ambulance services and the ability to travel to hospitals.

In the October 2017 issue of the Delaware Journal of Public Health, an article titled Climate Change and Population Health by Alan Greenglass, M.D. highlighted other potential health impacts related to greenhouse gases and air pollution: respiratory and cardiac health. With warmer and wetter weather, plants that cause many allergy symptoms like ragweed, tree pollen, and mold will thrive. Ozone (smog) and

particulate pollutants (soot) cause respiratory concerns. Ozone and particulates have direct effects on cardiac arrhythmias, angina, heart attacks, and strokes. DNREC Division of Air Quality provides localized data for New Castle County and the State of Delaware, including resources and reports such as the Annual Air Quality Report contain Delaware- specific monitoring data by location for ozone, PM2.5, and PM10 , which can be found at https://dnrec.alpha.delaware.gov/air/quality/monitoring/. The NCC2050 goals and objectives are aimed to create a built environment that protects our residents from impacts to their health in addition to protecting our infrastructure.

Tracking Environmental Health Data and Outcomes

In 2019, the Delaware Division of Public Health launched the My Healthy Community data portal, allowing residents to view usable, actionable neighborhood-level data related to population health and environmental and social determinant data. Health indicator data is available at street, ZIP code, Census tract, neighborhood, town/city, county and state levels, and users are able to compare their community's health indicators with other communities as well as explore data in the areas of air quality, asthma incidence, public and private drinking water results, drug overdose and death data, community safety, maternal and child health, healthy lifestyles, health services utilization, infectious diseases, education, socioeconomic influencers, lead poisoning, suicide and homicide, and populations vulnerable to climate change.

Social Equity and Climate Change

Environmental justice and low-income communities are more likely to be impacted by the effects of climate change. The American Public Health Association (APHA) cites several of these impacts that affect communities in Delaware:

- Low income and communities of color are more likely to be located in "urban heat islands"—dense urban areas with fewer trees, less green space, more buildings, higher energy use, and more impervious asphalt and concrete.
- Those with limited financial resources are vulnerable to food and water insecurity from rising food and water prices associated with drought and crop loss. Food insecurity is associated with higher risks of chronic illness such as diabetes and hypertension.

The Delaware Nature Society published a report titled *Climate Justice for Wilmington* in 2018, which was a companion piece to *Climate Justice: For a Prosperous & Sustainable Wilmington*, a report with additional detail about Wilmington's vulnerabilities and possible solutions. The principle of climate justice is similar to environmental justice in that no one should bear disproportionate burdens from climate change.

According to the 2018 Delaware Nature Society report, nearly a quarter of Wilmington's residents live below the poverty level making it difficult to prepare for and respond to Climate Change consequences.

Environmental justice communities already spend a larger proportion of their income on energy costs, and as they are less likely to own their homes, they lack control over energy efficiency of their homes and appliances. These communities are more likely to be negatively impacted by extreme weather events because recovery often requires a majority of their resources to rebuild. Low-income households are also less likely to have disaster insurance and have fewer resources to relocate away from floodplains. In both east and south Wilmington, where poverty rates are as high as 32%, substantial inundation from sea level rise is expected.

Based on social equity studies by WILMAPCO, roughly 21% of census block groups identified as Environmental Justice neighborhoods would be impacted by a 1.5-meter (~5 foot) sea level rise in New Castle County, which is nearly the same as the overall average for the County. However, there are disparities in communities with concentrations of non-Hispanic Black and low-income communities, as

shown in ***Figure L-3***. These communities are located along the Delaware River in the northeastern portion of New Castle County.

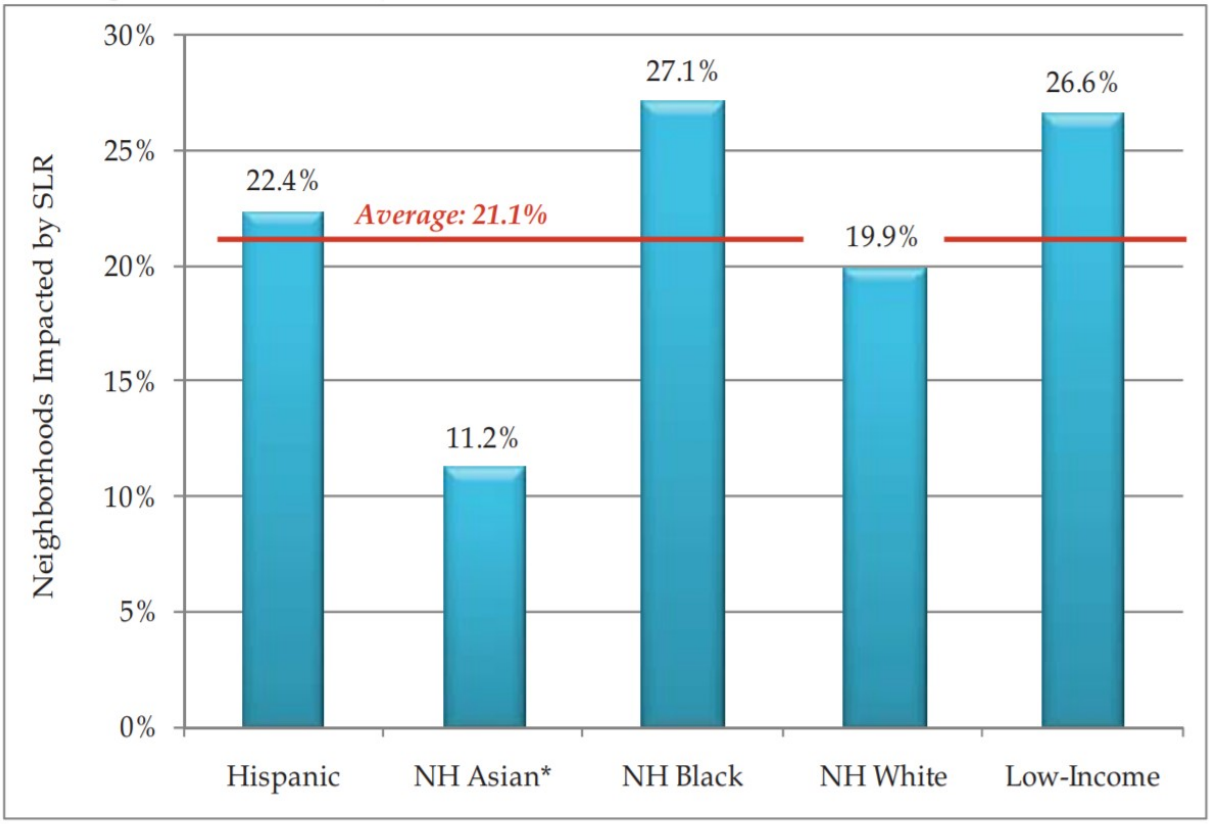


Figure L-3: Sea Level Rise Impacts on Racial and Ethnic Concentrations; Source: WILMAPCO

Energy Sources/Emissions Standards

According to the U.S. Energy Information Administration (EIA), Delaware is the smallest energy-producing state. The state consumes nearly 100 times more energy than it produces. Delaware generates the majority of its electricity from natural gas (87% in 2019). In the previous decade, 28% of electricity was produced from natural gas while 59% was produced from coal-fired generation plants. Delaware has set a renewable portfolio standard requiring Delaware's utilities to derive 40 percent of their energy from renewable sources such as wind and solar by 2035. More details and resources related to renewable energy sources and land use are available at https://www.nrel.gov/gis/solar.html.

About 43% of Delaware households rely on natural gas for home heating, 33% use electric heat, about 11% use fuel oil, and nearly 10% use propane, according to the EIA.

Energy policy at all levels is changing the landscape for energy production, and New Castle County will need to make decisions about the facilities needed for new energy sources. Land use policy related to facility siting, resource extraction, energy generation, and distribution infrastructure are key issues which the County will need to be prepared to address as we move into the future.

In 2021, the State of Delaware recently updated state policy to require that all new residential buildings must be zero net energy capable starting in 2025 and new commercial building construction must be zero net energy capable in 2030 and beyond. It also requires that the Delaware Energy Office in consultation with the Green Building Council of the Home Builders Association of Delaware create programs to encourage construction of zero net energy homes. As defined in the statute, "a zero net energy home or

building is defined as a residence or commercial building that, through the use of energy efficient construction, lighting, appliances and on-site renewable energy generation, results in zero net energy consumption from the utility provider. Therefore, a zero net energy capable home must be energy efficient enough that if the home or building owner chooses to add on-site generation, net zero energy consumption could be achieved."

Several programs are available for residents and businesses in New Castle County to assist in achieving net zero emissions including:

- **Weatherization Assistance Program** - helps households improve home energy efficiency. Eligibility is based on household size and income. Additional information can be found at: https://dnrec.alpha.delaware.gov/climate-coastal-energy/sustainable-communities/weatherization/.
- **Energy Efficiency Investment Fund (EEIF)** - helps Delaware businesses, local governments, and nonprofit organizations pay for energy efficient upgrades that lower energy use and costs. Additional information can be found at: https://dnrec.alpha.delaware.gov/climate-coastal-energy/efficiency/energy-efficiency-investment-fund/.
- **The Green Energy Program** - provides grant funding for green energy projects to offset the cost of photovoltaic, solar water heating, wind, and geothermal renewable energy technologies. Additional information can be found at: https://dnrec.alpha.delaware.gov/climate-coastal-energy/renewable/assistance/.
- **Energize Delaware** - low-interest loans that help businesses including farms, nonprofits, congregations, schools, government, and residents convert to solar or install energy-efficient systems. Additional information can be found at: https://www.energizedelaware.org.

Locally, New Castle County is making concrete steps to increase the use of renewable energy. In 2019, the County highlighted efforts to "combat climate change, to improve water quality, to limit sprawl development and to preserve plant and animal ecosystems," as County Executive Matthew Meyer wrote in an op-ed. The agenda included a variety of issues, with the following related to energy use and climate change:

- Incentives for commercial properties to transition to clean energy sources
- Forest preservation
- Updating stormwater regulations

This op-ed was part of the announcement of the GreeNCC program to improve the environment and enhance the quality of life in the County. Much of the legislation required to enact these policies have been passed or is under deliberation by County Council, as of mid-2021. Additionally, the County, in 2018, passed legislation establishing land use standards allowing solar energy systems to be installed in all nonresidential districts as well as the Suburban and Suburban Reserve zoning districts. This allows large scale solar energy systems as well as provisions for residential solar energy systems in the County. Since adopting these provisions, the County has received three applications totaling roughly 550 acres of land allocated to produce solar energy.

In June 2021, the County partnered with Constellation, a leading renewable energy solutions provider, for the purchase of renewable energy for 18 County facilities, including New Castle County's Public Works headquarters, several pump stations and treatment plants, Rockwood Museum, the Public Safety Building, the New Castle County Government Center, and the Gilliam Building. The County will continue to use energy from the electrical grid and support renewable energy sources by buying renewable energy certificates (RECs) equivalent to all of the use for those facilities. These purchases will not only reduce the County's greenhouse gas emissions, but it will also reduce operating costs by roughly $77,000 annually through the end of the contract in 2024.

The County is implementing other ways to make New Castle County greener, such as: installing five public access electric vehicle (EV) charging stations, purchasing five Chevrolet Bolts in 2020 as part of an

electric vehicle pilot program with a plan to add another five EVs to the fleet, and incorporating a 3.25kW, 350 square foot solar array on the rooftop of the new Appoquinimink Library and solar-powered site lighting in the parking lot. New Castle County is additionally the first county or municipality in Delaware to implement EV-ready provisions in its building codes, demonstrating a commitment to sustainability. Moving forward, the county should consider phased conversion of its passenger and heavy-duty fleets to electric vehicles and charging infrastructure for those vehicles on county property, as well as upgrading landscaping equipment to electric.

Emergency Preparedness/Hazard Mitigation Element Defined

New Castle County is vulnerable to a wide range of natural hazards including floods, tornadoes, tropical storms, hurricanes, winter storms, and earthquakes. The County is also vulnerable to human-caused hazards, such as hazardous material releases or spills and technological accidents or deliberate acts of terrorism. All of these hazards threaten the safety of our residents, damage property, disrupt the economy, degrade our natural ecosystems, and threaten our overall quality of life. While not all of these hazards are preventable, risks must be mitigated and prepared for.

Emergency preparedness and hazard mitigation are overarching issues that involve emergency service providers, infrastructure, communication, and land use planning. New Castle County coordinates teams from across County government to work together to promote the health, safety, and welfare of our community members.

From the Community

“New Castle County Council works with State Council to identify hazard mitigation actions/tasks that can be enacted. The plan is reviewed in coordination with comprehensive plans from the County and municipalities. It looks at those plans and integrates into the Hazard Mitigation Plan.” – Dave Carpenter, Jr., Coordinator of Emergency Services, New Castle County

“Development plans often greatly exceed the amount of parking required, and cumulatively this causes problems for stormwater and contributes to flood hazards due to more impervious area.” – Marc Cote, Director of Planning, DelDOT

NCC Today

Existing NCC Emergency Preparedness Plans & Measures

The New Castle County Office of Emergency Management manages all activities related to preparing County officials and the public for natural and technological disasters. The office employs the concept of comprehensive emergency management, addressing all types of hazards and relying on a partnership between all levels of government, private industry, community organizations, and the general public. The Office of Emergency Management operates under the four phases of Emergency Management: mitigation, preparedness, response, and recovery. Mitigation activities are undertaken to eliminate or reduce the chance of an occurrence or the effects of a disaster. Preparedness activities include developing plans to enhance response capabilities and conducting exercises to assess response efficiencies. Response activities are designed to provide the public with emergency assistance. Recovery activities are performed to return the community to normal or near normal through relief operations.

To best prepare all County residents, property owners, businesses, farmers, and government and community resources, the Office of Emergency Management develops and regularly updates several plans and programs:

Comprehensive Emergency Management Plan (CEMP)

The Comprehensive Emergency Management Plan (CEMP), generally referred to as the Emergency Operations Plan, outlines the county's roles and responsibilities during any natural, technological, or man-made disaster and major emergencies. This plan pertains specifically to County Government operations and support agency disaster operations.

Threat Incident Management Plan

This plan notifies, evacuates, and accounts for the employees and public that occupy the 47 county-maintained facilities. County employees comprise the evacuation teams in the six major facilities and participate in annual exercises to test the plan. This plan is continually revised and distributed to 40 department/office representatives.

Hazardous Materials Response Plan

This plan outlines the efforts of the fire service, Department of Natural Resources and Environmental Control, emergency medical services, police jurisdictions, and non-governmental agencies to plan for and respond to chemical emergencies in New Castle County. This plan is continually updated and revised in cooperation with the New Castle County Local Emergency Planning Committee (LEPC).

Delaware City Community Awareness & Emergency Response (CAER) Plan

This plan outlines the responsibilities of the chemical facilities (located on Route 9 near Delaware City) during an incident at one of the eight plants in that complex. It also delineates responsibilities for outside response agencies.

Weather Monitoring

The Office of Emergency Management monitors approximately 30 weather storms threatening New Castle County annually. Its new weather satellite computer provides up-to-date forecast and radar maps.

State Radiological Emergency Preparedness (REP) Program

The Office of Emergency Management is currently assisting in the update of the Delaware Radiological Emergency Response Plan. New Castle County participated in the REP Full-Scale Federally Evaluated Exercise in May 2008 with no deficiencies or issues and the 2010 Plume / Ingestion Pathway federally graded exercise with no deficiencies or issues.

Delaware Emergency Operations Plan (DEOP)

The New Castle County Office of Emergency Management contributes and supports the DEOP planning process in cooperation with the Delaware Emergency Management Agency (DEMA).

State of Delaware Hazard Mitigation Plan

New Castle County Office of Emergency Management assisted with collecting data from 12 municipalities and eight County departments for a statewide plan identifying mitigation projects to help reduce the effects of disasters in the county.

National Incident Management System (NIMS) Compliance

The New Castle County Office of Emergency Management ensures that the County is National Incident Management System (NIMS) compliant. This is accomplished through the delivery of NIMS and Incident Command System (ICS) training to hundreds of county emergency responders, development and participation in numerous exercises, reliance on ICS to manage incidents, and continued maintenance and management of emergency management systems and equipment.

New Castle County Hazard Mitigation Plan

The New Castle County Multi-Jurisdictional All-Hazard Mitigation Plan is a mandatory plan that was first developed by New Castle County in 2005. The plan assessed the potential hazards which could occur within the County and detailed a list of "mitigation actions" that could be taken to prepare for these possible hazards. The plan is reviewed and updated every five years, including updates to the risk assessment of potential hazards and the list of mitigation actions, documentation of any progress that has been made towards completing these actions, and documentation of any new actions that should be taken and are not in the plan. The latest plan revision was approved by FEMA in 2020. The overall risk ranking for New Castle County is shown in ***Figure L-4*** (from the 2020 AHMP).

Several of these top hazards, as identified in the AHMP, are discussed in detail below.

Hazard	Rank
Flood	1
Haz Mat	2
Coastal Wind	3
Winter Storm	4
Tornado	5
Dam/Levee Failure	6
Public Health Incident	7
Earthquake	8
Drought	9
Hail	10

Figure L-4: New Castle County Risk Ranking

Existing Floodplains and Concerns

Flooding is a year-round and statewide threat in Delaware. Just a few inches of rainfall potentially results in significant damage to homes and businesses, and coastal areas are at risk of flooding from storm surge or tidal flooding during storms.

The University of Delaware Water Resources Center (WRC) tracks floodplains and related topics and provides information and resources to the public. According to the WRC, Delaware floods tend to originate in two areas: along the Piedmont streams in New Castle County and from the tidal bay and the ocean. The WRC states that 16% or 67 square miles of New Castle County is within the 100-year floodplain (or 1% annual storm chance) area. This includes 128 road miles and 2,431 structures. Most of these roads and structures are in the Christina River watershed. Flooding also occurs outside of the mapped 100-year floodplain. Pluvial or urban flooding caused by intense precipitation and insufficient drainage is an increasing risk.

The Delaware Geological Survey (DGS), in cooperation with the U.S. Geological Survey (USGS), has been operating and maintaining continuous-record stream and tide gages throughout Delaware for many years. Among other things, the data collected by these gages are used for flood forecasting, warning, and response. This includes early warning systems which are used by the DGS, Delaware Emergency Management Agency, county emergency management agencies, most municipalities, and the National Weather Service.

The DNREC Floodplain Management Program works to preserve public health, safety, and well-being and protect property by reducing flood hazard risks statewide. To accomplish this mission, the program works

with agencies across all levels of government as well as the public to support risk-informed decision making.

The program works to help communities enforce minimum floodplain management standards, in keeping with federal regulations. It promotes adoption of higher standards to reduce the risk of damage caused by flooding, to protect life and property and to ensure that all development in the Special Flood Hazard Area (SFHA) is reasonably safe from flooding.

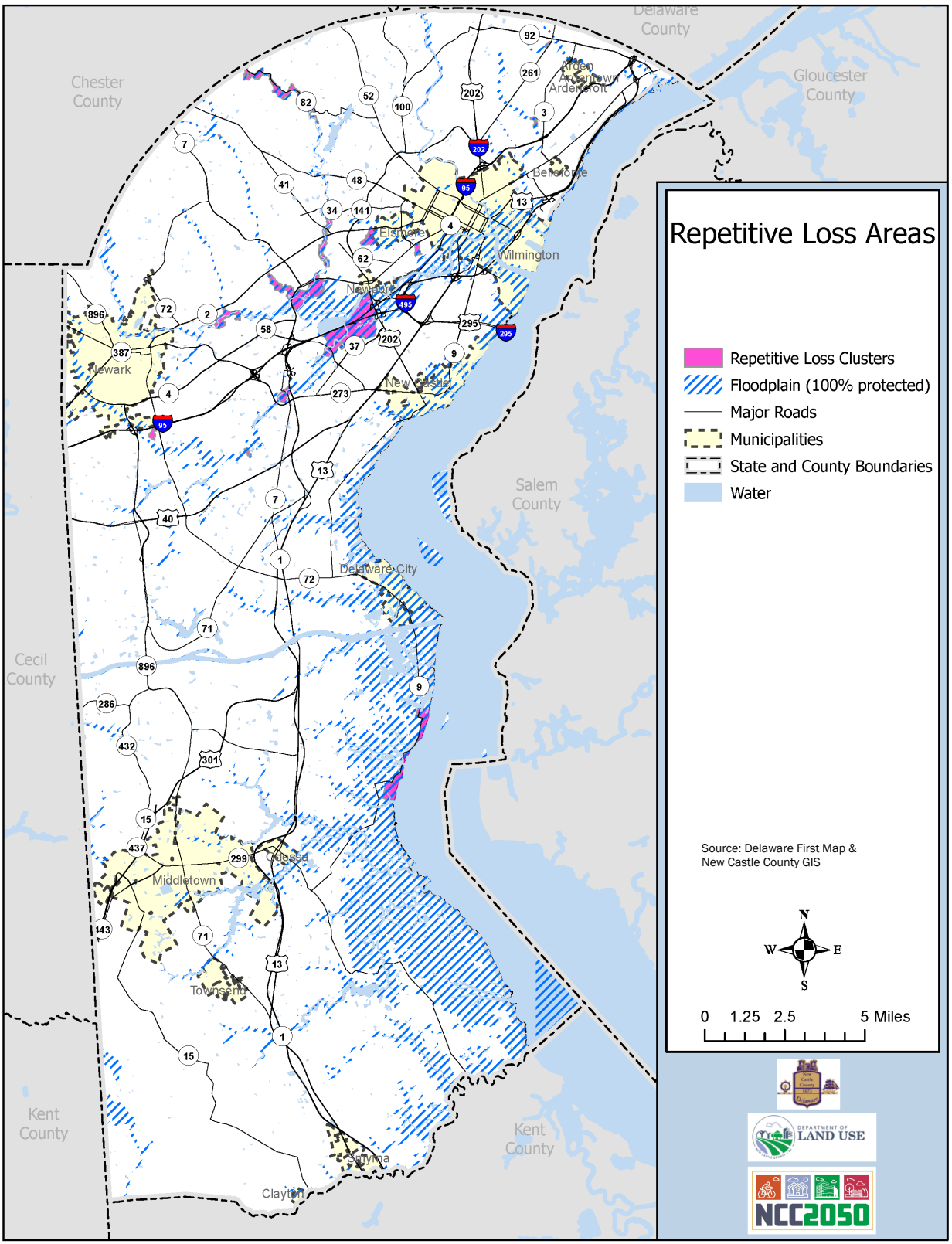
The Floodplain Management Program is also the state coordinating agency of the National Flood Insurance Program (NFIP) assisting Delaware's local jurisdictions and counties with the administration of their floodplain management ordinance requirements. The National Flood Insurance Program is administered by the Federal Emergency Management Agency (FEMA) which identifies and maps areas that are subject to flooding under certain conditions, establishes minimum criteria for development in identified flood prone areas, and underwrites flood insurance coverage.

FEMA works, partially through the NFIP, to reduce future flood damage and to break the cycle of repetitive flood damage by encouraging communities to adopt and enforce floodplain management regulations and by providing affordable insurance to property owners, renters, and businesses. FEMA maintains flood hazard mapping to define areas with the highest risk of flooding. These maps are used to help mortgage lenders and insurance companies determine requirements and help communities to understand flood risk and make informed decisions to manage flood risks.

In early 2020, DNREC coordinated with New Castle County and FEMA to revise the flood maps along more than 96 miles of non-tidal streams in New Castle County, mainly in the Brandywine-Christina watershed, according to an article in Delaware Public Media. The previous map was based on studies and data up to 30 years old.

This Comprehensive Plan includes a strategy to achieve a National Flood Insurance Program Community Rating System Class 4 Rating. The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of FEMA's National Flood Insurance Program (NFIP). The CRS uses a class rating system that is similar to fire insurance rating to determine flood insurance premium reductions for residents. CRS classes are rated from 9 to 1. As a community engages in additional mitigation activities, its residents become eligible for increased NFIP policy premium discounts. Each CRS Class improvement produces a 5% greater discount on flood insurance premiums for properties in the Special Flood Hazard Area (SFHA). New Castle County currently has a rating of 6, which amounts to a 20% flood insurance discount. One important step that the county should take to improve our CRS rating is to address repetitive loss areas (See ***Map L-2***). The clusters depicted in the properties identified in the 2017 application for the National Flood Insurance Program Community Rating System.

Map L-2: Repetitive Loss Areas



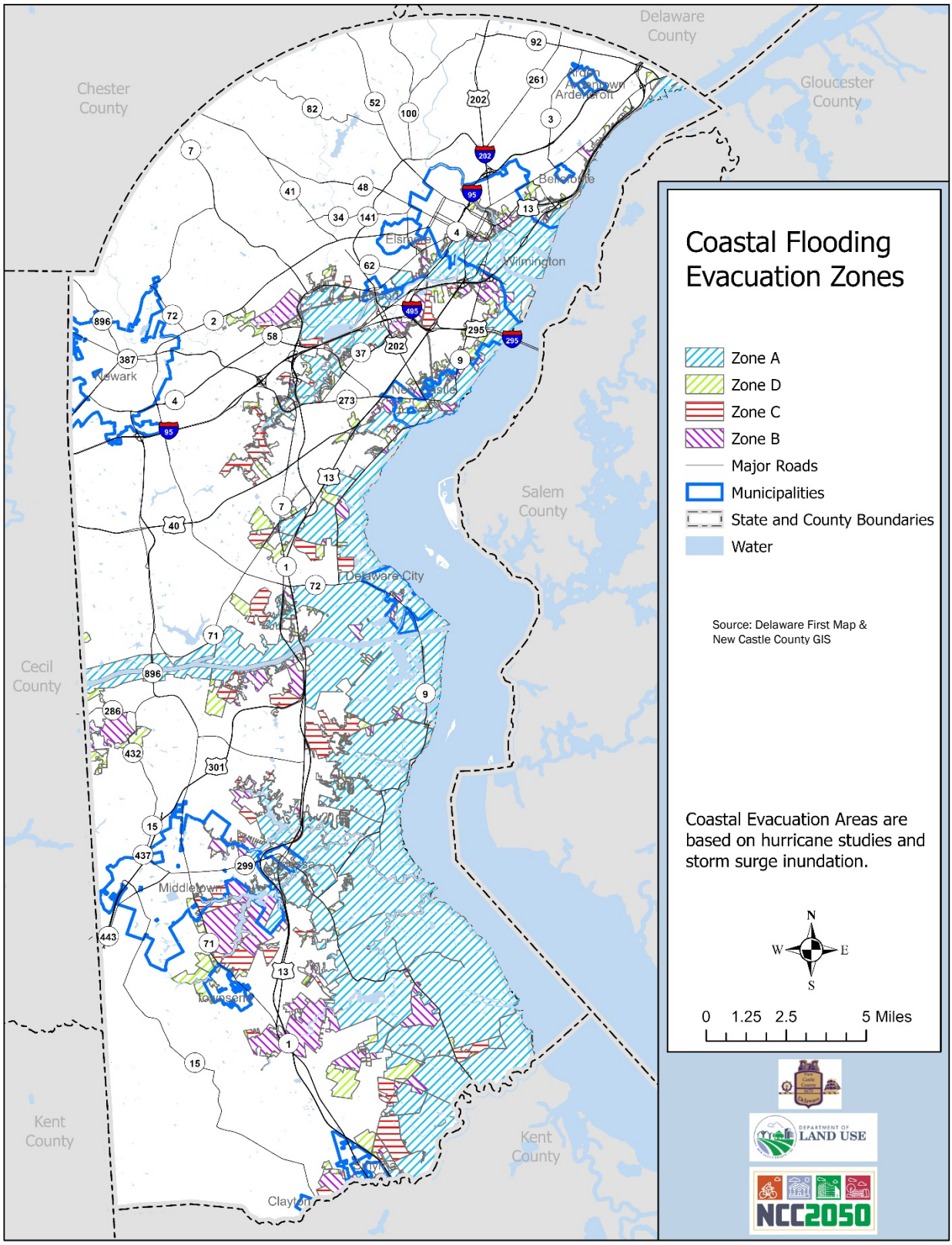
New Castle County experiences poor drainage, failing roadway and drainage infrastructure, and is home to considerable legacy development, including structures located in floodplains. A goal of this Comprehensive Plan is to ensure that our infrastructure and economic and social systems are resilient in all of our communities. This includes reducing the amount of infrastructure in areas prone to flooding or at risk of flooding and sea level rise.

In recent memory, remnants of Hurricane Ida (2021), Hurricane Sandy (2012), Hurricane Floyd (1999), and Tropical Storm Henri (2003) caused significant inland and tidal flooding issues. Storms Ida[1] and Henri produced record flooding impacts in the county with much of the water falling in the upper portions of the watershed in Pennsylvania and impacting downstream communities. Storm Ida occurred in September 2021 and the storm gauge in Chadds Ford recorded flood levels along the Brandywine Creek three feet higher than the previous record. After significant flooding from Hurricane Floyd in 1999 and Tropical Storm Henri in 2003, New Castle County purchased the land in the Glenville area, near Stanton, from the residents and demolished all structures in the flood prone areas.

When these extreme storms approach the region, occasionally evacuation orders are issued by County or state officials. *Map L-3* shows the identified Coastal Flooding Evacuation Zones, which are most at risk of flooding as a result of these types of storms.

[1] National Weather Service/National Oceanic and Atmospheric Agency. Accessed 9/20/21 at: https://water.weather.gov/ahps2/river.php?wfo=phi&wfoid=18692&riverid=204370&pt%5B%5D=143986&allpoints=143986%2C144664%2C145966%2C147524%2C147525%2C145967&data%5B%5D=crests

Map L-3: Coastal Flooding Evacuation Zones



Stormwater Management

One of the key functions of the New Castle County Department of Public Works is to control erosion and flooding within the county. The Department of Public Works maintains 60 stormwater management

facilities, reviews development proposals for compliance with the drainage code, and constructs new stormwater systems. Protection of the County's investment in existing commercial, industrial, and residential stormwater facilities is an ongoing effort for the department. In recent years, a major rehabilitation program was developed to address the County' long-term stormwater needs. (See Utilities, Water, and Sewer Element)

Storm Surge

As noted in the County All-Hazard Mitigation Plan, one of the main causes of coastal flooding is storm surge from major storms, like hurricanes or nor'easters. A storm surge is a large dome of water 50 to 100 miles wide that can rise anywhere from four or five feet up to 20 feet depending on the type and size of a storm. This surge of high water combined with waves driven by high winds can devastate coastal regions, causing severe beach erosion and property damage.

In Delaware, nor'easters are much more common than hurricanes. The National Weather Service characterizes nor'easters as large storms bringing heavy rain or snow, gale force winds, rough seas, and coastal flooding. . Because they tend to be slow-moving, Nor'easters generally impact an area over several days and multiple tide cycles, resulting in cumulative damages from repetitive flooding, wind, and erosion. The National Weather services also calls nor'easters 'Deceptive Killers', as most casualties of the storm are caused by indirect effects, including crashes on icy roads or exposure to cold.

New Castle County has constructed protections and buffers against storm surge, including wetlands for wave attenuation, sea walls, and dikes. These measures are important to preserve and allow for natural wetland migration, in combination with man-made solutions. See more details in the Conservation element.

Hazardous Materials

Hazardous materials (HazMat) incidents largely result from fixed facilities or when the materials are transported via air, rail, roadways, or waterways. According to the County All-Hazards Mitigation Plan, hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosive. Hazardous material incidents generally affect a localized area, and the proper use of planning and zoning should minimize the area of impact if an incident does occur. These incidents refer to occasions when solid, liquid, and/or gaseous contaminants are released from a fixed or mobile container, which often are accidental, resulting from external natural events like a severe storm or earthquake, or intentional, as with a terrorist attack, and they vary in intensity and concern based on the amount and type of contaminant released. Secondary concerns result after the initial incident if contaminants are carried outside the affected area by persons, vehicles, water, wind, or even wildlife.

Despite increasing safeguards and regulations, potentially hazardous materials are increasingly being used in commercial, agricultural, and domestic activities. This situation is made worse by the density of people and hazardous materials in some areas.

Most hazardous materials incidents in New Castle County are reported through local 911 centers. When hazardous materials are involved, local fire departments and DNREC respond. DNREC responders, in coordination with the fire chief, work to remediate the situation. Based on the complexity of the situation, the State Emergency Response Team (SERT) may also be activated to assist.

The County plan includes mitigation actions to work to limit exposure to hazardous materials risks. Some actions should be applied at the County level to address procedures and policies related to these risks, and others are targeted to specific areas or municipalities, roadways, railways. Most of these actions are focused on alert or notification systems and response training to limit the impacts of hazmat incidents.

Emergency Response and Mitigation

The County All-Hazards Mitigation Plan includes prioritized lists of hazard mitigation projects. Some of those potential projects related to storm surge and flooding include:

- Coordination with local municipalities including the City of New Castle, Town of Newport, Town of Elsmere, City of Newark, and the City of Wilmington to conduct a detailed flood vulnerability study to focus on flooding from severe storms and sea level rise
- Construction of flood barriers and other improvements
- Updates to local Flood Damage Prevention Ordinances
- Education initiatives to help property owners protect their property from storm surge and flood damage
- Stormwater infrastructure improvements, such as channel and culvert improvements

The state All-Hazards Mitigation Plan includes a Vulnerability Assessment which breaks down the interaction between population and development density and hazard risk. The plan also outlines recommended mitigation actions at the state and local levels. It recognizes that the most effective hazard mitigation policies begin at the local level to address specific hazards and concerns of communities and are coordinated across all levels of government. County land use policies are part of a range of policies at the federal, state, and local levels that work to prevent residential exposure to these hazards in high-risk area. The State's plan creates a framework for analyzing overall vulnerability, analyzing and incorporating local risk assessments into the statewide plan, and drawing state-level conclusions.

Related Goals, Objectives, and Strategies

Future planning must consider the potential impacts and effects of climate change to ensure a resilient New Castle County. All elements of this plan, from transportation and land use to economic development and housing, must be approached with the intent to balance the effects of climate change while promoting a vibrant economy and supporting our communities. We need to implement the best practices on how to be resilient and protect the well-being of our people and our infrastructure under these changing conditions. New Castle County has existing emergency preparedness and hazard mitigation plans and measures to promote the health, safety, and welfare of our communities, and the implementation of these measures involves the coordination of emergency response teams from across the county.

Climate change mitigation is an important consideration for New Castle County in future planning and policy development. The following goals, objectives, and strategies seek to form local steps in alignment with the Delaware Climate Action Plan (2021) with emphasis on a built environment that reduces greenhouse gas emissions and protects our people and critical infrastructure from the impacts of climate change.

Our strategies will help reduce greenhouse gases and other pollution sources to reduce and mitigate our impact on the environment and to protect our people and critical infrastructure and resources from the impacts of climate change, extreme weather, hazardous material releases, technological incidents, or deliberate acts of terrorism.

13. Goal: Environmental protection, climate change mitigation, and adaptation are important considerations in all county policies. Our community's collective built environment—infrastructure, transportation, nature, and development patterns—are designed in a way that limits greenhouse gas emissions and protects our people and critical infrastructure from impacts of climate change.

    13.1. Objective: Reduce Greenhouse Gas emissions.

        13.1.1. Strategy: Increase energy efficient and green building practices in all building types

        13.1.2. Strategy: Shift from current to future energy needs, leveraging opportunities to embrace clean energy and efficiency

13.1.3. Strategy: Work with transportation sector to foster land use/transportation integration that enables lower VMT, lower transportation emissions, etc.

13.1.4. Strategy: Reduce pollution and exposure to pollution/toxins by planning, analysis, and strengthening County regulations

13.1.5. Strategy: Encourage and incentivize the use of solar panels on all new construction

13.2. Objective: Strengthen/improve resiliency in the face of climate change threats through changes to the built environment (infrastructure, transportation, etc.) so to minimize risk and impacts to all people and communities.

13.2.1. Strategy: Integrate resiliency and hazard mitigation planning with public facilities plans/implementation such as parks and open space

13.2.2. Strategy: Adjust zoning and design standards to make New Castle County resilient against disruptions such as climate change and sea level rise

13.2.3. Strategy: Perform analysis of the criteria and perquisites as well as develop a plan to achieve a National Flood Insurance Program Community Rating System Class 4 Rating.

13.2.4. Strategy: Require that new residential and nonresidential developments account for sea level rise and other potential threats.

13.2.5. Strategy: Address climate change and its impacts through the network of protected lands/open space/parks

13.2.6. Strategy: Use open space design, green infrastructure, and other best practices in the design and use of space

13.2.7. Strategy: Increase carbon sequestration and storage

13.2.8. Strategy: Restore and protect natural habitats, sensitive lands, and native species as part of carbon sequestration strategy

13.2.9. Strategy: Encourage property owners to preserve natural, scientific, educational, aesthetic, recreational and cultural values as Nature Preserves in the State's Natural Areas Preservation Program (https://dnrec.alpha.delaware.gov/parks/natural-areas/)

14. Goal: Pursue a net zero built environment by following emerging technologies, and alternative regional and individual energy sources.

14.1. Objective: Increase the proportion of energy efficient building stock and conservation infrastructure in the building stock.

14.1.1. Strategy: County government leads by example and reviews County operations (e.g. procurement, public space management, buildings, other capital, etc.) to reduce greenhouse gas emissions, including:

1. Converting County passenger and heavy-duty vehicle fleet to electric

2. Conducting energy audits at all county-owned properties and implementing energy upgrades

3. Establish work policies that support reduced transportation congestion/emissions, such as flex schedule and remote work.

4. Deploying renewable energy at county-owned properties

5. Upgrading county land maintenance equipment (mowers, tractors, etc.) to electric

6. Converting large areas of mowed space at county properties (including offices and parks) to meadows, pollinator gardens, and forests

14.1.2. Strategy: Hire a sustainability manager to direct these activities and track progress

14.1.3. Strategy: Address flood risks associated with climate change by implementing environmental and land use policies

14.2. Objective: Reduce pollution from Transportation sources.

14.2.1. Strategy: Lead by example with investments in low/no emissions technology in government (e.g. Electric vehicles, charging stations, etc.)

14.2.2. Strategy: Collaborate with partners and other agencies to achieve reduction in Vehicle Miles Traveled (VMT) by vehicles with internal combustion engines.

14.2.3 Strategy: Evaluate potential county code revisions to encourage school districts to implement low/no mow practices in unused areas of their property.

See Also:

Conservation Element, Goal 2

Mobility Element, Goal 8 & 9

Environmental and Social Justice, Goal 15