Climate Action PLAN

Taking Action to Reduce Greenhouse Gas Emissions and Adapt to Climate Change

Approved by the Borough of Carnegie
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www.carnegieborough.com/lcap
Produced by the Borough of Carnegie Climate Action Task Force

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- LifeSpan Senior Center
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1. EXECUTIVE SUMMARY

With seasonal variations and catastrophic natural disasters becoming more intense and frequent, climate change threatens the health, safety, and overall well-being of communities across the globe. The Commonwealth of Pennsylvania and the Borough of Carnegie are no exception. The Borough of Carnegie recognizes a growing need to address its own contribution to climate change, as well as adapt to the impacts that will occur and be exacerbated, absent local greenhouse gas reduction. This Climate Action Plan includes an inventory of the Borough of Carnegie's greenhouse gas emissions (GHGs) from community-wide activities, establishes an emissions reduction target, and outlines feasible actions to achieve that target. In addition, the Plan identifies ways in which GHG reduction actions can further the Borough of Carnegie's ability to adapt to climate change impacts. While this Plan is not focused on adaptation, it ensures that GHG measures are not counteractive to the Borough of Carnegie's future resilience and will hopefully be a catalyst for developing a robust strategy towards that end.

1.1 Vision

Carnegie's LCAP vision is to become a climate-resilient community with restorative impact on natural systems beyond our borders. Carnegie will take action to reduce its carbon footprint and greenhouse gas emissions while enhancing resilience to climate risks through equitable economic development, meaningful stakeholder engagement, research, and innovation.

1.2 Mission

Our mission is to improve public health and well-being, mitigate climate change vulnerabilities, adapt to our changing reality, and transition Carnegie into a clean and sustainable community. We plan to build a set of initiatives to meet goals and objectives, identify stakeholders, and create a strategy for outreach and engagement.

2. EMISSIONS and CARNEGIE'S PLAN

2.1 Carnegie's Emissions Inventory shows sources are primarily from residential and commercial electric and natural gas use giving the borough an opportunity to significantly reduce emissions.

The Borough of Carnegie has developed a Climate Action Plan that is aligned with CONNECT's regional Plan, the State of Pennsylvania's Plan, state guidelines, borough ordinances, and the borough's Tri-Community Comprehensive Plan to advise, guide and encourage municipal, residential, and commercial segments of the community to be more sustainable in their processes.

The Borough of Carnegie will demonstrate environmental leadership and help our community rise to the difficult challenge of reducing the impact of climate change by taking reasonable steps to reduce GHG emissions. Municipal operations will begin by reducing utility costs through increased energy and water efficiency.

2.2 What are Greenhouse Gases?

Greenhouse gas such as CO2, are released as a result of fossil fuel combustion from energy use, heating, and transportation. These gases trap heat and contribute to climate change.

2.3 Why does it Matter?

Climate change is already impacting natural systems, infrastructure, and energy prices. For our region, it will continue to impact local air quality and cause flooding events, severe heat waves, and landslides.

2.4 What does it mean for Carnegie?

Every year, CO2 emissions result in local and global damages. Carnegie has an opportunity to develop a Plan to reduce greenhouse gas emissions and slow the effects of climate change.

2.5 Plan Consistencies

Commonwealth of Pennsylvania's 2021 Climate Action Plan | **CONNECT Local Climate Action Plan**

Tri-Community Comprehensive Plan

To ensure consistency with CONNECT'S Plan and the PA Climate Action Plan, the Borough of Carnegie's reduction targets meet the statewide targets. In addition, many of the statewide actions were incorporated into this Plan.

Statewide Climate Action

In 2008, the Pennsylvania Climate Change Act was passed, and requires the Department of Environmental Protection (DEP) to (1) develop an inventory of GHG emissions and update it annually; (2) administer a Climate Change Advisory Committee; (3) set up a voluntary registry of GHG emissions; and (4) prepare a Climate Change Action Plan and Climate Impacts Assessment, both to be updated once every three years. The most recent Climate Impacts Assessment, Greenhouse Gas Inventory, and Climate Action Plan were released in 2021. These documents offer information and guidance for local climate action planning in the Commonwealth. The Climate Impacts Assessment provides a scientific basis for potential statewide impacts of global climate change, which can be used alongside available local data to inform community adaptation efforts. The Climate Action Plan summarizes statewide greenhouse gas emissions, sets an emissions reduction target, and describes potential mitigation and adaptation actions for residents and businesses, as well as local and state government. The reduction targets are 26% by 2025 and 80% by 2050 from 2005 levels, consistent with Executive Order 2019-01 signed by Governor Wolf in 2019 (PA DEP, 2021).

CONNECT Regional Climate Policy

While CONNECT cannot by itself reduce emissions, member government policies and practices can dramatically reduce greenhouse gas emissions from a range of sources and help prepare the region for the anticipated impacts of climate change. CONNECT'S Regional Climate Action Plan is a guide that engages and empowers local communities, in order to reduce the collective greenhouse gas emissions and climate impacts to our shared region. CONNECT' climate goals are to reduce 30% by 2030, replace current energy sources with renewables, bolster resilience through local land, water and materials management and to motivate cleaner modes of transportation by residents and fleets. (CONNECT CLIMATE ACTION PLAN, 2021)

2.6 Carnegie Climate Action Plan

Reduce Emissions - 40% by 2030 / 80% by 2050

- Increase use of renewable and efficient energy in municipal, residential, and commercial buildings.
- Improve and encourage multi-modal transportation, increase mass transit ridership, adopt a bike strategy, explore traffic calming options, and install electric vehicles charging stations.
- Develop a pedestrian mobility plan that creates safe connections to our parks and everyday destinations.
- Combine stormwater management with green infrastructure and nature destinations.

Reuse and Recycle - 50% by 2030 / 100% by 2050

- Implement glass and electronic recycling programs.
- Expand paper, plastic, and aluminum recycling programs.
- Make recycling and trash receptacles easily available in public spaces and parks.
- Improve our current recycling education web page.

Support and Sustain

- Create and maintain climate action website providing support and information.
- Form an Environmental Advisory Council with members of the community as well as commission members, elected officials and borough administration to provide emission reduction programs and policy recommendations with updated recommendations for mitigation and adaptation options.
- Develop strategies for grant funding, resources, implementation, and resilience.
- Expand tree planting and rain garden programs, implement rain barrel and composting programs, preserve natural systems, and create new wildlife habitats.

Encourage and Educate

- Create programs and incentives to help educate and foster climate action goals within the community and work with regional and borough groups.
- Develop and host in-person and online workshops to increase awareness of climate change impacts and provide education on mitigation/adaptation options including but not limited to renewable energy suppliers and solar co-ops.
- Create Social Media groups and blogs offering resources and discussion for residents and business owners.
- Develop Environmental Literacy Project that includes seminars and workshops in online, print, in-person and class visits

The Borough of Carnegie will use creative and innovative in-person and online initiatives to effectively communicate our climate action message. Climate change is the greatest environmental challenge of the 21st century, with overwhelming evidence in the past decade. It poses a serious threat not just to the Borough of Carnegie's natural resources, but also to our jobs and our health.

Climate action presents huge opportunities for creating a healthier, safer, and more equitable zero-carbon world. The Borough of Carnegie has an unparalleled opportunity to make changes in ways that create jobs and benefit all residents. Scientists expect that with the current trends in fossil fuel use, Americans may see more intense heat waves, droughts, rainstorms, floods, wildfires and landslides in the future. These impacts could drag down our economy, stress our natural resources and worsen inequities facing many Americans. Action is required at all levels, and local governments have a unique role to play in building low-carbon communities.

In Pennsylvania, temperatures are expected to increase approximately 5.9°F by 2050 from the baseline period (1971-2000). Similarly, average annual precipitation in Pennsylvania has already increased by 8%, particularly in winter and spring (PA DEP, 2021). The most serious threats to the Borough of Carnegie are increased storm intensity, flooding, and extreme and extended heat events.

These impacts are caused by the accumulation of greenhouse gas (GHG) such as carbon dioxide (CO_2) and methane (CH_4) in the atmosphere, primarily resulting from burning fossil fuels and land use changes. Although the natural greenhouse effect is needed to keep the earth warm, a human enhanced greenhouse effect with the rapid accumulation of GHG in the atmosphere leads to too much heat and radiation being trapped. Carbon emissions from human activities have continued to rise in recent decades, reaching the highest rates in human history between 2000 and 2010 (Intergovernmental Panel on Climate Change (IPCC), 2014).

About half of all carbon dioxide emitted between 1750 and 2010 occurred in the last 40 years.

Energy, industry and transportation sectors have dominated the rise in emissions. Sectors in Pennsylvania, most responsible for GHG emissions are industrial at 32%, electricity production at 27%, and transportation at 24% (PA DEP, 2021).

With the current trajectory of population growth, urbanization, and reliance on personal vehicles, emissions will only continue to rise. Given the critical impacts of climate change on humanity, the time to act to reduce GHG and our carbon footprint is now.

Carnegie's Residential GHG Emissions are 52% natural gas and 48% electricity.

Carnegie's Commercial GHG Emissions are 74% electricity and 26% natural gas.

In addition to national and state efforts to make systemic changes that will reduce global emissions, local governments can play a powerful role in addressing climate change. The design of American communities—how we use our land, how we design our buildings, how we get around—greatly impacts the amount of energy we use and the volume of GHG emissions we produce. It is critical that communities like the Borough of Carnegie demonstrate that it is possible to dramatically reduce GHG emissions while creating more vibrant and prosperous places to live and do business.

3. PURPOSE and SCOPE

The Borough of Carnegie is joining an increasing number of local governments committed to addressing climate change at the local level, particularly emission reduction plans that include electric charging stations, solar options, multimodal transportation, increased public transportation, green infrastructure, green stormwater management, and enhanced recycling programs.

The Borough of Carnegie recognizes the risk that climate change poses to its residents and businesses and is acting now to reduce the GHG emissions of both its government operations and the community at-large through the innovative programs laid out in this Climate Action Plan. Furthermore, it is recognized that the Borough of Carnegie needs to address existing climate risks such as stormwater management and flooding and adapt its systems and infrastructure to new conditions. This Climate Action Plan takes advantage of common sense approaches and cutting-edge policies that our local government is uniquely positioned to implement – actions that can reduce energy use and waste, create local jobs, improve air quality, preserve our local landscape and history, reduce risk to people and property, and in many other ways benefit the Borough of Carnegie for years to come.

3.1 Purpose

By creating a clear course of action so that everyone has a role in creating and achieving climate and sustainability goals, our Climate Action Plan drives and coordinates local efforts toward a 40% reduction in GHG emissions of 2018 levels by 2030 and 80% below 2018 emission levels by 2050.

The Climate Action Plan is a framework for the development and implementation of actions that reduce the Borough of Carnegie's GHG emissions. The Plan provides guiding objectives and actions to realize our GHG reduction goal.

In addition to addressing mitigation concerns, the Climate Action Plan considers the vulnerability of the Borough of Carnegie to hazards that are and will continue to be exacerbated by climate change. The Plan prioritizes GHG reduction measures that support climate adaptation and does not propose any actions that are maladaptive to foreseen climate change impacts.

3.2 Scope

This Plan covers objectives and actions for reducing GHG emissions resulting from local government and community-wide activities within the Borough of Carnegie. It addresses the major sources of emissions and purchased energy and sets forth actions that both the Borough of Carnegie and community members can implement together to reduce greenhouse gas emissions

Scope 1: GHG Emissions from sources located within the Borough of Carnegie
Scope 2: Purchased energy (most often electricity)
Scope 3: GHG Emissions that occur within the Borough of Carnegie
Sources: Commercial, Municipal, and Industrial Buildings; Residential Buildings; Materials Management; Stormwater Management; and Transportation

3.3 Planning Process

The Plan creates a framework to document, coordinate, measure, and adapt efforts moving forward. In addition to listing actions, the Plan discusses how each action will be implemented via timelines, financing, and assignment of responsibilities to departments, staff, or community partners where known.

Framework

While Borough of Carnegie has already begun to reduce greenhouse gas emissions and climate risk through a variety of actions including municipal building energy inventory, joining a solar co op, implementing a community composting program, planting native plants, using rain gardens for stormwater management and plans for glass and electronic recycling events, this Plan is a critical component of a comprehensive approach to reduce Borough of Carnegie emissions and increase resilience. The two frameworks below, developed by ICLEI – Local Governments for Sustainability, USA (ICLEI), are known as the Five Milestones for Climate Mitigation and Adaptation.

As indicated by the figure to the right, climate action planning is a continuing cycle and does not stop with the development of this document. However, this Climate Action Plan represents Borough of Carnegie's first planning cycle, including the completion of the first three milestones for mitigation and partial completion of the first milestone for adaptation:

Milestone 1: Summarize emissions inventory and forecast; describe potential risks from climate change.

Milestone 2: Set reduction targets

Milestone 3: Outline objectives and actions for GHG reduction and adaptation

Timeline

- Carnegie Borough was accepted into the third year cohort of Pennsylvania's Local Climate Action Planning (LCAP) program led by ICLEI USA-Local Governments for Sustainability, August 2, 2021
- CONNECT supplied a 2018 GHG Inventory in September, 2021.
- Borough of Carnegie formed a Climate Action Task Force in October, 2021.
- Developed survey and presented to the public in November, 2021
- Created Local Climate Action Plan website and videos in December, 2021
- Collected surveys and worked on Climate Action Plan January-March, 2022
- Joined Solar Co-op Program, March 2022
- Had inventory completed for Municipal Building, March 2022
- Mayor Stacie Riley renewed the NWF Monarch Butterfly Pledge, March 2022
- Scheduled community composting program to begin Summer, 2022
- Climate interns worked in Temperate software for forecasts and developed vulnerability assessments, April, 2022
- Completed NOAA Environmental Literacy series, April 2022
- Three task force members and one Shade Tree Commission member attended Earth Day Celebration and gave out free environmental themed coloring books and crayons and reusable bags and discussed Monarch Butterfly Conservation, April 2022.
- Task force member and intern attended virtual NIHHIS conference, April 2022.
- Used ClearPath to create forecasts and graphs, January – June 2022
- Scheduled glass recycling, paper shredding, and drug dump events, April 2022
- Developed vulnerability assessment, May 2022
- Reviewed and edited Plan, May-July, 2022

3.4 Social Equity

Climate equity was a core component of the planning process and will continue to be through implementation. Climate Equity ensures the just distribution of the benefits of climate protection efforts and alleviates unequal burdens created by climate change. Implementation of this concept requires intentional policies and projects that simultaneously address the effects of and the systems that perpetuate both climate change and inequity. Under the status quo, however, not everyone is given the opportunity to participate and benefit.

Communities of color and low-income populations have historically been under-served by programs and investments and under-represented in decision-making, including for the development and implementation of climate policy. These exclusionary processes maintain or exacerbate disparities in public health; food, energy, and housing security; air and water quality; economic prosperity, and overall quality of life. These inequities primarily stem from ongoing institutional racial bias and historical discriminatory practices that have resulted in the inequitable distribution of resources and limited access to opportunities.

2020 Census and School Information

Total Population:	8,134
65 and Older:	18.4%
Foreign Born:	5.3%
Below Poverty Level:	15.8%
School Minority Enrollment	27% (1,341 students)

All Carlynton students are eligible for free school meals through a grant program.
Senior buildings - Carnegie Retirement Residence, Honus Wagner Apts, as well as LifeSpan Senior Center

Climate change is likely to amplify the impacts of existing inequities. Residents of color, immigrants, elderly and the very young, outdoor workers and those with lower incomes will disproportionately bear the burdens of climate change impacts. In addition, the many economic and health benefits of carbon reduction investments are not shared equitably.

To ensure an equitable Climate Action Plan, the Borough provided surveys in online and print formats 18.3% of Carnegie's residents do not have home broadband or internet access. Printed surveys were left at various locations throughout the borough and were available at the farmers market. Since many of the residents without internet access utilize library computers, surveys are available there.

3.5 Community-Driven Planning Process

Community-Driven Climate Resilience Planning: A Framework from the National Association of Climate Resilience Planners.

- **U.S. Climate Resiliency Toolkit**
- **Equitable and Just National Climate Platform**
- **New York City Climate Action Plan**

Our Climate Action Task Force was formed in October 2021 and includes residents, business owners and employees, council members, and shade tree commission members. Input was gathered through the online form and intercept surveys at the farmers market. Future actions will be evaluated in the same way. Climate Action Survey Results click here. The borough will continue with outreach strategies targeting low-income, immigrant, and minority residents.

4. CO-BENEFITS

Greenhouse gas reduction and climate resilience are not the only beneficial outcomes of climate action plans. The following outcomes are referred to as "co-benefits," and they illustrate how taking action on climate change results in a more prosperous community.

- Reduced energy demand
- Public environmental education
- Improved air quality
- Water conservation
- Enhanced land use and community design
- Improved public health and safety
- Clean community with green infrastructure aesthetics
- Increased resiliency
- Cost savings
- Clean job promotion
- Resource security (energy, food, water)
- Social equity

4.1 Improving Public Health

Climate change mitigation activities, particularly those related to transportation, help to clean the air by reducing vehicle emissions and therefore improve public health. Mitigation activities help to engender a greater degree of choice for Borough of Carnegie residents. More transit options combined with transit-oriented development practices make for a more vibrant, livable community with shorter commute times and more opportunities for active transport. This creates more connected and resilient neighborhoods.

4.2 Saving Money and Reducing Risk

In addition to addressing climate change, measures taken to reduce greenhouse gas emissions have other important benefits. The most obvious of these is the potential for significant cost savings. Many of the measures in this Plan pay for themselves quickly by reducing direct costs, such as fuel or energy used, and indirect costs such as maintenance. For instance, a "right-sized" vehicle fleet is less expensive to purchase and fuel, while also being less costly to maintain. Encouraging energy efficiency, public transit use, building improvements, and other measures will also result in lower energy and water bills for residents and employers as well.

Carnegie Utility Bills	2020	2021
Electricity for Buildings	$20,000	$24,000
Electricity for Traffic Lighting	$175,000	$183,000
Gas for Heat	$8,250	$7,400
Water	$6,500	$9,300
Water Fire Dept	$4,369	$4,369
Sewage	$9,600	$12,500
Gasoline – Police	$22,000	$22,000
Gasoline – Fire	$2,350	$2,500
Gasoline – Planning Dept	$700	$600
Gasoline – DPW	$14,750	$15,500

Acting now will also save on runaway costs on climate change, especially in the longer term. These costs range from infrastructure damage in extreme storms and pest control to industry losses, particularly for industries that depend on environmental conditions, such as winter sports.

4.3 Enhancing Resource Security

A key strategic side benefit of climate change mitigation activities is enhanced energy security through demand reduction putting less strain on the energy system as we transition to clean renewable energy. Similarly, demand shifts can help with improving water and food security as well.

Many of the GHG emissions mitigation actions identified here will also help borough government, businesses, and residents adapt to changing climate. Extreme and prolonged heat waves can put considerable strain on the reliability of energy delivery in peak periods, possibly leading to service disruption during times when cooling is most needed. Increasing efficiency will make service disruptions less likely allowing the Borough of Carnegie to better cope with those situations. Similarly, climate actions can secure food and water sources and prevent damage and service disruptions to these systems.

4.4 Creating Jobs

Renewable energy is a growing sector. The U.S. Department of Energy reports that sustainable tourism, green construction, and urban agriculture can provide job opportunities that didn't exist in the past. These climate protection measures can spur business and job growth during the design, manufacture, and installation of energy efficient technologies, which presents a particular opportunity to reinvest in the local economy and generate green jobs within Borough of Carnegie.

5. GREENHOUSE GAS INVENTORY

Since the early 1990s, U.S. cities have developed community-wide and local government operations greenhouse gas (GHG) inventories based on accounting protocols created by ICLEI. Known as the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions and the Local Government Operations Protocol, these standards created a credible and defensible methodology which accelerated the number of inventories created and provides consistency within and across U.S. communities. In 2014, ICLEI partnered with the World Resources Institute and C40 Climate Leadership Group to create the Global Protocol for Community Scale GHG Emissions, which allows communities around the world to compare their emissions footprint. Our local emissions study, or "greenhouse gas inventory" was completed by CONNECT and emission levels were determined for the community as a whole. The sum total of emissions produced within Borough of Carnegie limits.

5.1 Borough of Carnegie Community-Wide GHG Emissions

The following figure breaks down community-wide emissions in Borough of Carnegie. Note that emissions from the Borough of Carnegie's operations are embedded within the community-wide totals. For example, emissions from government buildings are included in the "Commercial" sector and emissions from Borough of Carnegie fleet vehicles are included in the "Transportation" figure above. Government operations are therefore a subset of total community emissions.

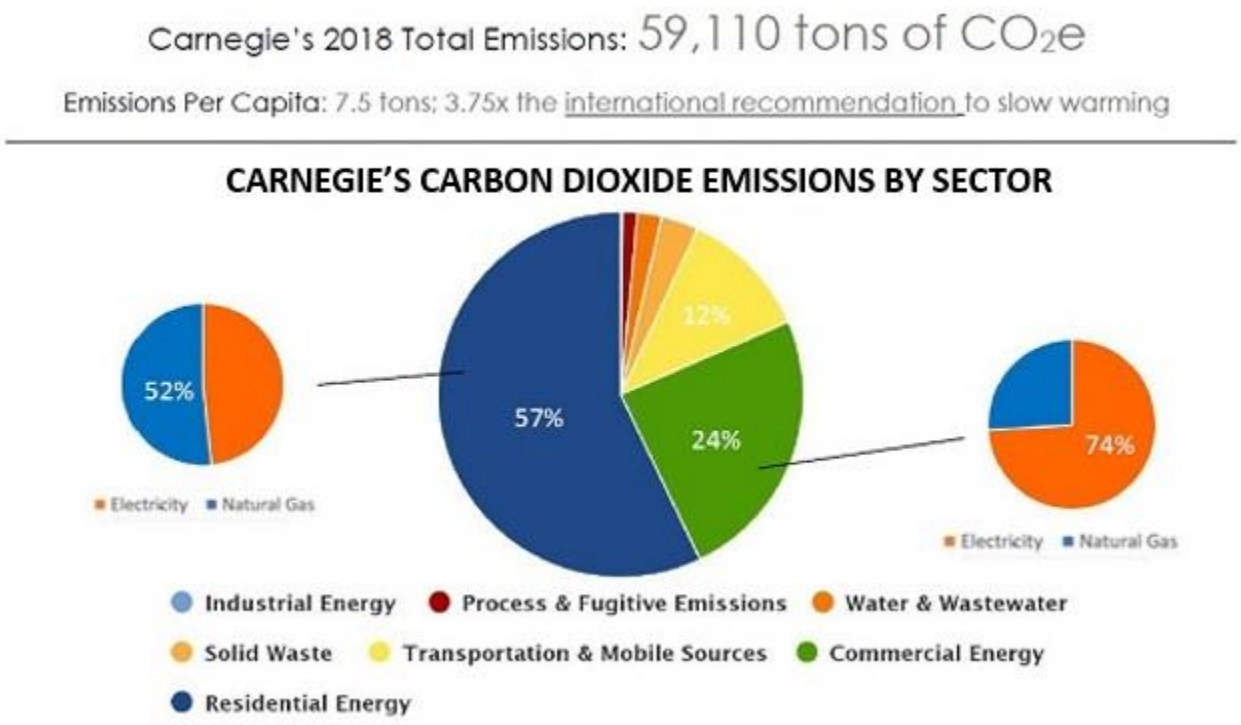


Figure 1: Borough of Carnegie Community-Wide GHG Emissions

Inventory By Scope And Sector

CO2e by scope and sector for the selected inventory year.

Scope	Sector	CO2e
Scope 1	Transportation & Mobile Sources	6,769
Scope 1	Commercial Energy	3,728
Scope 1	Industrial Energy	115
Scope 1	Residential Energy	17,446
Scope 1	Process & Fugitive Emissions	764
Scope 2	Commercial Energy	10,671
Scope 2	Residential Energy	16,330
Scope 3	Solid Waste	1,955
Scope 3	Water & Wastewater	1,259

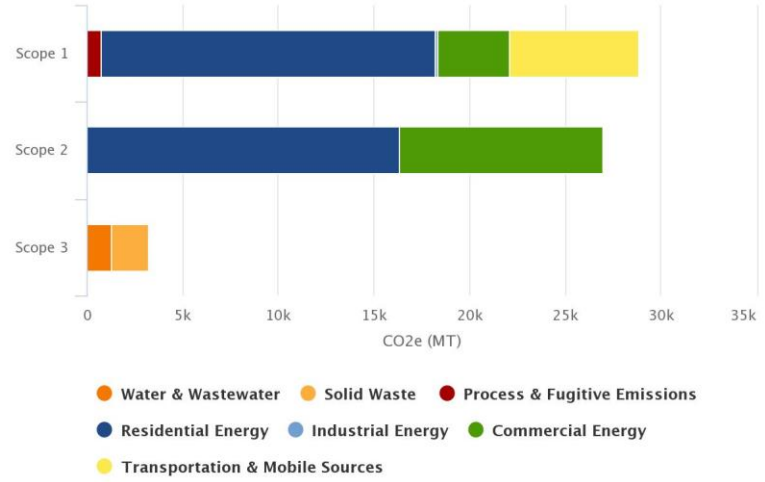


Figure 2: Borough of Carnegie Community-Inventory by Scope and Sector

Inventory By Sector

CO2e by sector for the selected inventory year.

Sector	CO2e
Transportation & Mobile Sources	6,769
Solid Waste	1,955
Water & Wastewater	1,259
Commercial Energy	14,400
Industrial Energy	115
Residential Energy	33,776
Process & Fugitive Emissions	764

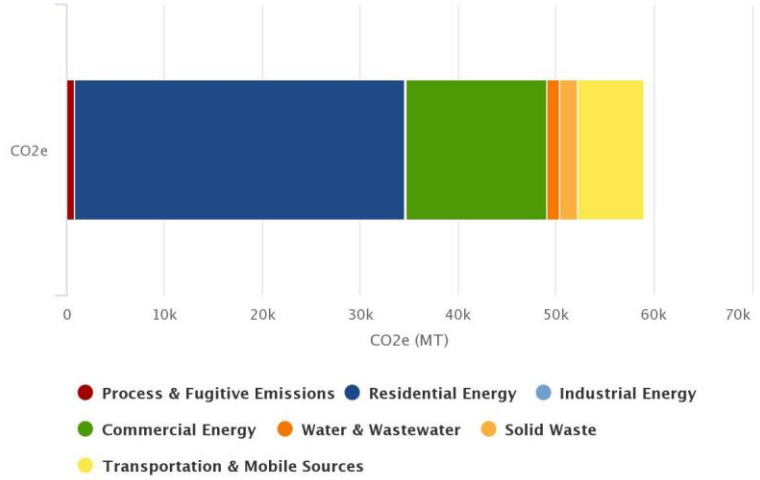


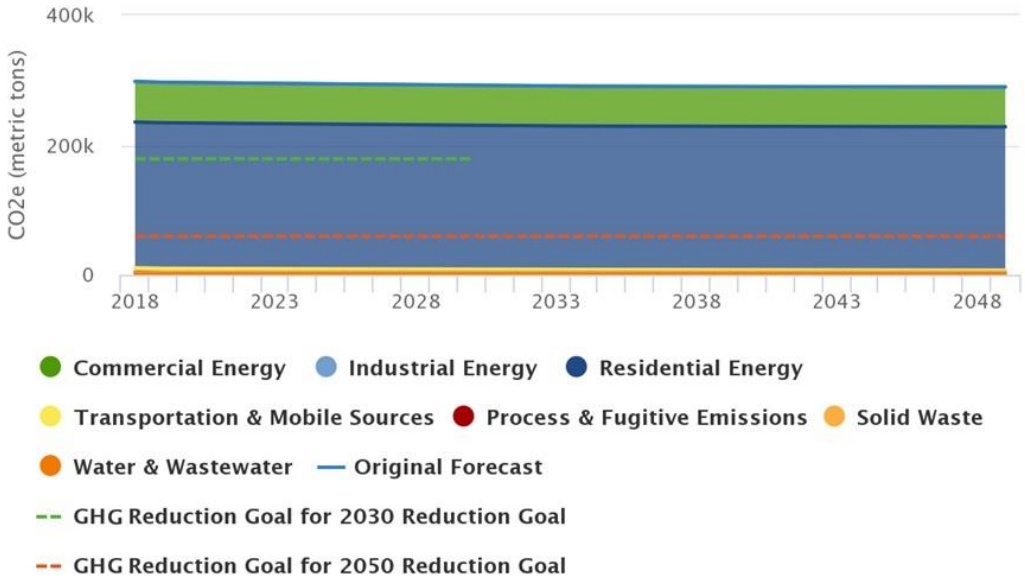
Figure 3: Borough of Carnegie Community-Inventory by Sector

5.2 Forecasting Borough of Carnegie's GHG Emissions

The Borough of Carnegie has also completed an emissions forecast based on projections of current data and expected future trends. This emissions forecast is the "Original" forecast (also known as a "Business as Usual" forecast), a scenario estimating future emissions levels if no further local action (i.e. projects within this Climate Action Plan) were to take place. The forecast indicates that, if we do not take action, GHG emissions will continue to increase.

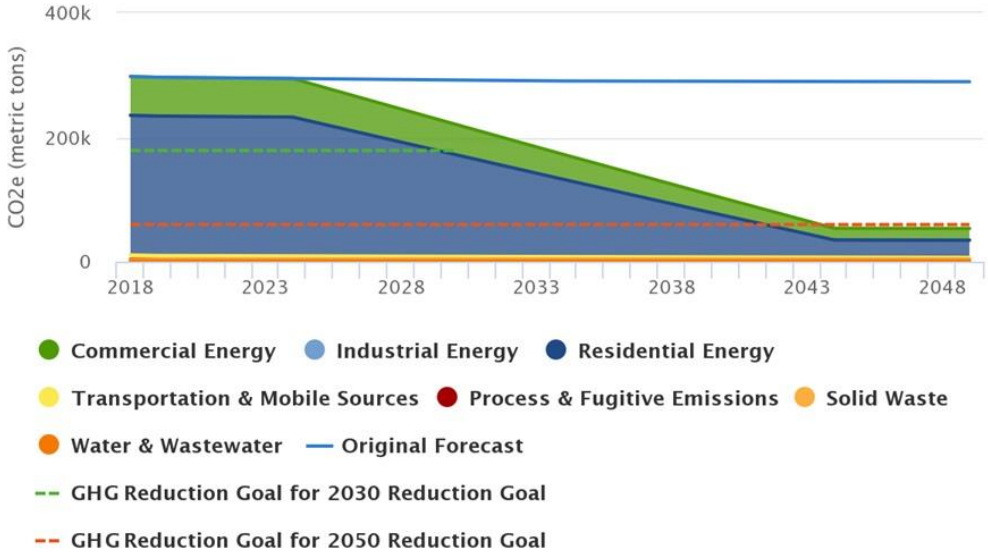
5.3 Projected CO2e Values Without Reductions

Figure 3 is a sample GHG inventory output produced using data from ClearPath.



5.4 Projected CO2e Values with Reductions Applied

Figure 3 is a sample GHG inventory output produced using data from ClearPath.



5.5 Usage Forecast by Sector and Year

COMMERCIAL			INDUSTRIAL			RESIDENTIAL		
Electricity Energy Equiv (MMBtu)			Electricity Energy Equiv (MMBtu)			Electricity Energy Equiv (MMBtu)		
Year	Usage	CO2e	Year	Usage	CO2e	Year	Usage	CO2e
2018	136806	21343	2018	136806	21343	2018	209349	32661
2019	136670	21322	2019	136670	21322	2019	209139	32628
2020	136533	21301	2020	136533	21301	2020	208930	32596
2021	136396	21279	2021	136396	21279	2021	208721	32563
2022	136260	21258	2022	136260	21258	2022	208513	32530
2023	136124	21237	2023	136124	21237	2023	208304	32498
2024	135988	21216	2024	135988	21216	2024	208096	32465
2025	135852	21194	2025	135852	21194	2025	207888	32433
2026	135716	21173	2026	135716	21173	2026	207680	32400
2027	135580	21152	2027	135580	21152	2027	207472	32368
2028	135445	21131	2028	135445	21131	2028	207265	32336
2029	135309	21110	2029	135309	21110	2029	207057	32303
2030	135174	21089	2030	135174	21089	2030	206850	32271
2031	135039	21068	2031	135039	21068	2031	206644	32239
2032	134904	21047	2032	134904	21047	2032	206437	32207
2033	134769	21025	2033	134769	21025	2033	206230	32174
2034	134634	21004	2034	134634	21004	2034	206024	32142
2035	134634	21004	2035	134634	21004	2035	206024	32142
2036	134634	21004	2036	134634	21004	2036	206024	32142
2037	134634	21004	2037	134634	21004	2037	206024	32142
2038	134634	21004	2038	134634	21004	2038	206024	32142
2039	134634	21004	2039	134634	21004	2039	206024	32142
2040	134634	21004	2040	134634	21004	2040	206024	32142
2041	134634	21004	2041	134634	21004	2041	206024	32142
2042	134634	21004	2042	134634	21004	2042	206024	32142
2043	134634	21004	2043	134634	21004	2043	206024	32142
2044	134634	21004	2044	134634	21004	2044	206024	32142
2045	134634	21004	2045	134634	21004	2045	206024	32142
2046	134634	21004	2046	134634	21004	2046	206024	32142
2047	134634	21004	2047	134634	21004	2047	206024	32142
2048	134634	21004	2048	134634	21004	2048	206024	32142
2049	134634	21004	2049	134634	21004	2049	206024	32142

Source: Temperate.com Software

COMMERCIAL			INDUSTRIAL			RESIDENTIAL		
Natural Gas - Energy Equiv (MMBtu)			Natural Gas - Energy Equiv (MMBtu)			Natural Gas - Energy Equiv (MMBtu)		
Year	Usage	CO2e	Year	Usage	CO2e	Year	Usage	CO2e
2018	771118	41013	2018	771118	41013	2018	3608266	191911
2019	770346	40972	2019	770346	40972	2019	3604658	191719
2020	769576	40931	2020	769576	40931	2020	3601053	191527
2021	768806	40890	2021	768806	40890	2021	3597452	191336
2022	768038	40849	2022	768038	40849	2022	3593855	191145
2023	767270	40808	2023	767270	40808	2023	3590261	190953
2024	766502	40768	2024	766502	40768	2024	3586671	190762
2025	765736	40727	2025	765736	40727	2025	3583084	190572
2026	764970	40686	2026	764970	40686	2026	3579501	190381
2027	764205	40645	2027	764205	40645	2027	3575921	190191
2028	763441	40605	2028	763441	40605	2028	3572345	190001
2029	762678	40564	2029	762678	40564	2029	3568773	189811
2030	761915	40524	2030	761915	40524	2030	3565204	189621
2031	761153	40483	2031	761153	40483	2031	3561639	189431
2032	760392	40443	2032	760392	40443	2032	3558077	189242
2033	759631	40402	2033	759631	40402	2033	3554519	189052
2034	758872	40362	2034	758872	40362	2034	3550965	188863
2035	758872	40362	2035	758872	40362	2035	3550965	188863
2036	758872	40362	2036	758872	40362	2036	3550965	188863
2037	758872	40362	2037	758872	40362	2037	3550965	188863
2038	758872	40362	2038	758872	40362	2038	3550965	188863
2039	758872	40362	2039	758872	40362	2039	3550965	188863
2040	758872	40362	2040	758872	40362	2040	3550965	188863
2041	758872	40362	2041	758872	40362	2041	3550965	188863
2042	758872	40362	2042	758872	40362	2042	3550965	188863
2043	758872	40362	2043	758872	40362	2043	3550965	188863
2044	758872	40362	2044	758872	40362	2044	3550965	188863
2045	758872	40362	2045	758872	40362	2045	3550965	188863
2046	758872	40362	2046	758872	40362	2046	3550965	188863
2047	758872	40362	2047	758872	40362	2047	3550965	188863
2048	758872	40362	2048	758872	40362	2048	3550965	188863
2049	758872	40362	2049	758872	40362	2049	3550965	188863

Source: Temperate.com Software

TRANSPORTATION			TRANSPORTATION			PROCESS & FUGITIVE			PROCESS & FUGITIVE		
Gasoline - On Road VMT			Diesel - On Road VMT			Electricity Energy Equiv (MMBtu)			Electricity Energy Equiv (MMBtu)		
Year	Usage	CO2e	Year	Usage	CO2e	Year	Usage	CO2e	Year	Usage	CO2e
2018	14007369	5769	2018	671348	1000	2018	136806	21343	2018	771118	41013
2019	13993362	5660	2019	670677	981	2019	136670	21322	2019	770346	40972
2020	13979368	5552	2020	670006	963	2020	136533	21301	2020	769576	40931
2021	13965389	5447	2021	669336	944	2021	136396	21279	2021	768806	40890
2022	13951424	5343	2022	668667	926	2022	136260	21258	2022	768038	40849
2023	13937472	5242	2023	667998	909	2023	136124	21237	2023	767270	40808
2024	13923535	5142	2024	667330	892	2024	135988	21216	2024	766502	40768
2025	13909611	5045	2025	666663	875	2025	135852	21194	2025	765736	40727
2026	13895702	4949	2026	665996	858	2026	135716	21173	2026	764970	40686
2027	13881806	4855	2027	665330	842	2027	135580	21152	2027	764205	40645
2028	13867924	4763	2028	664665	826	2028	135445	21131	2028	763441	40605
2029	13854056	4673	2029	664000	810	2029	135309	21110	2029	762678	40564
2030	13840202	4584	2030	663336	795	2030	135174	21089	2030	761915	40524
2031	13826362	4497	2031	662673	780	2031	135039	21068	2031	761153	40483
2032	13812536	4412	2032	662010	765	2032	134904	21047	2032	760392	40443
2033	13798723	4328	2033	661348	750	2033	134769	21025	2033	759631	40402
2034	13784924	4246	2034	660687	736	2034	134634	21004	2034	758872	40362
2035	13784924	4169	2035	660687	723	2035	134634	21004	2035	758872	40362
2036	13784924	4094	2036	660687	710	2036	134634	21004	2036	758872	40362
2037	13784924	4020	2037	660687	697	2037	134634	21004	2037	758872	40362
2038	13784924	3948	2038	660687	685	2038	134634	21004	2038	758872	40362
2039	13784924	3877	2039	660687	672	2039	134634	21004	2039	758872	40362
2040	13784924	3807	2040	660687	660	2040	134634	21004	2040	758872	40362
2041	13784924	3739	2041	660687	648	2041	134634	21004	2041	758872	40362
2042	13784924	3671	2042	660687	637	2042	134634	21004	2042	758872	40362
2043	13784924	3605	2043	660687	625	2043	134634	21004	2043	758872	40362
2044	13784924	3540	2044	660687	614	2044	134634	21004	2044	758872	40362
2045	13784924	3477	2045	660687	603	2045	134634	21004	2045	758872	40362
2046	13784924	3414	2046	660687	592	2046	134634	21004	2046	758872	40362
2047	13784924	3353	2047	660687	581	2047	134634	21004	2047	758872	40362
2048	13784924	3292	2048	660687	571	2048	134634	21004	2048	758872	40362
2049	13784924	3233	2049	660687	561	2049	134634	21004	2049	758872	40362

Source: Temperate.com Software

SOLID WASTE				WATER/WASTEWATER							
All - Waste Generated (wet tons)				Annual Biosolids Incinerated (MT)				Process N2O Population Served			
Year	Usage	CO2e		Year	Usage	CO2e		Year	Usage	CO2e	
2018	3432	1956		2018	219	52		2018	7844	18	
2019	3429	1954		2019	219	52		2019	7836	18	
2020	3425	1952		2020	219	52		2020	7828	18	
2021	3422	1950		2021	218	52		2021	7820	18	
2022	3418	1948		2022	218	52		2022	7813	18	
2023	3415	1946		2023	218	52		2023	7805	18	
2024	3412	1944		2024	218	52		2024	7797	18	
2025	3408	1942		2025	218	52		2025	7789	18	
2026	3405	1940		2026	217	52		2026	7781	18	
2027	3401	1938		2027	217	52		2027	7774	18	
2028	3398	1936		2028	217	52		2028	7766	18	
2029	3395	1935		2029	217	52		2029	7758	18	
2030	3391	1933		2030	217	52		2030	7750	18	
2031	3388	1931		2031	216	52		2031	7743	18	
2032	3384	1929		2032	216	52		2032	7735	18	
2033	3381	1927		2033	216	52		2033	7727	18	
2034	3378	1925		2034	216	51		2034	7719	18	
2035	3378	1925		2035	216	51		2035	7719	18	
2036	3378	1925		2036	216	51		2036	7719	18	
2037	3378	1925		2037	216	51		2037	7719	18	
2038	3378	1925		2038	216	51		2038	7719	18	
2039	3378	1925		2039	216	51		2039	7719	18	
2040	3378	1925		2040	216	51		2040	7719	18	
2041	3378	1925		2041	216	51		2041	7719	18	
2042	3378	1925		2042	216	51		2042	7719	18	
2043	3378	1925		2043	216	51		2043	7719	18	
2044	3378	1925		2044	216	51		2044	7719	18	
2045	3378	1925		2045	216	51		2045	7719	18	
2046	3378	1925		2046	216	51		2046	7719	18	
2047	3378	1925		2047	216	51		2047	7719	18	
2048	3378	1925		2048	216	51		2048	7719	18	
2049	3378	1925		2049	216	51		2049	7719	18	

Source: Temperate.com Software

WATER/WASTEWATER								
Wastewater Electric Energy Equiv (MMBtu				Water Supply Energy Equiv (MMBtu)				Daily N Load at Facility with Release To Environment (kg N/day)		
Year	Usage	CO2e		Year	Usage	CO2e		Year	Usage	CO2e
2018	3664	468		2018	4518	672		2018	65	49
2019	3660	467		2019	4513	671		2019	65	49
2020	3656	467		2020	4508	670		2020	65	49
2021	3653	466		2021	4504	670		2021	65	49
2022	3649	466		2022	4499	669		2022	65	49
2023	3645	466		2023	4495	668		2023	64	49
2024	3642	465		2024	4490	668		2024	64	49
2025	3638	465		2025	4486	667		2025	64	49
2026	3635	464		2026	4481	666		2026	64	49
2027	3631	464		2027	4477	666		2027	64	49
2028	3627	463		2028	4473	665		2028	64	49
2029	3624	463		2029	4468	664		2029	64	49
2030	3620	462		2030	4464	664		2030	64	49
2031	3616	462		2031	4459	663		2031	64	49
2032	3613	461		2032	4455	662		2032	64	49
2033	3609	461		2033	4450	662		2033	64	49
2034	3606	460		2034	4446	661		2034	64	48
2035	3606	460		2035	4446	661		2035	64	48
2036	3606	460		2036	4446	661		2036	64	48
2037	3606	460		2037	4446	661		2037	64	48
2038	3606	460		2038	4446	661		2038	64	48
2039	3606	460		2039	4446	661		2039	64	48
2040	3606	460		2040	4446	661		2040	64	48
2041	3606	460		2041	4446	661		2041	64	48
2042	3606	460		2042	4446	661		2042	64	48
2043	3606	460		2043	4446	661		2043	64	48
2044	3606	460		2044	4446	661		2044	64	48
2045	3606	460		2045	4446	661		2045	64	48
2046	3606	460		2046	4446	661		2046	64	48
2047	3606	460		2047	4446	661		2047	64	48
2048	3606	460		2048	4446	661		2048	64	48
2049	3606	460		2049	4446	661		2049	64	48

Source: Temperate.com Software

5.6 Borough of Carnegie's GHG Reduction Target

The Borough of Carnegie's reduction target is consistent with the statewide target of 26% reduction by 2025, 40% by 2030, and 80% by 2050 from 2005 levels, as it exceeds its local percentage of the total emissions reduction needed in order to achieve that target. The Borough of Carnegie established the following targets to maintain a vibrant, healthy, and safe community for future generations, while improving the quality of life for those who live here today.

5.7 The Borough of Carnegie Climate Action Plan

The following pages identify the sectors within the Borough of Carnegie Climate Action Plan, the number of actions within each sector, and the contribution of each sector toward the GHG reduction goal. Each sector has a dedicated section within this document where objectives and specific actions (both new and those already employed) are described.

While the local government cannot address climate change by itself, government policies and practices can dramatically reduce greenhouse gas emissions from a range of sources and help prepare Borough of Carnegie for the anticipated impacts of climate change. In addition, the Borough of Carnegie will assist residents and businesses in their endeavors to reduce emissions through programs explained in this Plan. By working together, the Borough of Carnegie can not only do its part toward achieving a stable climate but we can also reap the benefits of healthier air, lower costs for utilities and services, improved transportation and accessibility, a more vibrant local economy, and many other positive side effects of reducing our carbon footprint.

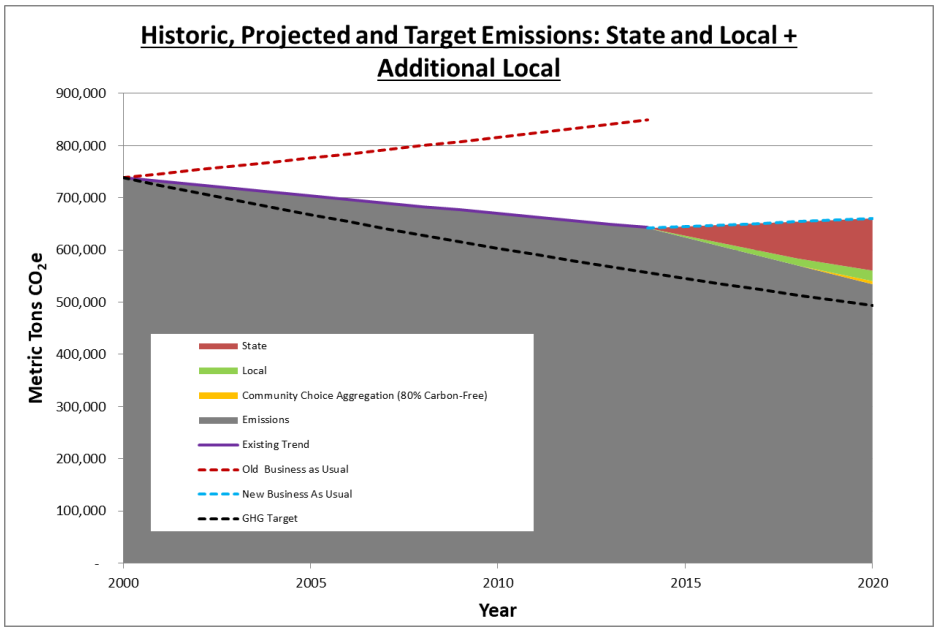


Figure 5: Visualizing GHG Reductions

6. TAKING ACTION

6.1 Emissions Reduction Potential

Calculating expected emissions reductions for each objective and action requires making assumptions about degree of implementation, technology, and individual behavioral changes several years into the future. The uncertainty associated with these assumptions makes it difficult to assign exact reduction totals to each objective or action. To address this uncertainty and provide a simple but useful reference for reduction potential, a series of symbols and percentage ranges has been devised to represent the emission reductions associated with each objective and its actions:

Symbol	GHG Reduction
	Small Impact Range
	Medium Impact Range
	Significant Impact Range

6.2 Evaluating Co-Benefits

In addition to measuring the GHG reduction potential, each objective and action is also evaluated for other benefits such as public health, equity and justice, jobs and prosperity, and environmental conservation. The symbols below will indicate which co-benefits a measure will generate.

Symbol	Co-Benefit
	Supports jobs and economic prosperity
	Advances social equity
	Fosters resource security
	Improves public health and local environmental quality

6.3 Supporting Actions

Certain actions might be supportive of more than one objective within the same or another sector. These cross-cutting actions will be indicated in the “Supporting Actions” column for each objective.

6.4 Consistency with Statewide Climate Action Plan

The Commonwealth of Pennsylvania’s 2021 Climate Action Plan includes many actions that are meant to be implemented by local governments as well as on the state-level. This Climate Action Plan incorporates as many of those actions as possible and appropriate. The tables in the following chapters will allow you to indicate whether an action is adapted from the statewide plan.

6.5 Climate Adaptation

Some of the proposed actions reduce risk to climate hazards as well as greenhouse gas emissions, which is explicitly identified in the “Reduces Climate Risks” column. This Plan does not propose any actions that would foreseeably increase the community’s risk to climate hazards, but some actions are more directly supportive of climate adaptation than others. The “Climate Adaptation” chapter describes climate hazards and related actions in more detail.

6.6 Carnegie's Climate Actions in Context

Broadly speaking, the use of fossil fuels for energy (including electricity, heating, transportation, and other uses) is the single largest contributor to greenhouse gas emissions and climate change. Fossil fuels still supply a considerable share of energy for electricity, heating, transportation, and other energy-producing uses. Emissions from fossil fuel combustion for energy, including transportation, represent 93% of the Carnegie's total GHG emissions. Energy Production is a cross-cutting sector in that nearly all activities that take place in the community require energy of some sort. While Duquesne Light is working hard to increase the percentage of electricity generated through renewable sources, opportunities also exist for citizens and Borough of Carnegie's local government to produce small-scale renewable energy or fuels, offsetting the need for fossil fuels. This sector is limited to energy production exclusively – objectives and actions that focus on end use energy efficiency are included in other sectors. The programs and projects within this sector are designed to spur local government and community investment in renewable energy sources including those that produce electricity, heat, and mobile fuels.

A. TAKING ACTION - Commercial, Municipal, and Industrial Buildings

Energy consumed in commercial buildings and industrial processes account for 24% of Borough of Carnegie's total GHG emissions. Improving the efficiency of our commercial buildings and reducing the energy intensity of the local industrial sector will contribute significantly to achieving Borough of Carnegie's greenhouse gas reduction target. Depending on rates, most Duquesne Light customers pay about 15 cents per kilowatt hour before taxes and fees. Our grid is powered by 1/3 nuclear, 1/3 natural gas, and 1/3 coal. In our grid, 1.3 pounds of CO2 is emitted for every kilowatt hour of power produced, so, for example, if you save 1,000 KWH of energy, relatively easy to do with LED lighting, you prevent 1,300 lbs of CO2 from entering the atmosphere.

Goals	Objective	Co-Benefits	Reduction Potential
Reduce energy use in commercial, municipal, & industrial buildings & replace current energy sources with renewables.	CB 1 – Increase energy efficiency and provide access to reduction measures.		
	CB 2 – Environmental Literacy and Education		
	CB 3 – Source energy from renewable or less carbon-intensive power options.		

Objective CB 1 – Increase energy efficiency and provide access to reduction measures

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
CB-1A	Inventory public buildings and energy use patterns to identify savings opportunities.	Y	**CB-1E**	Enroll in discounted Building Operator Certification for facility managers/building staff to train in energy efficiency.	Y	**CB-1I**	Implement a Building Energy Disclosure Ordinance for all buildings in the community.	-
CB-1B	Use the free municipal/ school PennTAP toolkit to estimate potential energy savings in municipal buildings.	-	**CB-1F**	Use a cooperative program to purchase energy management, consulting, or upgrades at lower prices.	N	**CB-1J**	Participate in People's Gas Energy Efficiency Program for local gov't buildings with high gas usage that are unable to electrify.	-
CB-1C	Join PADEP's Shared Energy Manager's Program to receive a free shared energy manager with CONNECT that assists in energy benchmarking, auditing, and renewable evaluation.	-	**CB-1G**	Join a CONNECT Regional Pooled Municipal Energy Implementation Model to better enable energy and solar projects.	Y	**CB-1K**	Continue public lighting, traffic, and streetlight replacement programs with DLC.	Y
CB-1D	Establish a strategic energy management plan that includes specific energy, water, and transportation emissions reductions targets and goals.	Y	**CB-1H**	Consider Energy Star Certification	-	**CB-1L**	Continue Sustainable PA certification and seek SolSmart Certification	-

Objective CB 2 – Environmental Literacy and Education

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
CB-2A	Educate local businesses about the financial benefits of building energy tracking.	-	**CB-2C**	Promote Green Business Challenges and partner with the business community to participate in assessments for saving energy and reducing emissions during operations.	-	**CB-2E**	Provide actionable information about local, state, and federal energy efficiency funding/financing options like CPACE on our website	-
CB-2B	Publicize PennTAP commercial and manufacturing energy toolkits and assistance to businesses in the community.	-	**CB-2D**	Partner with local utilities to ensure properties maximize use of energy efficiency rebates and retrofit programs.	Y	**CB-2F**	Create a unique URL for environmental literacy project and create Facebook groups.	-

Objective CB 3 – Source energy from renewable or less carbon-intensive power options.

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
CB-3A	Join Western PA Energy Consortium to procure renewable power at a cheaper rate.	-	**CB-3D**	Create a solar advisory committee/task force.	-	**CB-3G**	Create local incentives and rebates to encourage solar panel installation.	-
CB-3B	Buy local renewable energy credits, offsets, etc to offset use of non-renewable power by the local government.	Y	**CB-3E**	Complete solar feasibility study of roofs in the community.	-	**CB-3H**	Install solar on municipal buildings and join solar co-op.	Y
CB-3C	Enter into a power agreement with local renewable producers and convert from natural gas to electric for heating.		**CB-3F**	Amend development codes to encourage solar friendly site orientation.		**CB-3I**	Roof cooling application using cool roof coatings.	Y

B. TAKING ACTION - Residential Buildings

Energy consumed in residential buildings accounts for 57% of Borough of Carnegie's total GHG emissions. Improving the efficiency of our residential building stock will contribute significantly to achieving Borough of Carnegie's greenhouse gas reduction target, while saving residents money on utility bills and reducing the need for new infrastructure. Depending on rates, most Duquesne Light customers pay about 15 cents per kilowatt hour before taxes and fees. Our grid is powered by 1/3 nuclear, 1/3 natural gas, and 1/3 coal. In our grid, 1.3 pounds of CO_2 is emitted for every kilowatt hour of power produced, so, for example, if you save 1,000 KWH of energy in a year, relatively easy to do with LED lighting, you prevent 1,300 lbs of CO_2 from entering the atmosphere.

Goals	Objective	Co-Benefits	Reduction Potential
Reduce energy use in residential buildings & replace current energy sources with renewables.	RB 1 – Reduce energy consumption through weatherization, electrification, code updates, and increased access to energy efficiency opportunities.		
	RB 2 –Environmental Literacy and Education.		
	RB 3 – Source energy from renewable or less carbon-intensive power options.		

Objective RB 1 – Reduce energy consumption through weatherization, electrification, code updates, and increased access to energy efficiency opportunities.

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
RB-1A	Research cooperative programs for residents.	Y	**RB-1C**	Increase accessibility to free utility and region weatherization programs to increase efficiency of lower income homes and promote lead safety.	Y	**RB-1E**	Double the number of homes weatherized through existing programs per year.	Y
RB-1B	Assess current enforcement of energy codes and train inspectors.	-	**RB-1D**	Improve ordinances to exceed minimum efficiency requirements.	Y	**RB-1F**	Roof cooling applications.	Y

Objective RB 2 – Environmental Literacy and Education

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
RB-2A	Educate residents about the financial benefits of building energy tracking.	-	**RB-2C**	Promote Green Challenges for residents to participate in assessments for saving energy and reducing emissions during operations.	-	**RB-2E**	Provide actionable information about local, state, and federal energy efficiently funding/financing options on our website	-
RB-2B	Publish a green guide to educate residents on energy /	-	**RB-2D**	Partner with local utilities to ensure properties maximize use of energy	Y	**RB-2F**	Create a unique URL for environmental literacy project and	-

	sustainability actions.			efficiency rebates and retrofit programs.			create Facebook groups.	

Objective RB 3 – Source energy from renewable or less carbon-intensive power options.

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
RB-3A	Create a solar advisory committee/task force	-	**RB-3D**	Procure the free residential PennTAP toolkit on behalf of residents and encourage use to estimate potential energy savings in residential buildings.	Y	**RB-3G**	Complete solar feasibility study of roofs in the community	-
RB-3B	Help low-income, high-energy burden homes take advantage of energy bill assistance during winter.	Y	**RB-3E**	Amend codes to encourage solar friendly site orientation	N	**RB-3H**	Increase residential uptake of utility incentives for energy efficiency.	Y
RB-3C	Create local incentives and rebates to encourage solar panel installation.	-	**RB-3F**	Join Solar Co-Op and source energy from sustainable green suppliers.	Y	**RB-3I**	Enhance support to residents for installing small-scale renewable energy systems and conversion from natural gas to electric for heating..	Y

C. TAKING ACTION - Materials Management

All waste materials directly disposed in landfills directly contribute to climate change through greenhouse gases emitted during decomposition, while incineration and the hauling of waste to or from facilities also contributes to total impacts. As a result of global changes to the recycling market, glass and various types of plastic have been removed from service leading to a decrease in recycling and an increase in solid waste sector emissions. Despite solid waste tonnage contributing little to total GHG emissions in 2018, building up local recycling infrastructure was one of the most popular climate actions in our survey results among residents and business owners and should be considered integral to the long-term sustainability of our region. Survey takers identified expanded overall recycling infrastructure and education, composting, and glass, and electronic recycling. Climate Action Survey Results click here

Goals	Objective	Co-Benefits	Reduction Potential
Bolster resilience and reduce solid waste generation.	MM 1 – Reduce waste at its source and enable re-use of materials to lower emissions.		
	MM 2 –Environmental Literacy and Education.		

Objective MM 1 – Reduce waste at its source and enable re-use of materials to lower emissions.								
Action #	**Action**	**Reduces Climate Risk**	**Action #**	**Action**	**Reduces Climate Risk**	**Action #**	**Action**	**Reduces Climate Risk**
MM-1A	Consider recycling ordinances that promote recycling in multi-family and commercial buildings or reuse of building materials during construction / remodeling / demolition.	Y	**MM-1E**	Encourage and highlight Sustainable Restaurant Designation in local eateries.	Y	**MM-1I**	Use cooperative purchasing program, such as COSTARS, to procure sustainable local government materials/products at a lower price.	Y
MM-1B	Continue with PA DEP Section 902 Recycling Program	Y	**MM-1F**	Create community composting program that reduces yard litter and food waste sent to landfill.	N	**MM-1J**	Build and support native planting for lawns, community gardens, urban farms, and alternative growing platforms.	Y
MM-1C	Continue partnership with Republic Services for pop-up glass collection services.	Y	**MM-1G**	Create program to distribute reusable shopping bags and water bottles.	Y	**MM-1K**	Provide resources for reuse programs and continue to promote PRC electronic and hard to recycle events.	Y
MM-1D	Partner with Republic Services and regional government representatives to provide pop-up electronic collection services.	Y	**MM-1H**	Use recycling and composting technical assistance programs to upgrade recycling programs, maximize material recovery, and ensure program sustainability.	Y			

Objective MM 2 – Environmental Literacy and Education								
Action #	**Action**	**Reduces Climate Risk**	**Action #**	**Action**	**Reduces Climate Risk**	**Action #**	**Action**	**Reduces Climate Risk**
MM-2A	Run a recycling education campaign that includes print and online assets.	-	**MM-2C**	Provide recycling education workshops in-person, visiting, or online.	-	**MM-2E**	Host PRC Composting Seminars.	-
MM-2B	Expand and enhance current recycling education web page.	-	**MM-2D**	Create a unique URL for environmental literacy project.	-			

D. TAKING ACTION – Stormwater Management

The Borough of Carnegie is located in the Lower Chartiers Watershed Flood Plain. Chartiers Creek cuts through the middle of the Borough of Carnegie. It brings beauty and wildlife and is often a source for water recreation but during extreme storms it also threatens the business district and many residents with severe flooding. Each year, the Carnegie Shade Tree Commission with Tree Vitalize plants at least a dozen trees in our parks and along the creek banks. The commission has planted rain gardens in Main Street parking lots that absorb over 800,000 gallons of stormwater each year.

Goals	Objective	Co-Benefits	Reduction Potential
Bolster resilience through stormwater management and water conservation.	SM 1 – Implement sustainable stormwater initiatives.		
	SM 2 – Environmental Literacy and Education.		

Objective SM 1 – Implement sustainable stormwater initiatives.

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
SM-1A	Continue to use ALCOSAN GROW grants to install green stormwater infrastructure.	y	**SM-1E**	Encourage cool paving options.	Y	**SM-1I**	Work with surrounding communities located within the Lower Chartiers Watershed to create a "One Water Plan" in watersheds.	y
SM-1B	Build green infrastructure such as green roofs, bioswales, and rain gardens.	y	**SM-1F**	Continue with Shade Tree Commissions strategic plan that identifies focus areas for tree planting through Tree Vitalize.	N	**SM-1J**	Continue to work with Chartiers Valley District Flood Control Authority, Engineers, Lower Chartiers Watershed, and local conservancies.	y
SM-1C	Incorporate green infrastructure language into Stormwater Management Ordinances.	y	**SM-1G**	Expand local hazard mitigation plans to factor in expected vulnerabilities explicitly related to climate change.	y	**SM-1K**	Continue to fulfill action items from Mayor Stacie Riley's NWF Monarch Butterfly Conservation Pledge.	y
SM-1D	Target vacant land for green projects and fruit tree planting.	Y	**SM-1H**	Continue to incorporate PA DEP's Stormwater Best Management Practices into municipality's standard operating procedure.	Y	**SM-1L**	Encourage and support Shade Tree Commission's native planting in public areas and initiative for residents to use native planting in their lawns.	Y

Objective SM 2 – Environmental Literacy and Education

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
SM-2A	Engage in SilverJackets flood education for residents and businesses, notify residents of flooding resources and any activity impacts on stormwater.	-	**SM-2C**	Continue rain garden education by updating rain garden maintenance plans, virtual classrooms, and outdoor, online and in-classroom events.		**SM-2E**	Continue native planting and habitat restoration education by updating virtual classrooms, participating in Earth Day Events, hosting annual mayor's butterfly festival, as well as establishing new community events.	-
SM-2B	Establish virtual classrooms for catchment and other stormwater resources.	-	**SM-2D**	Host PRC Rain Barrel Seminars.	-	**SM-2F**	Create a unique URL for environmental literacy project and create Facebook groups.	-

E. TAKING ACTION - Transportation

Emissions from transportation is a common sight to nearly everyone in the Borough of Carnegie. Besides emitting greenhouse gases, transportation fossil fuels also produce a host of criteria air pollutants when combusted, reducing local air quality and affecting our health. Transportation accounts for 12% of Borough of Carnegie's total GHG emissions. This chapter focuses on programs and policies to reduce emissions from transportation and includes design-oriented approaches as well as expansion of alternate modes such as walking, biking, or public transportation to and from the most common destinations in the Borough of Carnegie.

Goals	Objective	Co-Benefits	Reduction Potential
Motivate cleaner modes of transportation by residents and fleets.	TR 1 – Encourage and increase accessibility to alternate modes of transportation such as walking, biking or mass transit.		
	TR 2 – Environmental Literacy and Education.		
	TR 3 – Increase electric vehicle use in fleets and the broader community.		

Objective TR 1 – Encourage and increase accessibility to alternate modes of transportation such as walking, biking or mass transit.

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
TR-1A	Continue to work with Port Authority to implement transit oriented development.	Y	**TR-1C**	Implement new bike infrastructure, paths, and lanes, targeting busy or dangerous areas.	Y	**TR-1E**	Form a neighborhood biking and walking committee.	-
TR-1B	Prioritize complete streets development strategies.	Y	**TR-1D**	Encourage carpool, vanpool, or bikeshare options in borough government and in the community.	-			

Objective TR 2 – Environmental Literacy and Education.

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk
TR-2A	Utilize CONNECT EV info sheet.	-	**TR-2B**	Provide education for federal, state and DLC EV and charging grants or rebates.	-	**TR-2C**	Create a unique URL for environmental literacy project.	-

Objective TR 3 – Increase electric vehicle use in fleets and the broader community.

Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk	Action #	Action	Reduces Climate Risk

TR-3A	Research EV needs, permitting, and tech support.	-	**TR-3D**	Join EV purchasing collaborative.	Y	**TR-3G**	Assess municipal fleets.	N
TR-3B	Build electric vehicle accommodations and charging stations	Y	**TR-3E**	Adopt policies, parking rules, and zoning ordinances that enable electric vehicle growth and adoption when updating comp plan.	Y	**TR-3H**	Start borough initiative to organize local commercial businesses to be Duquesne Light charging partners.	Y
TR-3C	Install public EV chargers in local lots and parks.	Y	**TR-3F**	Collaborate with DLC to ensure optimization of electrical grids for increased EV use and cleaner EV impacts.	Y	**TR-3I**	Participate in DLC's Fleet Advisory Service to create an individualized strategic EV plan for Carnegie's fleet. Start borough	

7. CLIMATE ADAPTATION

This section provides a high-level assessment of potential climate impacts and highlights those greenhouse gas reduction actions that support adaptation for each type of hazard. While the Borough of Carnegie does not currently have the capacity to complete a more robust climate vulnerability assessment and adaptation plan, the following analysis was completed to educate the public on local impacts and inform future efforts.

The Borough of Carnegie will continue adapting actions and impacts of this Climate Action Plan with input from the Climate Action Task Force, residents and business owners, and elected officials. Current interns will assist in the creation of an Environmental Literacy Project and additionally provide resilience resources and apply for grant funding. The borough will create plans for climate adaptation, hazard mitigation and emergency preparedness and continue to discuss and plan efforts to help protect and prepare the most vulnerable populations in our community including seniors, disabled persons, immigrants, low-income residents, renters, and children.

7.1 Anticipated Climate Impacts

Over the last 110 years, the Commonwealth of Pennsylvania has experienced a long-term warming of more than 1.8°F, as well as an increasing number of wet months. The warming and wetting trend is expected to continue at an accelerated rate, especially if the world continues on its current path of greenhouse gas emissions. As compared to a 1977-2000 baseline, the average annual statewide temperature will likely increase 5.9°F by mid-century and 9.4°F by end-of-century. Compared to the same baseline, average precipitation will likely increase about 8% by mid-century and 12% by end-of-century. Furthermore, the Commonwealth is likely to see an increase in the frequency and intensity of extreme heat events and extreme rainfall events. The extent of drought conditions is less predictable at this time, but higher overall temperatures will increase evaporative demand and reduce water availability. These changes will have a variety of ecological, economic, and social impacts on the Commonwealth, particularly related to agriculture, energy, forests, human health, outdoor recreation, water, wetlands and aquatic ecosystems, and coastal resources (PA DEP, 2021). See more details about statewide climate projections and risks in the Pennsylvania Climate Impacts Assessment, updated in 2021.

In order to understand the extent to which these statewide impacts will be felt in Borough of Carnegie, we used Temperate software to identify likely changes from today through 2050.

Expected Increases

- Unusually high temperatures
- Heat Waves
- Frequency and severity of storm events
- Flooding events
- Poor Air Quality
- Landslides

Additional Resources:

- Pennsylvania Climate Impacts Assessment Update
- U.S. Climate Explorer

7.2. Adaptive Greenhouse Gas Reduction Measures

Some greenhouse gas reduction measures also reduce risk to climate hazards. The following are a few of many examples of how these outcomes can be related to one another:

- Actions that improve energy efficiency and distribute renewable energy can (1) reduce pressure on the grid when there is higher energy demand for heating and air conditioning during extreme heat events, and (2) increase energy independence for households and businesses, as opposed to complete reliance on centralized power infrastructure that could fail during a catastrophic event. These types of actions include, but are not limited to:
    - Energy-efficient building design for new construction, and retrofits for existing buildings (e.g. weatherization)
    - Onsite combined heat and power (CHP)
    - Smart grid technologies
    - Microgrids
- Actions that reduce impervious surfaces can reduce the potential for flooding by retaining stormwater in place. These types of actions include, but are not limited to:
    - Expanding or restoring green space
    - Installing green roofs, rain gardens, bioswales, pervious pavers, and other green infrastructure (as well as requiring them for future development)
- Installing green roofs and planting trees adjacent to buildings can regulate indoor temperatures during extreme heat events.
- Expanding and protecting alternative transportation routes (bicycle, pedestrian, bus, and rail) provides network redundancies and alternative routes for emergency evacuation.
- Water efficiency and conservation actions can (1) reduce pressure on the grid from energy used for pumping, treating, and distributing water, and (2) make the community less vulnerable to drought.

8. VULNERABILITY ASSESSMENT

8.1 Hazard – Heat Waves and Extreme Hot Days

Extreme Heat and Heat Waves are at risk of increasing in frequency and intensity

As a result of the heat-trapping greenhouse gases emitted through human activities, our global and local climates are changing. Over the last 110 years, the Commonwealth of Pennsylvania has experienced a long-term warming of more than 1.8°F, and an increase in the number of wet months. U.S. Climate Explorer data for our region indicates that average daily temperatures have been increasing and will continue to rise throughout the remainder of the century. Under a high emissions scenario, average temperatures are project to rise as much as 3°F by 2050, and over 6°F by the end of the 21st century.

Risk Impact Description - Moderate to High

Much of the Borough of Carnegie is covered by concrete and asphalt which means it will be impacted by the urban heat island effect caused when these surfaces absorb much more solar radiation than dirt or green space that is then permeated throughout the environment, artificially raising temperatures. Indoor spaces and vehicles will consume more energy to keep cool. Increased energy usage will raise utility bills and emissions. Water usage will increase. Public health will be negatively impacted, especially vulnerable populations such as seniors and outdoor spaces and activities may become less accessible.

Risk Impact Areas

- Emergency Management and Services
- Public health
- Emotional and Mental Health
- Employment and Job Access
- Energy Delivery Systems
- Food Supply Systems
- Housing Security
- Public safety
- Recreation and Quality of Life
- Transportation
- Waste Management
- Water Supply

Risk Impact Adaptive Capacity Factors – Moderate to High

The ability of residents and businesses to adjust to extreme heat and to respond to its consequences depends on available income to cover increased utility costs and the use of sustainable energy sources such as solar and wind.

Specific adaptive factors include

- Access to Basic Services, Data, Education, and Healthcare
- Budgetary Capacity
- Community Engagement
- Disaster Response and Recovery
- Delivery of Services
- Economic Diversity and Health
- Environmental Conditions
- Government Capacity and Municipal Services
- Infrastructure Capacity
- Land Use Planning
- Resource Availability

Risk Impact Adaptive Capacity Factors is the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences of hazards.

Specific Risk Areas and Actions

- **EMERGENCY MANAGEMENT AND SERVICES**
  Calls from heat related health issues will significantly increase. Sharing personnel and equipment with neighboring communities is an option as well as re-evaluating and updating existing communication methods for heat alerts, advisories, and updates. During heat waves and extreme freezing temperatures, the borough has used its municipal building as a haven for cooling or warming to vulnerable members of the community. Assessment of staffing, resource levels, current response, and continuity of operations plans for these programs, including explicit consideration of vulnerable populations, should be a priority. The burden to the borough's police and fire department would include health issues from wearing heavy, cumbersome equipment during extreme heat events. Officers on patrol outdoors will be vulnerable to heat related illness. The borough could develop Memorandums of Understanding with state personnel regarding funding of local police costs incurred to protect safety along vulnerable state-owned road infrastructure during extreme heat events.
- **EMOTIONAL AND MENTAL HEALTH**
  Heat waves could make activities more difficult which could affect people's mental health since activities they enjoy might be harder. Carnegie should help to develop a case study of hospital-based practices that foster community resilience to climate change so the findings could be utilized.
- **EMPLOYMENT AND JOB ACCESS**
  Jobs that are primarily performed outdoors will become more difficult during warmer weather and may need to be conducted during cooler evening hours. Workers could experience difficult commutes during extreme heat events and unbearable conditions in taller buildings since higher floors absorb more heat. The borough would need to work with the CCDC to acquire grant funding to launch business recovery and resiliency programs. The borough's public works department will need to review and possibly modify work schedules or evaluate park facility use and rentals to ensure personal health and safety.
- **ENERGY DELIVERY SYSTEMS**
  Energy delivery will be impacted by overloaded systems as higher temperatures increase usage and decrease delivery efficiency. The borough will work with industry partners, PA State, and regulators to strengthen PA's power supply by using sustainable sources. Carnegie could invest in solar power for more energy-efficient homes through a solar co-op program, but price will be a barrier for many residents. An extreme heat event could cause grid failure interrupting internet and communications making it difficult to reach the public with important alerts. Carnegie will identify shared communication technology options for emergency responders and government agencies to ensure continued and coordinated communication during emergency events.
- **FOOD SUPPLY SYSTEMS**
  Climate change will disrupt global food production. The borough will need to develop a food security plan that would include resources for maintaining community and private gardens, the importance of not wasting food, and sustainable diets.
- **HOUSING**
  Home weatherization and sustainable energy sources are most important first steps.
- **PUBLIC HEALTH**
  Heat waves increase the chance of heatstroke and sap people's energy, especially in a humid environment such as PA. Carnegie will continue to invest in planting more trees to create more shade. Green roofs absorb less heat.
- **RECREATION AND QUALITY OF LIFE**
  Higher temperatures make outdoor activities more difficult. The effect of higher temperatures can be mitigated by providing more shade through tree planting and greenspace expansion.

- **TRANSPORTATION**
  Roads and large paved areas are the cause of urban heat island effect. CoolSeal or similar material could be used on the roads in Carnegie in a light grey finish that reflects much more solar radiation than traditional asphalt roads and can reduce temperatures by as much as 10-25 degrees Fahrenheit. The sealant does not create glare like snow. Use of similar coatings on other artificial surfaces, such as sidewalks or building roofs will also reduce urban heat island effect. The Borough will need to invest in creating sustainable transportation and multimodal transportation with emphasis on pedestrian corridors with trail expansion and more land allocated for walk space. Public transportation should be more accessible and residents should be encouraged to take the bus over driving.
- **WATER SUPPLY**
  People and plants will consume more water due to higher temperatures causing a strain on the water supply. The borough should educate residents on the benefits of conserving water and how they can save money by doing so.

Recommended Actions

Adaptation Action Description

- Investment in solar power.
- Plant more trees.
- Green space expansion to ease urban island heat effect.
- Apply CoolSeal or similar sealant to roads and other applicable surfaces.
- Educate the community on the importance of reducing water usage.
- Create Green roofs to naturally cool buildings.
- Drought, extreme storms, and changing weather patterns could disrupt the global food supply and interfere with farmland and growing cycles. Community and private gardens for a sustainable diet could help the community adapt.
- Carnegie will have to develop programming and outreach to help residents and local businesses understand the risks and the importance of adaptation by transitioning to a sustainable lifestyle.

Rising Temperatures & Heat

The following graph indicates that average daily temperatures have been increasing and will continue to rise through 2090, which could impact agriculture, public health, and other sectors of the community.

This graph is from U.S. Climate Explorer.

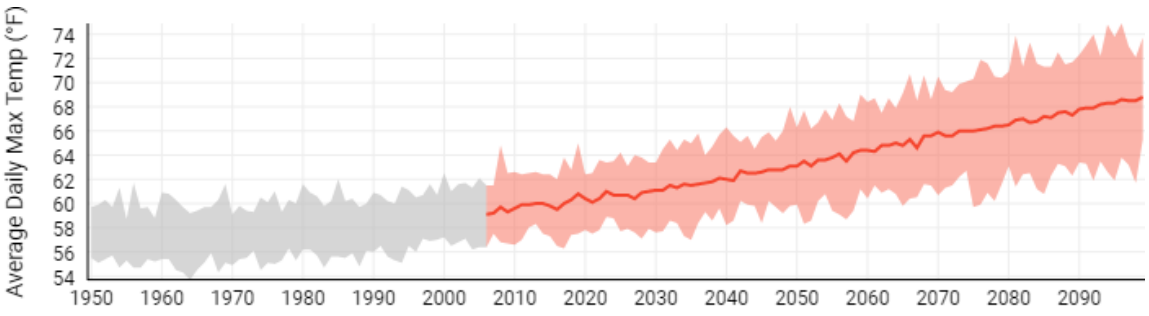
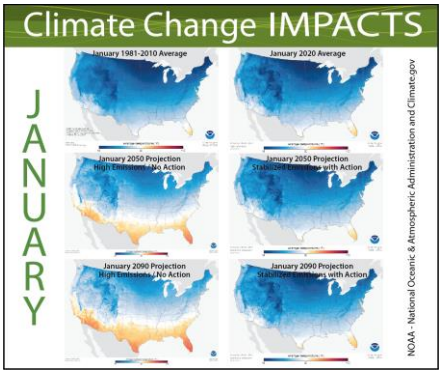
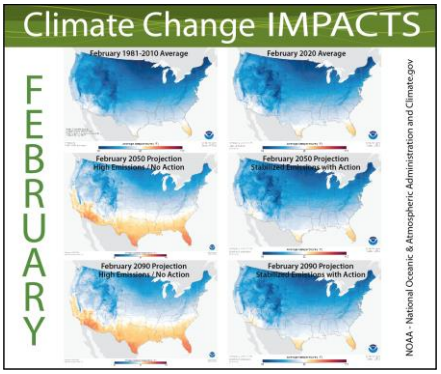
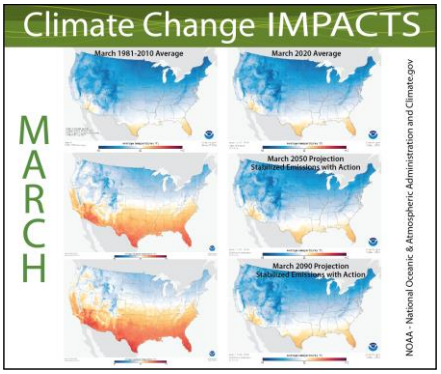
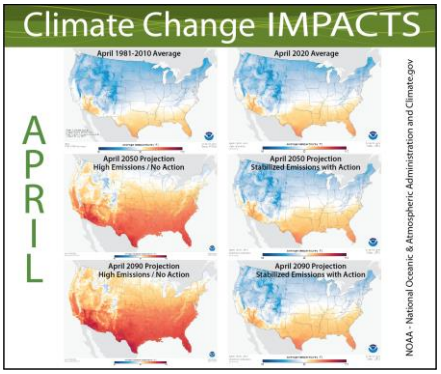


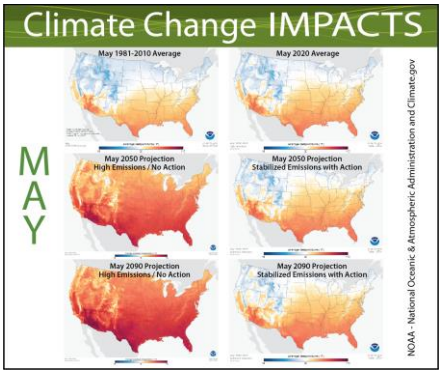
Figure 5: Average Daily Temperature Between 1950-2090

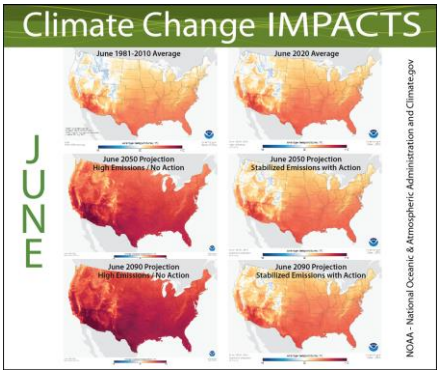

Climate Change IMPACTS
JANUARY
January 1981-2010 Average
January 2020 Average
January 2050 Projection
High Emissions / No Action
January 2050 Projection
Stabilized Emissions with Action
January 2090 Projection
High Emissions / No Action
January 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov

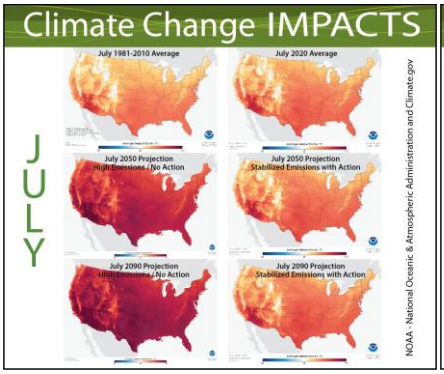

Climate Change IMPACTS
FEBRUARY
February 1981-2010 Average
February 2020 Average
February 2050 Projection
High Emissions / No Action
February 2050 Projection
Stabilized Emissions with Action
February 2090 Projection
High Emissions / No Action
February 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov

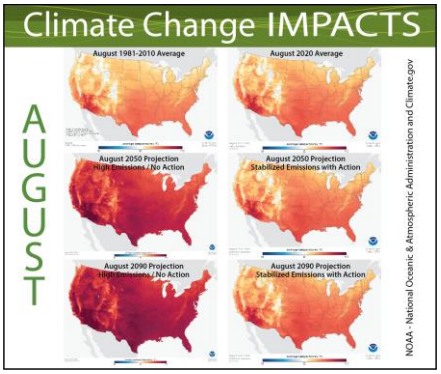

Climate Change IMPACTS
MARCH
March 1981-2010 Average
March 2020 Average
March 2050 Projection
Stabilized Emissions with Action
March 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov

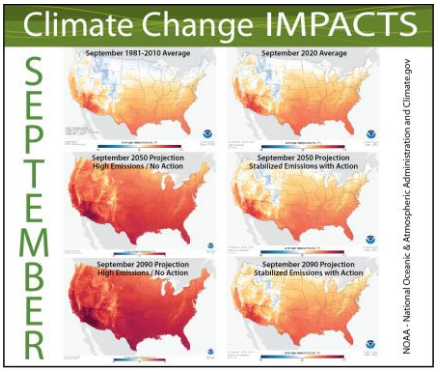

Climate Change IMPACTS
APRIL
April 1981-2010 Average
April 2020 Average
April 2050 Projection
High Emissions / No Action
April 2050 Projection
Stabilized Emissions with Action
April 2090 Projection
High Emissions / No Action
April 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov

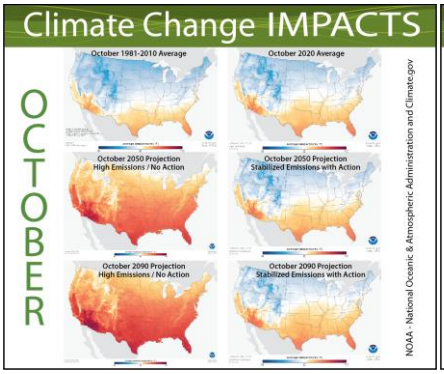

Climate Change IMPACTS
MAY
May 1981-2010 Average
May 2020 Average
May 2050 Projection
High Emissions / No Action
May 2050 Projection
Stabilized Emissions with Action
May 2090 Projection
High Emissions / No Action
May 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov

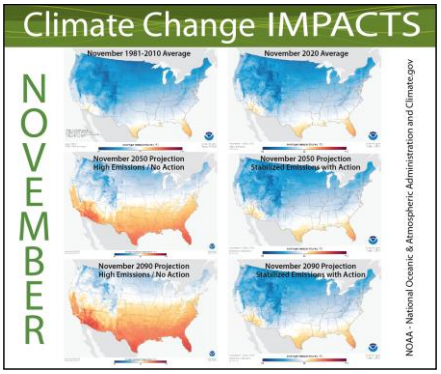

Climate Change IMPACTS
JUNE
June 1981-2010 Average
June 2020 Average
June 2050 Projection
High Emissions / No Action
June 2050 Projection
Stabilized Emissions with Action
June 2090 Projection
High Emissions / No Action
June 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov

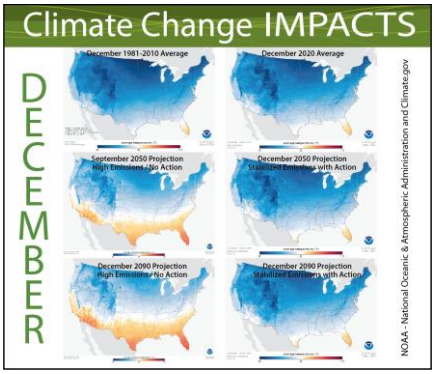

Climate Change IMPACTS
JULY
July 1981-2010 Average
July 2020 Average
July 2050 Projection
High Emissions / No Action
July 2050 Projection
Stabilized Emissions with Action
July 2090 Projection
High Emissions / No Action
July 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov


Climate Change IMPACTS
AUGUST
August 1981-2010 Average
August 2020 Average
August 2050 Projection
High Emissions / No Action
August 2050 Projection
Stabilized Emissions with Action
August 2090 Projection
High Emissions / No Action
August 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov


Climate Change IMPACTS
SEPTEMBER
September 1981-2010 Average
September 2020 Average
September 2050 Projection
High Emissions / No Action
September 2050 Projection
Stabilized Emissions with Action
September 2090 Projection
High Emissions / No Action
September 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov


Climate Change IMPACTS
OCTOBER
October 1981-2010 Average
October 2020 Average
October 2050 Projection
High Emissions / No Action
October 2050 Projection
Stabilized Emissions with Action
October 2090 Projection
High Emissions / No Action
October 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov


Climate Change IMPACTS
NOVEMBER
November 1981-2010 Average
November 2020 Average
November 2050 Projection
High Emissions / No Action
November 2050 Projection
Stabilized Emissions with Action
November 2090 Projection
High Emissions / No Action
November 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov


Climate Change IMPACTS
DECEMBER
December 1981-2010 Average
December 2020 Average
December 2050 Projection
High Emissions / No Action
December 2050 Projection
Stabilized Emissions with Action
December 2090 Projection
High Emissions / No Action
December 2090 Projection
Stabilized Emissions with Action
NOAA - National Oceanic & Atmospheric Administration and Climate.gov

8.2 Hazard – Intense and More Frequent Storms, Flooding

Precipitation averages have increased 57% each decade over the past twenty years. Without action, precipitation averages will continue to increase causing major Chartiers Creek flood events.

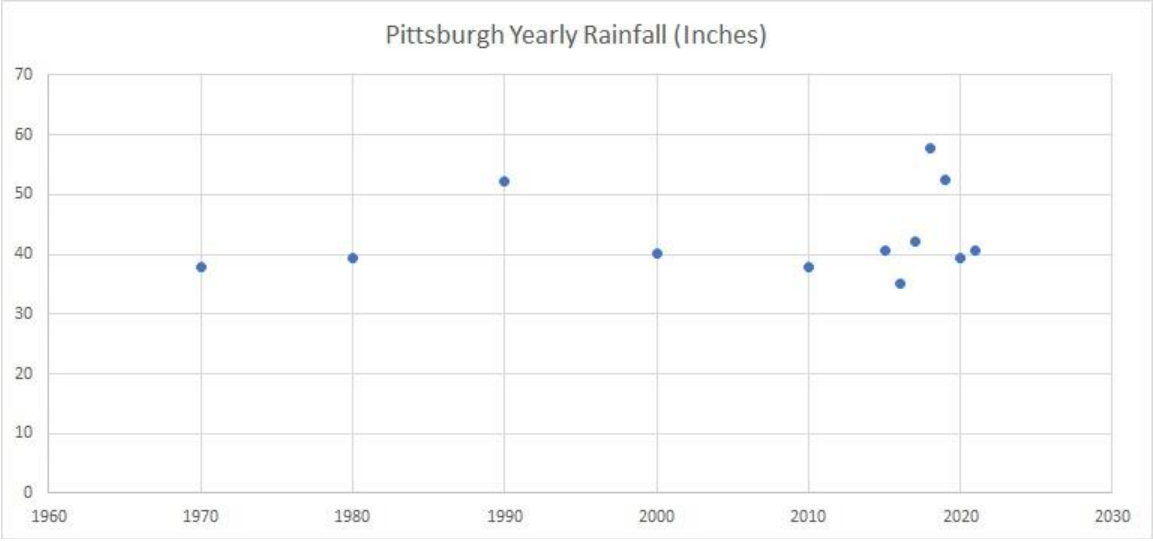
On September 17, 2004, Chartiers Creek crested at 25.44ft with 15,900 discharge (cubic feet per second) making it our worst major flood event surpassing the historical flood of 1912. Remnants of Hurricane Ivan dumped 5.9 inches of rain on Allegheny County in one day breaking a record set only 9 days earlier.

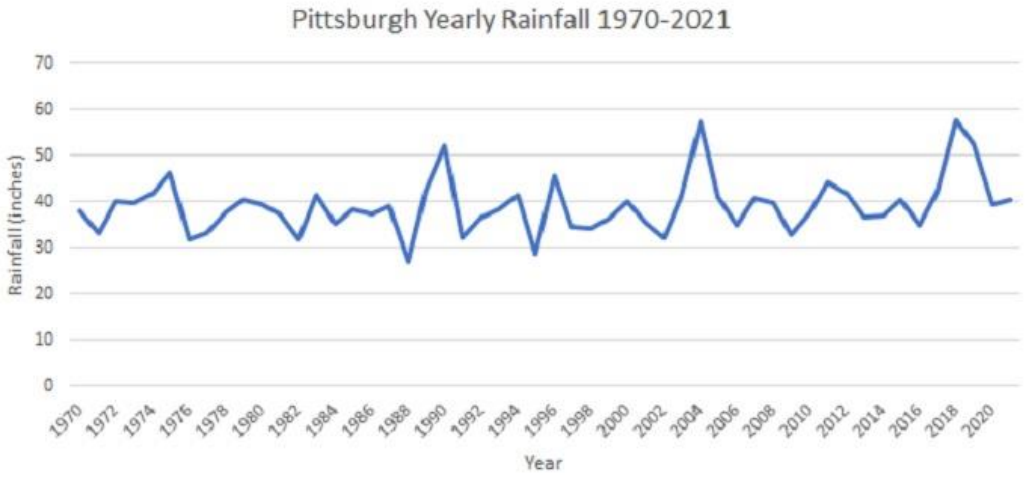
More intense hurricane and storm activity combined with increased precipitation averages make it very likely that Carnegie will experience several 24hour periods with 5.9+ inches of precipitation. By 2059 Chartiers Creek could experience major flood stage events several times each year, particularly in the months of May, June, July, September, and October putting the Borough of Carnegie on Flood Watch more frequently.

Action Stage 14ft
Flood Stage 20ft
Moderate Flood Stage 21ft
Major Flood Stage 23ft

Previous Year Samples

- August 2016 - monthly rainfall average 3.46 in - highest crest 3.46ft with a discharge of 1980.
- December 2016 - monthly rainfall average 3.43 in and 6 inches of snow (9.43 in total) - highest crest 9.51ft with a discharge of 7100.
- July 2017 - monthly rainfall average 6.42 in. Heavy precipitation events within a short period of time - highest crest 11.59 ft and discharge 9190.





Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1970	1.61	1.92	3.35	3.09	4.36	4.61	3.89	1.55	2.77	4.8	2.64	3.29	**37.88**
1980	1.56	1.32	5.65	2.94	4.32	4.34	6.76	5.1	1.29	2.42	2.38	1.38	**39.46**
1990	3.3	3.31	1.47	3.48	6.19	4.24	6.59	3.59	6	3.51	2.05	8.51	**52.24**
2000	1.7	2.53	2.26	3.15	5.69	5.64	6.28	3.66	3.1	2.09	1.38	2.64	**40.12**
2010	2.9	3.22	2.19	1.76	5.19	5.13	2.86	1.68	3.27	2.12	5.97	1.56	**37.85**
2015	2.25	1.55	4.01	3.95	2.72	7.34	3.61	2.29	5.08	3.34	1.38	3.04	**40.56**
2016	1.79	3.14	2.83	2.25	3.61	3.1	3.12	3.29	3.08	3.94	1.43	3.43	**35.01**
2017	3.54	1.46	5.02	3.54	5.15	3.78	6.42	2.63	0.58	4.11	4.15	1.77	**42.15**
2018	4.28	7.04	2.96	4.43	2.83	6.1	3.96	4.53	8.5	3.59	4.57	4.29	**57.83**
2019	3.06	3.97	2.37	3.44	5.96	6.42	6.92	2.45	5.34	7.19	1.65	3.52	**52.46**
2020	3.69	3.3	4.83	2.3	2.19	2.3	3.1	5.57	0.92	3.29	2.02	3.53	**39.33**
2021	2.27	2.82	3.88	2.67	3.09	4.29	3	6.41	3.93	3.84	0.88	3.45	**40.53**
2029	3.17	3.63	3.45	3.45	4.53	5.67	4.78	3	4.6	4.32	3.41	3.13	**47.14**
2039	3.66	4.18	3.98	3.97	5.22	6.54	5.52	3.46	5.3	4.98	3.93	3.61	**54.35**
2049	4.42	5.05	4.81	4.8	6.3	7.9	6.67	4.18	6.41	6.02	4.75	4.37	**65.68**
2059	5.6	6.42	6.11	6.1	8.02	10.04	8.47	5.32	8.15	7.66	6.04	5.55	**83.48**

Increased Frequency and Intensity of Extreme Storm and Flood Events

In the Northeast, higher annual temperatures projections will result in increased levels of annual precipitation and a higher frequency of heavy rain events. Winter and spring precipitation are especially subject to these effects. If sewer overflows, polluting runoff, and street flooding are seeming more common, it's because climate change has already affected our communities. Over the last 50 years, the Northeast saw more than a 70% increase in precipitation, and a 75% increase in heavy rain events. At this rate, data indicates that CONNECT communities will be experiencing at least one additional major rain event each year through 2035 and increases to their total annual and winter precipitation in the coming decades.

Risk Impact Description – Moderate to High

More frequent rainstorms will overwhelm the ecological functions that normally mitigate negative impacts from extreme events. Mitigation ease varies between species. The first step is identifying and evaluating areas in the Critical Area buffer to prioritize ecological buffer restoration efforts. Species and habitat in critical buffer areas can be destroyed easily during extreme rainstorms. Threatened and endangered habitats must be protected with high priority. Strengthening biodiversity will allow threatened habitats to rebuild. Natural habitat supports biodiversity and native species will naturally thrive with little human help.

Risk Impact Areas

- Emergency Management and Services
- Emotional and Mental Health
- Employment and Job Access
- Energy Delivery Systems
- Food Supply Systems
- Housing Security
- Internet and Communications
- Public Safety
- Recreation and Quality of Life
- Transportation
- Waste Management
- Wastewater and Storm Water
- Water Supply

Risk Impact Adaptive Capacity Factors

The ability of residents and businesses to adjust to extreme storms and respond to consequences would depend on availability of additional funds to cover increased costs.

Specific adaptive factors include:

- Access to Basic Services, Data, Education, and Healthcare
- Budgetary Capacity
- Community Engagement
- Disaster Response and Recovery
- Delivery of Services
- Economic Diversity and Health
- Environmental Conditions
- Government Capacity and Municipal Services
- Infrastructure Capacity
- Land Use Planning
- Resource Availability

Risk Impact Adaptive Capacity Factors is the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences of hazards.

Specific Risk Areas and Actions

- **EMERGENCY MANAGEMENT AND SERVICES**
  Carnegie has an adequate emergency response system, CodeRED, but emergency management may be needed more frequently for future conditions. Sharing of resources, including emergency personnel and equipment, must be considered as it will improve efficiency of emergency services. EMS has identified a more detailed evaluation of locations as a high priority. The borough will also test and implement new technologies, materials, and tools to increase preparedness, as well as create new partnerships. Some of these technologies may include new pavement materials that can withstand extreme weather, inflatable flood barriers, and various means of back-up power to protect traffic control facilities, including central operations points and street controllers, and communications. Stricter flood regulations must also be developed for critical facilities.
- **EMOTIONAL AND MENTAL HEALTH**
  Studies show rain has negative effect on emotions and mental health. It also shown that neighborhoods with strong neighborhood networks and social ties are far more resilient. Often, neighbors are the first responders. Neighborhood emergency response teams can be created and promoted and activated in emergencies. Fire and police departments could offer training and outreach. This action will help enforce social and organizational ties to the community.

- **EMPLOYMENT AND JOB ACCESS**
  Worse weather may hurt job productivity. The Borough's Public Works departments may need to review and modify work schedules. Times for park use and park shelter rentals may also need evaluation to ensure personal health and safety.
- **ENERGY DELIVERY SYSTEMS**
  Increase in rainstorm frequency may cause power outages and other negative effects on infrastructure, but there are resources to adapt with infrastructure upgrades. Continuation of the borough's electricity demand-response program during peak usage or pre-blackout periods is essential. Energy efficiency, weatherization, and renewable energy generation are all important. Education and resources should emphasize electrical reductions during demand hours to lessen the burden on the power supply system during high heat events. It is also important to build upon existing educational programs that provide information regarding energy efficiency and conservation.
- **FOOD SUPPLY SYSTEMS**
  Resources, such as food collections, must be readily available during rainstorm seasons.
- **HOUSING SECURITY**
  Property owners should purchase flood insurance and improve policyholder awareness at time of sale or renewal. This is important since many Carnegie residences and businesses are in a flood zone.
- **INTERNET AND COMMUNICATIONS**
  Power outages may affect communications. The ability to fix the power grid may also be hindered. Best practices must be identified for flood proofing of all communications infrastructure and electrical equipment.
- **PUBLIC SAFETY**
  Rainstorms and flooding pose multiple dangers to public safety. Adequate emergency notification systems and emergency housing will be necessary. Carnegie should review zoning code and strengthen language (where necessary) to better protect citizens and increase resiliency in buildings.
- **RECREATION AND QUALITY OF LIFE**
  Overall negative impacts on daily life will occur, depending on economy and individual health. Vacant land can be converted into meaningful and connected open space. Public parks and other recreational activities may be negatively affected by flooding and storms. Businesses will be impacted as people are much less likely to leave their homes during rainstorms. Sustainable open space with native/adaptive plants allows for less water usage and stormwater management.
- **TRANSPORTATION**
  The main forms of transportation (cars and buses) will become harder to use. Pumps or other mitigation alternatives for streets may be necessary. The public should be educated on the dangers of driving through flooded roads.
- **WASTEWATER and STORMWATER**
  Flooding will complicate wastewater and stormwater management. An open space category should be utilized in zoning codes to protect sensitive areas (e.g. stormwater sites, steep slopes, floodways, etc.). These actions will reduce flooding and pollution from wastewater and stormwater.

Recommended Actions

Adaptation Action Description

- Protection of threatened and endangered habitats should be a priority. Strengthening biodiversity and allowing threatened habitats to rebuild means that ecosystems will rebuild faster after extreme rain events.
- Natural habitat should be used as much as possible in open space and rain garden planning to support biodiversity as a measure of flood control.

- Use of Integrated flood protection systems that use structural (engineering) and non-structural (rain gardens) measures.
- Urban landscaping requirements should be developed into community-managed open spaces. Current East and West Main Street parking lot rain gardens absorb more than 800,000 gallons of storm water each year. Carnegie Park has one completed rain garden and one in the building process and one is in the planning stages for Seventh Avenue Park. Residents should be encouraged to build their own rain gardens.
- Each year the borough replaces stormwater infrastructure. Current work is taking place in the Cubbage Hill/Seventh Avenue Park area.
- Develop programming and outreach to assist residents and local businesses with funding and reimbursements for storm impacts. Educate and train community groups to participate in responding to hazards.

8.3 Hazard – Air Quality

Allegheny County has one of the worst air qualities in the country

Allegheny County's poor air quality, ranked among the worst in the nation, is chiefly caused by our unique topography interacting with industrial process emissions from a concentration of manufacturing in the region, as well as the burning of fossil fuels for energy and vehicular transportation. Based on 2014 air quality data, Carnegie had 25% - 45% more diesel particles than the national average. Despite improvements over the last decades, climate change threatens to undercut the County's progress in meeting air quality standards - making it harder to protect public health. Changes in weather patterns can influence the incidence of smog, pollen, and inversion events. Increased temperatures promote smog formation among mixtures of existing air pollutants and may lengthen the pollen season, exposing our communities to more health hazards.

Risk Impact Description - Moderate

Poor air quality, caused by industrial pollutants impacts everyone. Exposure to long-term poor air quality causes risk of developing respiratory or cardiovascular diseases such as heart disease, respiratory infection, lung cancer, or stroke. Certain populations are at a higher risk such as seniors and adults with preexisting respiratory or cardiovascular disease. Children have narrower respiratory tracts putting them at higher risk, especially if they have asthma.

Many buildings in Carnegie may not be equipped to filter out pollutants and keep the air inside the house clean. This could compound the issue as people will not be able to retreat indoors when air quality is poor or, in some cases, people will expose themselves to worse air quality indoors.

Risk Impact Areas

- Public Health
- Emotional and Mental Health
- Employment and Job Access
- Housing
- Recreation and Quality of Life
- Transportation

Risk Impact Adaptive Capacity Factors

Specific adaptive factors include

- Access to Basic Services, Data, Education, and Healthcare
- Budgetary Capacity
- Community Engagement
- Environmental Conditions
- Government Capacity and Municipal Services
- Resource Availability

Risk Impact Adaptive Capacity Factors is the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences of hazards.

Specific Risk Areas and Actions

- **PUBLIC HEALTH**
  Poor air quality has a significant impact on public health, increasing the likelihood of disease and risk of hospitalization or death for at-risk populations.
- **EMPLOYMENT AND JOB ACCESS**
  Poor air quality makes outdoor work more difficult. Electrifying borough equipment and fleets would improve air quality, improving the health of our workers and residents.
- **HOUSING**
  Many houses in Carnegie are old and may not be able to keep indoor air clean. Residential filtering capabilities need to be assessed and improved.
- **RECREATION AND QUALITY OF LIFE**
  Poor air quality makes outdoor activities difficult and discourages people from being active.
- **TRANSPORTATION**
  Cars and buses are large sources of pollutants in the community. Public transportation, ride sharing and walking should be encouraged. This can be accomplished through complete street connections and routes.

Recommended Actions

Adaptation Action Description

- Encourage multi-modal transportation including use of public transportation and ride sharing and increased walking.
- Provide public electric charging stations that use sustainable energy sources.
- Convert borough fleets and equipment to electric.
- Encourage solar or sustainable energy sources for residential and commercial electric and heating.
- Expand greenspace and native planting.

8.4 Hazard – Landslides

Carnegie is at low risk of landslides

Heavy bouts of precipitation and high spring temperature conditions. The secondary effects of heavy precipitation, such as excess storm water drainage and residential runoff, also contribute to the saturation and weakening of slopes. Certain areas of the borough may be at risk of landslides in the future, though the overall risk is low. These areas include Seventh Avenue Park, Rosslyn Heights, Cubbage Hill, Chioda Field, and the area near Carnegie Park. This tool shows areas that may be at risk https://landslide-portal-alcogis.opendata.arcgis.com/pages/map-tools.

Risk Impact Description and Recommended Actions – Low

Landslides are difficult to predict and pose a risk to safety and a strain on public and emergency services. Mitigation efforts include reinforcing at risk slopes. These efforts include retaining walls, stronger vegetation, and modifying slopes to be less prone to landslides. Slopes should be assessed based on vulnerability and appropriate mitigations should be implemented.

9. IMPLEMENTATION and MONITORING

9.1 Implementing the Climate Action Plan

The following matrix summarizes the actions contained within this Plan, a timeline that reflects priority and feasibility, status (if an existing action), the entities responsible for implementation, potential funding mechanism/source, and metrics to monitor progress.

Acronyms:

Status:
NS=Not Started
IP=In Progress
C=Complete
O=Ongoing

Departments:
AD=Administration
CE=Code Enforcement
PW=Public Works
PL=Planning
STC=Shade Tree Commission
ENG=Borough Engineer

Funding:
ST=Staff Time
GF=Grant Funding
BF=Borough Funding

Climate Action Plan Implementation Matrix

Action Number	Action	Timeline	Status*	Responsible Entities	Funding Mechanism / Source**
CB-1C	Establish PACE program and/or partner with utilities to offer on-bill financing for commercial energy efficiency retrofit projects	0-5 yr	NS	CDD	ST; GF
CB-1A	Inventory public buildings and energy use patterns to identify savings opportunities	0-5 yr	NS	CE	ST
CB-1B	Use the free municipal/school PennTAP toolkit to estimate potential energy savings in municipal buildings	0-5 yr	NS	AD	ST
CB-1C	Join PADEP's Shared Energy Manager's Program to receive a free shared energy manager with CONNECT that assists in energy benchmarking, auditing, and renewable evaluation.	0-5 yr	NS	AD	ST
CB-1D	Establish a strategic energy management plan that includes specific energy, water, and transportation emissions reductions targets and goals including conversion to electric heating from natural gas heating.	0-5 yr	NS	CE, AD	ST
CB-1E	Enroll in discounted Building Operator Certification for facility managers/building staff to train in energy efficiency.	0-10 yr	NS	AD, CE, PW	BF
CB-1F	Use a cooperative program to purchase energy management, consulting, or upgrades at lower prices.	0-5 yr	NS	AD	BF, GF

CB-1G	Join a CONNECT Regional Pooled Municipal Energy Implementation Model to better enable energy and solar projects.	0-5 yr	NS	AD	ST
CB-1H	Consider Energy Star Certification	0-5 yr	NS	AD	ST
CB-1I	Implement a Building Energy Disclosure Ordinance for all buildings in the community.	0-10 yr	NS	CE, PL	ST
CB-1J	Participate in People's Gas Energy Efficiency Program for local gov't buildings with high gas usage and unable to electrify	0-5 yr	NS	AD	ST
CB-1K	Continue public lighting, traffic, and streetlight replacement programs with DLC	Permanent	O	AD	GF
CB-1L	Continue Sustainable PA certification and seek SolSmart Certification	Permanent	O	AD	ST
CB-2A	Educate local businesses about the financial benefits of building energy tracking.	Permanent	IP	AD, CE	ST
CB-2B	Publicize PennTAP commercial and manufacturing energy toolkits and assistance to businesses in the community.	Permanent	NS	AD	ST
CB-2C	Promote Green Business Challenges and partner with the business community to participate in assessments for saving energy and reducing emissions during operations.	Permanent	NS	AD	ST
CB-2D	Partner with local utilities to ensure properties maximize use of energy efficiency rebates and retrofit programs.	0-20 yr	NS	AD	ST
CB-2E, RB-2E	Provide actionable information about local, state, and federal energy efficiency funding/financing options like CPACE on our website	Permanent	NS	AD	ST
CB-2F, RB-2F, MM-2D, SM-2F, TR-2C	Create a unique URL for environmental literacy project	0-2 yr	NS	AD	GF
CB-3A	Join Western PA Energy Consortium to procure renewable power at a cheaper rate.	Permanent	NS	AD	ST
CB-3B	Buy local renewable energy credits, offsets, etc to offset use of non-renewable power by the municipal government.	Permanent	NS	AD	ST
CB-3C	Enter into a power agreement with local renewable producers	0-10 yr	NS	AD	ST
CB-3D, RB-3A	Create a solar advisory committee/task force.	0-2 yr	NS	AD	ST
CB-3E, RB-3I	Complete solar feasibility study of roofs in community.	0-2 yr	NS	CE	ST
CB-3F, RB-3F	Amend development codes to encourage solar friendly site orientation.	0-5 yr	NS	PL, CE	ST
CB-3G, RB-3D	Create local incentives and rebates to encourage solar panel installation.	0-10 yr	NS	PL	ST
CB-3H, RB-3H	Install solar on municipal buildings and join solar co-op.	0-10 yr	IP	AD	ST
CB-3I, RB-1F	Roof cooling applications.	0-5 yr	NS	PL, CE, PW	ST
RB-1A	Research cooperative programs for residents	0-2 yr	NS	AD	ST

RB-1B	Assess current enforcement of energy codes and train inspectors.	0-5 yr	NS	PL, CE, PW	ST
RB-1C	Increase accessibility to free utility and region weatherization programs to increase efficiency of lower income homes and promote lead safety.	0-5 yr	NS	PL, CE, AD	ST
RB-1D	Improve ordinances to exceed minimum efficiency requirements.	0-10 yr	NS	PL, CE	ST
RB-1E	Double the number of homes weatherized through existing programs per year.	0-30 yr	NS	PL, CE, AD	ST
RB-2A	Educate residents about the financial benefits of building energy tracking.	Permanent	NS	AD	ST
RB-2B	Publish a green guide to educate residents on energy/sustainability actions.	0-2 yr	NS	AD	ST
RB-2C	Promote Green Challenges for residents to participate in assessments for saving energy and reducing emissions during operations.	0-5 yr	NS	AD	ST
RB-2D	Partner with local utilities to ensure properties maximize use of energy efficiency rebates and retrofit programs.	0-5 yr	NS	AD	ST
RB-1B	Help low income, high energy burden homes take advantage of energy bill assistance during winter.	0-2 yr	NS	AD	ST
RB-1E	Procure the free residential PennTAP toolkit on behalf of residents and encourage use to estimate potential energy savings in residential buildings.	0-2 yr	NS	AD	ST
RB-3J	Increase residential uptake of utility incentives for energy efficiency.	0-2 yr	NS	PL, AD	ST
RB-3K	Enhance support to residents for installing small-scale renewable energy systems.	0-20 yr	NS	PL, AD	ST
MM-1A	Consider recycling ordinances that promote recycling in multi-family and commercial buildings or reuse of building materials during construction/remodeling/demolition.	0-5 yr	NS	PL	ST
MM-1B	Continue with PA DEP Section 902 Recycling Program	Permanent	O	AD	ST
MM-1C	Continue partnership with Republic Services for pop-up glass collection services.	Permanent	O	AD	ST
MM-1D	Partner with Republic Services and regional government representatives to provide pop-up electronic collection services.	Permanent	IP	AD	ST
MM-1E	Encourage and highlight Sustainable Restaurant Designation in local eateries.	0-5 yr	NS	AD	ST
MM-1F	Create community composting program that reduces yard litter and food waste sent to landfill.	Permanent	IP	AD	ST
MM-1G	Create program to distribute reusable shopping bags and water bottles.	0-10 yr	NS	AD	St
MM-1H	Use recycling and composting technical assistance programs to upgrade programs, maximize material recovery, and ensure	0-5 yr	NS	AD	ST

	program sustainability.				
MM-1I	Use cooperative purchasing program, such as COSTARS, to procure sustainable local government materials/products at a lower price.	0-5 yr	NS	AD	ST
MM-1J	Build and support native planting for lawns, community gardens, urban farms, and alternative growing platforms.	Permanent	O	AD, STC	ST
MM-1K	Provide resources for reuse programs and continue to promote PRC electronic and hard to recycle events.	Permanent	O	AD	ST
MM-2A	Run a recycling education campaign that includes print and online assets.	Permanent	O	AD	ST
MM-2B	Expand and enhance current recycling education web page.	0-2 yr	NS	AD	ST
MM-2C	Provide recycling education workshops in-person, visiting, or online.	Permanent	NS	AD	ST
MM-2E	Host PRC Composting seminars	Permanent	NS	AD	ST
SM-1A	Continue to use ALCOSAN GROW grants to install green stormwater infrastructure	Permanent	O	ENG	ST, GF
SM-1B	Build green infrastructure such as green roofs, bioswales, and rain gardens.	0-20 yr	IP	PW, STC, AD	ST, GF
SM-1C	Incorporate green infrastructure language into Stormwater Management Ordinances.	0-5 yr	IP	PL	ST
SM-1D	Target vacant land for green projects and fruit tree planting.	0-10 yr	IP	PW, STC, AD	ST, GF
SM-1E	Encourage cool paving options.	0-5 yr	NS	PW, AD	ST, GF
SM-1F	Continue with Shade Tree Commission strategic plan that identifies focus areas for tree planting through Tree Vitalize.	Permanent	O	STC, AD	ST, GF
SM-1G	Expand local hazard mitigation plans to factor in expected vulnerabilities explicitly related to climate change.	0-10 yr	NS	STC, PW, AD, PL	ST, GF
SM-1H	Continue to incorporate PA DEP's Stormwater Best Management Practices into municipality's standard operating procedure.	Permanent	O	STC, ENG, PW, AD, PL	ST, GF
SM-1I	Work with surrounding communities to create a "one Water Plan" in watersheds.	0-5 yr	NS	STC, ENG, PW, AD, PL	ST, GF
SM-1J	Continue to work with Chartiers Valley District Flood Control Authority, Army Corps of Engineers, Lower Chartiers Watershed, and local conservancies.	Permanent	O	STC, ENG, PW, AD, PL	ST, GF
SM-1K	Continue to fulfill action items from Mayor Riley's NWF Monarch Butterfly Conservation Pledge.	Permanent	O	STC, ENG, PW, AD	ST, GF
SM-1L	Encourage and support Shade Tree Commission's native planting in public areas and initiative for residents to use native planting in their lawns.	Permanent	O	STC, AD	ST, GF
SM-2A	Engage in ALCOSAN flood education for residents and businesses, notify residents of flooding resources and any activity impacts on stormwater.	Permanent	NS	AD	ST

SM-2B	Establish virtual classrooms for catchment and other stormwater resources.	Permanent	NS	AD	ST, GF
SM-2C	Continue rain garden education by updating rain garden maintenance plans, virtual classrooms, and outdoor, online, and in-classroom events.	Permanent	O	STC, AD	ST, GF
SM-2D	Host PRC Rain Barrel Seminars.	Permanent	NS	AD	ST, GF
SM-2E	Continue native planting and habitat restoration education by updating virtual classrooms, participating in Earth Day Events, hosting annual mayor's butterfly festival, as well as establishing new community events.	Permanent	IP	STC, AD	ST, GF
TR-1A	Continue to work with Port Authority to implement TOD	Permanent	IP	ENG, AD	ST, GF
TR-1B	Prioritize complete streets development strategies.	0-2 yr	IP	ENG, AD	ST, GF
TR-1C	Implement new bike infrastructure, paths, and lanes, targeting busy or dangerous areas.	0-20 yr	NS	ENG, PL, AD	ST, GF
TR-1D	Encourage carpool, vanpool, or bikeshare options in borough government and in the community.	0-20 yr	NS	PL, AD	ST
TR-1E	Form neighborhood biking and walking committee.	0-5 yr	NS	PL, ENG, AD	ST, GF
TR-2A	Utilize CONNECT EV info sheet	0-2 yr	NS	AD	ST
TR-2B	Provide education for federal, state and DLC EV and charging grants or rebates.	Permanent	NS	AD	ST
TR-3A	Research EV needs, permitting, and tech support.	0-5 yr	NS	PL, AD	ST
TR-3B	Build electric vehicle accommodations and charging stations.	0-10 yr	NS	PL, ENG, AD	ST, GF
TR-3C	Install public EV chargers in local lots and parks.	0-10 yr	NS	PL, ENG, AD	ST, GF
TR-3D	Join EV purchasing collaborative.	0-10 yr	NS	PL, ENG, AD	ST, GF
TR-3E	Adopt policies, parking rules, and zoning ordinances that enable electric vehicle growth and adoption.	0-10 yr	NS	PL, ENG, AD	ST, GF
TR-3F	Collaborate with DLC to ensure optimization of electrical grids for increased EV use and cleaner EV impacts.	0-5 yr	NS	PL, ENG, AD	ST, GF
TR-3G	Assess municipal fleets.	0-2 yr	NS	AD	ST, GF
TR-3H	Start borough initiative to organize local commercial businesses to be Duquesne Light charging partners.	0-10 yr	NS	PL, ENG, AD	ST, GF

9.2 Monitoring Progress of the Climate Action Plan

Establishing a monitoring process enables Borough of Carnegie to track the impacts of the actions included in the Plan and compare estimated impacts to what is actually achieved in terms of energy savings, renewable energy production, and GHG emissions reduction. Assessing the implementation status of the actions will allow determination of whether the action is performing well and to identify corrective measures. This process is also an opportunity to understand barriers to implementation and identify best practices or new opportunities in moving forward.

Starting in 2023, progress reports are to occur every 3 years and will include status updates on each action within this Plan, including any known metrics of impact (e.g. reduction in residential kWh and the corresponding GHG emissions). The progress report will also include an updated community GHG inventory to illustrate progress towards the reduction target(s) and allow Borough of Carnegie to evaluate the need for any modification to the original targets, objectives, and/or actions of this Climate Action Plan.

10. References

Intergovernmental Panel on Climate Change (IPCC). (2014). *Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K Pachauri, and L.A. Meyer (eds.)].* Geneva, Switzerland: Cambridge University Press.

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III tothe Fifth Assessment Report of the IPCC [Core Writing Team, R.K. Pachauri, and L.A. Meyer (eds.)].* Geneva, Switzerland.

IPCC. (2014). *Summary for Policymakers. In: Climate Change 2014: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Av.* Cambridge, U.K. and New York, NY, USA.: Cambridge University Press.

PA DEP. (2021). *Climate Change*. Retrieved from Pennsylvania Department of Environmental Protection: https://www.dep.pa.gov/Citizens/climate/Pages/default.aspx

PA DEP. (2021). *Pennsylvania Climate Impacts Assessment 2021*. Retrieved from http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=3667348&DocName=PENNSYLVANIA%20CLIMATE%20IMPACTS%20ASSESSMENT%202021.PDF%20%20%3cspan%20style%3D%22color:green%3b%22%3e%3c/span%3e%20%3cspan%20style%3D%22color:blue%3b%22%3e%28NEW%29%3c/span%3

PA DEP. (2021). *Pennsylvania Greenhouse Gas Inventory*. Retrieved from https://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/Climate%20Change%20Advisory%20Committee/2021/2021_GHG_Inventory_Report_2021-09-02.pdf

Pennsylvania Department of Environmental Protection (PA DEP). (2021). *Pennsylvania Climate Action Plan*. Retrieved from http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=3925177&DocName=2021%20PENNSYLVANIA%20CLIMATE%20ACTION%20PLAN.PDF%20%20%3cspan%20style%3D%22color:green%3b%22%3e%3c/span%3e%20%3cspan%20style%3D%22color:blue%3b%22%3e%28NEW%29%3c/span%3e%209/2

Shortle et al. 2015. (n.d.). *Climate Impacts Assessment Update.* Retrieved from PA Department of Environmental Protection: http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=5002&DocName=2015%20PENNSYLVANIA%20CLIMATE%20IMPACTS%20ASSESSMENT%20UPDATE.PDF%20

Shortle, J. (2015). *Climate Change.* Retrieved November 14, 2019, from Pennsylvania Department of Environmental Protection (PA DEP): https://www.pennfuture.org/Files/Admin/Pennsylvania-Climate-Impacts-Assessment-Update---2700-BK-DEP4494.compressed.pdf

Appendix I: GHG Quantification Methodology

This appendix details GHG calculation methods and other technical information gathered and used throughout the report.

Greenhouse Gas Inventory Methodology

The Borough of Carnegie's Greenhouse Gas Inventory was provided by CONNECT for the base year 2018. The inventory is consistent with ICLEI's U.S. Community Protocol Reporting Framework that requires an inventory of emissions from the following five Basic Emissions Generating Activities (BEGAs)

- Use of electricity by the community
- Use of fuel in residential and commercial stationary combustion equipment
- On-road passenger and freight motor vehicle travel
- Use of energy in potable water and wastewater treatment and distribution
- Generation of solid waste by community

CONNECT Inventory Process

- Retrieving data – CONNECT requested activity data from utilities, haulers and other service providers on behalf of its municipalities.
- Activity data and activity estimates were organized into CONNECT's Master Data Workbook.
- Data was entered into ICLEI's ClearPath Tool.

Forecast and Reduction Modeling

- Hazards were determined using Temperate software.
- Data was entered into ICEI's ClearPath Tool for ClearPath Tool to determine outcomes if no action is taken or if reduction actions are implemented.

Appendix II: Climate Change Science

PA DEP's 2021 Climate Impacts Assessment.

The Intergovernmental Panel on Climate Change (IPCC)'s *Global Warming of 1.5°C* Special Report affirms that "temperature rise to date has already resulted in profound alterations to human and natural systems, including increases in droughts, floods, and some other types of extreme weather; sea level rise; and biodiversity loss – these changes are causing unprecedented risks to vulnerable persons and populations."[1] Researchers have made progress in their understanding of how the Earth's climate is changing in space and time through improvements and extensions of numerous datasets and data analyses, broader geographical coverage, better understanding of uncertainties and a wider variety of measurements.[2] These refinements expand upon the findings of previous

[1] Allen, M.R., O.P. Dube, W. Solecki, F. Aragón-Durand, W. Cramer, S. Humphreys, M. Kainuma, J. Kala, N. Mahowald, Y. Mulugetta, R. Perez, M.Wairiu, and K. Zickfeld, 2018: Framing and Context. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press. 53 pp.

[2] IPCC, 2018: Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

IPCC Assessments – today, in the IPCC Sixth Assessment Report, observational evidence from all continents and most oceans shows that "with further global warming, every region is projected to increasingly experience concurrent and multiple changes in climatic impact-drivers."[3]

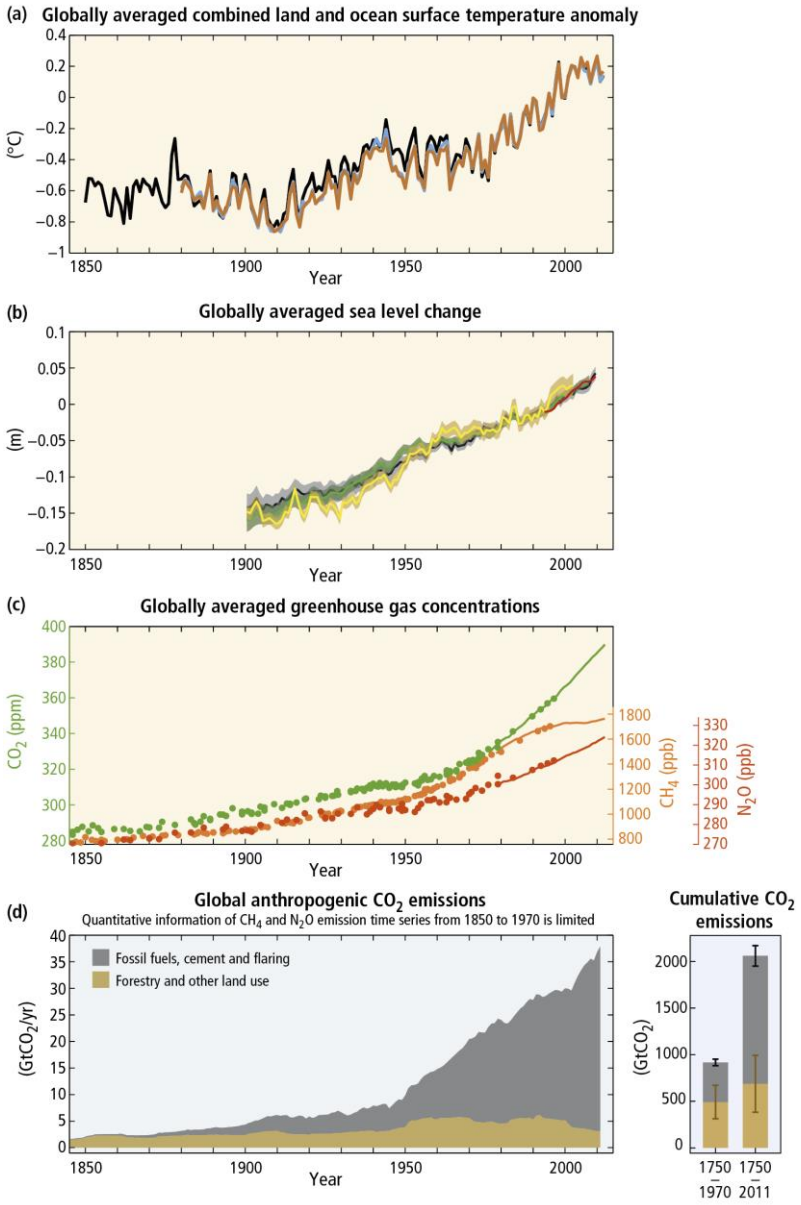


Figure 1: Observations and other indicators of a changing global climate system[4]

[3] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

[4] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K Pachauri, and L.A. Meyer (eds.)]. Geneva, Switzerland, 151 pp

The IPCC Sixth Assessment asserts that "each of the last four decades have been successively warmer than any decade that preceded it since 1850. The likely range of total human-caused global surface temperature increase from 1850-1900 to 2010-2019 is 0.8°C to 1.3°C. Human influence is very likely the main driver of the global retreat of glaciers since the 1990s and the decrease in Arctic sea ice area between 1979–1988 and 2010–2019." Lastly, "human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since AR5."[5]
In short, the Earth is already responding to climate change drivers introduced by mankind.

Temperatures and Extreme Events are Increasing Globally

Surface temperature is projected to continue to rise until at least the mid-century under all assessed emission scenarios. Subsequently, increased global warming also includes the frequency and intensity of hot extremes, marine heatwaves, extreme precipitation, agricultural and ecological droughts, tropical cyclones, and the reduction in Arctic sea ice, snow cover, and permafrost. The ocean will continue to warm and acidify, and global mean sea level to rise. Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions.[6]

[5] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.
[6] Ibid.

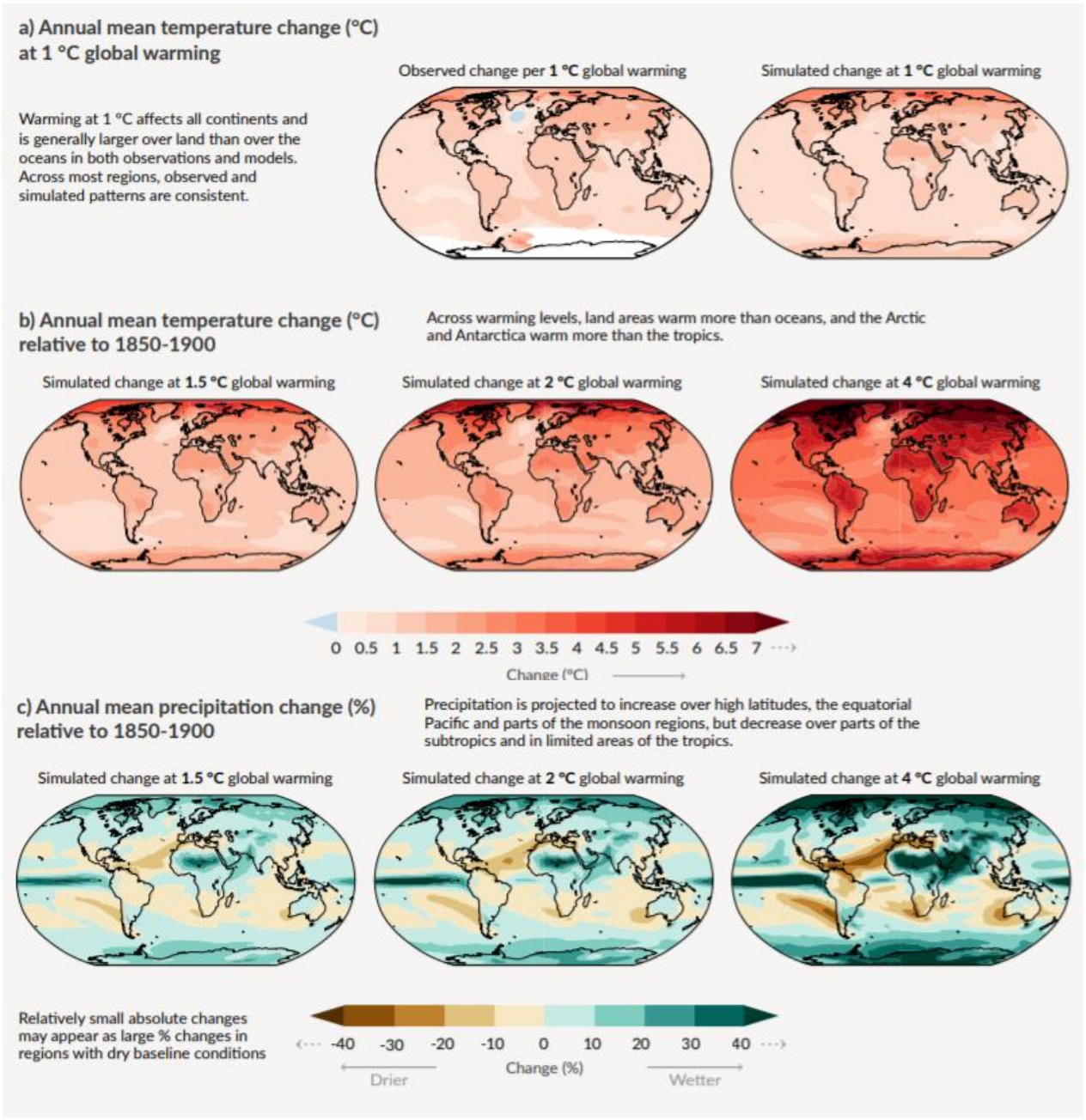


Figure 2: Change in average surface temperature, precipitation and soil moisture. Panel a) shows the comparison between observed and simulated surface temperature at 1°C global warming. Relative to 1850-1900, panel b) highlights simulated surface temperature changes at global warming levels of 1.5°C, 2°C and 4°C, whereas, panel c) shows simulated precipitation changes when global warming levels of 1.5°C, 2°C and 4°C are applied.[7]

[7] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

Climate Risks

Climate change is projected to undermine food security. Due to projected climate change by the mid-21st century and beyond, global marine species redistribution and marine biodiversity reduction in sensitive regions will challenge the sustained provision of fisheries productivity and other ecosystem services. For wheat, rice and maize in tropical and temperate regions, climate change without adaptation is projected to negatively impact production for local temperature increases of 2°C or more above late 20th century levels, although individual locations may benefit. Global temperature increases of ~4°C or more above late 20th century levels, combined with increasing food demand, would pose large risks to food security globally. Climate change is projected to reduce renewable surface water and groundwater resources in most dry subtropical region, intensifying competition for water among sectors.

Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist. Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change. Health impacts include greater likelihood of injury and death due to more intense heat waves and fires, increased risks from foodborne and waterborne diseases and loss of work capacity and reduced labor productivity in vulnerable populations. Risks of undernutrition in poor regions will increase. Risks from vector-borne diseases are projected to generally increase with warming, due to the extension of the infection area and season, despite reductions in some areas that become too hot for disease vectors.

In urban areas climate change is projected to increase risks for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea level rise and storm surges. These risks are amplified for those lacking essential infrastructure and services or living in exposed areas. Rural areas are expected to experience major impacts on water availability and supply, food security, infrastructure and agricultural incomes, including shifts in the production areas of food and non-food crops around the world.

Climate change is projected to increase displacement of people. Populations that lack the resources for planned migration experience higher exposure to extreme weather events, particularly in developing countries with low income. Climate change can indirectly increase risks of violent conflicts by amplifying well-documented drivers of these conflicts such as poverty and economic shocks.[8]

[8] Hoegh-Guldberg, O., D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K.L. Ebi, F. Engelbrecht, J.Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S.I. Seneviratne, A. Thomas, R. Warren, and G. Zhou, 2018: Impacts of 1.5ºC Global Warming on Natural and Human Systems. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I.Gomis, E. Lonnoy, T.Maycock, M.Tignor, and T. Waterfield (eds.)]. In Press

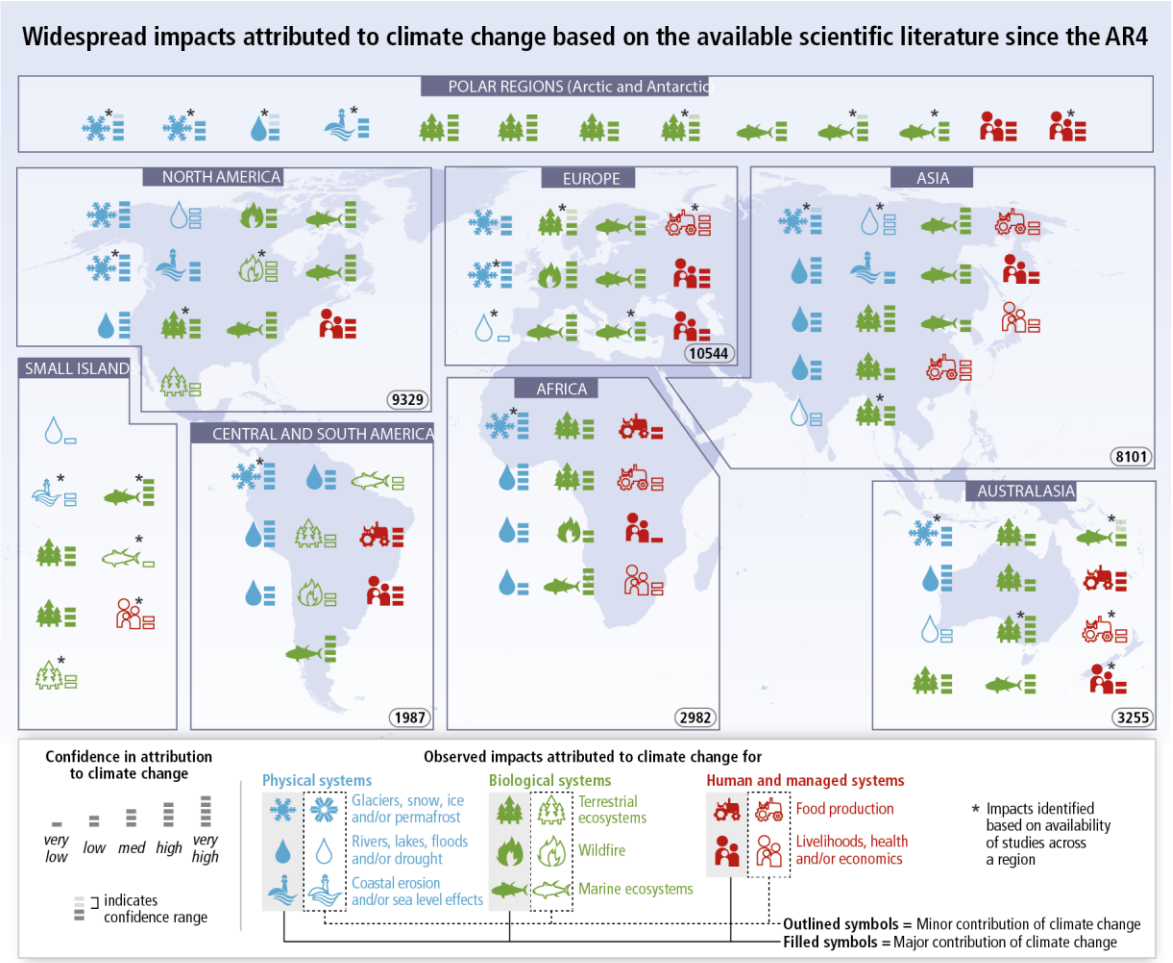


Figure 3: Climate impacts around the world. Symbols indicate categories of attributed impacts, the relative contribution of climate change (major or minor) to the observed impact and confidence in attribution. Numbers in ovals indicate regional totals of climate change publications from 2001 to 2010, based on the Scopus bibliographic database for publications in English with individual countries mentioned in title, abstract or key words (as of July 2011). These numbers provide an overall measure of the available scientific literature on climate change across regions; they do not indicate the number of publications supporting attribution of climate change impacts in each region. Studies for polar regions and small islands are grouped with neighboring continental regions.[9]

Greenhouse Gas Emissions Must be Reduced

The recent and massive buildup of greenhouse gases in our atmosphere is conceivably more extraordinary than changes observed thus far regarding temperature, sea level, and snow cover in the Northern hemisphere in that current levels greatly exceed recorded precedent going back much further than the modern temperature record. Anthropogenic greenhouse gas emissions have increased since the pre-industrial era driven largely by economic and population growth. In 2019, emissions concentrations were higher than at any time in the last two million years.[10] Historical emissions have increased atmospheric concentrations of carbon dioxide, methane and nitrous oxide to a rate ten times faster than any sustained rise of CO2 in the last 800,000 years, leading to an uptake of energy by the climate system. [11]

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[9] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K Pachauri, and L.A. Meyer (eds.)]. Geneva, Switzerland, 151 pp

[10] Ibid.

[11] Allen, M.R., O.P. Dube, W. Solecki, F. Aragón-Durand, W. Cramer, S. Humphreys, M. Kainuma, J. Kala, N. Mahowald, Y. Mulugetta, R. Perez, M.Wairiu, and K. Zickfeld, 2018: Framing and Context. In: Global Warming of 1.5°C. An IPCC Special

In response to the problem of climate change, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, and waste diversion, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts. While this Plan is designed to reduce overall emissions levels, as the effects of climate change become more common and severe, local government adaptation policies will be fundamental in preserving the welfare of residents and businesses.

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