Malvern Borough
Community Climate Profile

Brandywine Conservancy, July 2021

Introduction

According to 2017's Climate Science Special Report, **"sixteen of the warmest years on record for the globe occurred in the last 17 years (1998 was the exception)."** The historic scientific evidence clearly shows a change in climate for the Greater Philadelphia Region with a shift to concentrated extreme heat waves as well as heavy rain and snow events. While many might not consider climate change a "municipal issue," municipalities bear the burden of needing to manage the impacts of flooding from heavy rainfall, clearing heavy snowfall, and dealing with extreme heat. Broadly, the Greater Philadelphia Region will see an increase in sea level, warmer conditions, more intense precipitation events, and longer periods of drought. It is difficult to respond to these slow, incremental changes in climate, but municipalities that plan considering future climate conditions will be better prepared to safely serve their community.

This report includes a high-level overview of the ways that Malvern Borough is already experiencing the impacts of climate change but is not a fully exhaustive report. This report intends to inform the Comprehensive Plan Update process by providing data points of historical conditions and modeled future conditions. These climate conditions should be considered for future planning of municipal actions. The Delaware Valley Regional Planning Commission (DVRPC) prepared a guide for municipalities entitled "Municipal Management in a Changing Climate" which advises that to prepare for climate change, municipalities need to adjust in the following ways:

- "Prepare municipal facilities for a changing climate, including both buildings and recreation facilities
- Maintain and upgrade stormwater systems to handle more intense rainfall
- Modify delivery of municipal services (e.g., refuse collection times) appropriately
- Assure employee contracts are suitable for conditions
- Maintain and expand tree cover with species appropriate for a changing climate
- Assure cooling centers are available for residents
- Update regulations to account for climate change"

Introduction

While weather and climate can often be thought of interchangeably, differentiating between the two concepts is important to better understanding and preparing for climate change.

"**Weather** is the state of the atmosphere at any given time and place. Most of the weather that affects people, agriculture, and ecosystems takes place in the lower layer of the atmosphere. Familiar aspects of weather include temperature, precipitation, clouds, and wind that people experience throughout the course of a day. Severe weather conditions include hurricanes, tornadoes, blizzards, and droughts.

Climate is the long-term average of the weather in a given place. While the weather can change in minutes or hours, a change in climate is something that develops over longer periods of decades to centuries. Climate is defined not only by average temperature and precipitation but also by the type, frequency, duration, and intensity of weather events such as heat waves, cold spells, storms, floods, and droughts.

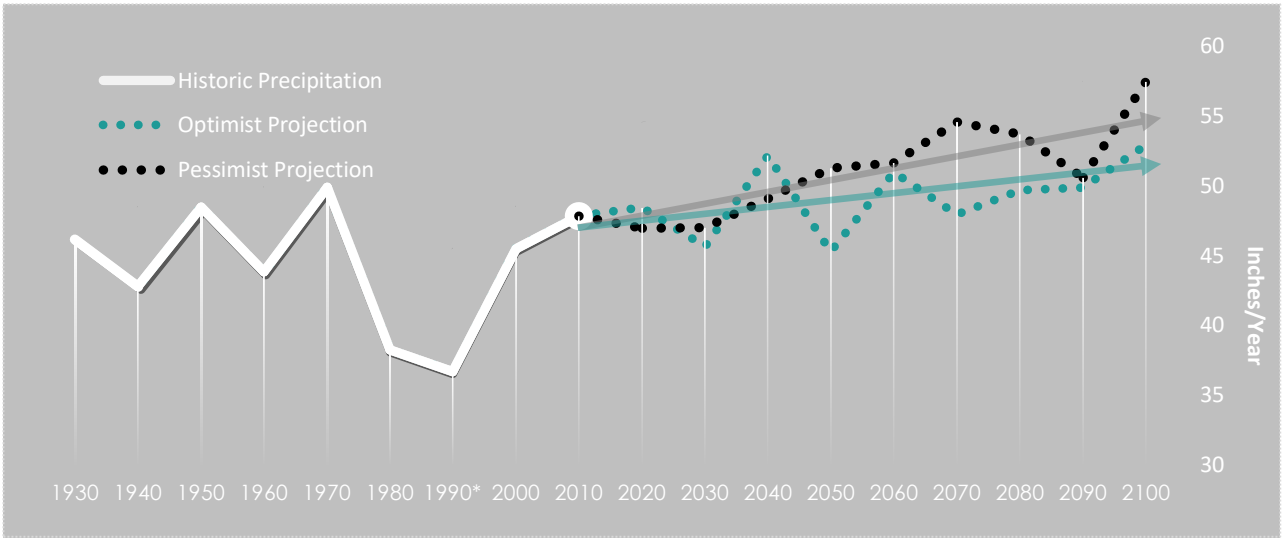
The concepts of climate and weather are often confused, so it may be helpful to think about the difference between weather and climate with an analogy: weather influences what clothes you wear on a given day, while the climate where you live influences the entire wardrobe you buy."

Source: EPA, https://www.epa.gov/climate-indicators/weather-climate

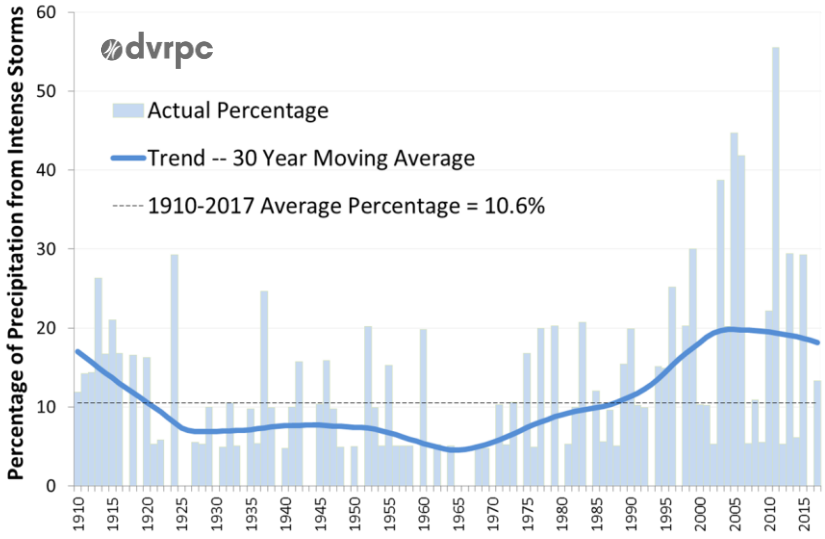
Precipitation

The following illustrates precipitation data, both measured and projected, for Malvern Borough. From 1970-1980, the Borough experienced 49.9 inches per year (in/yr) of precipitation, on average. From 2010-2020 the Borough experienced 47.83 in/yr, on average. In an optimist scenario, projections show the Borough experiencing 52.87 in/yr from 2090-2100. In a pessimist scenario, projections show 57.44 in/yr from 2090-2100.

Average Precipitation



Intense Storms and Precipitation



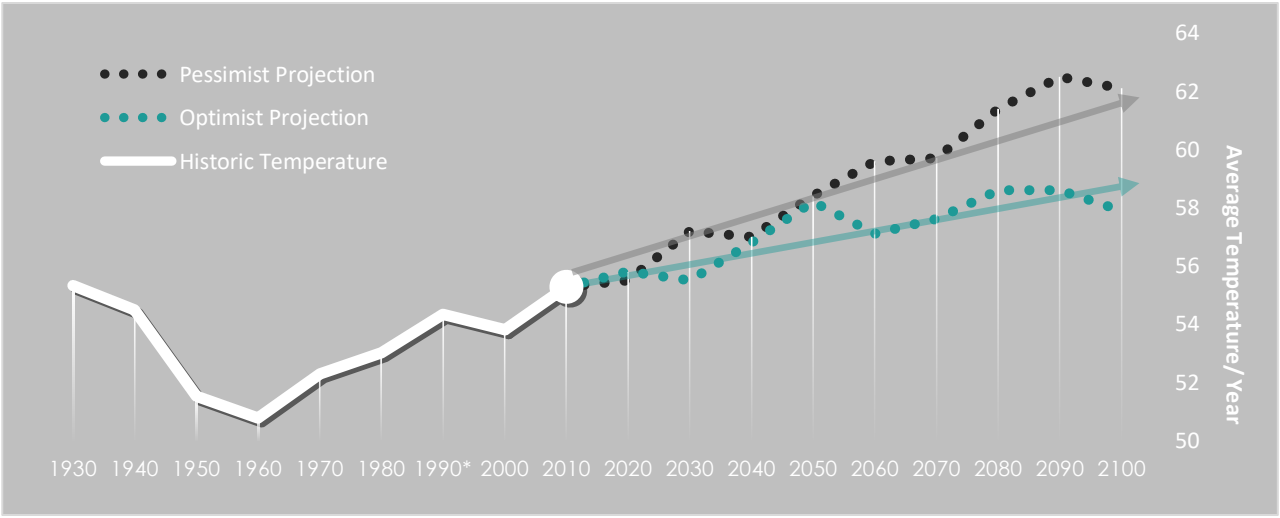
Source: Source: DVRPC chart using data accessed 24 May 2018 from www.ncdc.noaa.gov/cag/.

Data Sources: Historic precipitation from NOAA's national climate data center, DEVAULT 1 W, PHOENIXVILLE 1 E & WEST CHESTER 2 NW weather stations. Projected precipitation data from National Center for Atmospheric Research (NCAR) Community Climate System Model (CCSM) projections compiled using the iTree tool developed by USDA Forest Service, Davey Tree Expert Co., National Arbor Day Foundation, Society of Municipal Arborists, International Society of Arboriculture and Casey Trees. Intense Storms and Precipitation graph from DVRPC.

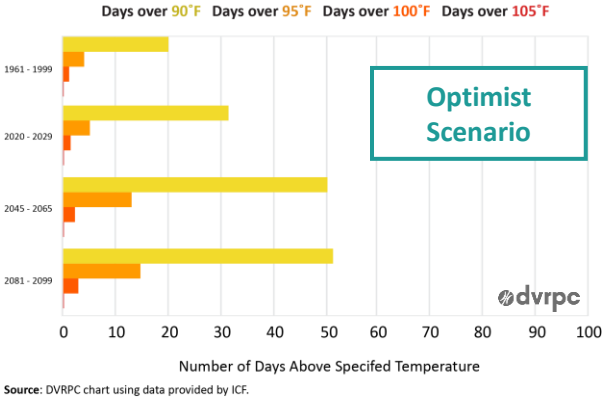
Temperature

The following illustrates temperature data, both measured and projected, for Malvern Borough. From 1970-1980, the Borough experienced a temperature of 49.89°F on average, annually. From 2010-2020 the Borough experienced temperatures of 47.83°F on average. In an optimist scenario, projections show the Borough experiencing average temperatures of 57.9°F from 2090-2100. In a pessimist scenario, projections show average temperatures of 62.1°F from 2090-2100.

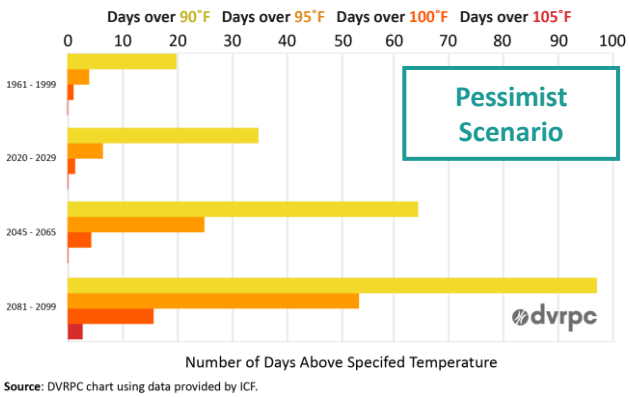
Average Temperature



Days Over Specified Temperatures



Source: DVRPC chart using data provided by ICF.



Source: DVRPC chart using data provided by ICF.

Data Sources: Historic temperature from NOAA's national climate data center, DEVAULT 1 W, PHOENIXVILLE 1 E & WEST CHESTER 2 NW weather stations. Projected temperature data from National Center for Atmospheric Research (NCAR) Community Climate System Model (CCSM) projections compiled using the iTree tool developed by USDA Forest Service, Davey Tree Expert Co., National Arbor Day Foundation, Society of Municipal Arborists, International Society of Arboriculture and Casey Trees. Days over specified temperatures graphs from DVRPC.

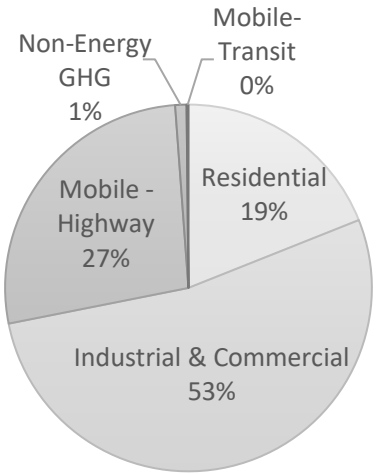
GHG

Emissions

The following information illustrates greenhouse gas emissions (GHG) within Malvern Borough, according to the 2015 Energy and Emissions Profile for Malvern Borough, developed by the Delaware Valley Regional Planning Commission (DVRPC). Overall emissions are illustrated as well as emissions within the Borough attributed to different sectors.

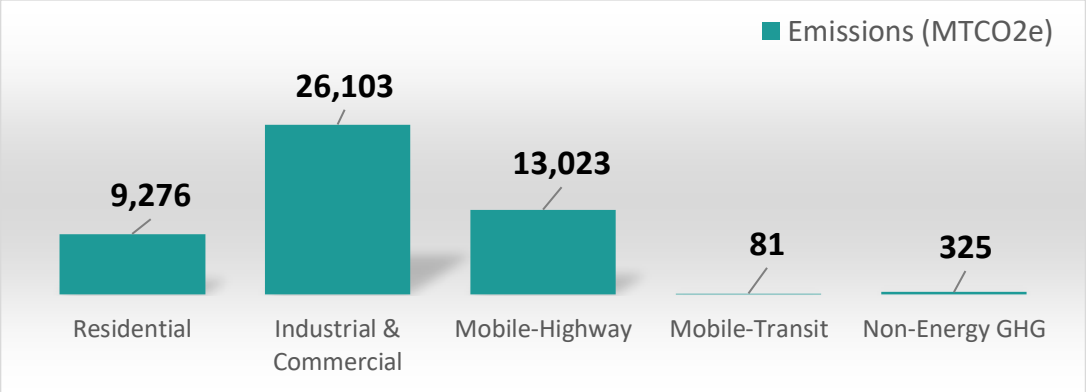
Borough Greenhouse Gas Emissions

Overall



Total Borough Emissions	**48,809 $MTCO^2e$**
% of County Emissions	**0.7%**

By Sector



Carbon Sequestration

Absorbing and storing atmospheric carbon dioxide is called “carbon sequestration.” According to the University of California, Davis, “Biological carbon sequestration is the storage of carbon dioxide in vegetation such as grasslands or forests, as well as in soils and oceans.”

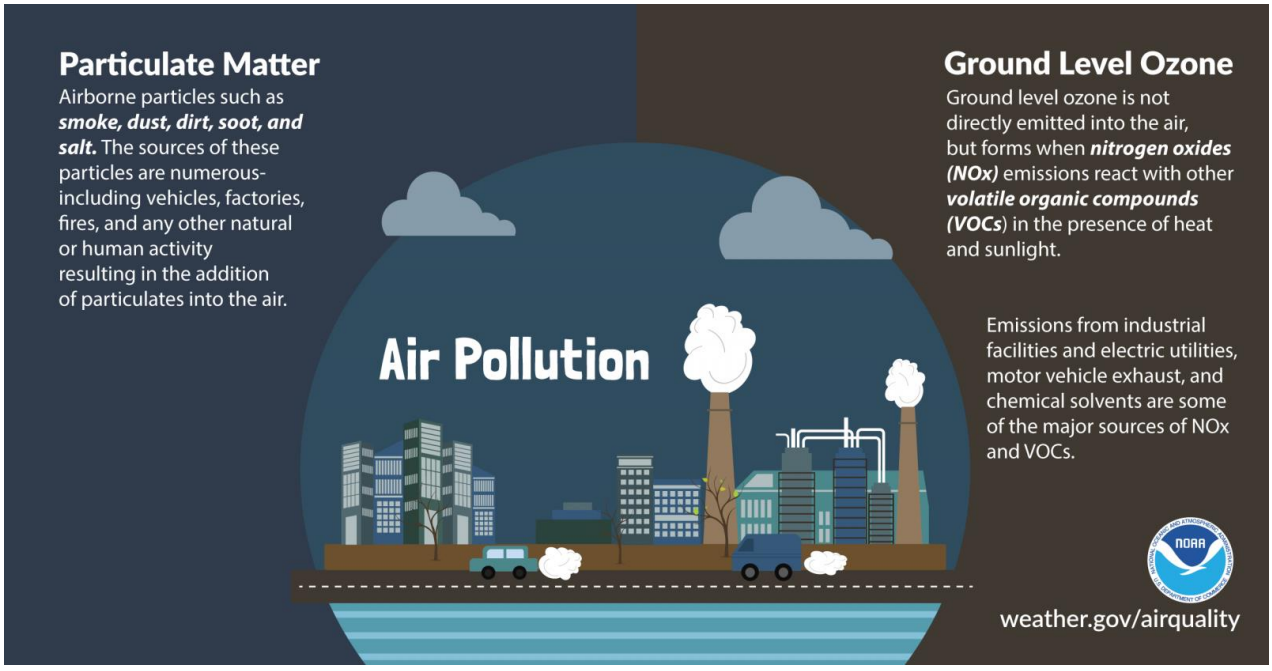
Data Sources: GHG emission data from Delaware Valley Regional Planning Commission (DVRPC)
https://www.dvrpc.org/webmaps/MunicipalEnergy/mcdDetail.aspx?mcdcode=4202946792 .

Air Quality

Climate change can impact air quality and air quality can also impact climate change. Pollutants such as cars and trucks (mobile sources) and power plants and factories (non-mobile sources) impact air quality. According to the CDC, higher temperatures may increase allergens and air pollutants. Higher temperatures will also increase ground level ozone. Air quality metrics are complicated and interrelated; the infographics below seek to give a summary of the interrelationships.

Air Quality Impacts Related to Increased Temperatures

Allergen Levels + Ground-Level Ozone = Air Quality



Health Impacts + Air Quality

Increased Allergen Levels

More

- Cases of allergies
- Asthma episodes

Increased Ground-Level Ozone

More

- Respiratory illnesses
- Premature deaths

Data Sources

Data sources used in this profile include the following:

1. Wuebbles, D.J., et al., 2017: Executive summary. In: Climate Science Special Report: Fourth National Climate Assessment, Volume I ("CSSR") [Wuebbles, D.J., et al.(eds.)]. U.S. Global Change Research Program, Washington, DC, USA, p. 13, doi:10.7930/J0DJ5CTG.
2. Delaware Valley Regional Planning Commission's (DVRPC) "Municipal Management in a Changing Climate" Municipal Implementation Tool #31 https://www.dvrpc.org/Reports/MIT031.pdf
3. US EPA's Climate Indicators Page https://www.epa.gov/climate-indicators/weather-climate
4. University of California, Davis https://climatechange.ucdavis.edu/science/carbon-sequestration/biological/
5. Pennsylvania Climate Impacts Assessment, 2021 https://www.dep.pa.gov/Citizens/climate/Pages/impacts.aspx
6. i-Tree Landsape v4.3.1 (n.d.). Retrieved May, 2021 from https://landscape.itreetools.org/
7. National Centers for Environmental Information: National Oceanic and Atmospheric Administration retrieved from https://www.ncdc.noaa.gov/cdo-web/search
8. DVRPC Energy and Emissions Profile for Malvern Borough, Chester County, PA https://www.dvrpc.org/webmaps/MunicipalEnergy/mcdDetail.aspx?mcdcode=4202946792
9. Climate Nexus https://climatenexus.org/climate-change-issues/
10. Center for Disease Control (CDC) Climate and Health fact sheet: https://www.cdc.gov/climateandhealth/pubs/AIR-QUALITY-Final_508.pdf
11. US EPA's Ozone Pollution Page https://www.epa.gov/ozone-pollution-and-your-patients-health/course-outline-and-key-points-ozone#health%20effects
12. PA DEP's Air Quality Partnerships Page https://www.ahs.dep.pa.gov/AQPartnersHTML/health.htm