



Pennsylvania Climate Impacts Assessment and Climate Action Plan 2021

**Environmental Justice Advisory Board
November 16, 2021**

Tom Wolf, Governor

Patrick McDonnell, Secretary

Today's Presenter



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DEP Climate Program

Pennsylvania Climate Change Act (Act 70 of 2008) Requires DEP to:

- Develop a [climate impacts assessment](#) (3 yrs.)
- Prepare and update a [climate action plan](#) (3 yrs.)
- Develop an [inventory of greenhouse gases](#) (GHGs) (update annually)
- Administer a [climate change advisory committee](#) (CCAC) (bimonthly)
- Set up a voluntary registry of GHG emissions ([TCR](#))

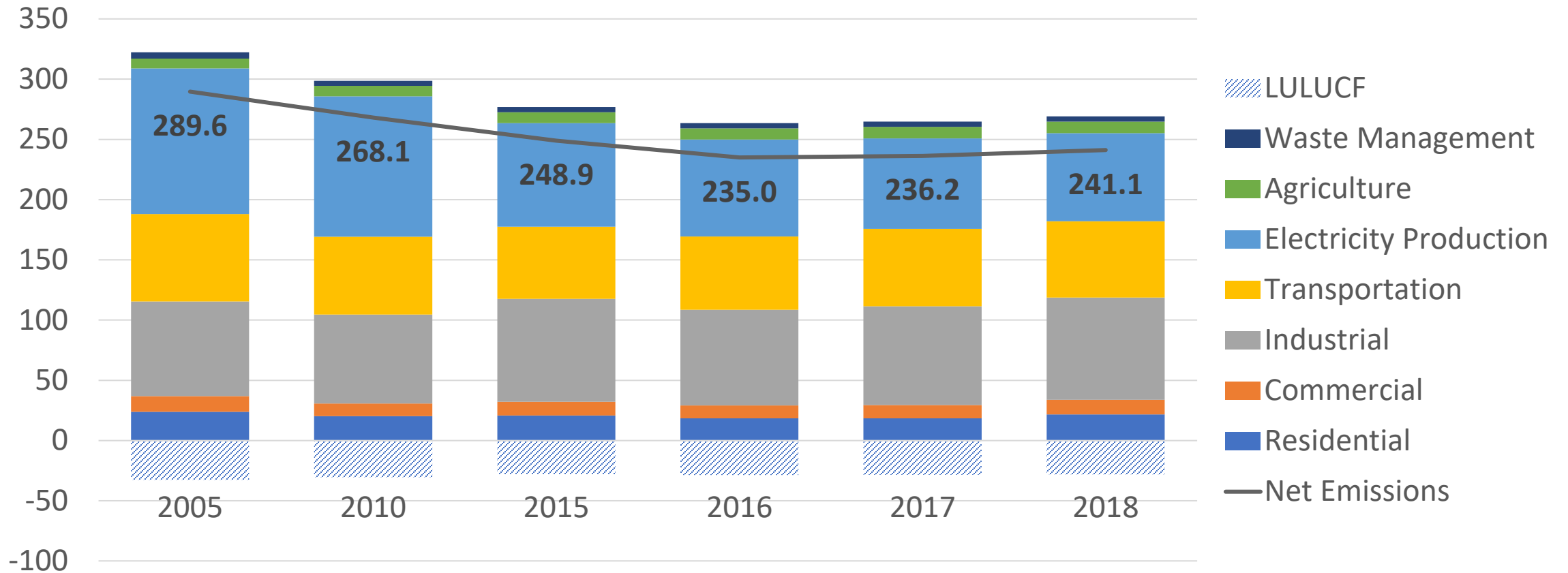
Why a Climate Program?

“Climate change is the most critical environmental threat confronting the world...Given the urgency of the climate crisis facing Pennsylvania and the entire planet, the commonwealth must continue to take concrete, economically sound and immediate steps to reduce emissions.”

– *Governor Tom Wolf, October 3, 2019*

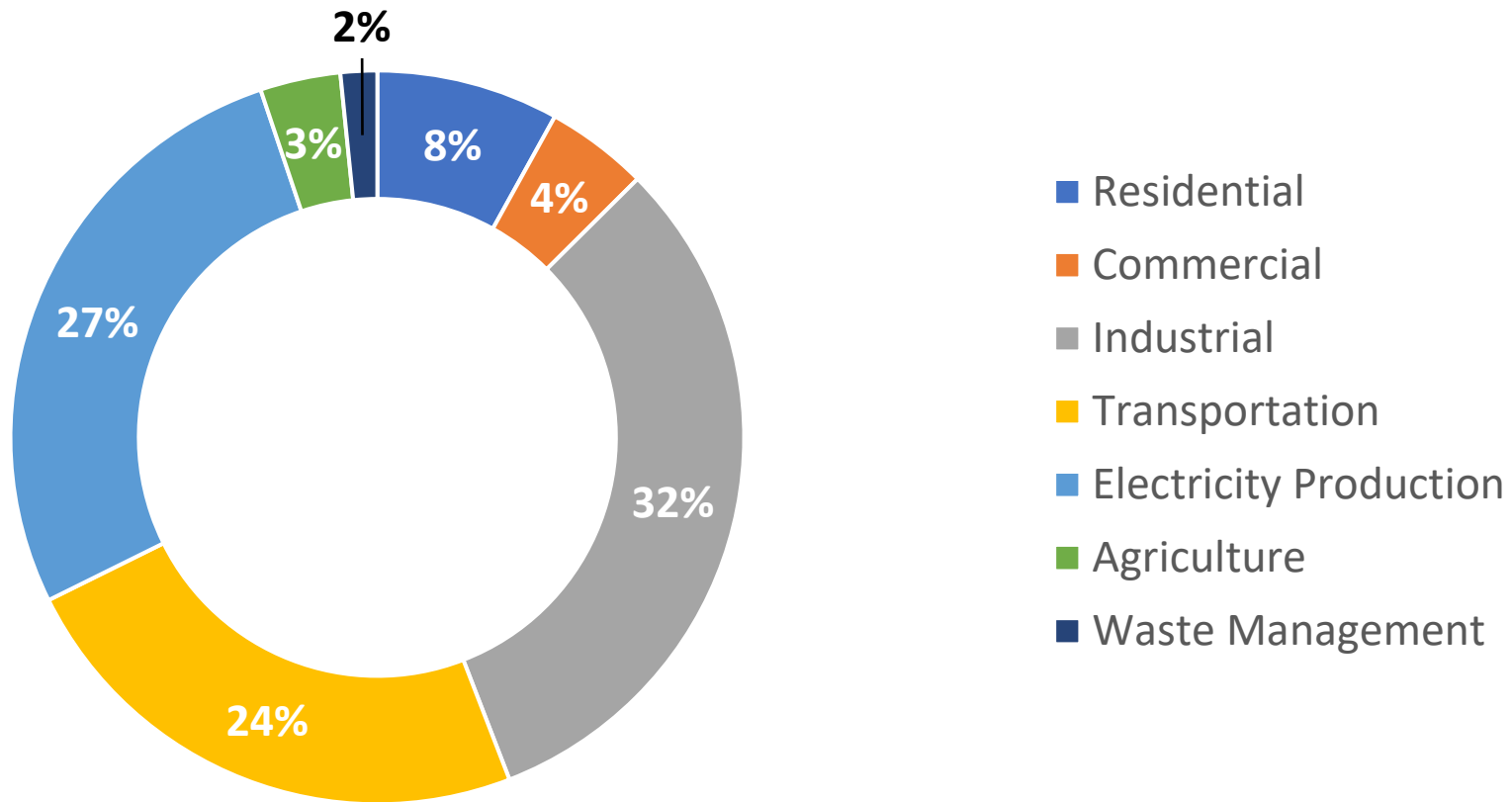
GHG Emissions Inventory

GHG Emissions (MMT CO_2e) by Sector



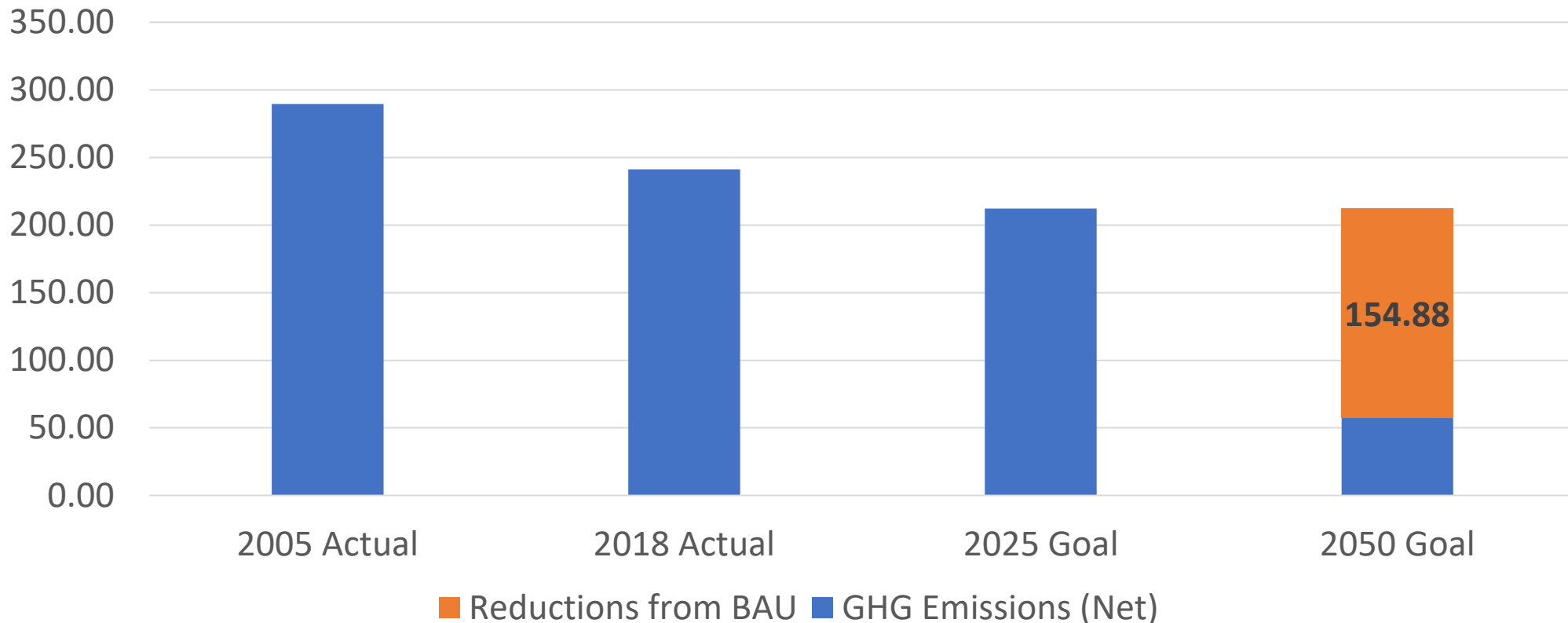
GHG Emissions Inventory

Pennsylvania 2018 GHG Emissions
% of Total by Sector



Greenhouse Gas Reduction Goals

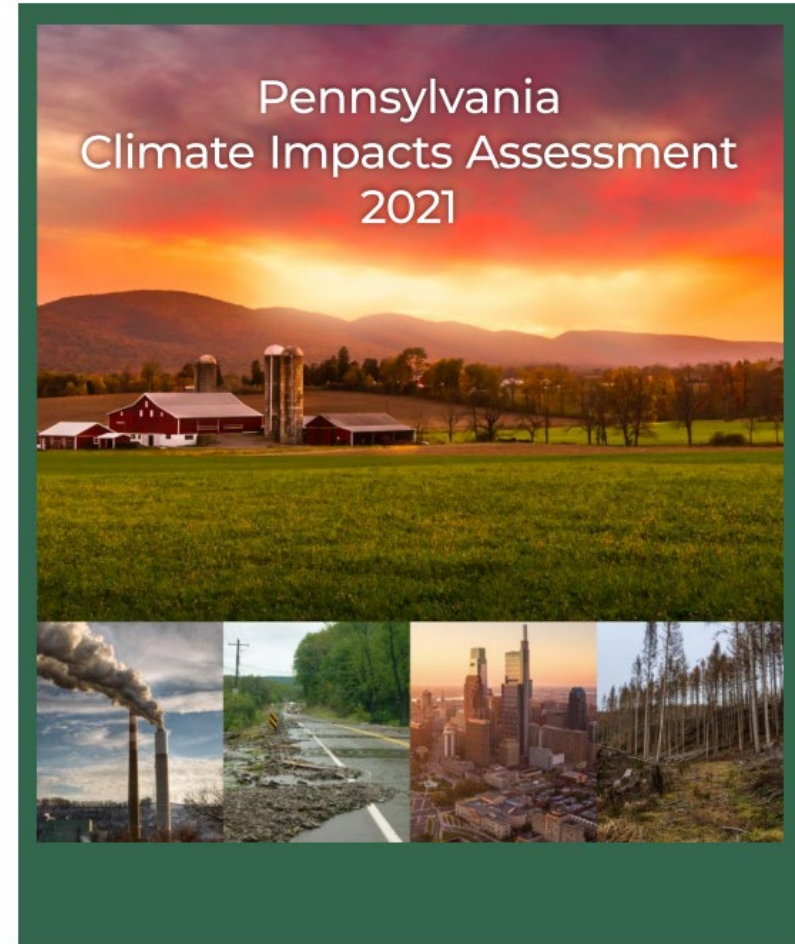
GHG Reductions Needed to Meet 2025 and 2050 Goals (MMT_{CO2e})



2021 Impacts Assessment Focus Areas and Updates

Purpose of this Report:

- Update: Reflect latest available information on climate science and impacts
- Risk-based approach: Understand relative timing and severity of impacts to inform overall risk ratings and priorities for adaptation
- Make it actionable: Directly inform priority adaptation actions in the Climate Action Plan (CAP)



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Impacts Assessment – Climate Projections

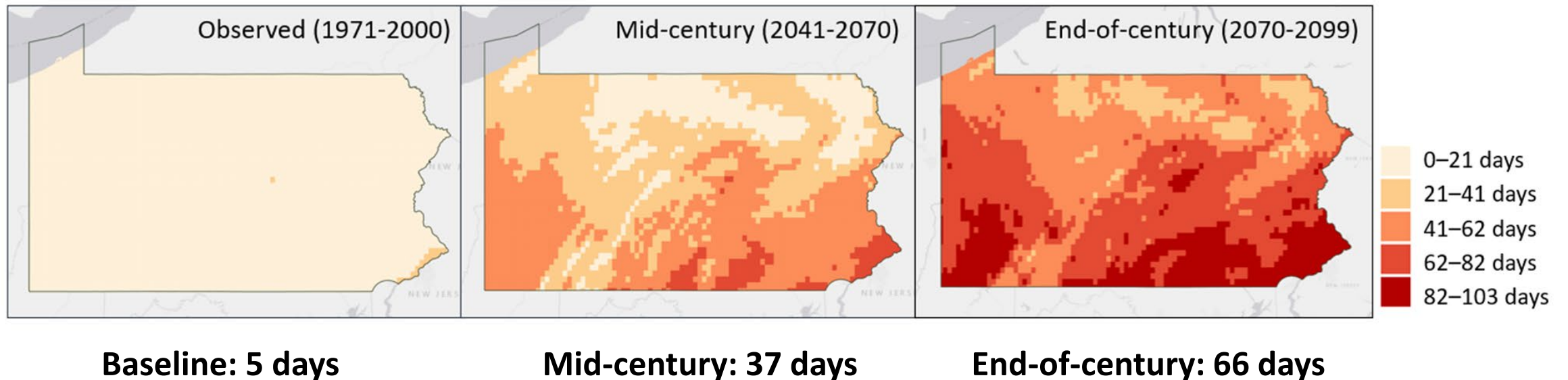
Climate Projections - PA is getting warmer and wetter.

- Over past 110 years, temperatures in PA increased by more than 1.8°F and are expected to increase by an additional 5.9°F by 2050
- Cities are expected to see increased frequency of 100+ degree days
- Annual precipitation in PA has increased by 10% since early 20th century and is expected to increase by another 8% by 2050, with a winter increase of 14%

Impacts Assessment – Climate Projections

Observed and projected annual days with temperatures above 90°F

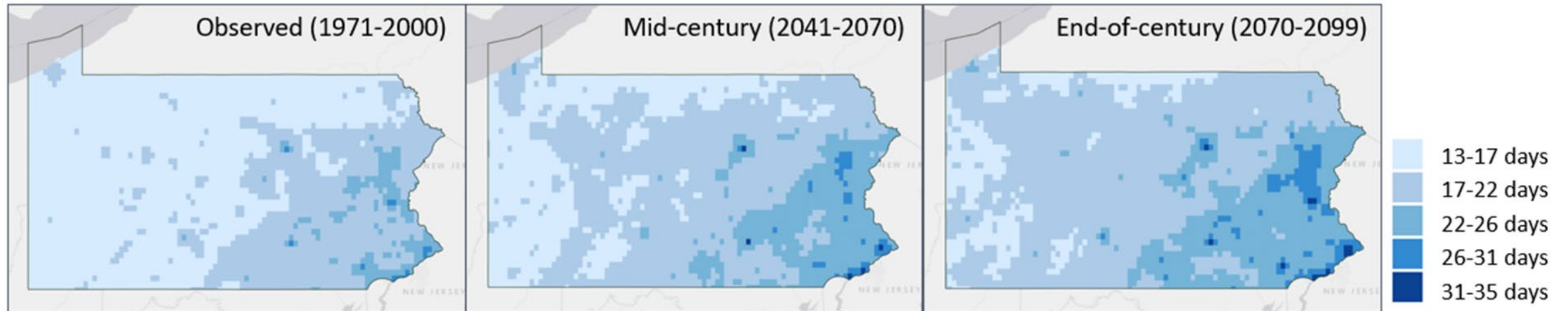
Average Annual Number of Days with Temperatures >90°F



Impacts Assessment – Climate Projections

Observed and projected annual days with “very heavy” precipitation

Number of Days with Very Heavy Precipitation

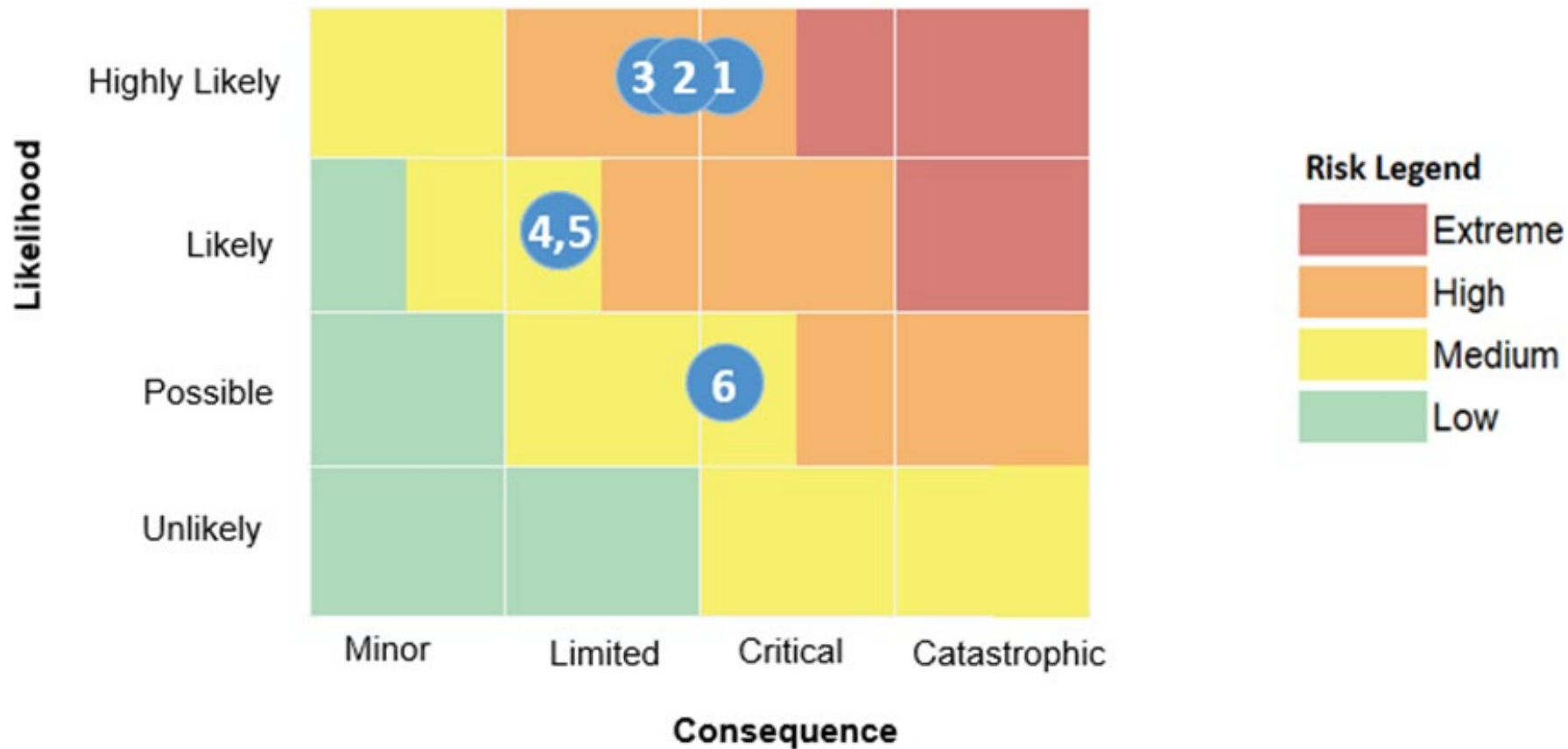


Baseline: 12.4 days

Mid-century: 15.4 days

End-of-century: 16.8 days

2050 Risk Assessment Results



1 = Increasing average temperatures

2 = Heavy precipitation and inland flooding

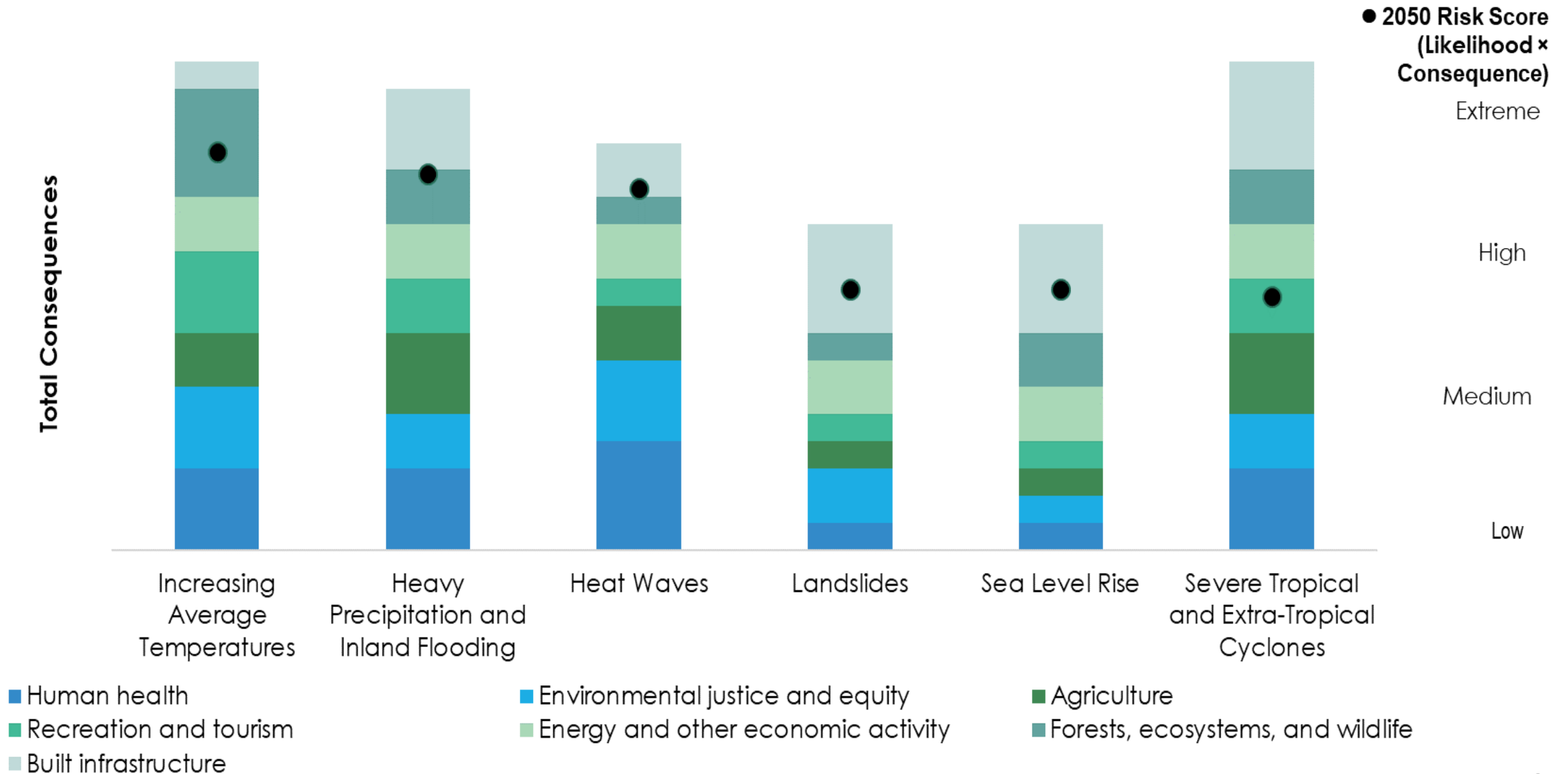
3 = Heat waves

4 = Landslides

5 = Sea level rise

6 = Severe tropical and extra-tropical cyclones

2050 Risk Assessment Results



2050 Risk Assessment Results

Consequence Category → Hazard	Human health	Environmental justice and equity	Agriculture	Recreation and tourism	Energy and other economic activity	Forests, ecosystems, and wildlife	Built infrastructure	Overall Risk Rating
Increasing average temperatures	12	12	8	12	8	16	4	10.7
Heavy precipitation and inland flooding	12	8	12	8	8	8	12	9.9
Heat waves	16	12	8	4	8	4	8	9.3
Landslides	3	6	3	3	6	3	12	5.6
Sea level rise	3	3	3	3	6	6	12	5.6
Severe tropical and extra-tropical cyclones	6	4	6	4	4	4	8	5.3

Risk Assessment Key Findings

- **Flooding is currently the highest-risk hazard** facing Pennsylvania, and flood risks are projected to increase; at the same time, risks from **increasing average temperatures and heat waves** could rise to be as high as flooding is today by mid-century
 - Flooding from heavy rain events affects built infrastructure, human health, and agriculture, with ripple effects throughout the economy
 - Increasing average temperatures could affect nearly every aspect of life
- **Heat waves will become increasingly common** and will create particular health and economic risks for vulnerable populations
- **All hazards could affect public health negatively**—especially heat waves, increasing temperatures, and flooding
- **Climate change will not affect all Pennsylvanians equally.** Some may be more at risk because of their location (and inability to relocate), income, housing, health, or other factors
- **Landslides and sea level rise can cause severe impacts in the locations where they occur,** but pose relatively low risks statewide
- **Severe tropical storms, flooding, and landslides already pose risks,** and these could become more likely or severe in the future

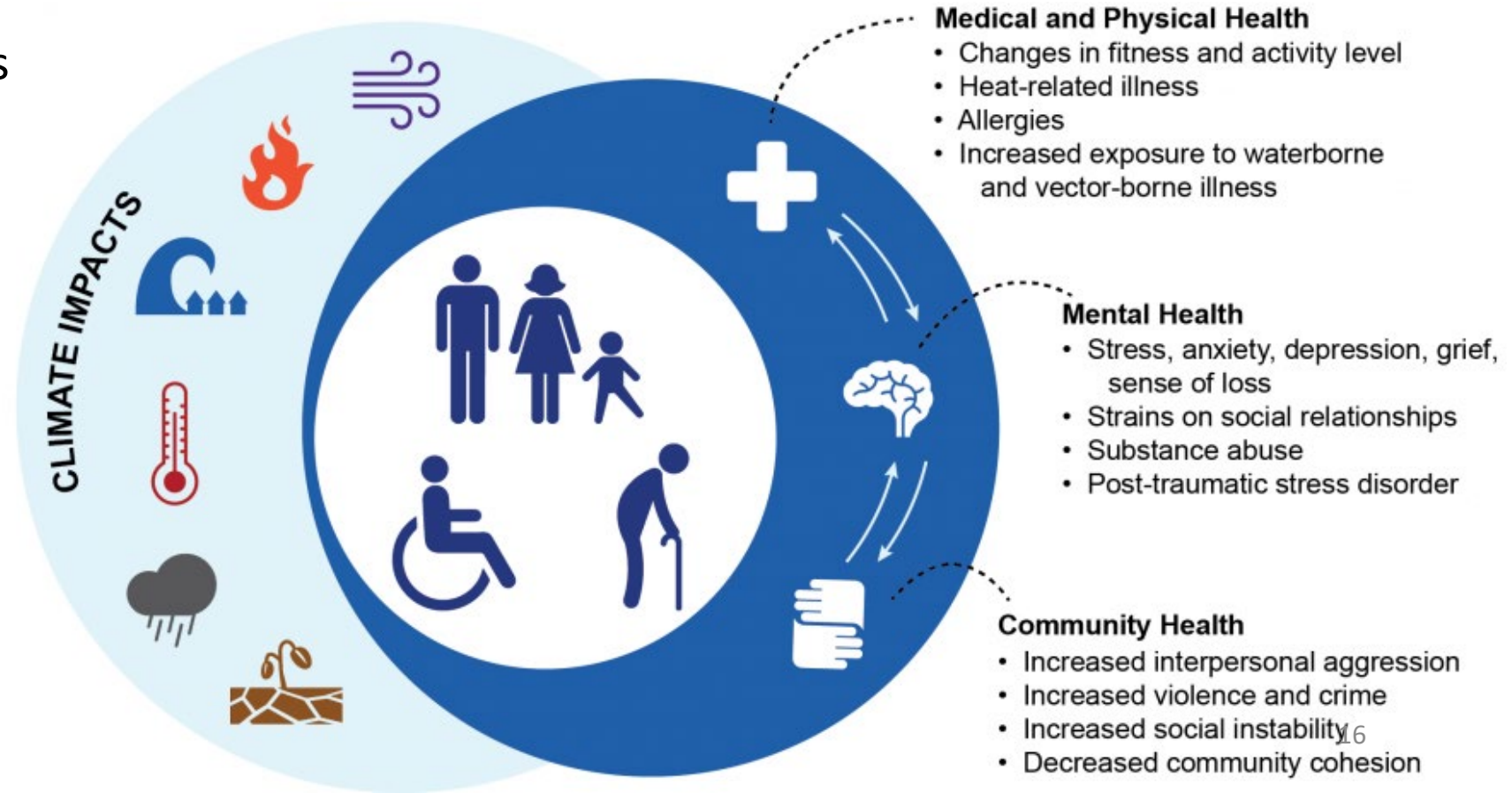
Impacts to Human Health

Increasing average temperatures and heat waves are projected to increase:

- heat-related illnesses or deaths
- allergies
- violence and crimes
- anxiety and mood disorders

Flooding and severe cyclones can also have severe health impacts such as:

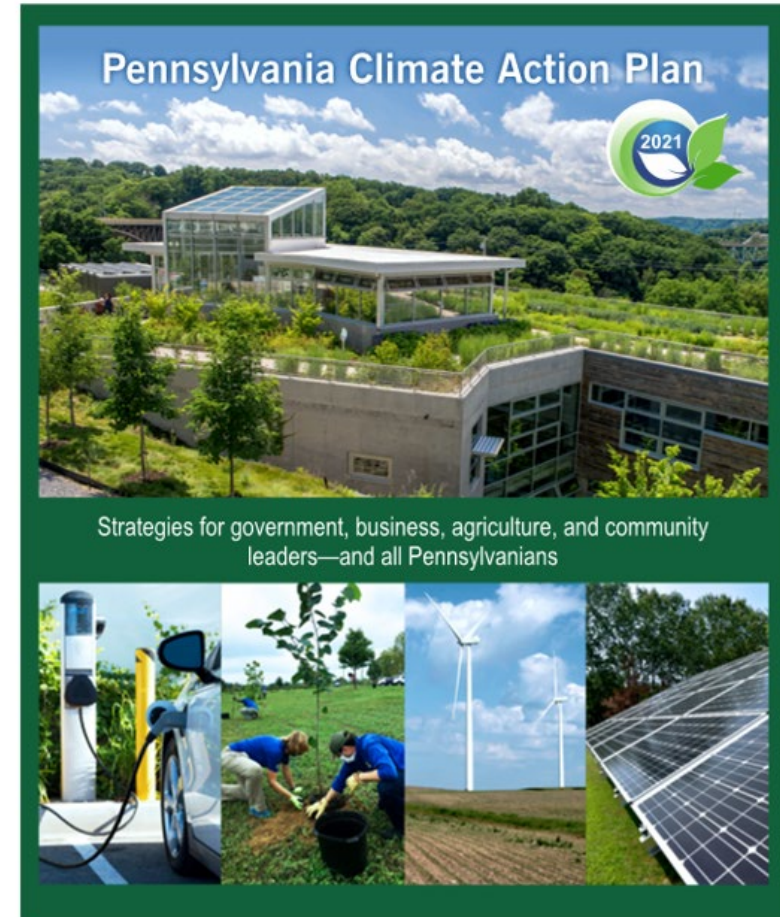
- disrupting critical services
- making conditions are more hazardous



Pennsylvania Climate Action Plan 2021

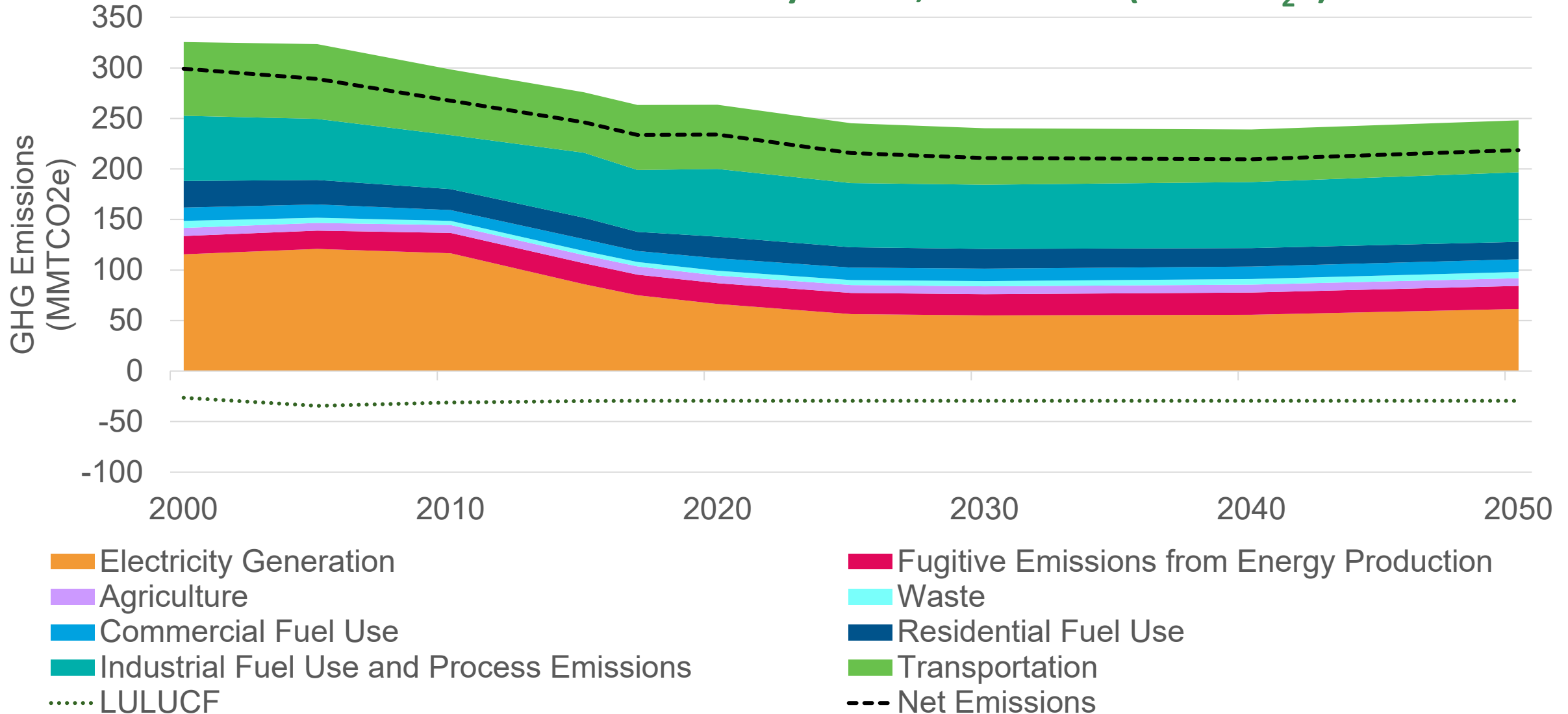
Purpose of this Report:

- Updated BAU Emissions Scenario Projections
- Outlines a pathway to reaching PA's GHG reduction goals: 26% by 2025 and 80% by 2050 from 2005 levels
- Quantifies GHG reduction and economic costs/benefits of climate action
- Includes discussion on the role of “enabling technologies” in meeting PA's GHG reduction goals
- Priority adaptation actions directly informed by the Pennsylvania Climate Impacts Assessment 2021
- Focus on equity throughout



Pennsylvania Climate Action Plan – Business As Usual

Business-as-usual net emissions by sector, 2000-2050 (MMTCO₂e)



Pennsylvania Climate Action Plan – Strategies

Start Now and Implement in 5 years:

- Institute the most up-to-date building codes for energy efficiency.
- Improve residential and commercial energy efficiency.
- Increase distributed on-site solar energy.
- Increase Industrial energy efficiency and fuel switching.
- Use programs and incentives to increase energy efficiency for agriculture.
- Incentivize use of distributed combined heat and power.
- Keep nuclear energy generation at current levels.

Pennsylvania Climate Action Plan – Strategies

Start Now and Implement in 10 years:

- Incentivize building electrification.
- Increase fuel efficiency of light-duty vehicles and reduce vehicle miles traveled for single-occupied vehicles
- Increase use of light-duty electric vehicles.
- Institute a low-carbon fuel standard to reduce the carbon intensity of transportation fuels.
- Increase capture of biogenic methane from non-fossil sources, including animal manure, food waste, and landfill gas, for use in by commercial and industrial properties.
- Reduce fugitive methane emissions from fossil fuel extraction industries such as oil and natural gas operations.
- Provide training and tools for agricultural best practices.
- Increase land and forest management to increase carbon absorption.

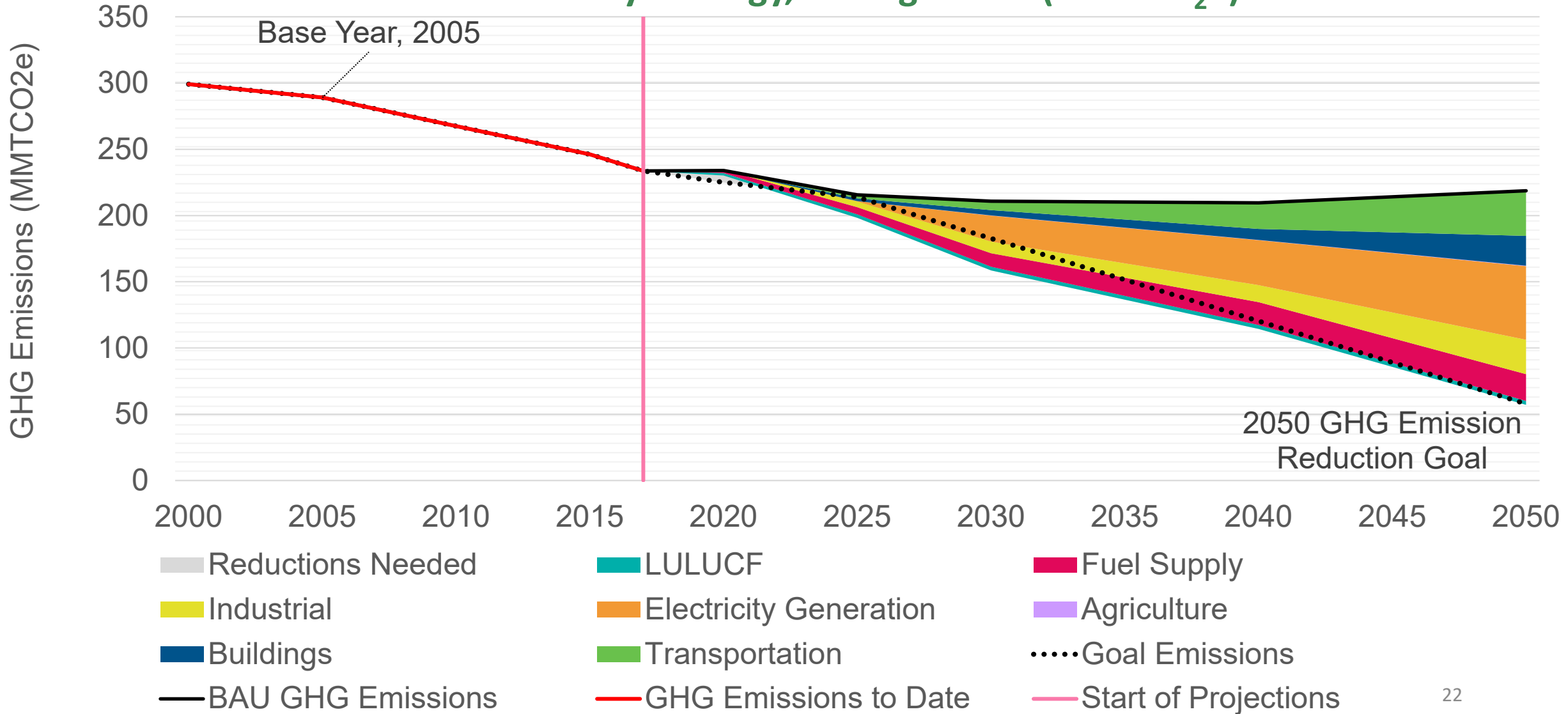
▶ Pennsylvania Climate Action Plan – Strategies

Start Now and Implement in 10+ years:

- Implement a multi-state Memorandum of Understanding to make all medium- and heavy-duty vehicle sales zero emissions vehicles by 2050.
- Establish a carbon emissions-free grid.

Pennsylvania Climate Action Plan – Business As Usual

GHG reductions by strategy, through 2050 (MMTCO₂e)



Enabling Technologies

- Incentivizing grid-level battery storage;
- Power-to-gas and blue and green hydrogen;
- Carbon capture, utilization, and storage (CCUS);
- Direct Air Capture (DAC);
- Peak energy load and balancing strategies;
- Carbon offsets; and
- Disruptive digital technologies.

Adaptation Planning – Climate Action Plan

1. Impacts of Increasing Average Temperatures and Heat Waves on Health

2. Impacts of Flooding and Storms on Health

3. Impacts of Increasing Average Temperatures on Environmental Justice and Equity

4. Impacts of Flooding on Environmental Justice and Equity

5. Impacts of Increasing Average Temperatures on Forests, Ecosystems, and Wildlife

6. Impacts of a Warmer and Wetter Climate on Agriculture

7. Impacts of Increasing Average Temperatures on Recreation and Tourism

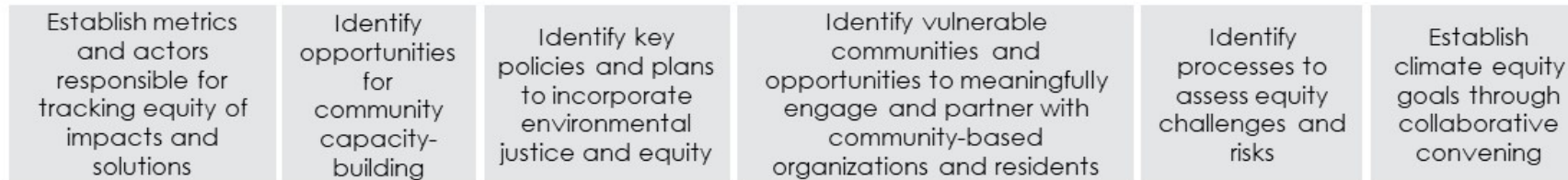
8. Impacts of a Changing Climate on Built Infrastructure

9. Impacts of Landslides on Built Infrastructure

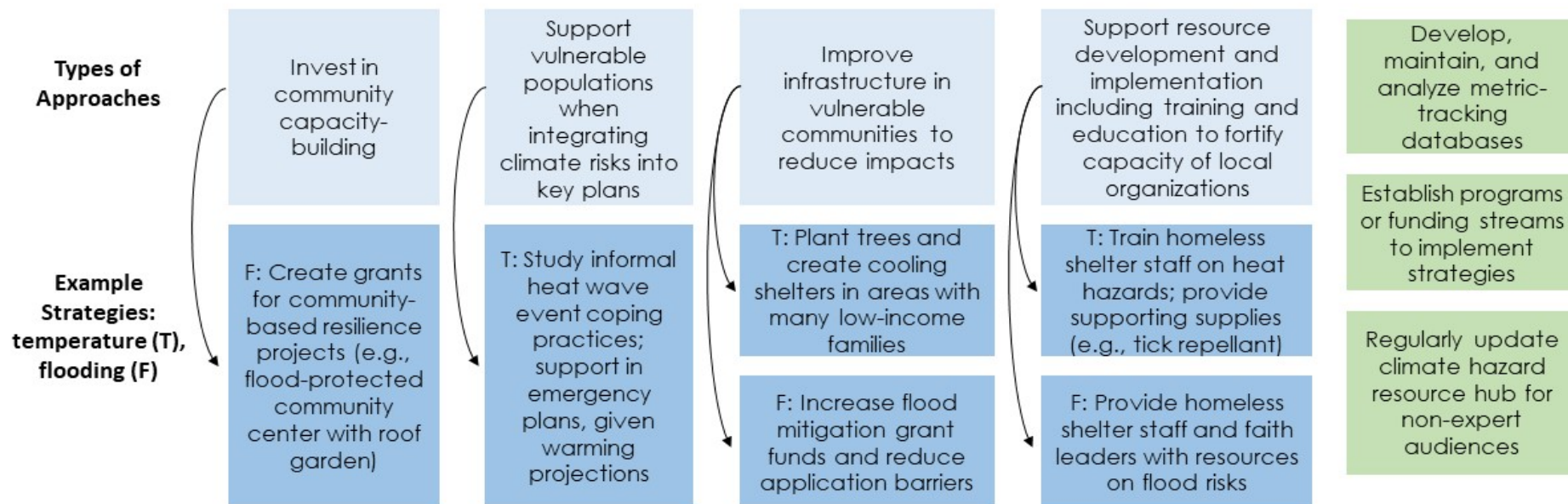
Adaptation Planning – Climate Action Plan

Example: Adaptation strategy pathway to reduce increased hazard impacts of high temperatures and flood on overburdened and vulnerable populations

Types of Foundational Actions to Understand and Prepare to Address Impacts and Vulnerabilities

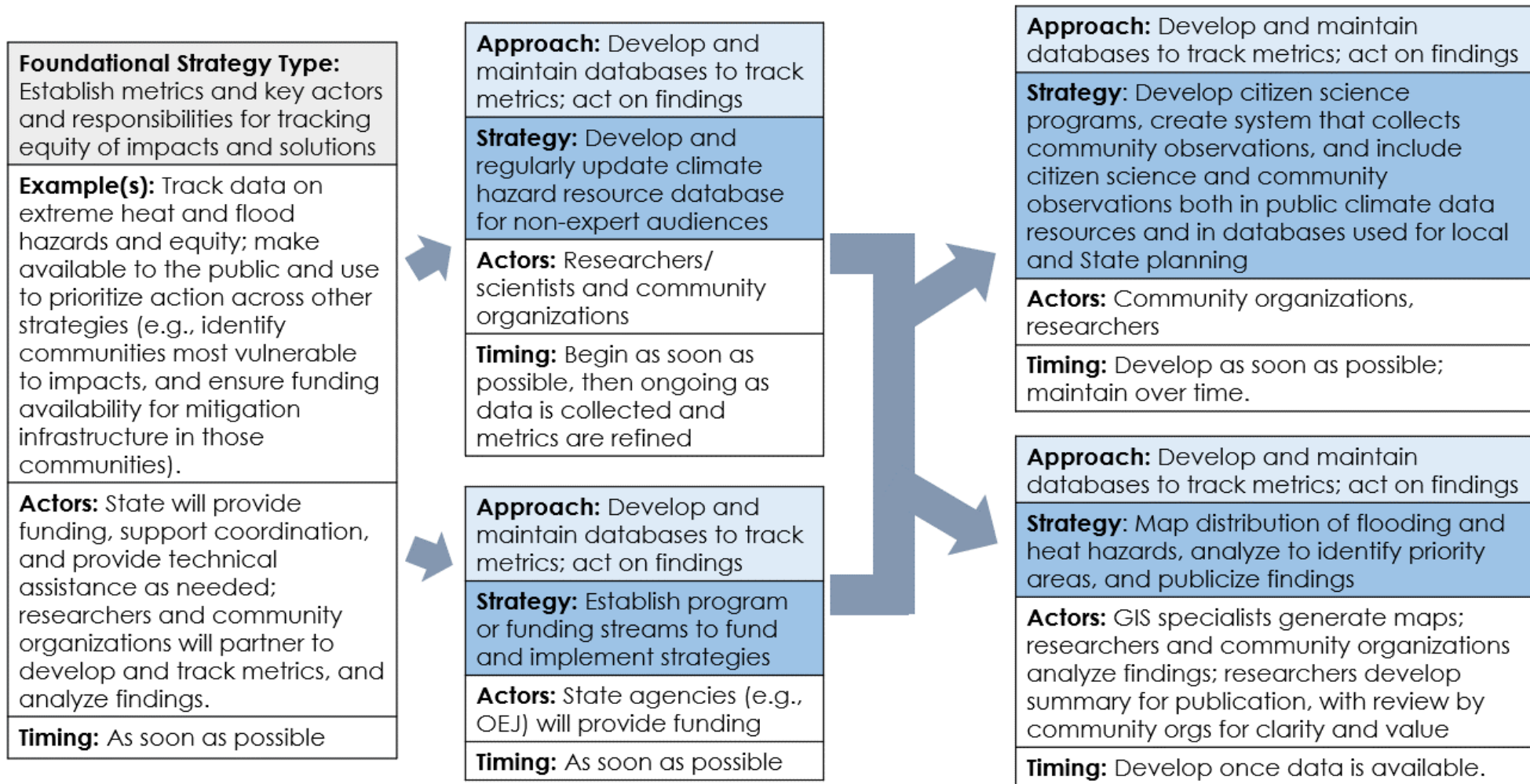


Approaches to Reduce Vulnerabilities and Manage Impacts



Adaptation Planning – Climate Action Plan

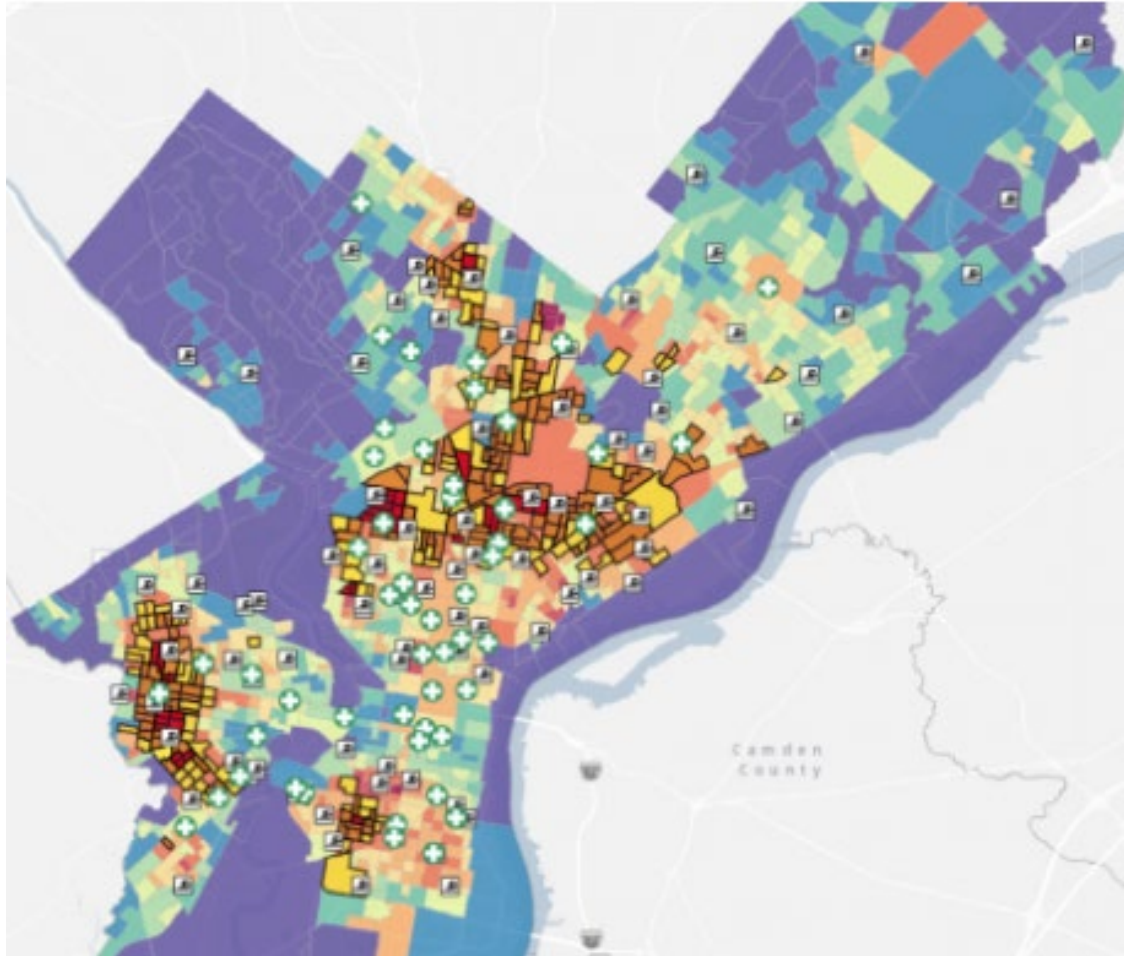
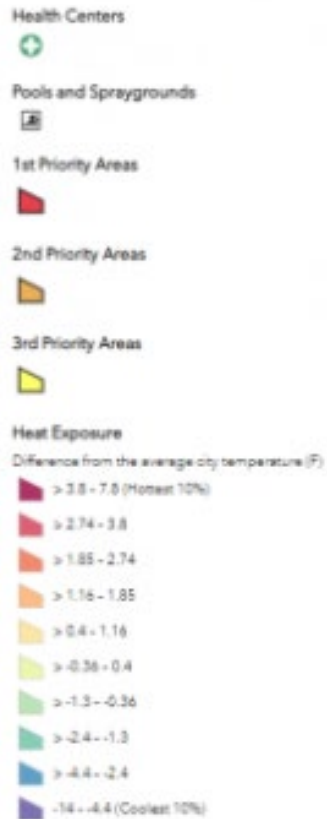
Example set of strategies to be pursued to support climate justice and counteract equity challenges resulting from increased average temperatures (top) and flooding (bottom).



Adaptation Planning – Climate Action Plan

Case Study

A Community-Driven Approach to Tackling Heat in Philadelphia



Philadelphia Heat Vulnerability Index map

Philadelphia Office of Sustainability (OOS). 2019. "Beat the Heat Hunting Park: A Community Heat Relief Plan."

https://www.phila.gov/media/20190719092954/HP_R8print-1.pdf.

OOS, 2019. "Beat the Heat Hunting Park." Kellner, Hans. July 16, 2019. "Heat Vulnerability Index highlights City hot spots." <https://www.phila.gov/2019-07-16-heat-vulnerability-index-highlights-city-hot-spots/>

Pennsylvania's Ongoing Energy and Climate Efforts

PA's Ongoing Energy and Climate Efforts

Executive Order 2019-01 directs commonwealth agencies to:

- Reduce energy use by 3% per year and 21% by 2025 from 2017 levels
- Procure renewable energy to offset at least 40% of the Commonwealth's annual electricity use
- Design and construct new buildings/renovation projects as a high-performance buildings
- Replace 25% of the state vehicle fleet with battery electric and plug-in electric hybrid cars by 2025
- **Established the GreenGov Council** – helps incorporate environmentally sustainable practices into the Commonwealth's policy, planning, operations, procurement, and regulatory functions. It promotes best practices and energy efficiency, including solar purchase for state buildings.

PA's Ongoing Energy and Climate Efforts

- **Oil and Gas Sources Emissions Control Regulations** – reduces emissions from natural gas well sites, compressor stations and along pipelines, to not only contribute to climate change mitigation, but also help businesses reduce the waste of a valuable product.
- **Act 213 of 2004, Alternative Energy Portfolio Standard** – requires electrical distribution and electrical generation companies to purchase a certain percentage of electricity from alternative generation sources.
- **Act 129 Phase IV** – expands on phase III, as electric distribution companies incorporate energy efficiency and conservation programs into their operations.
- **[DCNR's Adaptation Plan](#)** – outlines over 100 action steps to increase resiliency against climate change impacts.

PA's Ongoing Energy and Climate Efforts

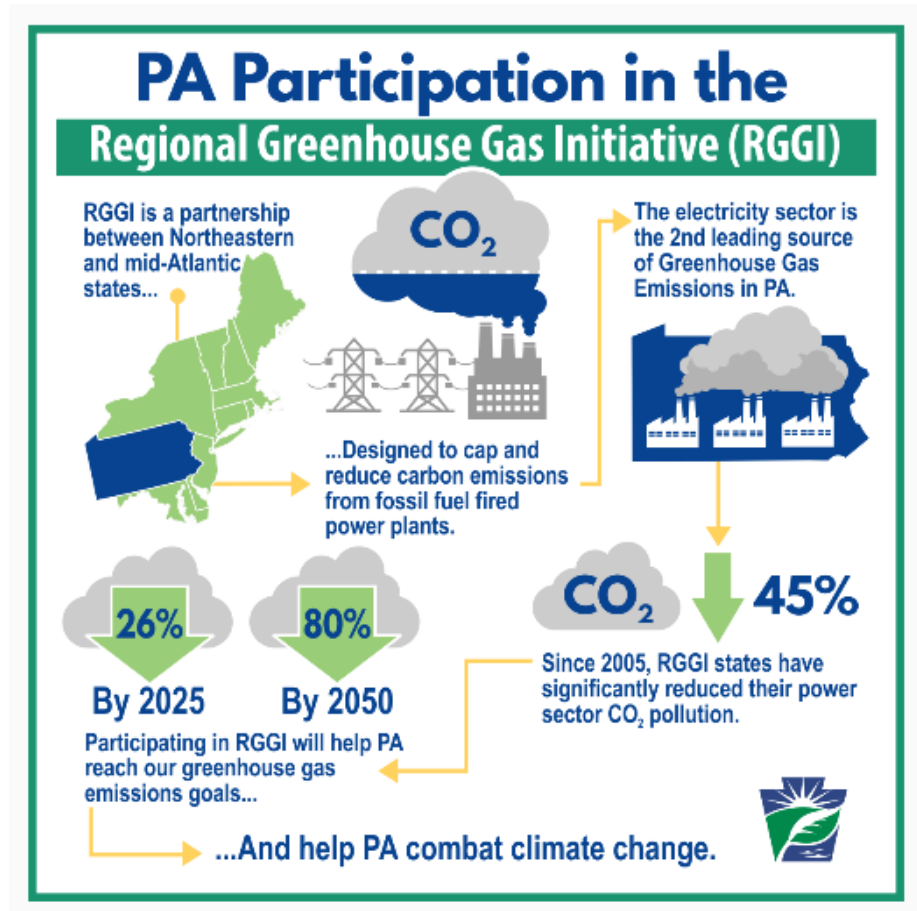
- [PennDOT's Vulnerability Study](#) – helps anticipate the impacts of extreme weather events so that transportation funding and resiliency may be prioritized.
- **ZEV Rulemaking** – coordinates standards that control smog-causing pollutants and GHG emissions of light-duty vehicles.
- **Medium- and Heavy-Duty Zero Emission Vehicles MOU** – advances and accelerates the market for electric medium- and heavy-duty vehicles.
- [EV Roadmap](#) – identifies strategies to increase the adoption of EVs. The Roadmap identifies near-, mid-, and long-term strategies to incentivize and remove barriers to EV adoption.

PA's Ongoing Energy and Climate Efforts

- **Driving PA Forward** – creates grants and rebate programs aimed at improving air quality in Pennsylvania by **spurring the transition from older, polluting diesel engines to clean engine technologies powered by electricity, compressed natural gas, propane, or clean diesel**. This initiative is a product of the Volkswagen Mitigation Trust Fund, a one-time penalty settlement that provided funds to establish a series of grants and the rebate program.
- **AFIG** – promotes the use of alternative fuels in Pennsylvania. AFIG has operated four incentive programs: Alternative Fuel Vehicle Rebate Program, AFIG Grant Program, AFIG Fixing America's Surface Transportation (FAST) Act Infrastructure Program, and Alternative Fuels Technical Assistance Program.

PA's Ongoing Energy and Climate Efforts

- **RGGI** – reduces GHG emissions from the power sector while also generating economic growth. It sets a regional cap on emissions from electric power plants.



PA's Ongoing Energy and Climate Efforts

- **PEDA COVID-19 Restart Grant** – awarded \$1.7 million in grant funding to restart 11 clean energy projects disrupted by the COVID pandemic in urban, rural with an emphasis on environmental justice neighborhoods. The projects were intended to: Re-hire workers or hiring of additional workers to complete the project quickly, make immediate equipment payments to restart the supply chain, and overcome lost revenue due to market stagnation. Clean energy projects supported included: 4 solar projects, 3 energy efficiency projects, 1 solar & energy efficiency project, 1 EV charger project, and 2 high performance building projects.
- **C-PACE expansion** – provides business property owners with low-interest, long-term loans for clean energy and clean water projects that are repaid as property tax to benefit the community.

PA's Ongoing Energy and Climate Efforts

- **DEP's Local Climate Action Program** – allows local governments and college students to work together to develop GHG inventories and climate action plans.
- **Shared Energy Manager Program** – DEP hired a contractor to serve as a part-time Shared Energy Manager (SEM) for five jurisdictions that had participated in DEP's Local Climate Action Program (LCAP). The SEM supported those local governments in implementing many of the energy-related strategies from their CAPs such as energy benchmarking, energy audits, solar PV feasibility assessments, development of energy management plans, and alternative fuel evaluations for fleet vehicles.
- **PA Climate Leadership Academy** – advances the capacity of state and local government agencies, infrastructure organizations, and businesses to develop and implement sound climate change initiatives via comprehensive training programs.



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION



Energy Programs Office

Thank you!

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DEP Climate Website: www.dep.pa.gov/climate

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