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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Energy Programs Office

Climate Change Advisory Committee Meeting

April 27, 2021

Tom Wolf, Governor

Patrick McDonnell, Secretary

Agenda

- **Introduction**
  - Approval of February minutes
- Summary of CCAC Feedback
- ICF Presentation on 2021 CAP
  - 2021 CAP discussion
- Break
- Public Comment
- Updates
- New Business
- Next Steps/Next meeting

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Tentative 2021 IA/CAP Review Timeline

Meeting Date	Materials	Shared w/ CCAC	Feedback Requested
2/23/2021	- Final IA with refined findings - Updated Draft CAP with supporting analysis information incorporated (GHG mitigation results, enabling technologies, adaptation pathways) - Initial economic and co-benefits information, as available	2/9/2021	3/2/2021
4/27/2020	- Draft Final CAP and supporting analysis information, including all near final economic and co-benefits analyses	4/20/2021	5/11/2021
6/22/2021	- Final CAP from ICF	6/15/2021	TBD (letters)

Outcomes of CCAC Dec. Feedback

Materials Provided for Review	Committee Members Who Provided Feedback	# of Written Comments and Questions
2021 Climate Action Plan Final Draft	5	Written – 95
February 2021 Meeting Slides	8	Written – 3 Verbal – 23

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Outcomes of CCAC Feb. Feedback

- ***Feedback: Editorial/wordsmithing comments, comments to suggest additional information be added for clarification, and suggested formatting changes (~55 written comments received).***
  - **Decision:** Most comments were taken and resulting changes incorporated into the CAP
- ***Feedback*: *Reminder to be consistent throughout the report when using $MTCO_2e$ and $MMTCO_2e$. (18 written comments received).***
  - **Decision:** This has been addressed throughout the report – in general, most graphs related to the baseline GHG inventory and BAU projections are in $MMTCO_2e$, while the strategy-focused sections and graphs are in $MTCO_2e$ (this rule does not apply everywhere, however).

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Outcomes of CCAC Feb. Feedback

- ***Feedback: Request to include on-site/distributed solar as an active strategy for the building sector. (2 verbal comments received, 1 written comment received).***
  - ***Resulting Changes*:**
    - Re-ran IPM to include separate generation categories for distributed and grid-scale solar.
    - Built out a new strategy that estimates GHG emissions reductions from the addition of on-site, distributed solar installations.
    - Added on-site solar strategy to CAP report and included a discussion on associated impacts/implementation.

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Outcomes of CCAC Feb. Feedback

- ***Feedback: Requested clarification on whether stretch codes can actually be required by PA, or if they are only a voluntary option (2 written comments received).***
  - **Decision:** Added clarification to the CAP report which explains that the existing requirement is to review codes once every 3 years. Code updates are not in the BAU, since there is not a requirement to actually update the code. The text in the Building Codes strategy specifies the creation of a single stretch code for PA Department of Labor and Industry approval to allow uniform adoption across the Commonwealth.

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Outcomes of CCAC Feb. Feedback

- ***Feedback: There should be another version of the BAU Electricity Generation by Fuel Type graph with the proposed pathway to achieve the 80% reduction in 2050. (1 written comment received, 1 verbal comment received).***
  - ***Resulting changes:*** *We have included a corresponding wedge chart showing policy case electricity generation by fuel type.*

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Outcomes of CCAC Feb. Feedback

- ***Feedback: Abandoned mine lands do not revert to mature forestland, they may be better suited for targeted placement of solar, which could continue to provide carbon sequestration through vegetated plantings. (1 written comment received).***
  - ***Resulting Changes*****:** Added more details in the discussion section of the land-use sequestration strategy that highlights DEP's award-winning program focused on reforestation efforts on abandoned mine lands. Also added additional information on the use of lands and resilience of tree types to climate change.

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Outcomes of CCAC Feb. Feedback

- ***Feedback: It might helpful to know and/or reference that the PUC has issued a Secretary Letter formally soliciting comments regarding the potential ownership of storage by the EDCs. (1 written comment received).***
  - **Resulting Changes:** Added a sentence to the "Why It Matters for Pennsylvania" section of the battery storage enabling technology that says the PUC has issued a letter soliciting comments regarding EDC battery ownership.

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Outcomes of CCAC Feb. Feedback

- ***Feedback: How is the grid defined? Specifically, what makes the grid distinct from the electricity generation sector? (1 written comment received)***
  - **Decision/Note:** Generally, the grid includes the generation and delivery of electricity to consumers. Carbon Emissions Free Grid strategy section now includes a sentence that says “The electric grid is the network that generates and delivers electricity to consumers and includes generating stations, electrical substations, and transmission and distribution power lines.”

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Outcomes of CCAC Feb. Feedback

- ***Feedback: Request to clearly label each of the GHG reduction strategies so that the reader can easily keep track of them and find the corresponding information (1 written comment received).***
  - **Decision:** We have updated each of the strategies to have an associated letter – they are now listed in the CAP Report starting with this letter (e.g., "A. Support Energy Efficiency Through Building Codes"). We chose to use letters because numbers give the appearance that the strategies are ranked.

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Outcomes of CCAC Feb. Feedback

- ***Feedback: Clarify section that explains the process for prioritizing strategies, specifically who actually conducted the evaluation and scoring (1 written comment received).***
  - **Decision:** More language was added to the CAP report to explain how and who conducted the evaluation and scored the results.
- ***Feedback: When looking at hydrogen as an enabling technology, it is important to consider not just the production side, but also what end-users will have to consider before deploying it (i.e., equipment retrofits) (1 written comment received).***
  - **Decision:** Added more detail to the enabling technology section for hydrogen that explains the context around using hydrogen as a vehicle fuel, specifically related to upfront fixed costs and vehicle/equipment incremental costs (as compared to EVs).

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Outcomes of CCAC Feb. Feedback

- ***Feedback: Suggest rewording the description of blue hydrogen because most of the public may inadvertently misinterpret this to mean that blue hydrogen contains less carbon (1 written comment received).***
  - **Decision:** A text box was added to the hydrogen enabling technology section that explains key terminology including power-to-gas, blue hydrogen, and green hydrogen. Additional clarification was added within this text box.

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2021 Pennsylvania Climate Action Plan

CCAC Meeting April 27, 2021

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Agenda

- Summary of CAP Updates
- GHG Modeling Overview and Updates
- Draft Economic Modeling Results for GHG Reduction Strategies
- Adaptation Pathways
- Implementation Approach
- Next Steps

Today's Presenters from ICF

Cassie Bhat
Impacts Assessment Lead

Deb Harris
Project Manager, CAP Lead

Bill Prindle
Sustainable Energy and Climate Expert

Bansari Saha
Economics Expert

Adam Agalloco
Energy and Climate Expert

Logan Pfeiffer
Report Lead

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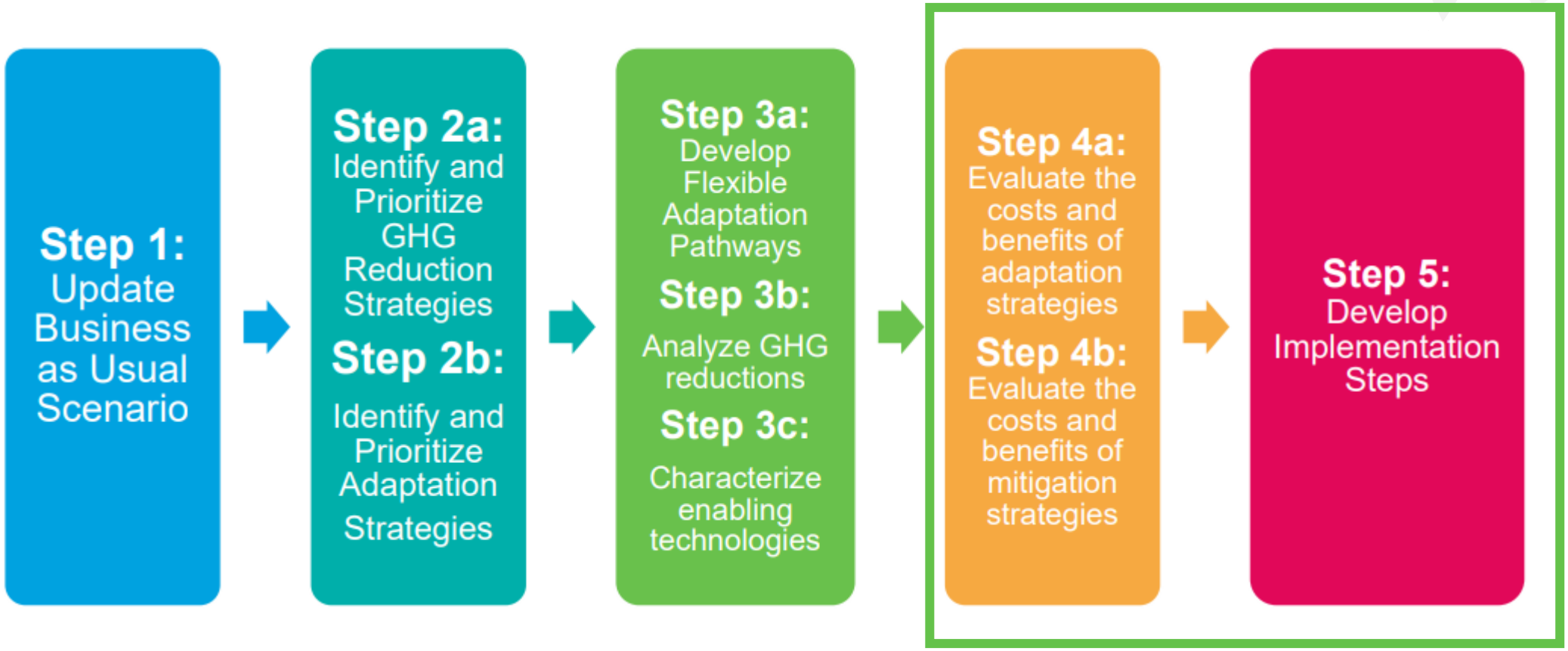
Climate Action Plan: General Approach



CAP Updates

1) Reviewed and addressed CCAC feedback as determined with DEP

2) Updated modeling for a pathway to achieve 80% GHG emission reductions by 2050, based on CCAC feedback

3) Developed economic modeling of costs and benefits of strategies

4) Developed adaptation strategy pathways for priority climate impacts identified in the IA

5) Drafted additional sections of the CAP to provide content in all sections

Remaining CAP Work to Complete

1) Collect and address feedback on the draft final plan from the CCAC

2) Complete and update Executive Summary and Appendices

3) Conduct complete final review and QC of information and modeling results

4) Editing and formatting

GHG Reduction Strategies

Updates

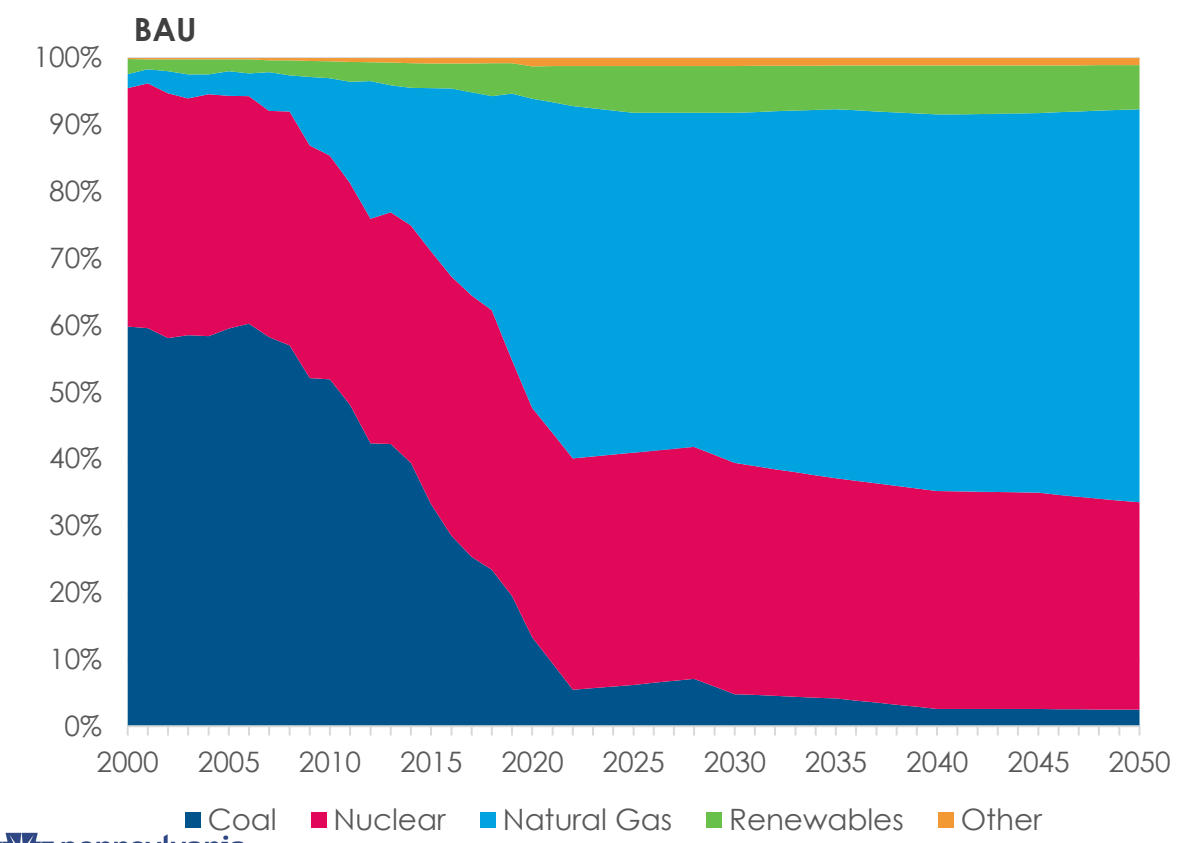
- GHG Modeling Overview and Updates
- Draft Economic Modeling Results for GHG Reduction Strategies
- Recommended Considerations for CCAC Review

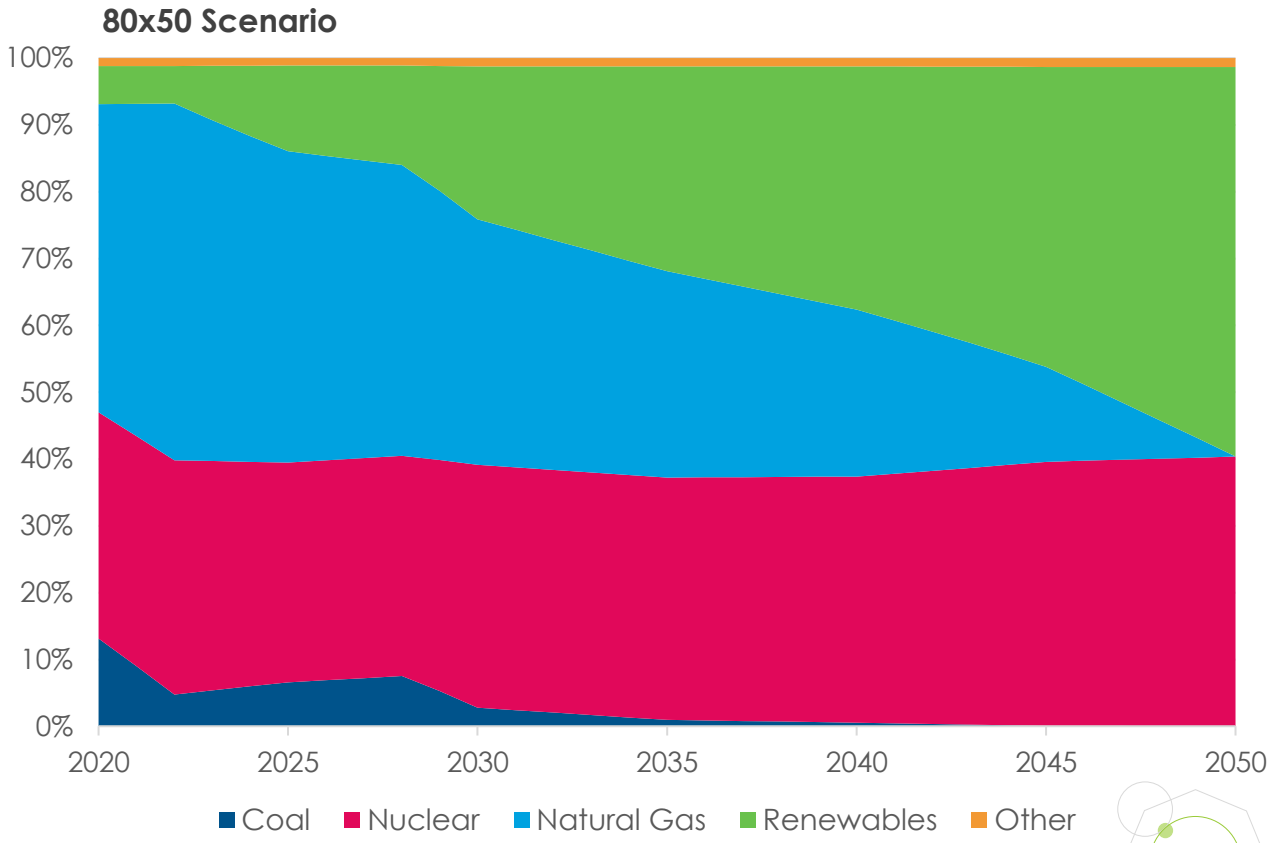
GHG Modeling Overview and Updates

- Overall GHG Reduction Modeling Results
  - Pennsylvania will come close (25.4%) to meeting the 2025 target of reducing GHG emissions 26% below 2005 levels by implementing all modeled strategies.
  - Reaching Pennsylvania's 2050 target of reducing GHG emissions 80% below 2005 levels will require the implementation of all recommended strategies across all sectors and may include the use of additional enabling technologies.
  - Reductions from electricity generation, transportation, and building strategies will be responsible for the greatest cumulative reductions through 2050.
- Updates to Modeling Results
  - Updated BAU analysis for electricity sector.
  - Added electricity generation categories for small-scale solar, broken out by residential and commercial (i.e., distributed on-site solar).
  - Low Carbon Fuel Standard (LCFS) strategy was updated to show zero GHG reductions in 2050 as the carbon intensity goal is achieved by 2050 from electrification in other transportation strategies.
  - Corrected a data pull/population error for BAU electricity generation emissions.

Electricity Generation Mix Under the BAU and 80x50 Scenarios

- Adjusted BAU to reflect the requirement for in-state Tier II generation and to reflect a waste coal set aside.
- These changes results in some economic changes within the model, including increased RGGI prices.
- Given how sensitive nuclear is – how on the margin – these resulting economic changes were sufficient to keep the nuclear units online.





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Increase Distributed Onsite Solar

Description	Key Assumptions
Includes the installation of onsite distributed solar in both the residential and commercial sectors. To maximize the benefits of this strategy, additional efforts will be needed, such as actions to expand the development of solar across the Commonwealth, legislation to help develop a robust solar industry at the distributed level, and strategies that increase the value of solar renewable energy credits (SRECs).	• Used IPM to determine the distributed solar generation through 2050, in alignment with Strategies N and O (outlined below). The modeling resulted in a clean grid (100% AEPS requirement by 2050), based on the following constraint: •The solar carve out is assumed to be in line with the Finding Pennsylvania's Solar Future Plan initially, and then will go beyond it in 2030 through 2050. This included a carveout to allow for at least 20% of the total solar to come from distributed solar resources.
Reductions from BAU in 2050	**5,819,168 MTCO2e** **Replaces 21,581 GWH of grid-supplied electricity**

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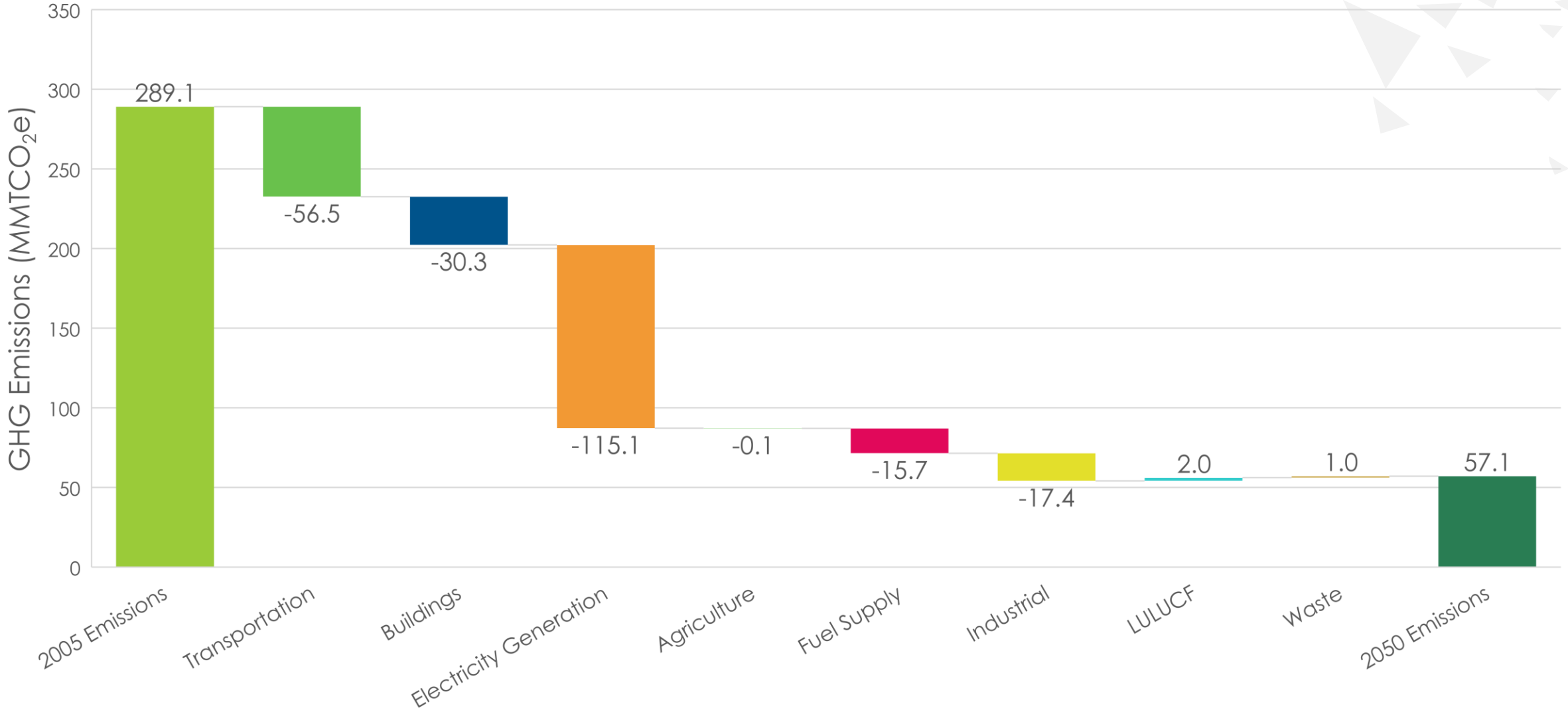
*GHG emissions associated with decreased electricity consumption from this strategy are not included in totals – a generation-based GHG accounting approach is used in line with the state inventory.

GHG Reductions from 2005 to 2050 ($MMTCO_2e$)



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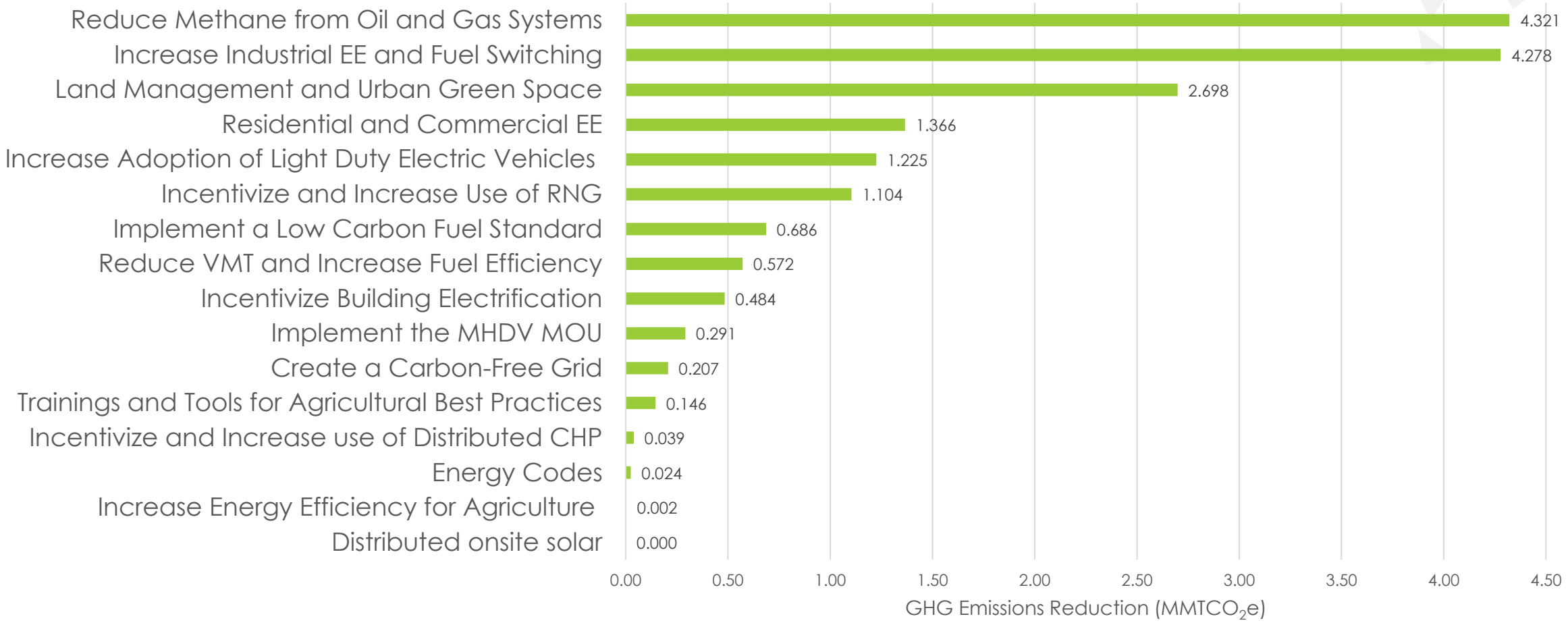
Note: Increased emissions are expected from Waste due to population growth driving higher emissions from MSW and wastewater. Increased emissions from LULUCF are due to a decline in net carbon sequestration, mainly from reductions forest land sequestration and agricultural soil carbon.

GHG Reductions from Strategies in **2025**, **Compared to BAU in 2025** ($MMTCO_2e$)



- *Note that this chart excludes strategies for which emissions reductions are not estimated. Reductions associated with electricity consumption are not included.*
- *Onsite solar will reduce 0.000296 MMTCO2e in 2025*

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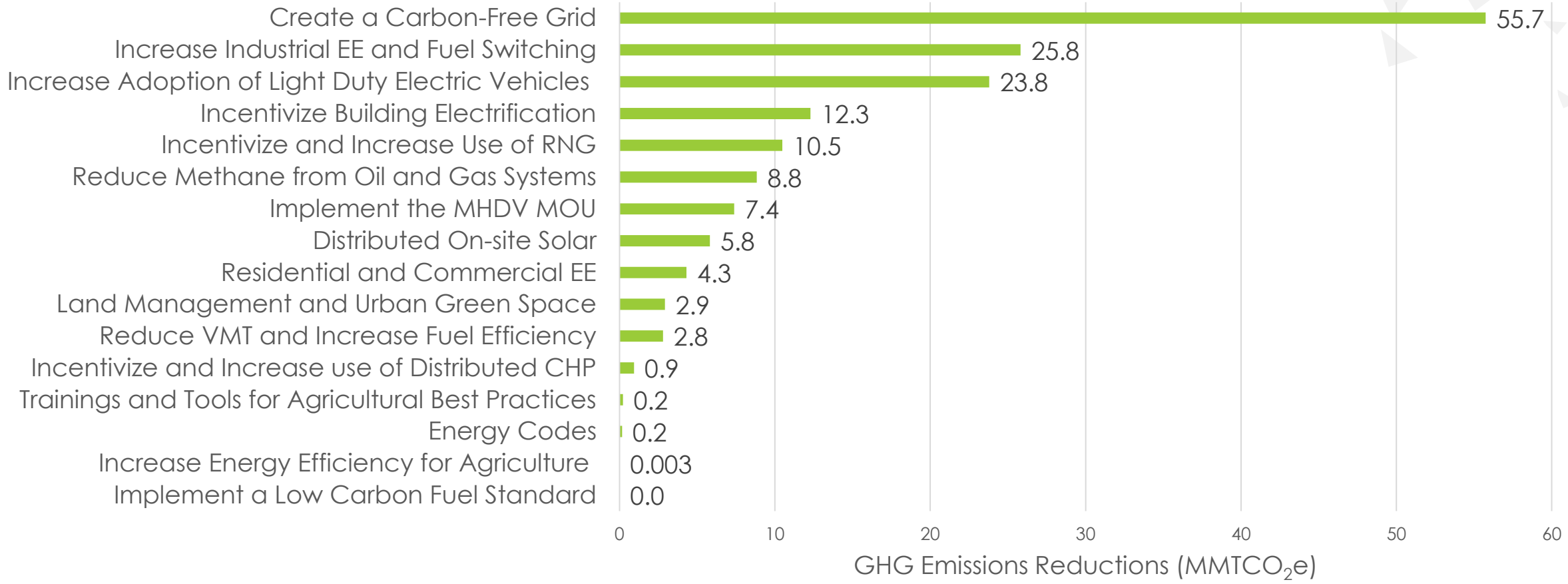
GHG Reductions from Strategies in **2050**, **Compared to BAU in 2050** ($MMTCO_2e$)



- *Note that this chart excludes strategies for which emissions reductions are not estimated. Reductions associated with electricity consumption are not included.*
- *The LCFS strategy reduces emissions prior to 2050, but the carbon intensity goal is achieved by 2050 (due to electrification from other transportation strategies), so there are no reductions expected in 2050 from the low carbon fuel standard.*

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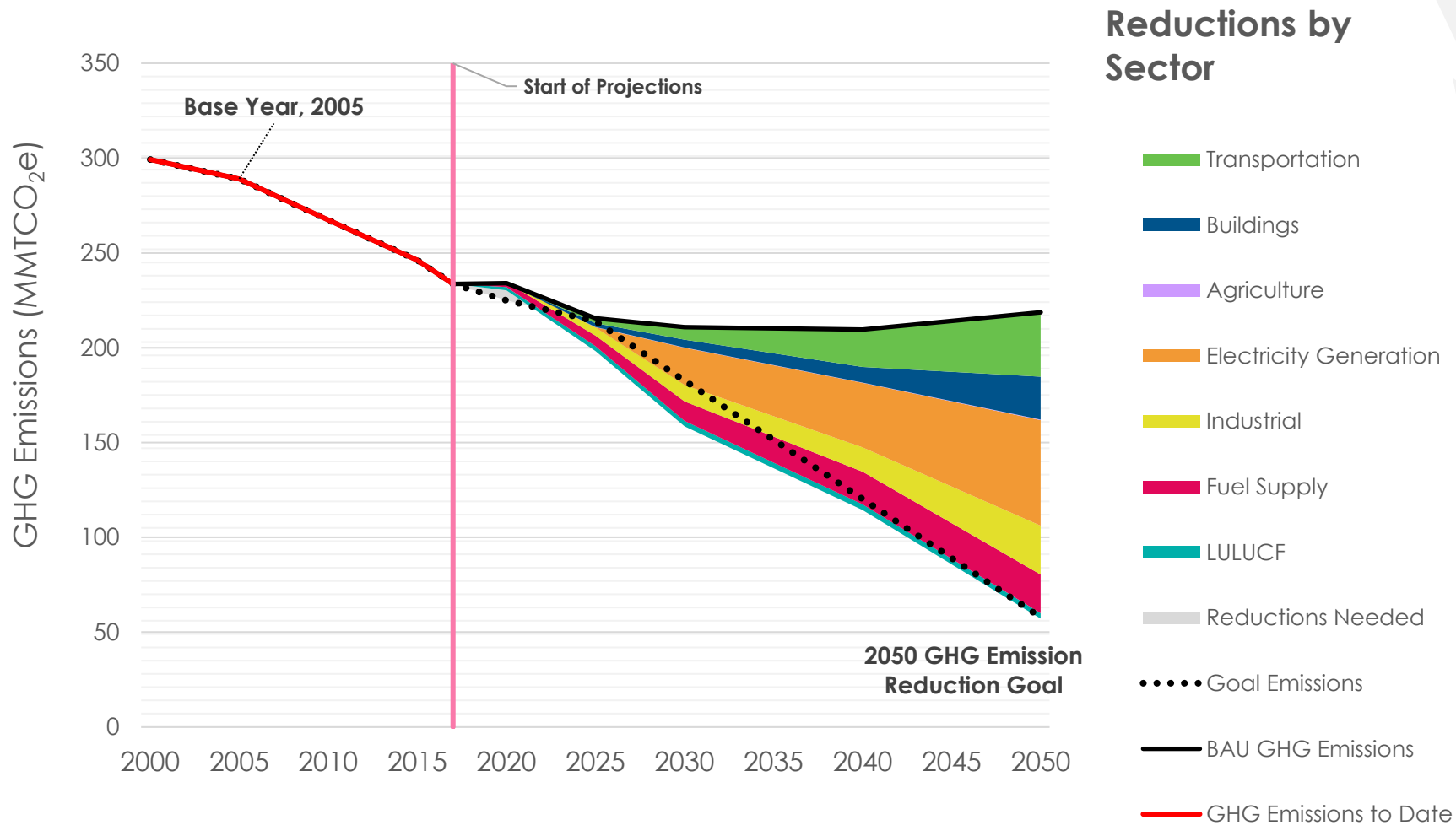
GHG Reductions from Strategies – Pathway to Achieve 80% Reduction in 2050



Note that this chart excludes strategies for which emissions reductions are not estimated. Reductions associated with electricity consumption are not included.

Insights

- The reductions estimate represents a *potential pathway* or options to reduce emissions by 80% from 2005 in 2050; these are not the only options to reduce GHG emissions.
- The reductions estimated do not represent specific policy recommendations. Instead, a suite of options are presented that together reduce emissions from 2005 by 80% in 2050, and that contain a lot of the components needed for deep reductions.
- Like many other studies and the growing consensus, a decarbonized grid and energy supply, along with fuel switching, are large potential drivers of reductions, but a full suite of options is needed.
- The electricity generation mix is projected to become less dependent on fossil fuels over time if the strategies described in the CAP are implemented.

Initial Insights

- 30% of the total reductions from 2005 to 2050 are driven by reductions seen in the BAU, mainly from the shift from coal to natural gas electricity generation and increased efficiency in buildings and cars seen in earlier parts of the time series
- 70% of total reductions from 2005 to 2050 are a result of actions between 2018 and 2050
- Deep reductions are needed across all sectors (see table)
  - Energy supply needs to be decarbonized, both through low or no carbon gases and carbon-free electricity
  - Efficiency needs to be a part of the solution
  - Innovation and changes in the industrial sector are required
  - Fuel switching (e.g., fuel oil to gas or electrification), particularly for transportation and the buildings sector plays a major role in reductions

Sector	Modeled Reductions (2005-2050)
Transportation	76%
Buildings	81%
Electricity Generation	95%
Agriculture	1%
Fuel Supply*	87%
Industrial	29%
LULUCF**	-6%

*Includes RNG
**Represents a 6% decrease in sequestration

How to Interpret Economic Modeling

- Investments in electric energy efficiency result in both **positive** and **negative** economic impacts:
  - Positive impacts: Increases in manufacturing and construction (installation) jobs, as well as increasing residential disposable income and commercial expenditures directly resulting from bill savings.
  - Negative impacts: Opportunity costs of investment and impacts to power generators from lost revenues.

Net Present Value+	**-$4.91 billion**
Cost/(Benefit) per ton of GHG Reduced	**$50.55 $MTCO_2e$**
Average Annual GSP*	**$344.65 million**
Average Annual Disposable Income*	**$121.39 million**
Average Annual Employment	**4,118 jobs**

+negative NPV indicates costs are greater than savings; *assuming a 1.75% discount rate

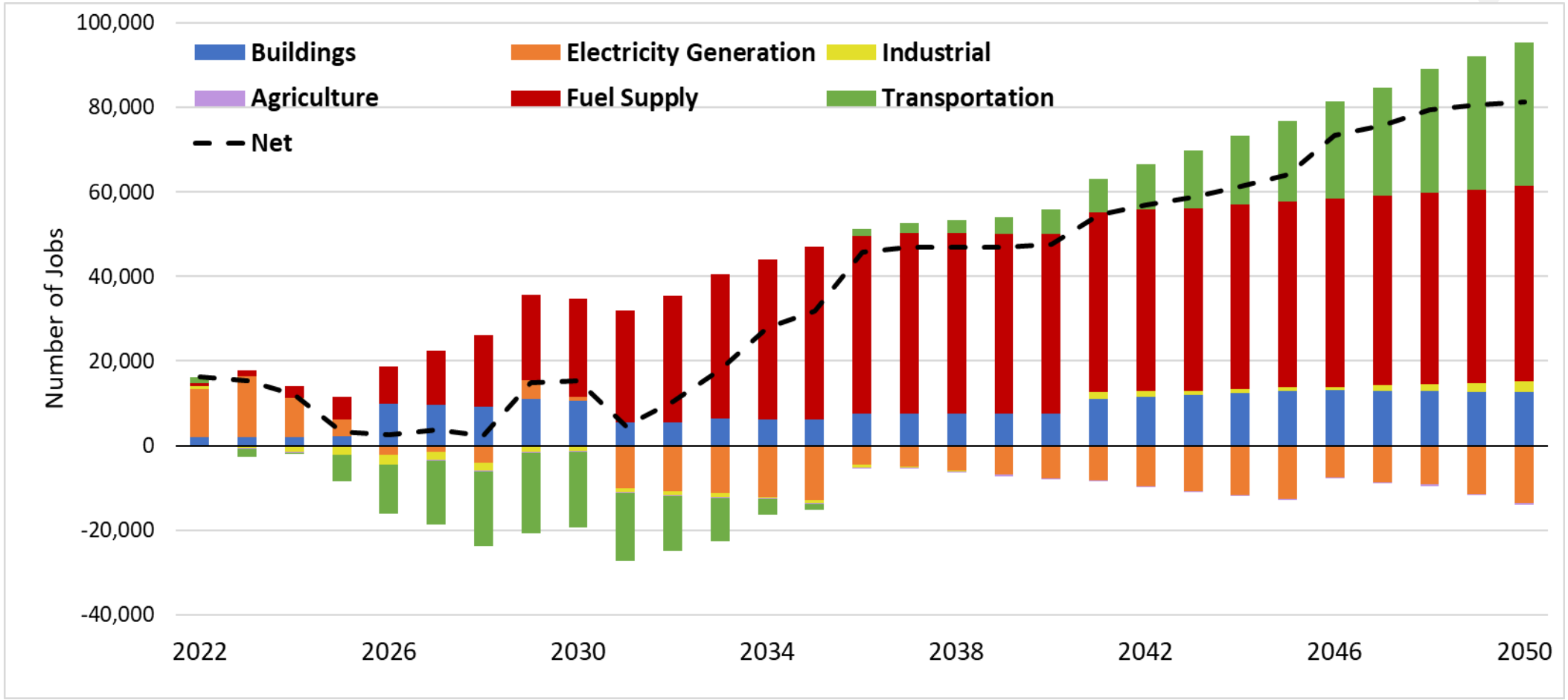
How to Interpret GSP, Disposable Income, and Employment

- Modeling completed with REMI
  - REMI is a dynamic macroeconomic forecasting and policy analysis model
  - Projects distributional changes on the economy based on shocks to employment, investments, prices, production costs, wages, etc.
  - Combines aspects of Input-Output modeling with Computable General Equilibrium techniques
  - "Hybrid" macro-econometric model
  - Model can evaluate economic changes over time, allowing changes driven by inputs from one year to carry through multiple years
  - Estimates distributional impacts on sectors and/or regions
- Key outputs of the REMI model include:
  - *Gross State Product* (GSP): market value of goods and services produced by labor and property within PA
  - *Disposable Personal Income* (DPI): total after-tax income received by individuals; it is the income available to persons for spending or saving.
  - *Employment* (jobs and job-years): estimate of total employment impacts (full-time plus part-time). Annual employment results presented as jobs; cumulative employment results presented as job-years.

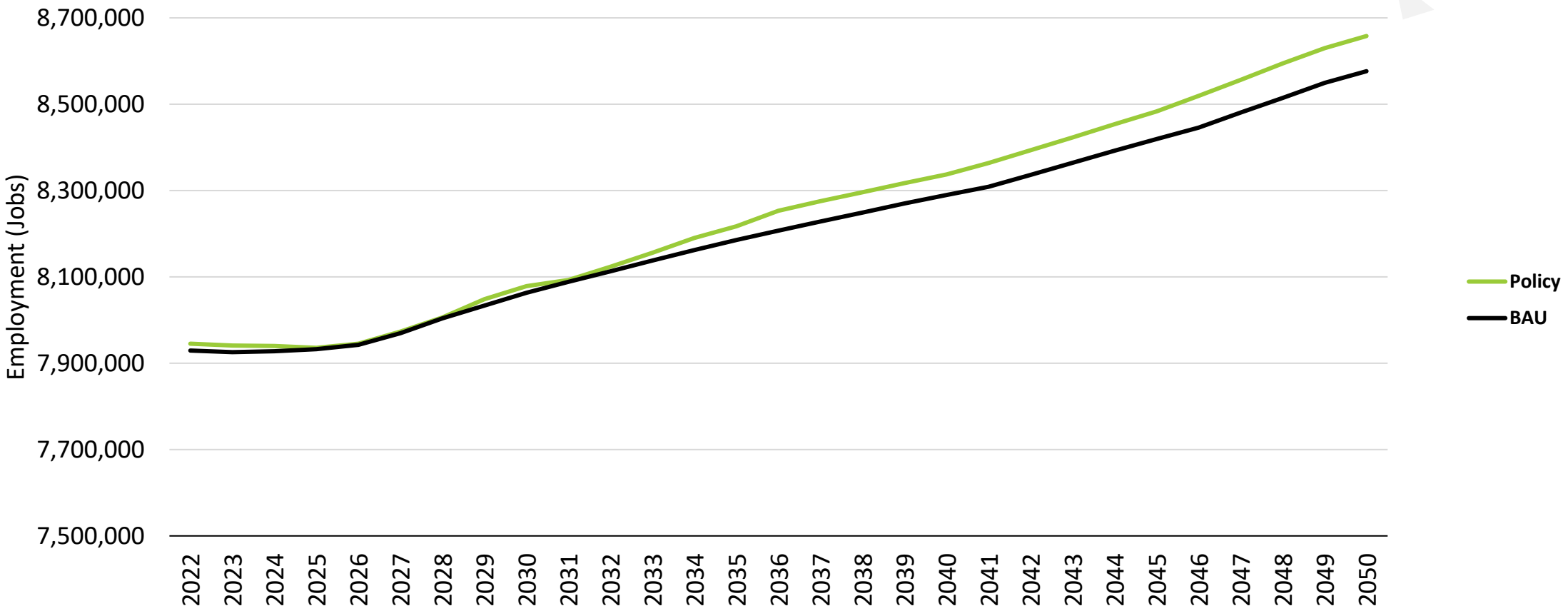
GHG Reduction Strategies Key Economic Insights

- Overall, if the recommended GHG reduction strategies are implemented, they would:
  - Create over one million cumulative job-years in the Commonwealth by 2050, with an annual average of roughly 38,000 jobs per year, an increase of about 0.46% in average annual terms.
  - Result in a slight decrease in the average annual gross state product (GSP) for the entire modeling time horizon.
    - Average annual GSP decreases by 0.02%, but trends positive in later years with a GSP increase of 0.13% by 2050. However, the Pennsylvania economy continues to grow at a robust pace even with these strategies in place.
  - Decrease disposable personal income (DPI) slightly.
    - The average annual DPI decreases by 0.10%, but trends positive in later years with a DPI increase of 0.14% by 2050. Disposable income continues to grow in the Commonwealth but at rates marginally lower than under the BAU baseline.
- All strategies are estimated to be cost-effective on a cost per MTCO2e reduced basis. Additionally, most strategies result in co-benefits such as improved air and water quality, improved health outcomes, increased energy security, and improved equity and environmental justice outcomes.

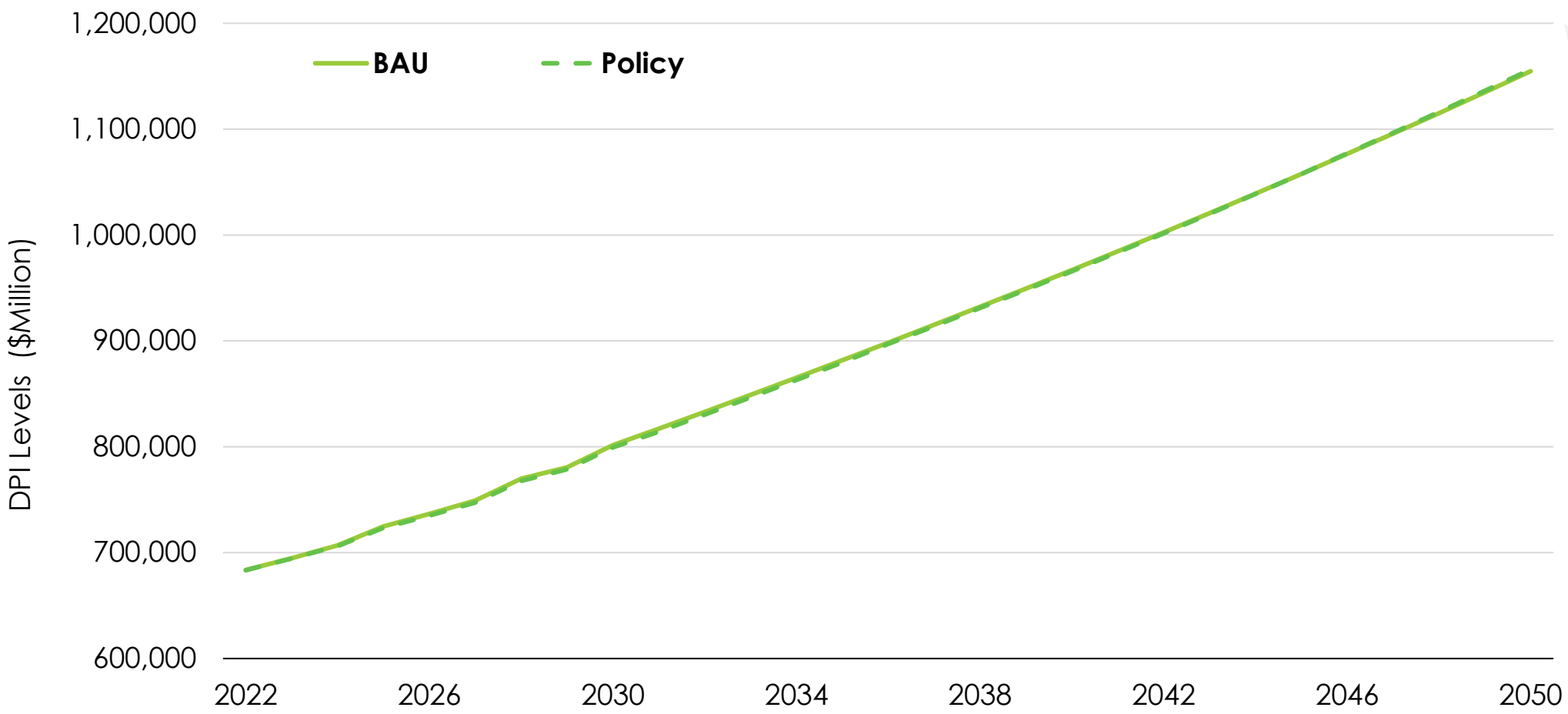
Summary Employment Impacts



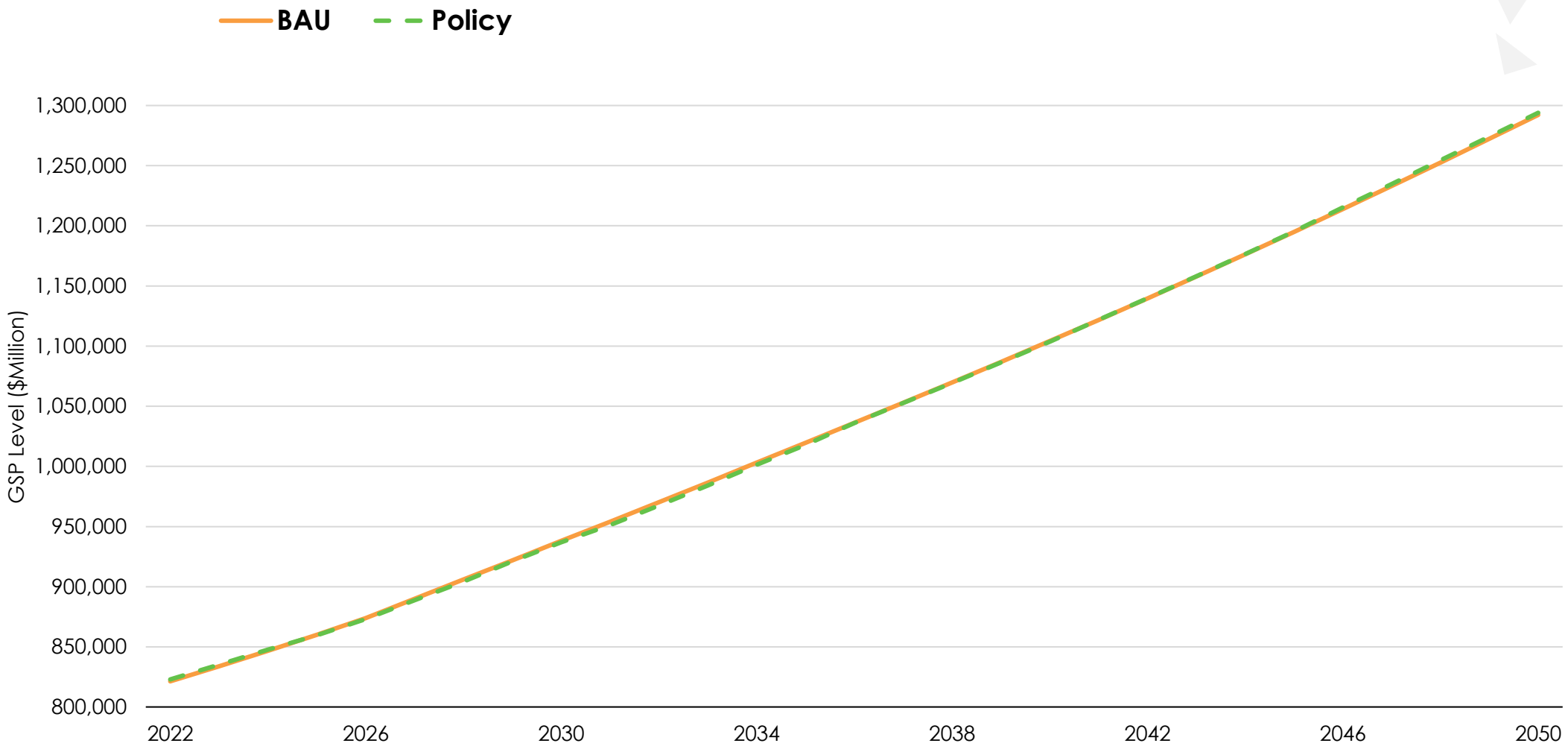
Comparison of Employment Levels under the BAU and the Policy Scenarios



Disposable Income Summary Impacts

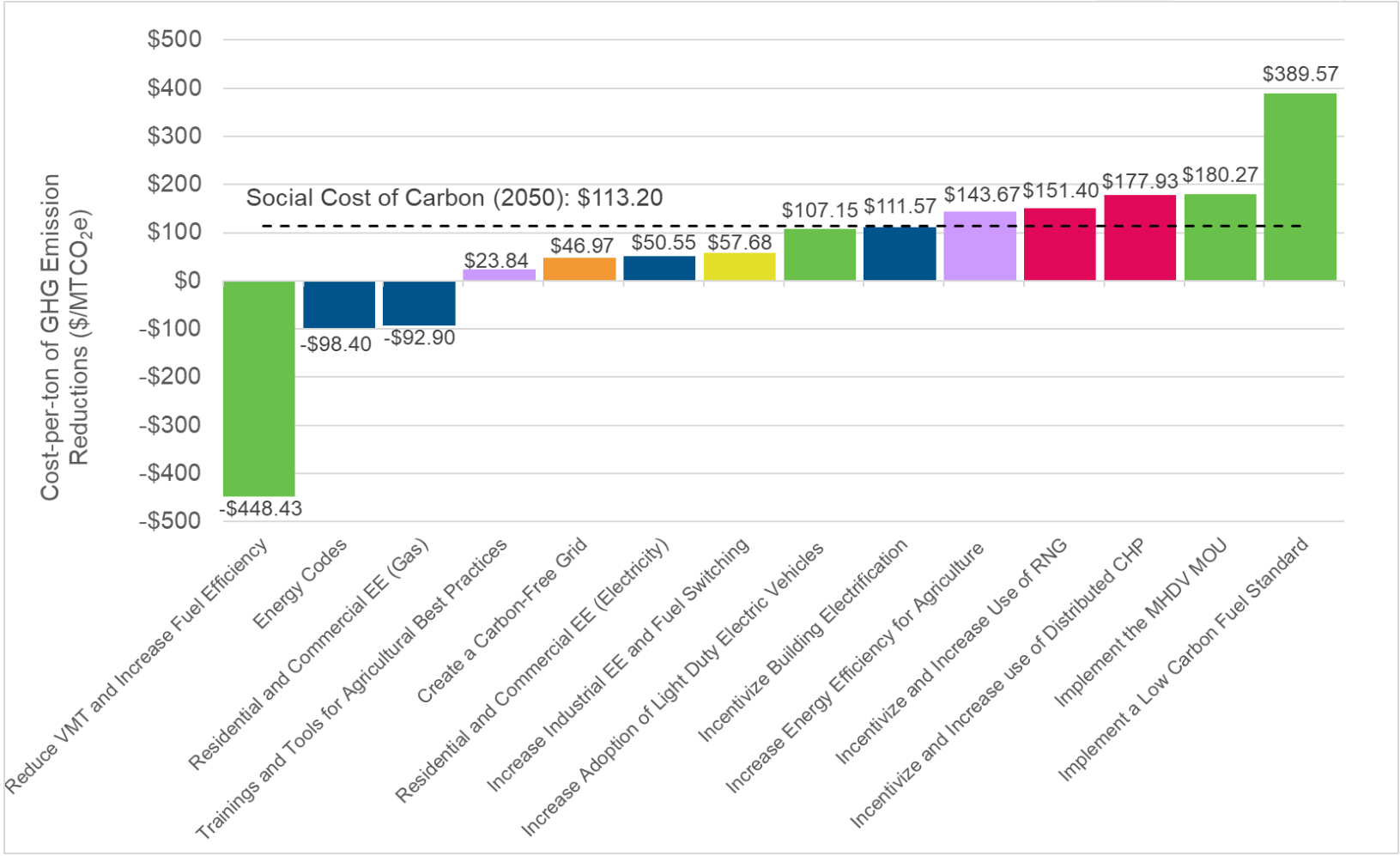


GSP Summary Impacts



Cost/MTCO$_2$e by Strategy

- Most of the modeled strategies are cost-effective compared to the social cost of carbon benchmark.
- Other cost-effectiveness measures like NPV and macroeconomic effects like jobs and GSP should also be considered. Additionally, unquantified effects like increased equity and co-benefits should be qualitatively assessed to inform a more holistic evaluation of cost-effectiveness.



Suggested Review Considerations for GHG Reduction Strategies in the CAP

- Varying levels of information are provided for strategies across categories (e.g., social and health benefits). Is there a strategy write up that you suggest is the appropriate level of information to provide that we should use as the preferred model for all other strategies? Or are you OK with varying levels of information?
- Are there any gaps in the information provided for strategies that you suggest be filled?
- Do you have any suggested improvements or additional information that you recommend including in the report to help reader understanding or provide a richer discussion?
- Do the results make sense, or do you have questions/suggestions for clarifications?

Adaptation Pathway

- Adaptation Pathway
- Recommended Considerations for CCAC Review

Begin adaptation planning in the CAP

- IA identified "priority areas" for adaptation – high-risk combinations of hazard(s) (e.g., flooding) and sectors (e.g., build infrastructure)
- In the CAP, we developed "adaptation strategy pathways" for each priority impact area.
- Each pathway includes:
  - Foundational strategies
  - Strategy categories
  - Example strategies
  - Example progression of strategies
  - Key actors
  - An overview of cost and benefits
  - A case study
- Strategies were gathered from a range of resource and then synthesized into example pathways

Priority areas identified for adaptation:

- Heat and Flooding Impacts on Health
- Heat and Flooding Impacts on Overburdened and Vulnerable Populations
- Increasing Average Temperatures Impacts on Forests, Ecosystems, and Wildlife
- Warmer and Wetter Climate Impacts on Agriculture
- Increasing Average Temperatures Impacts on Recreation and Tourism
- Flooding Impacts to Built Infrastructure
- Landslides Impacts to Built Infrastructure

Understanding Adaptation Strategy Pathways

Foundational Strategies

mechanisms to enable understanding of impacts and adaptive management over time (e.g., assessing/prioritizing risks, mainstreaming, monitoring)

Strategy Categories

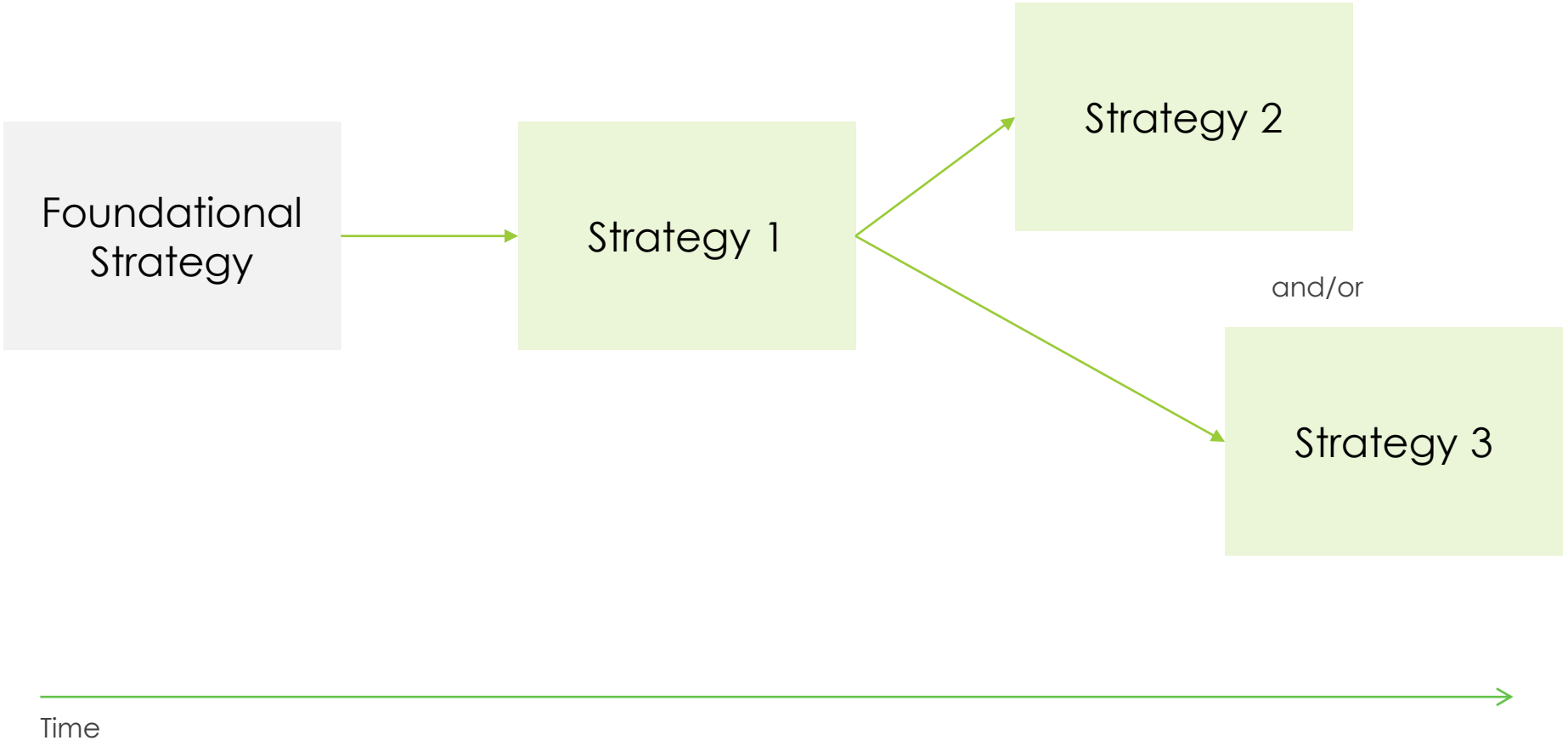
General approaches to tackling impacts in each priority area

Specific Strategy Examples

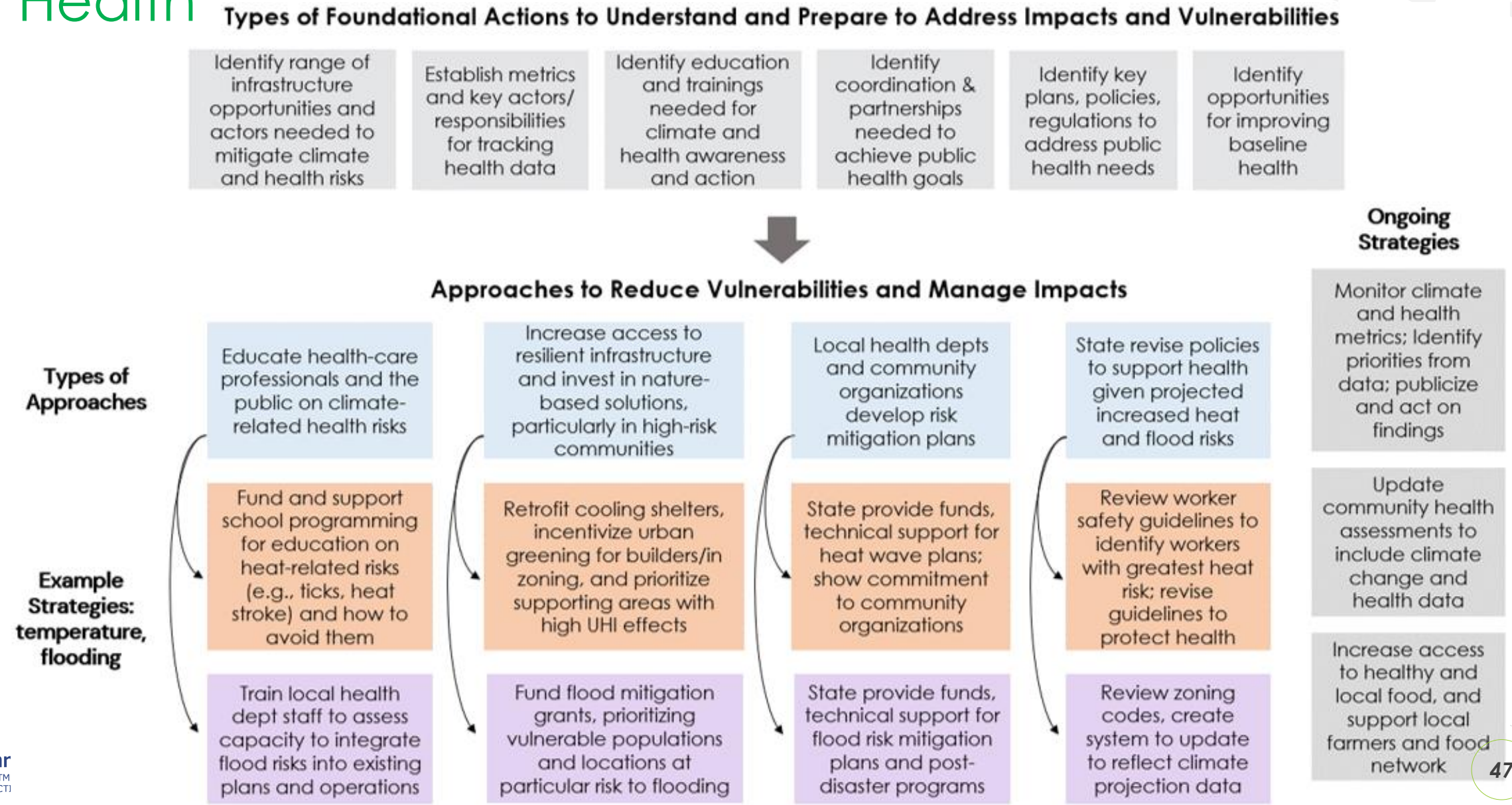
Examples of specific strategies under each category

Understanding Adaptation Strategy Pathways

What?
Who?
When?



Addressing the Impacts of Increasing Heat and Flooding on Health



Addressing the Impacts of Increasing Heat and Flooding on Health

Foundational Strategy Type: Identify key plans, policies, regulations to address heat and health risks

Example(s): State and local health departments identify a) community needs by partnering with community organizations and b) business priorities by working with representatives, and then collectively work to strengthen policies and plans to protect public health throughout the Commonwealth

Actors: State Department of Health, local health departments, community organizations, business representatives

Timing: As soon as possible

Approach: Revise policies to support health given projected increased heat and flood risks

Strategy: Review worker safety guidelines to identify workers most at risk; revise guidelines as needed to protect health

Actors: State Department of Health, local health departments, community organizations, business representatives

Timing: As soon as possible

Approach: Revise policies to support health given projected increased heat risks

Strategy: Local health departments hold workshops with local community organizations to identify types of jobs where heat risks are greatest, opportunities for increased safety, and potential barriers to implementation or effectiveness

Actors: Local health departments, community organizations

Timing: After guidelines are reviewed

Approach: Revise policies to support health given projected increased heat risks

Strategy: Local health departments connect with business representatives to identify priorities for supporting workers, potential compliance challenges, and goals for promoting worker safety

Actors: Local health departments, business representatives

Timing: After guidelines are reviewed and community workshops are held

Addressing the Impacts of Increasing Heat and Flooding on Health

Examples of additional strategies (in Appendix C)

Strategy	Actor
Increase access to resilient infrastructure and invest in nature-based solutions, particularly in communities at high risk to infrastructure-related health risks (e.g., flood risks from poorly protected infrastructure at low elevation)	State agencies, municipalities
Retrofit cooling shelters, incentivize urban greening for builders/in zoning, and prioritize supporting areas with high UHI effects	State agencies, municipalities
Fund flood mitigation grants, prioritizing vulnerable populations and locations at particular risk to flooding	State legislature
Develop local, community-informed risk mitigation plans	Municipalities, community-based organizations
State provide funds and technical support for heat wave plans and flood risk mitigation and post-disaster programs; show commitment to community organizations	State legislature, state agencies
State revise policies to support health given projected increased heat and flood risks	State legislature
Review worker safety guidelines to identify workers with greatest heat risk; revise guidelines to protect health	State agencies, municipalities

Strategy	Actor
Review zoning codes, create system to update to reflect climate projection data	State agencies, municipalities, researchers
Strengthen climate change public health messaging and outreach (methods, content, and target groups and events)	State agencies, County and Municipal Health Departments, municipalities, community-based organizations
Engage vulnerable groups through existing community networks to conduct outreach and education on climate and health risks, understand concerns, and solicit potential solutions	Municipalities, County and Municipal Health Departments, State Health Centers, community-based organizations
Coordinate on health and emergency efforts across sectors	State agencies, municipalities
Require that emergency preparedness plans include coordination and communication among critical stakeholders. These stakeholders may include community organizations, local businesses, local health departments, hospitals and other health-care delivery facilities, utilities, and local government	State legislature, state agencies, municipalities

Case Study: Implementing Strategies at PennDOT to Manage Flood Risks, with Health and Safety Benefits

- **Key health risks associated with extreme flooding involve transportation**: 1) physical safety risks from floodwaters or limited access to critical services, and 2) road accidents due to reduced visibility and hazardous driving conditions
- PennDOT has **conducted a vulnerability study** and **identified resilience strategies**, such as:
  - Maintenance and Inspections:
    - Improve maintenance procedures and armoring of stream banks to prepare for potential increased flooding events in the future;
    - Continue to expand and improve methods and procedures for pre- and post-flood inspections of roadways, bridges & streams;
    - Plan for increasing redundancy at roadway locations that may be impacted by storms (ensure secondary roads are maintained and available for use).
  - Design:
    - Identify updates to PennDOT design manuals based on national research and other university studies;
    - Program projects to improve stormwater capacity, reduce impermeability and ensure adequate maintenance of infrastructure;
    - Work with municipalities to identify the impacts of development on stormwater management; and
    - Identify facilities requiring design upgrade in advance of funding requests.

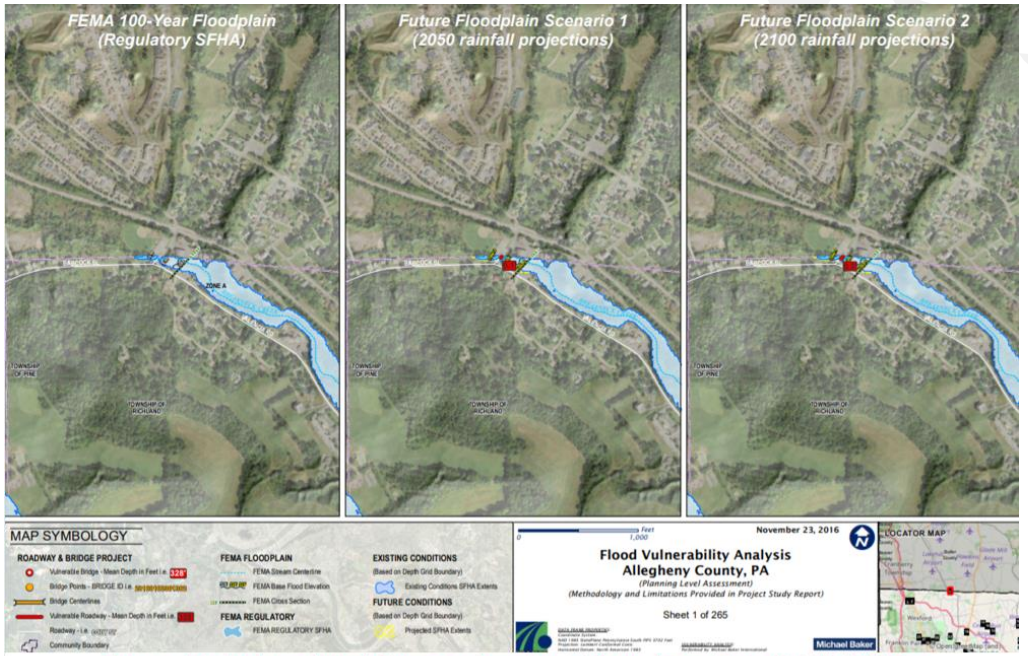
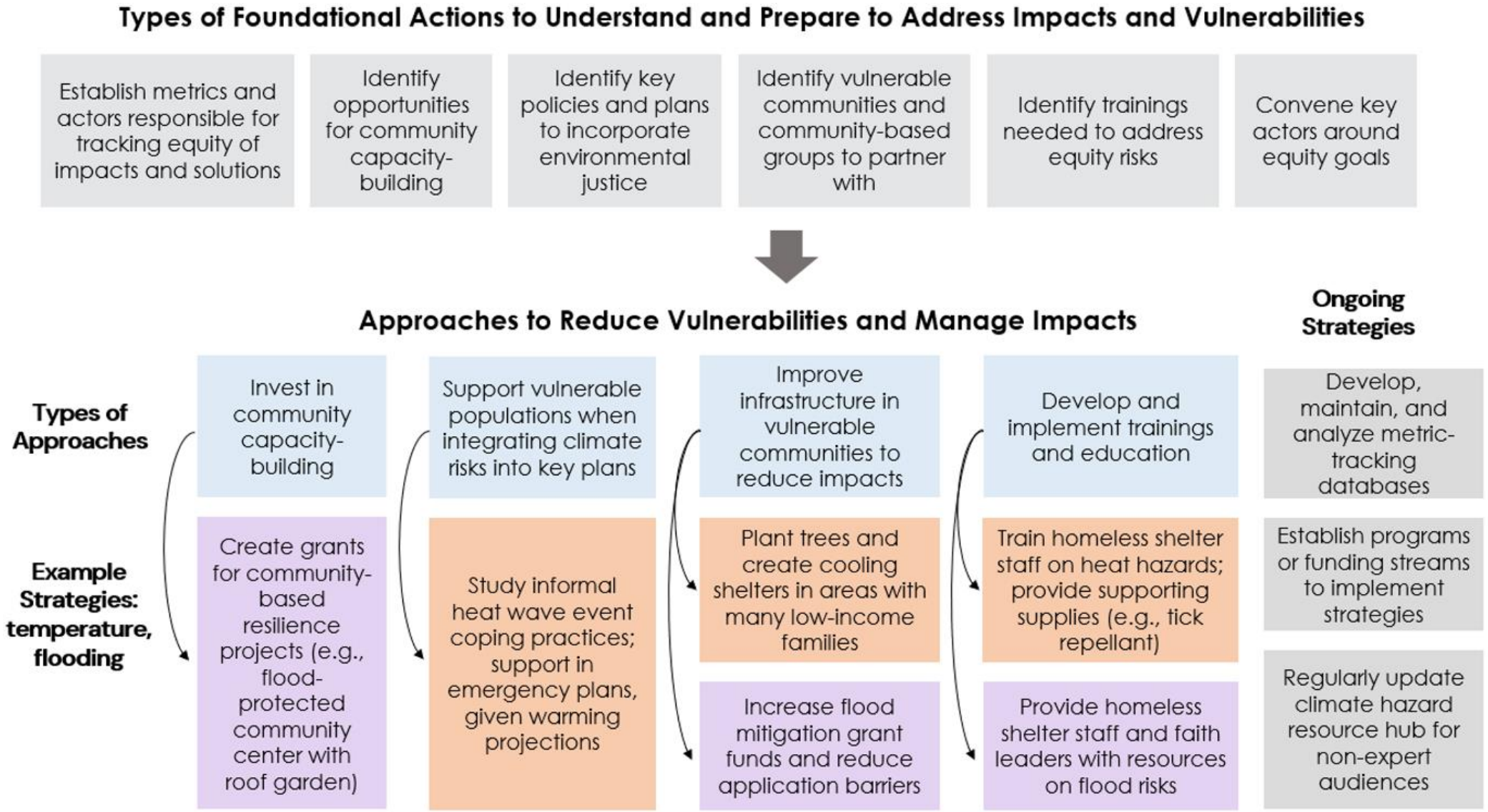


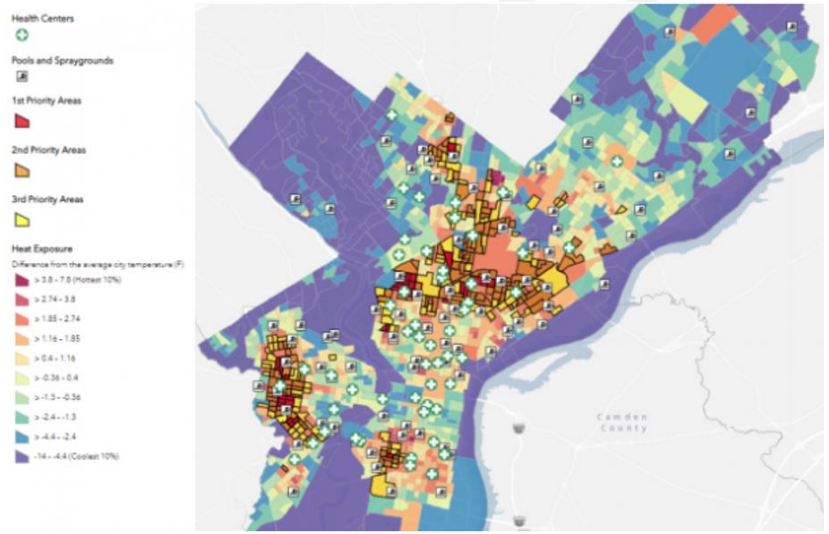
Figure 32. Future flood forecast maps. Taken from PennDOT, 2017a.

Addressing the Impacts of Increasing Heat and Flooding on Overburdened and Vulnerable Populations



Case Study: A Community-Driven Approach to Tackling Heat in Philadelphia

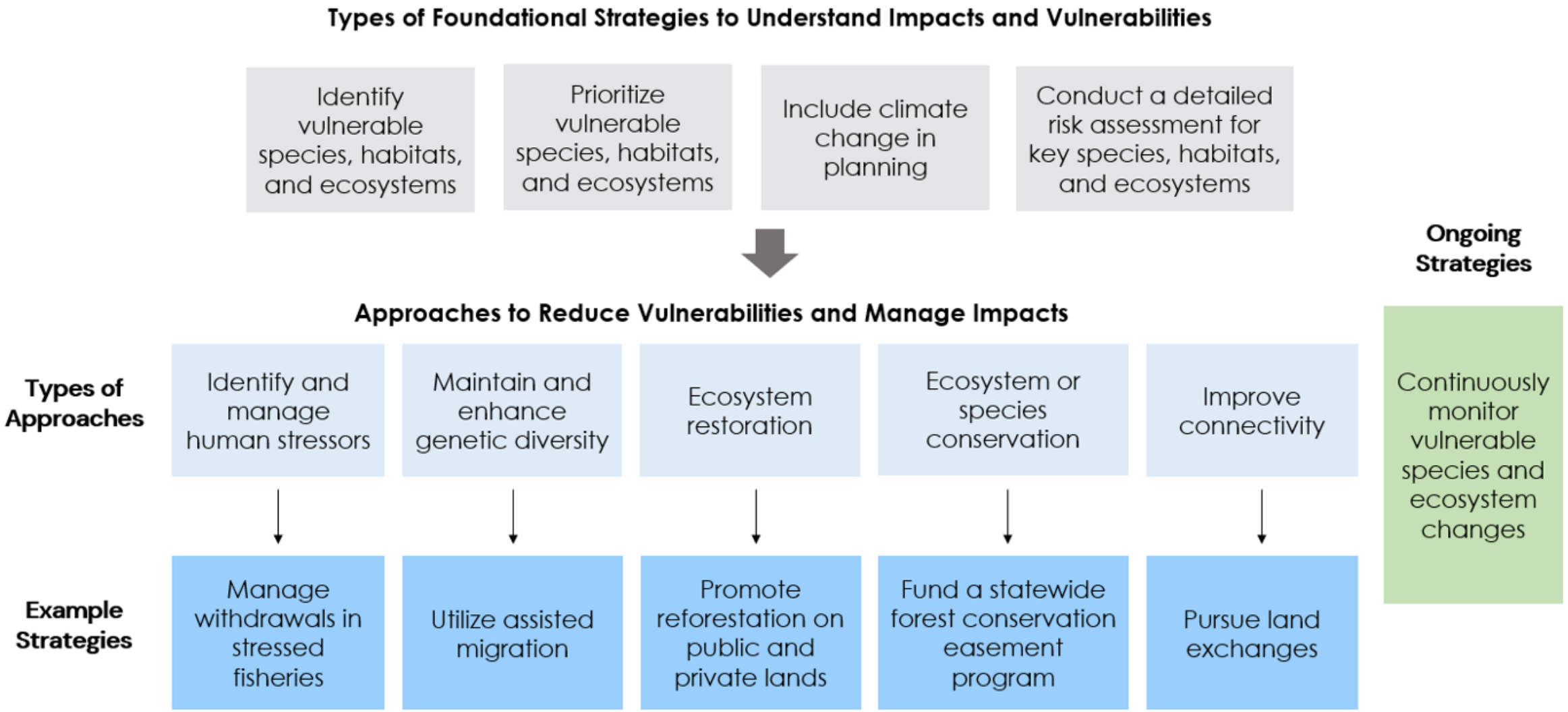
- In 2018, the Philadelphia Office of Sustainability (OOS) launched the **"Beat the Heat" initiative** to support communities disproportionately exposed and vulnerable to environmental stressors like extreme heat.
- For the Initiative's pilot, the City convened an **interdisciplinary Heat Team to work with community leaders and residents in Hunting Park**, one of Philadelphia's "hottest and most heat vulnerable" neighborhoods, to identify root causes of heat disparities and support "community-driven decision-making about how to reduce these inequities."
- Example strategies that emerged as next steps include:
  - Implementing cooling measures such as tree plantings and green stormwater infrastructure
  - Reviewing city policies related to land use, green infrastructure, transportation, and outreach to consider how they might address heat
  - Identifying better ways to communicate about heat and cooling resources



Philadelphia Heat Vulnerability Index map. Taken from Kellner, 2019.

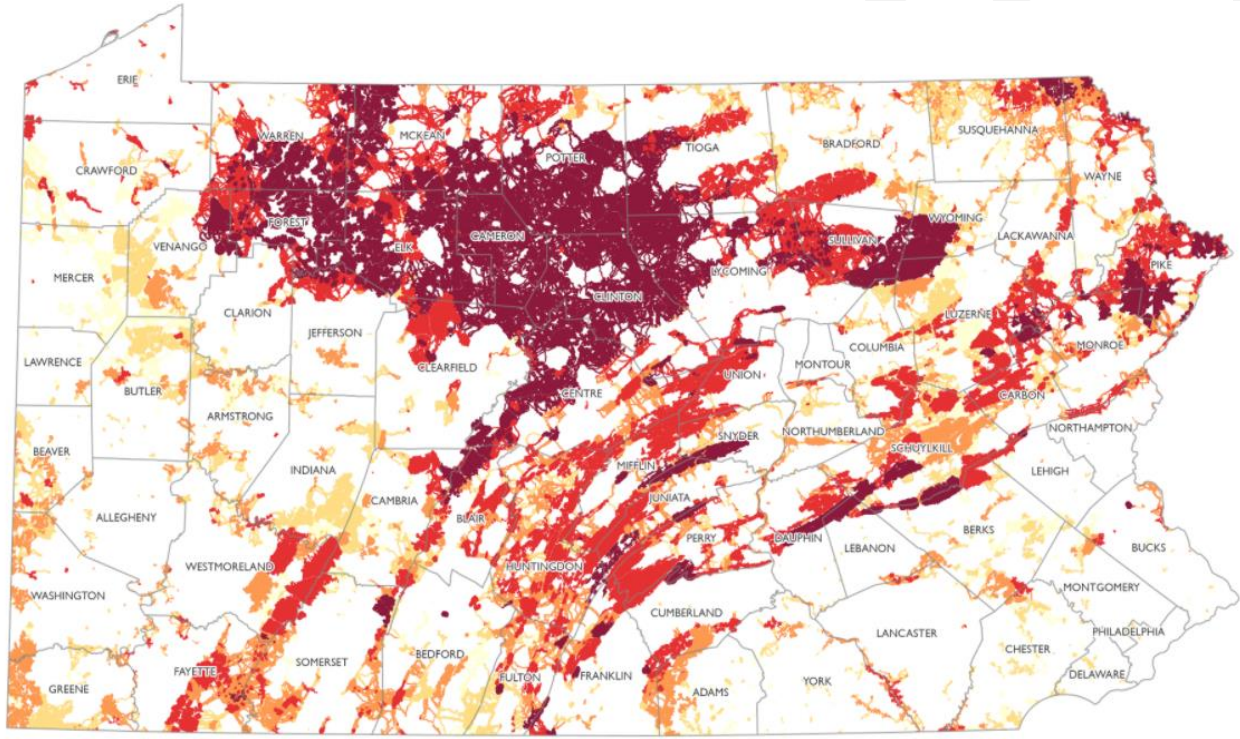
Members of the community attending the Beat the Heat Neighborhood Design Workshop. Taken from OOS, 2019.

Addressing the Impacts of Increasing Average Temperatures on Forests, Ecosystems, and Wildlife



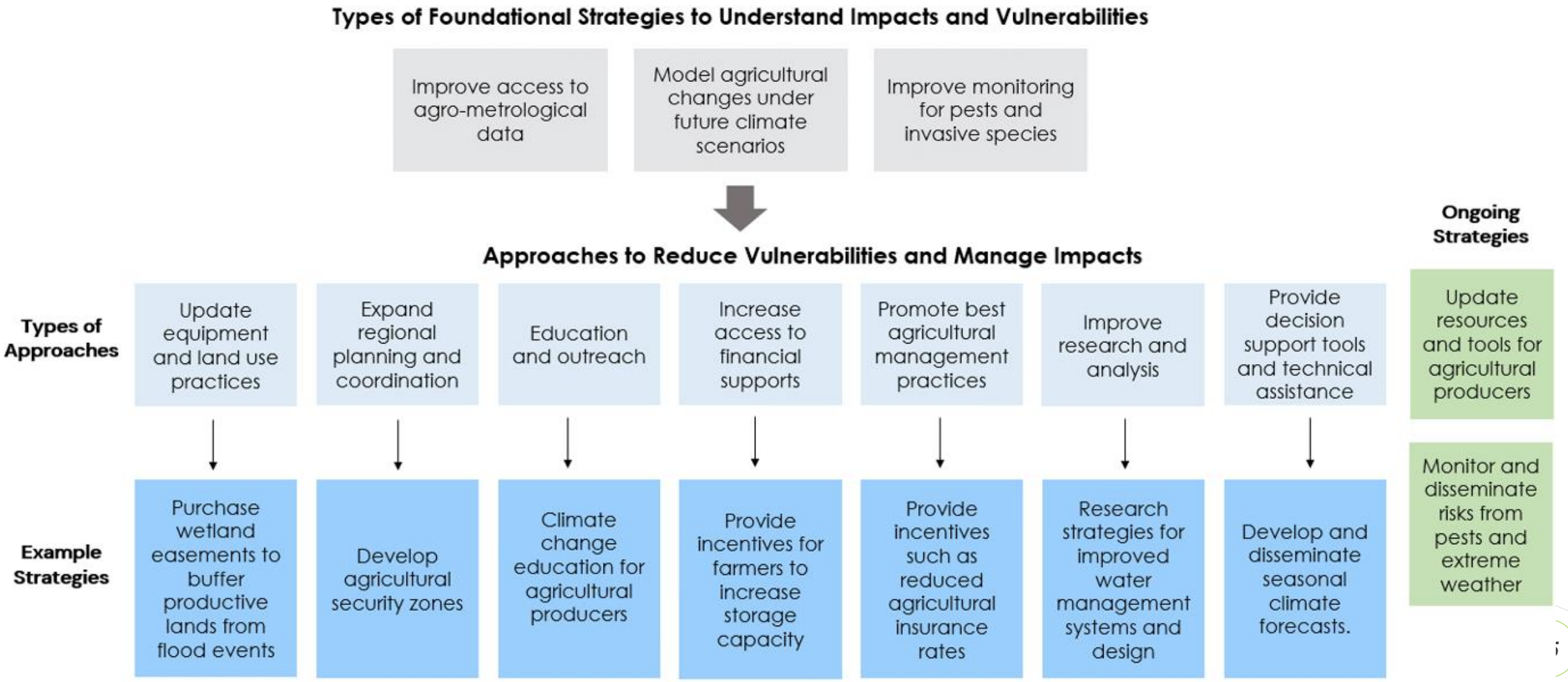
Case Study: Identifying Species Vulnerable to Climate Change to Inform Adaptation Planning

- DCNR and Western Pennsylvania Conservancy launched the Pennsylvania Natural Heritage Program (PNHP), which collects actionable data on the State's ecological resources to help ensure the biological diversity in the Commonwealth as the climate changes.
  - Statewide corridor analysis
  - Monitor climate impacts to at-risk species like the snow trillium flower
- WPC is using PNHP findings to reshape its conservation planning process
  - Protected 90 acres of land in the Laurel Highlands



Climate Change Connectivity Priority Scores identified in the PNHP study.

Addressing the Impacts of Warmer and Wetter Climate on Agriculture

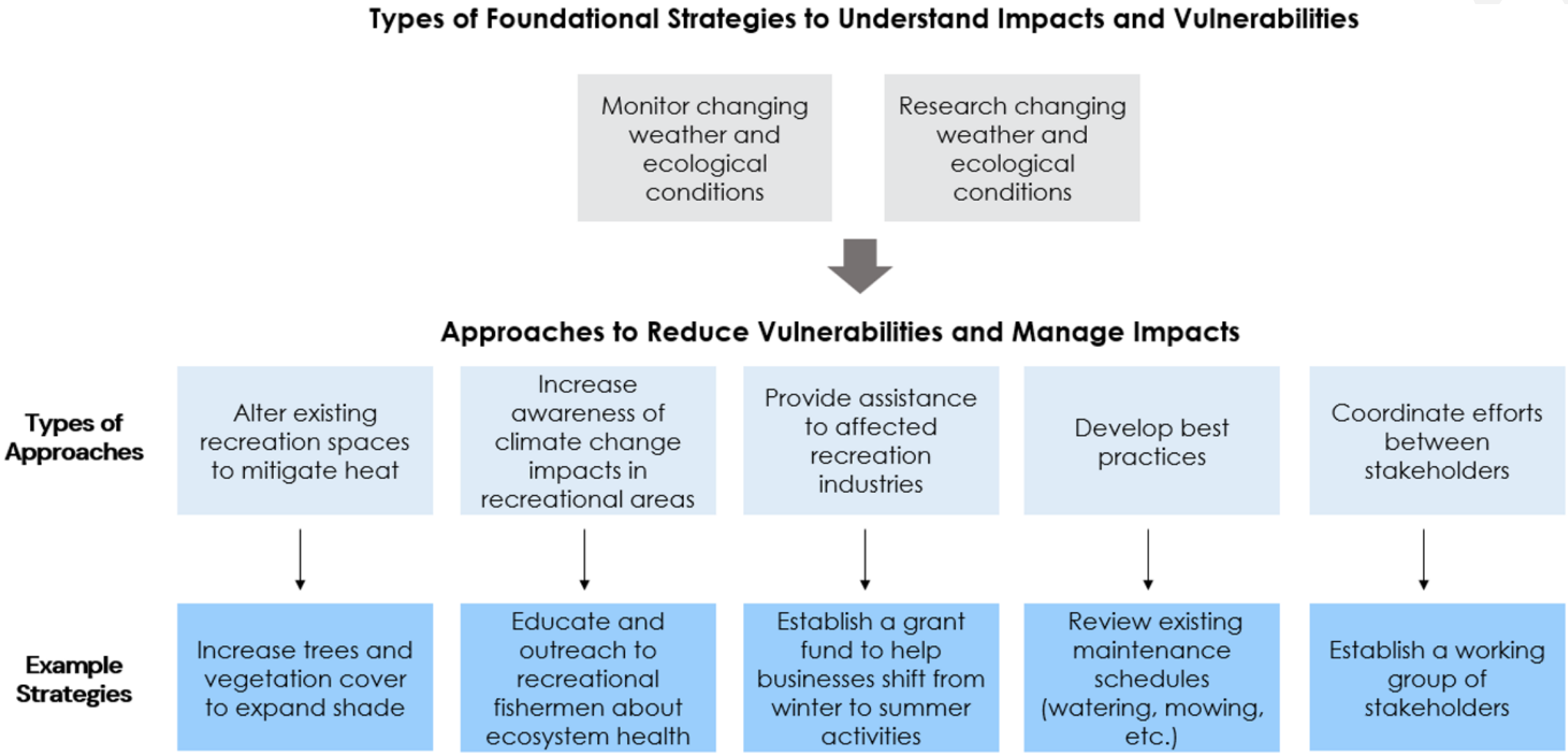


Case Study: USDA Northeast Climate Hubs

- USDA's climate hubs provide a wide array of information and resources on climate impacts to agriculture and adaptation opportunities.
- The Northeast Hub highlights opportunities from partner agencies and research findings and tools from universities.
  - Highlighted NRCS's funding opportunities for improving soil management practices
  - Advanced its partnership with Penn State. The Hub is supporting Penn State researchers as they investigate cropping practices that can be used on dairy farms to reduce erosion and minimize the need for fertilizers and pesticides.

A pasture in Pennsylvania.

Addressing the Impacts of Increasing Average Temperatures on Recreation and Tourism

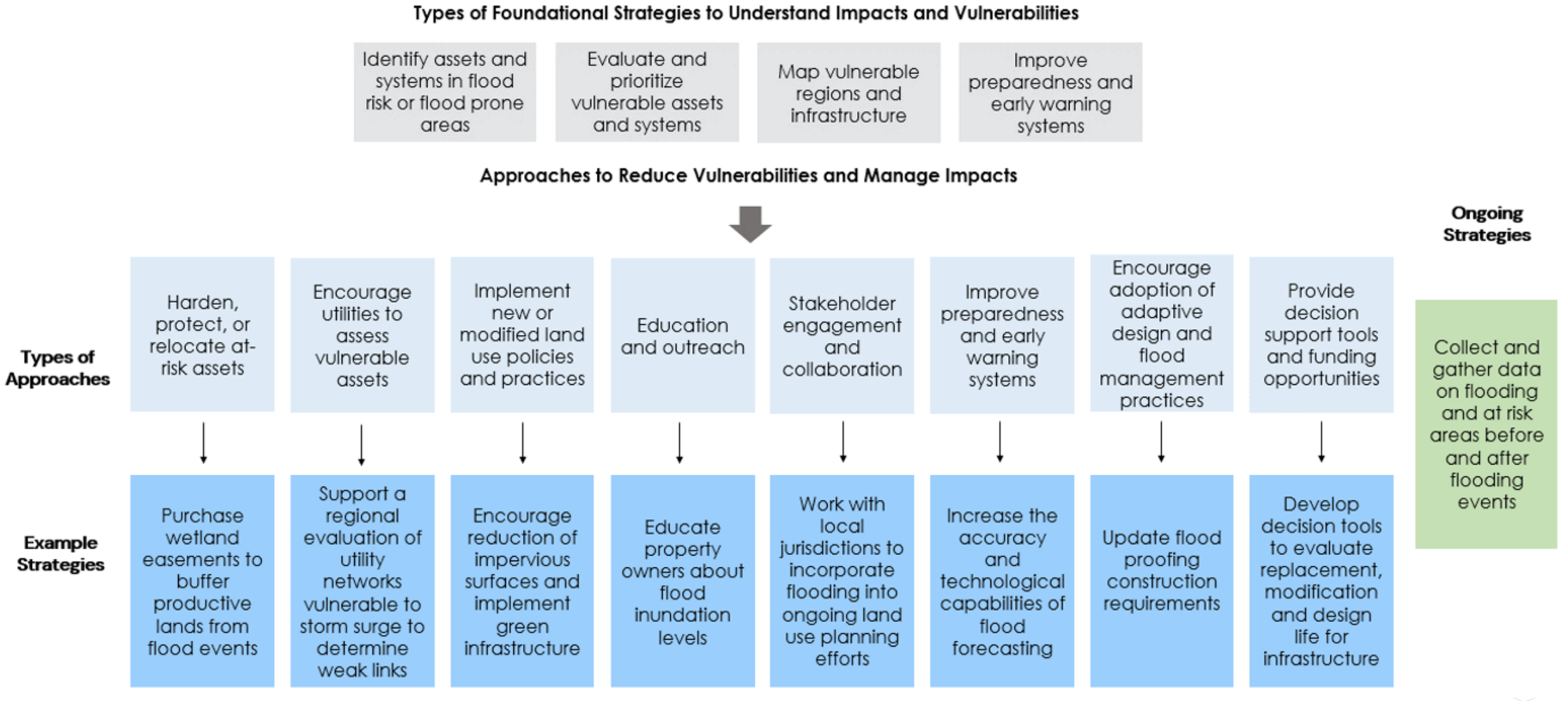


Case Study: Transforming Winter Ski Resorts

- Ski resorts and winter recreation areas are deploying snowmaking and snow storage techniques to keep skiing seasons viable.
  - Many have invested in snowmaking technologies.
  - Other innovative techniques like snow storage could also be explored.
- Ski resorts have started investing in services for year-round recreation.
  - E.g., Seven Springs Mountain Resort and Blue Mountain Resort offer dozens of mountain biking trails.
  - E.g., Montage Mountain Ski Resort developed a zip line and outdoor water park to mitigate reductions in winter activity.

A cyclist mountain biking at Blue Knob State Park. The park provides year-round outdoor recreation activities including winter sport opportunities (e.g., skiing) as well as a wide array of summer opportunities (e.g., mountain biking).

Addressing the Impacts of a Changing Climate on Built Infrastructure

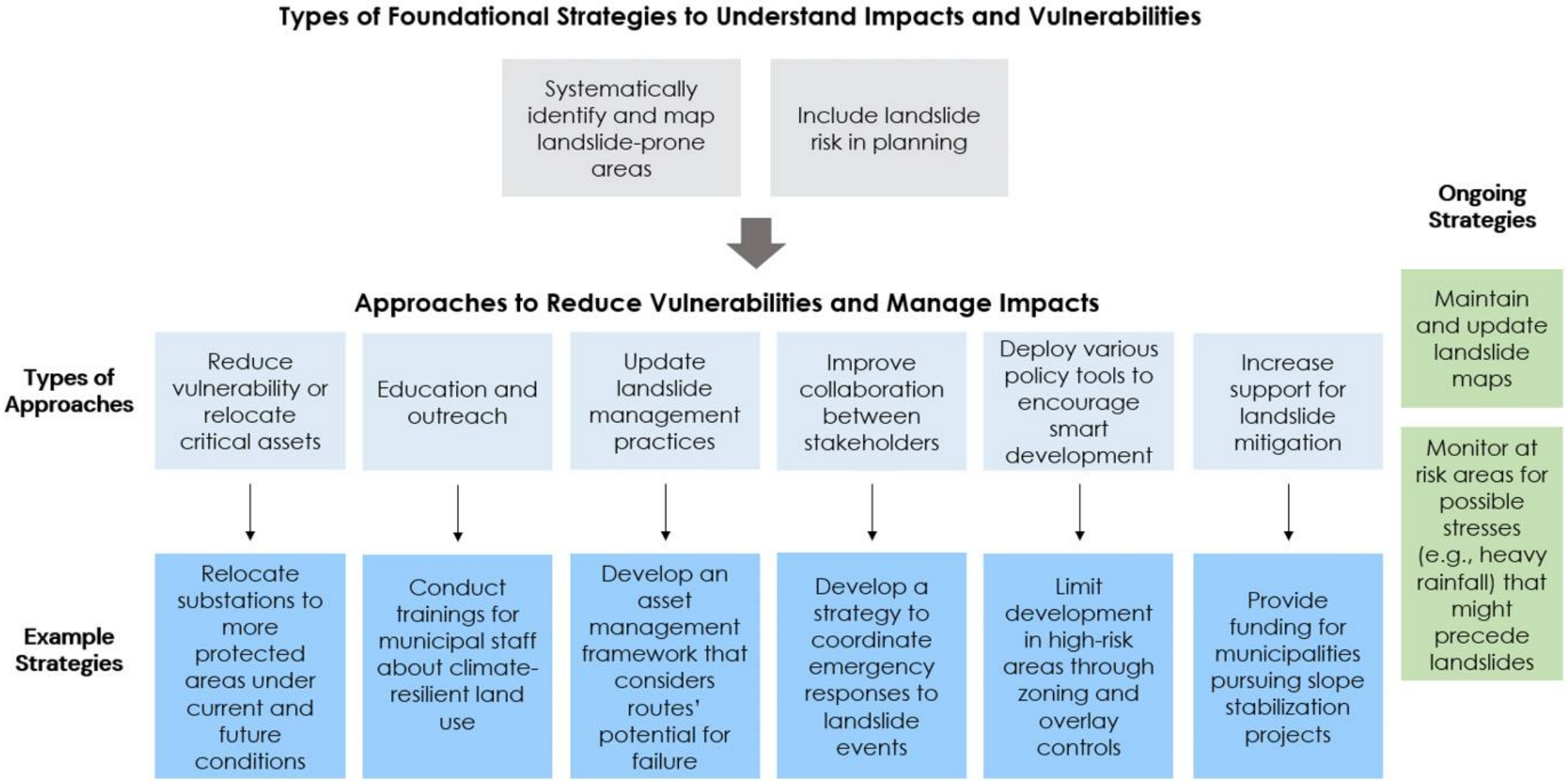


Case Study: Reducing Flood Hazards in New York City

- The Hurricane Sandy Rebuilding Task Force (Task Force) and U.S. Department of Housing (HUD) launched the "Rebuild by Design" competition as part of the Hurricane Sandy recovery process.
  - This competition crowd-sourced innovative design solutions to promote resilience in the areas impacted by Hurricane Sandy.
- One of the winning projects, "The Big U", proposed building "10 continuous miles of protection" along the impacted coast in New York City.
  - The project proposes segmenting the coast into sections, with each area identifying specific infrastructure and social community planning goals.
  - An "integrated flood protection system" is planned to reduce flood risk, including floodwalls and flood gates, a raised bulkhead and underground seepage barrier, and elevated parks along the East River.

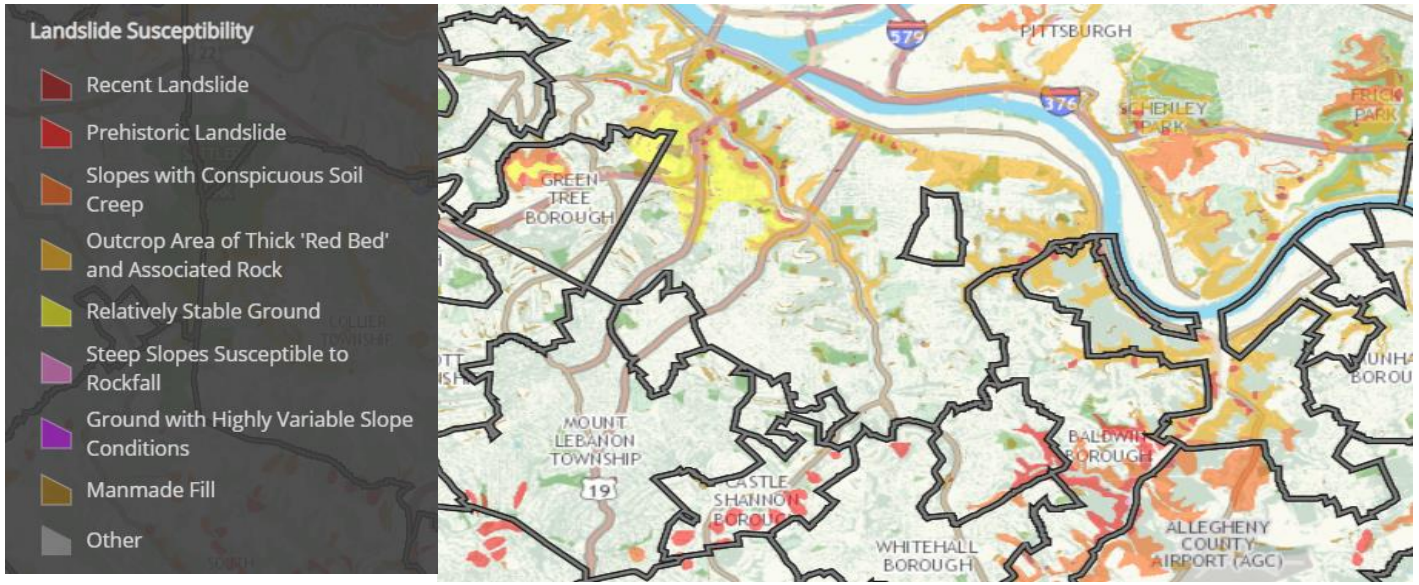
"The Big U" Vision.

Addressing the Impacts of Landslides on Built Infrastructure



Case Study: Predicting and Mapping Landslides in Allegheny County

- In 2018, Allegheny County experienced landslides that amounted to an estimated $40 million dollars in damage. In response, the County created a Landslide Task Force.
  - The Task Force coordinates both county departments (e.g., Emergency Services, Public Works, Budget) and external stakeholders (e.g., Carnegie Mellon, PEMA, National Weather Service, PennDOT, DEP, utilities)
  - The County also developed a Landslide map tool, which identifies sites with recent or historic landslides, and highlights areas with landslide risks.



Portion of the Allegheny County landslide map tool.

Suggested Review Considerations for Adaptation Strategy Pathways in the CAP

- Are there any gaps in the information provided that you suggest be filled?
- Do you have any suggested improvements or additional information that you recommend including in the report to help reader understanding or provide a richer discussion?
- Are there other examples or information that you think would be relevant to add?

Implementation Considerations

- Approach
- Recommended Considerations for CCAC Review

Implementation Approach

Challenges and opportunities

Implementation Principles

Equitable and beneficial implementation

Monitoring and Evaluation

Key stakeholders

Implementation Approach: Challenges and Opportunities

Challenges

- **Costs:**
  - Some mitigation and adaptation actions will have high costs, especially upfront costs
  - Securing funding can be difficult and piecemeal
  - Stakeholders should consider holistic accounting of costs, including costs of inaction, future cost savings, and the value of co-benefits
- **Political will and resistance to change:**
  - The actions proposed in the CAP will create change in people's lives and work, and change can be hard
  - Political views on climate change, energy, transportation and other topics may delay or prevent action on certain strategies in the CAP
  - Education and outreach, and careful program design can help alleviate these concerns

Implementation Approach: Challenges and Opportunities

Opportunities

- **Increase jobs and expand business:**
  - As new technologies and policies are implemented, job and business opportunities increase.
  - Clean energy jobs are one of the fastest growing sectors.
  - Potential revenue from RGGI could be invested in businesses or programs that help decarbonize the economy.
- **Build resiliency:**
  - Resilient infrastructure and energy systems and greater energy security are increasingly important as the climate changes and becomes more variable and extreme.
  - Industries and local governments can adopt plans to adapt their systems and infrastructure to ultimately reduce or eliminate risks of their vulnerable assets, which can be supported by FEMA Building Resilient Infrastructure Communities (BRIC) funding.

Implementation Approach: Challenges and Opportunities

- **Increase equity:**
  - GHG reduction and climate resilience strategies should be designed to ensure equity and to protect all communities, especially the most vulnerable.
  - Improving equity can overlap with job growth opportunities—job training and advancement programs should be focused on low-income and marginalized individuals so that they can participate in the clean energy economy.
- **Increase environmental and health benefits:**
  - With the reduced combustion of fossil fuels, the Commonwealth would see a sharp decrease in air and water pollutants, improving the health of Pennsylvanians.
- **Optimize land use:**
  - The recommended strategies provide opportunities to optimize land use (e.g., suitable locations for solar, public transit-oriented development).
  - Optimal land-use also presents a prime opportunity to implement both GHG reduction and climate adaptation strategies in concert.

Implementation Approach: Principles

- To effectively implement the CAP and the strategies proposed within it, strategy implementation will be guided by the following principles:
  - Enhance collaboration between government and stakeholders.
  - Consider the needs of vulnerable communities and the effects of actions on equity, access, and inclusion.
  - Conduct monitoring and evaluation (M&E) assessments of strategies.

Implementation Approach: Equitable and Beneficial Implementation

- Designed to equitably and beneficially improve the lives of Pennsylvanians.
- Both the benefits and costs of implementing the CAP should be equitably distributed.
- Some primary ways to design for equitable and beneficial outcomes include:
  - Developing equity indicators,
  - Identifying areas or communities with low equity outcomes,
  - Assessing the causes of inequity and the needs of different communities, and
  - Developing implementation methods that reduce the causes of inequity.

Implementation Approach: Key Stakeholders

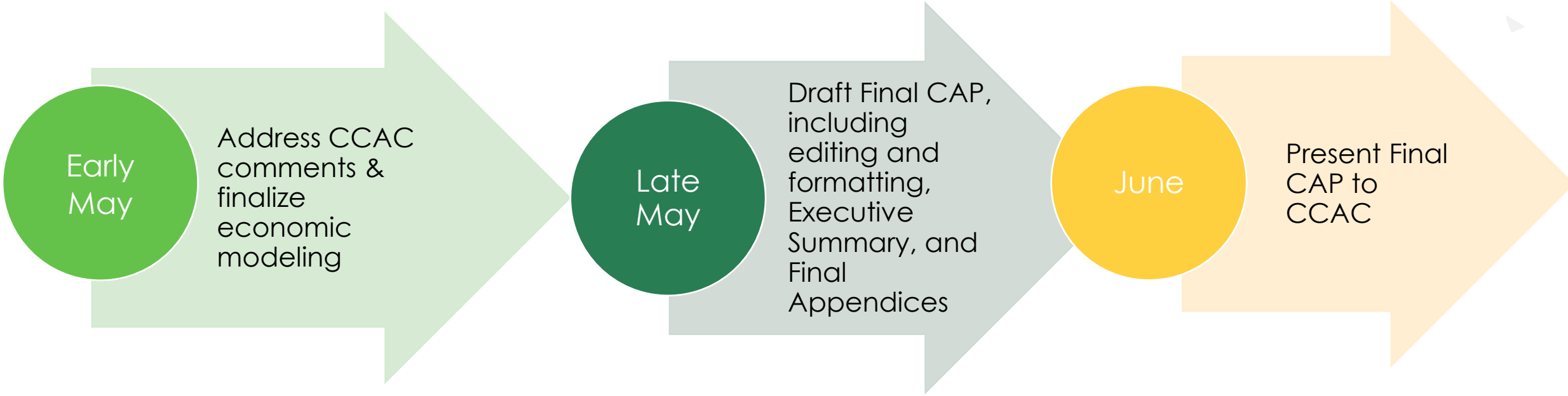
- Effectively implementing the CAP will require many stakeholders and leaders including:
  - Citizens
  - Businesses and industries
  - State legislature
  - State government agencies
  - Local government
  - Utilities
  - Public Utilities Commission
  - Federal government
- Each group of stakeholders will play a unique but vital role, and all will be needed to most effectively implement the CAP.

Implementation Approach: Monitoring and Evaluation (M&E)

- M&E is a framework for effective strategy implementation.
- M&E is used to track and assess the performance of strategies over time with the goal of improving current and future performance.
- Depending on the indicators and interim evaluations, strategies can be corrected to improve future outcomes.
- M&E does require additional resources, but the potential cost savings and long-term improvements in performance typically offset resource costs.
- Evaluation findings can be used to raise awareness of and to promote effective strategies, attract investments, and provide accountability and transparency.

Next Steps

Climate Action Plan Timeline



Next Steps

- Please review these slides and the latest CAP document. Then submit any written feedback to lbyron@pa.gov by May 11, 2021.
  - Please consider the recommended questions in this presentation as you are reviewing, but as usual, all comments and feedback are welcome.
  - Suggested sections for providing comments, based on the amount of new content:
    - Section 3: Opportunities for Reducing GHG Emissions in PA
    - Section 4: Opportunities to Adapt to the Impacts of Climate Change in PA
    - Section 5: Implementing Climate Action in PA
- DEP and ICF will review feedback and incorporate it into the CAP development process.
- Next CCAC meeting is June 27, 2021.
  - Will share the final CAP and request CCAC letters.


Thank You

Agenda

- Introduction
  - Approval of February minutes
- Summary of CCAC Feedback
- ICF Presentation on 2021 CAP
  - **2021 CAP discussion**
- Break
- Public Comment
- Updates
- New Business
- Next Steps/Next meeting

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Public Comment (15 min)

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Updates

- Membership Update
- RGGI status
- AEPS 2020 Annual Report
- GreenGov 2020 Annual Report
- Gov. Wolf’s 3/22 Solar Announcement

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Tentative 2021 IA/CAP Review Timeline

Meeting Date	Materials	Shared w/ CCAC	Feedback Requested
2/23/2021	- Final IA with refined findings - Updated Draft CAP with supporting analysis information incorporated (GHG mitigation results, enabling technologies, adaptation pathways) - Initial economic and co-benefits information, as available	2/9/2021	3/2/2021
4/27/2020	- Draft Final CAP and supporting analysis information, including all near final economic and co-benefits analyses	4/20/2021	5/11/2021
6/22/2021	- Final CAP from ICF	6/15/2021	TBD (letters)

Next Meeting

2021 Regular Meeting Dates:

- ~~*Tuesday February 23*~~
- ~~*Tuesday April 27*~~
- **Tuesday June 22**
- Tuesday August 24
- Tuesday October 26
- Tuesday December 14

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