



2024 Pennsylvania Climate Impacts Assessment and Climate Action Plan

Presentation to Climate Change Advisory Council



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Project Manager

Martha Hart
Deputy Project Manager

August 22, 2023

Agenda

- 1. Introduction**
 - The ICF Team
 - Project Approach and Scope
- 2. CCAC Engagement**
- 3. 2024 Climate Impacts Assessment (CIA)**
 - Review of Approach
 - Focus Areas and Updates for the 2024 CIA
 - CIA Outline
 - Q&A and Discussion
- 4. 2024 Climate Action Plan**
 - Review of Approach
 - Focus Areas and updates for 2024 CAP
 - CAP Outline
 - Q&A and Discussion

The ICF Team

Integrated Team of climate risk, adaptation, sectoral, GHG, and economic experts with **Institutional Knowledge** and who **understand Pennsylvania**



- Global consulting services company with ~9,000 professionals
- unmatched industry expertise with cutting-edge engagement capabilities to help organizations solve their most complex challenges.
- We are composed of reliable and experienced professionals, most of whom have worked with DEP on previous successful projects.



- Top-25 research university and the land-grant institution of higher education in the Commonwealth of Pennsylvania
- Faculty and scientists participating
- in the CIA and CAP represent the College of Earth and Mineral Sciences, College of Agriculture, PSU's Institutes for Energy and Environment, and the PSU Center for Energy Law and Policy.



- Environmental consulting and engineering firm with a wide range of environmental planning, engineering, and environmental compliance services.
- Inch and Meter assists government and private sector clients with addressing environmental challenges by planning and designing for a sustainable future.



- Runs technically enabled renewable energy and energy efficiency incentive programs for utilities and public entities
- Deep experience in Pennsylvania as the Pennsylvania Alternative Energy Portfolio Standard (AEPS) administrator for the Pennsylvania Public Utilities Commission (PUC)
- Experience in LMI loan and incentive programs from design to implementation has generated a deep understanding of how to reach these communities and design effective and embraced incentive programs.

Leadership Team



Adam Agalloco

Project Manager and
Mitigation Strategies Analysis
Lead



Martha Hart

Deputy Project Manager and
CCAC Coordination Lead



Deb Harris

Project Advisor: State
Government and
Decarbonization



Bill Prindle

Project Advisor: CAPs,
Technologies and Policy



Adam Parris

Project Advisor: Adaptation &
Environmental Justice



Cassandra Bhat

Impacts & Adaptation Lead



Dany Kahumoku

Equity Lead



Bansari Saha

Economic Assessment Lead



Logan Pfeiffer

Reports Lead

Experts and Support Team

Experts in:

- Transportation
- Electricity
- Buildings
- Industry
- Land Use & Agriculture
- Low Carbon Fuels (H₂, RNG, etc.)
- Climate Science & Risks
- Resilience Strategies
- Methane Emissions
- Embodied Carbon
- Energy Efficiency & Renewable Energy Implementation
- Health, Waste, and Air Quality



Project Approach and Scope

Fundamental Updates

Drawing from new baseline and other information

Expanding and Deepening Selected Elements

Emerging Policy
Technology
Market Developments
Impacts to Environmental Justice
Communities

Task	2023						2024					
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Kickoff	●											
Climate Impact Assessment (CIA)	Initial Draft CIA ●		Updated Draft CIA ●		Draft Final CIA ●		Final CIA ●					
Climate Action Plan (CAP)		Initial Draft CAP ●		Updated Draft CAP ●		Draft Final CAP ●		Final CAP ●				
Climate Change Advisory Committee (CCAC) Coordination		●		●		●		●		●		●

A report that is **shaped**, **populated**, and **refined** throughout the process

CCAC Engagement

Green=change
 Grey=no action
 Yellow=discuss/ponder
 Name: Please provide name

Side note- looks like they bounce around from referencing PDF page number and page number on the document footer. I'm updating to PDF page number where I catch it

Document	Page or Slide Number	Line Numbers, if Applicable	Table or Figure Number, if Applicable	Comment	Commentor	DEP Notes	ICF Notes	Decision	Notes
Climate Action Plan Draft Final	30		14	publication, the state was in the process of joining RGGI but had not officially joined yet? Or perhaps this should be added the first time RGGI is mentioned?	Lindsay Baxter	add 2022 start date?	change	2022 in the call out box referenced and when RGGI is first mentioned	
Climate Action Plan Draft Final	27		Environmental Justice	I find this graphic a little confusing. For total reductions, I think it might be helpful to show graphically how S1 plus S2 equals both pieces together of the outline of the big oval. I also think it would be more helpful to spell out strategy 1 and Strategy 2 rather than S1 and S2.	Gary Merritt and Jason Kelso	Agree	Can implement	Take suggested change on graphic.	Waiting for info from DEP (Heidi)
Climate Action Plan Draft Final	27		Environmental Justice	Has anyone looked at the economic implications of this as it relates to Climate Change Risk in detail? Also, has anyone looked at the potential impact on communities were climate changed has shutdown and eliminated jobs ties to the fossil fuel sector this creating a new class/area that should be protected by the EJ Program not to create new EJ areas?	Gary Merritt and Jason Kelso		We did not look at the economic implications of climate risk specific to PA - we can try to cost this out, or include a case study from elsewhere (e.g., Miami beach), but these estimates we can cite now are more national. 1. Job loss would not really make a new class of EJ unless those folks are already covered by an EJ definition. We did not look at the specific local job implications, but there is going to be shifting of jobs between sectors	Check with DCED on just transition (DEP to share). Include in 5.3.1 if good information exists. Look for other areas.	Waiting for info from DEP (Heidi)
CCAC Meeting Slides	34			How to interpret economic modeling is very important information. Please repeat numerous times in CAP.	Steve Krug	Let's discuss appropriate areas to make this clear	Look for appropriate areas to make this clear. More detail in the Appendix. Suggest on page 30 at least, and then maybe reminder footnotes on each of the metrics presented in	Include interpretation notes when we discuss econ modeling upfront (around page 30). Take right from the CCAC	

Comment Matrix from 2021 IA and CAP will be used to gather input from CCAC during 2024 CIA and CAP development

- ICF will provide Independent and authoritative knowledge and accurate information on climate science, technologies, GHG accounting methods, and climate and energy policies.
- Prior to today, our team reviewed the CCAC letters attached to the 2021 IA and CAP along with feedback shared with DEP on the scope of the 2024 CIA and CAP.
- ICF will be participating in six CCAC meetings, providing project updates, gathering feedback, and sharing final findings.
 - Feedback and input will be considered by DEP and ICF and an indication of how feedback was used and incorporated will be provided at the start of each CCAC meeting
 - CCAC will have 2 weeks to provide input following each meeting
- All correspondence and interaction with/for ICF should go through DEP (contact: Megan Porta)

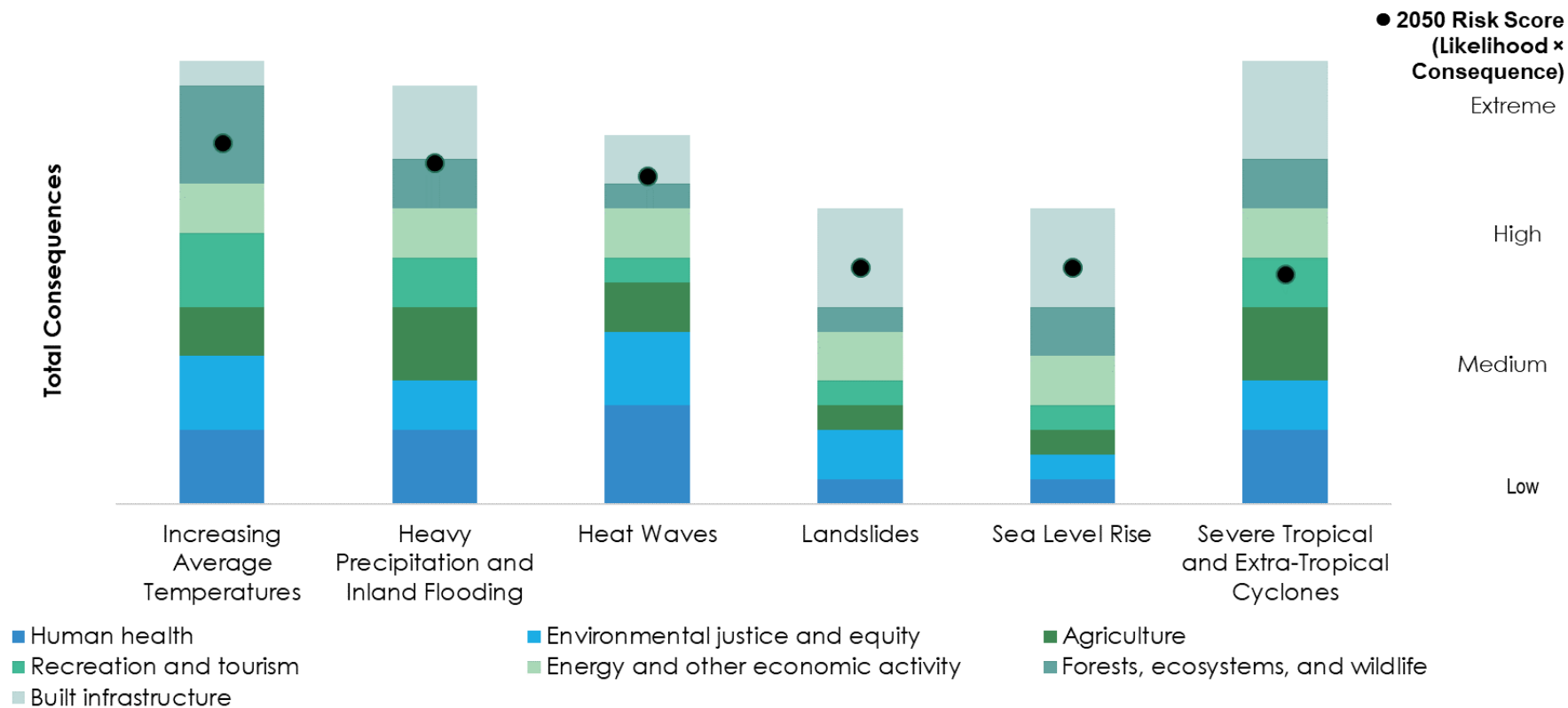




→ 2024 Climate Impacts Assessment

An opportunity to further enhance the risk-based approach to evaluating climate change impacts pioneered in the 2021 CIA.

2021 CIA Risk-Based Approach



[2021 Climate Change Impacts Assessment](#) Risk Ratings

- Identify impacts by hazard
- Rate the likelihood of each hazard
- Rate the impacts and consequences by sector
 - Human health
 - Environmental justice and equity
 - Agriculture
 - Recreation and tourism
 - Energy and other economic activity
 - Forests, ecosystems, and wildlife
 - Built infrastructure
- Evaluate and prioritize risks (by hazard and sector)

2024 CIA Focus Areas and Updates

Core Science Updates

- Latest [climate science](#) (CMIP6) and [recent trends](#)
- Discussion of [attribution science](#)
- Incorporate [new literature](#) in the analysis of impacts and risks

Enhanced Analyses

- Incorporate input DEP's [community engagement](#) processes
- Additional detailed analysis of [impacts in priority sectors](#) (such as health), particularly in EJ communities
- Expanded discussion of [economic benefits](#) of mitigation and adaptation, particularly in EJ communities

Accessible Products

- Translate CIA with supplemental communications material to help disseminate CIA findings

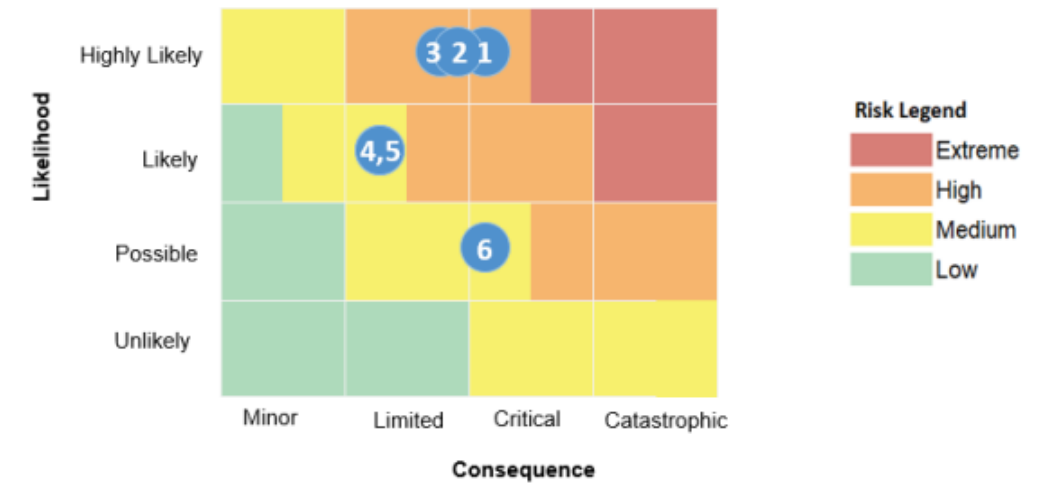


Figure 28. Overall summary risk matrix

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

Out of State Impacts

Climate changes outside of our borders can still have effects within the Commonwealth. These will be addressed in call-outs or throughout the CIA as appropriate.

2024 CIA Process

1 Initial Draft CIA

Report outline

Current climate change data and trends

Annotated bibliography of literature review updates

Summary of community inputs

2 Updated Draft CIA

Updated to all items in initial draft CIA based on comments and feedback

Updates to risk assessment ratings and content

Enhanced analysis of health and equity impacts

Discussion of economic opportunities of CIA

Initial discussion on attribution science

3 Draft Final CIA

Updates to all previous items based on comments and feedback (with focus on newly drafted sections)

Additional analysis of other priority topics as applicable

Initial draft of executive summary

4 Final CIA

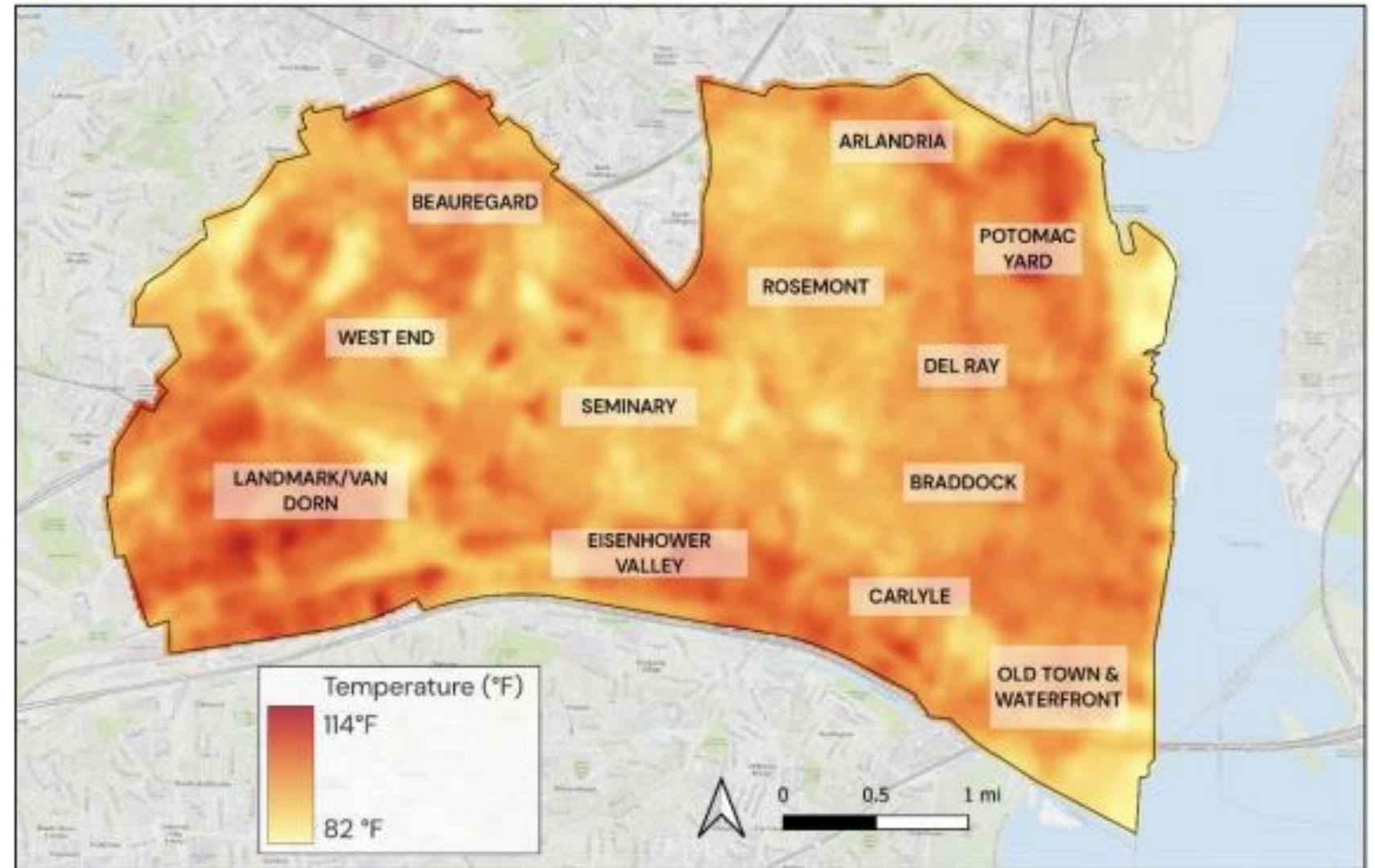
Updates on all previous items based on comments and feedback

Delivery of supplemental materials for DEP to share with a nontechnical audience

Updated Risk Assessment Content – Example “Deep Dive” Analyses

DEP and ICF will work together to identify up to 3 topics for additional analysis focused on health and equity impacts, such as:

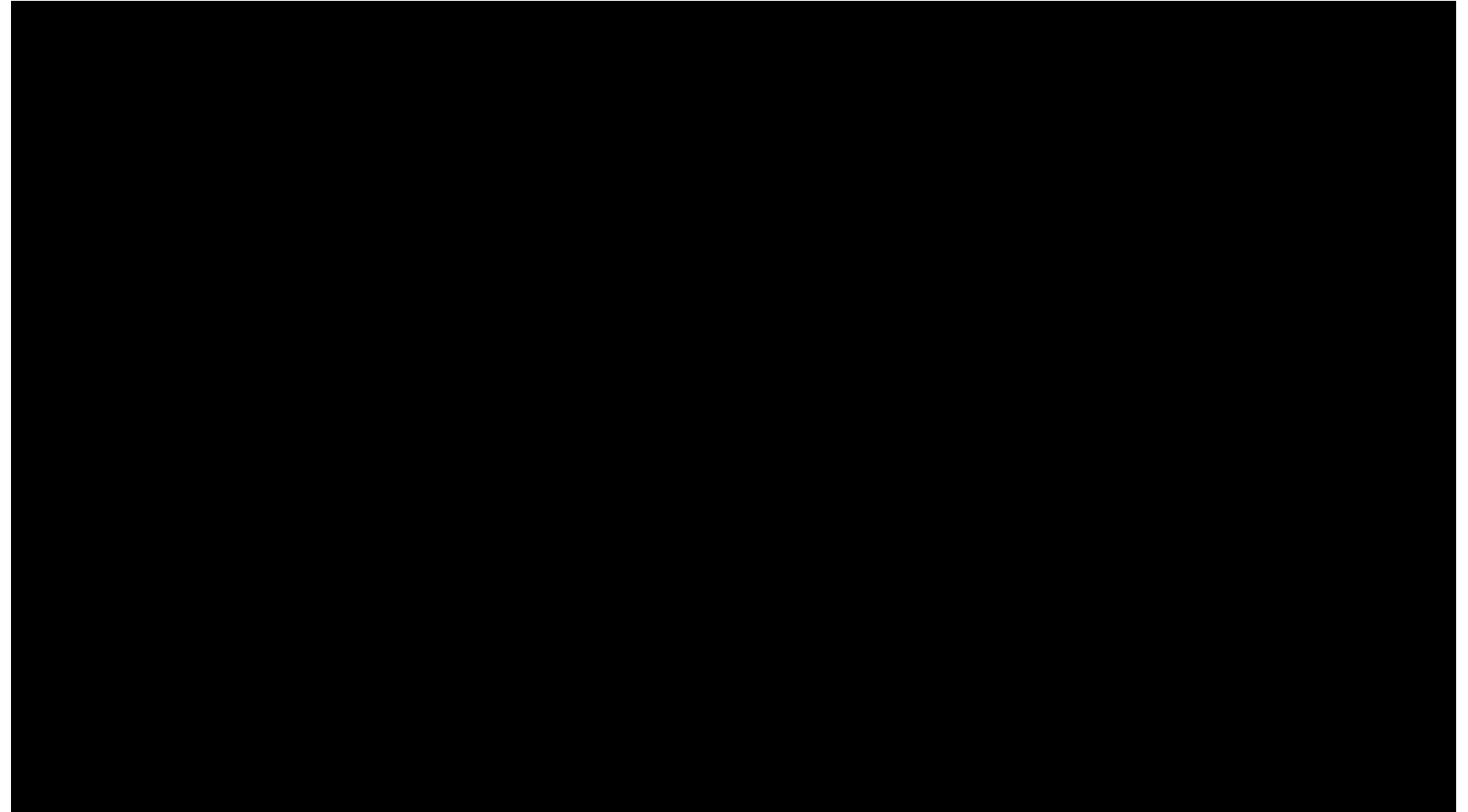
- Detailed mapping of land surface temperature and urban tree canopy cover
- Additional analysis of the cost of climate change hazards
- Air quality analysis of potential costs of future air quality
- Enhanced discussion of economic opportunities from adaptation and mitigation strategies



Example land surface temperature map from [Alexandria ECCAP](#)

Communicate Findings and Opportunities

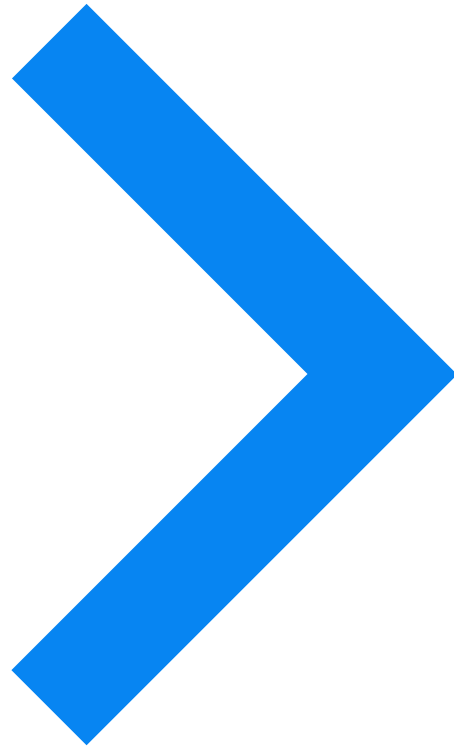
- The CIA results will enable the Commonwealth's residents to understand their relative exposure to risk and inform priority adaptation strategies in the CAP.
- Supplemental Materials beyond the CIA report for a nontechnical audience
 - 1–2–page fact sheet on impacts by sector.
 - Media package for a storymap and media distribution.
- Enhanced content and formatting of the CIA report to make it easier to digest for a general audience with higher level takeaways throughout the report.



[DEP Climate Change Impacts Storymap](#)

2024 CIA Outline

Review draft CIA outline (provide separately).



Climate Impacts Assessment Q&A and Discussion



→ 2024 Climate Action Plan

An opportunity for DEP to create a bold vision that exceeds goals; dives deeper into assessing the costs, benefits, co-benefits, and impacts for Pennsylvanians, particularly those in disadvantaged communities; and takes a stronger implementation focus with the aim of being a blueprint for action and potential legislative changes.

2024 CAP Process

1 GHG Emissions and Sequestration Trends

- Collect key updates and new data sources
- Develop and model 3 BAU Scenarios
- Assess achievement of state GHG reduction goals
- Select BAU scenario

2 Strategies to Reduce GHG Emissions and Adapt to Climate Change

- Update and prioritize mitigation and adaptation strategies
- Identify gaps and develop new strategies
- Incorporate equity approach
- Model GHG reductions
- Assess emerging technologies

3 Cost Effectiveness of Strategies

- Assess Societal Benefits, Costs, and Cost-Effectiveness Metrics
- Evaluate mitigation strategies impacts to consumer energy rates
- Assess economic impacts of strategies

4 Implementation and Legislation

- Identify specific, and actionable steps to implementation of strategies
- Develop technical support documentation for legislative action

5 Report Development

- Document, compile, and synthesize technical information into a visually attractive, data-driven, and understandable report
- Ensure clear communication of strategies supporting GHG reduction and climate resilience goals

2024 CAP Focus Areas and Updates

Existing CAP Strategies

Build upon and refine with a focus on **bolder actions**

Opportunities for the commonwealth to **meet and exceed climate goals**

Impacts of Mitigation and Adaptation Strategies

Dive deeper into the **cost effectiveness, co-benefits, and energy rate** impacts

Evaluate impacts on communities with a focus on **environmental justice communities**

Updated GHG Modeling

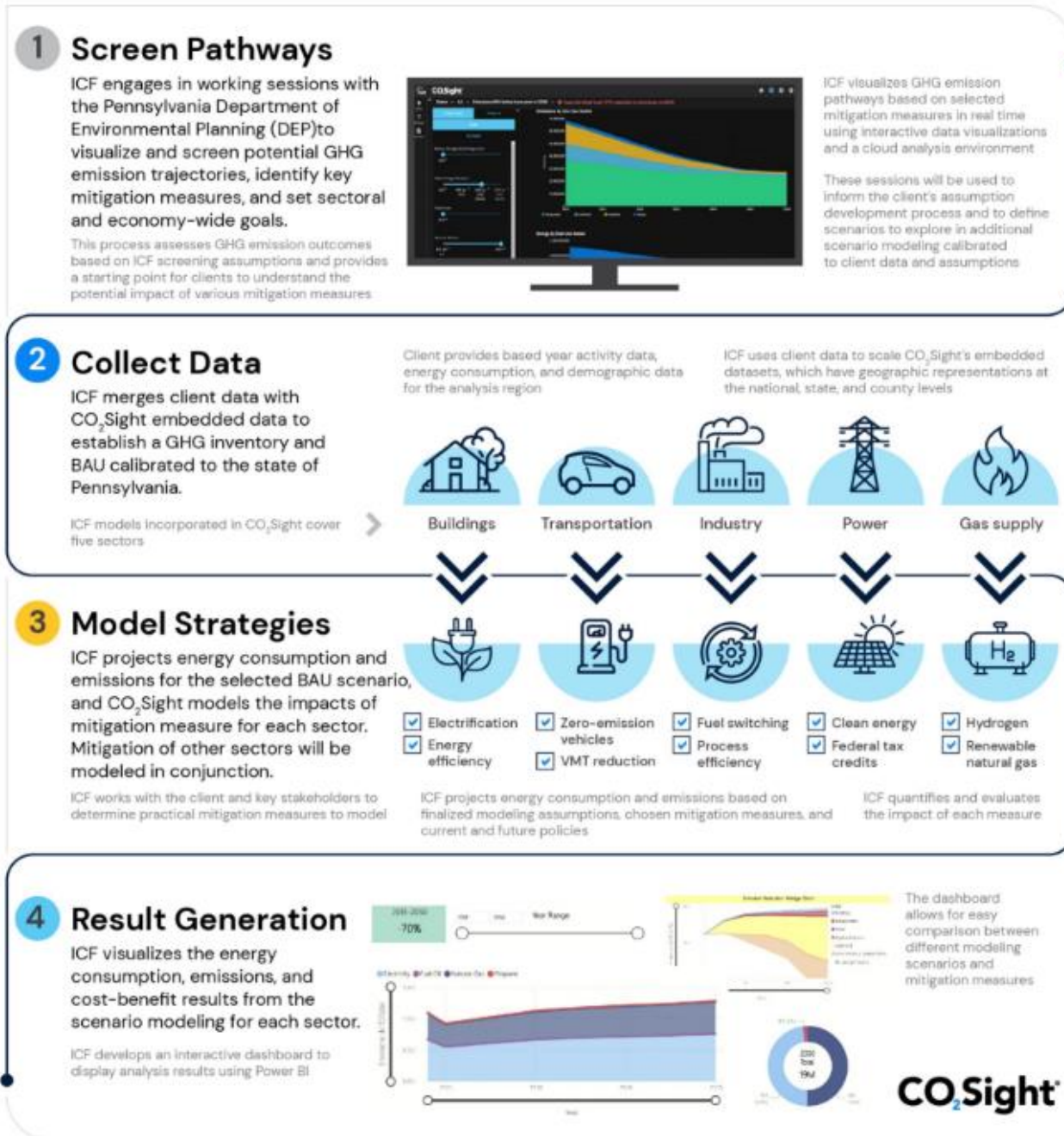
Inclusion of CO₂Sight data/approach

Evaluation of the impacts of key emerging technologies such as **hydrogen fuels** and **carbon capture**

Focus on Implementation

Provide a stronger focus on the implementation of CAP strategies to serve as a blueprint for **potential legislative changes**

Modeling GHG Reduction Pathways- CO₂Sight

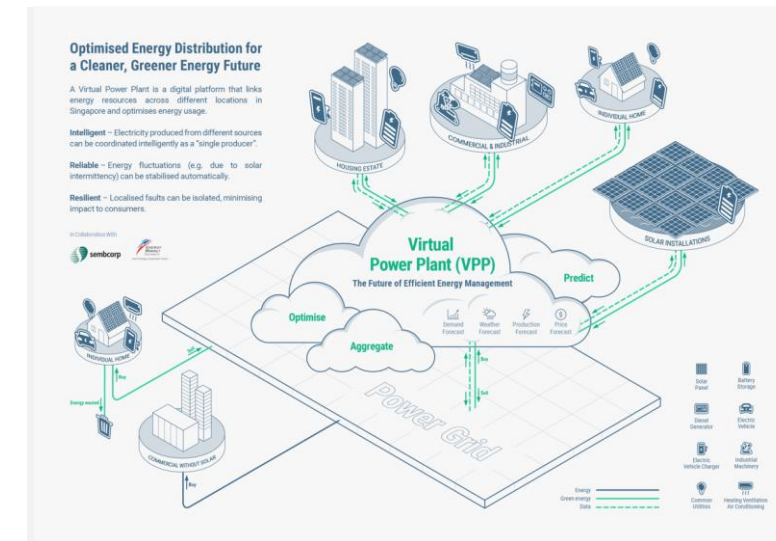
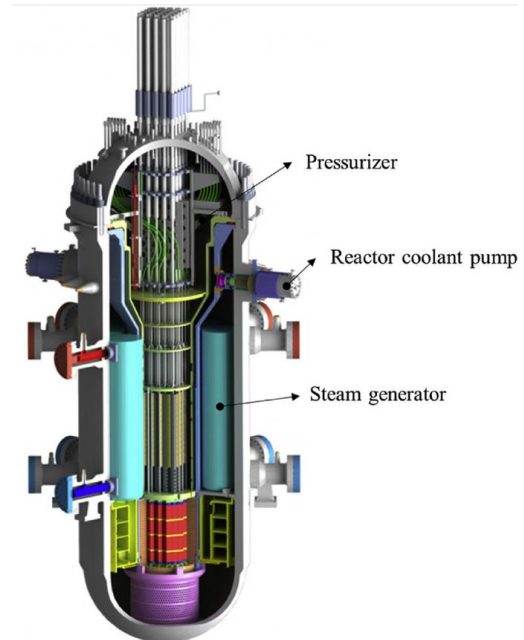


- ICF will use CO₂Sight, ICF's decarbonization modeling platform to screen potential pathways (i.e., a collection of GHG reduction strategies) that align with the strategies selected to be modeled.
- CO₂Sight allows ICF to more quickly provide trajectory toward decarbonization results.
- Using the CO₂Sight process will help the Commonwealth focus on areas of interest and to further develop assumptions on strategies to model reductions from GHG emissions.

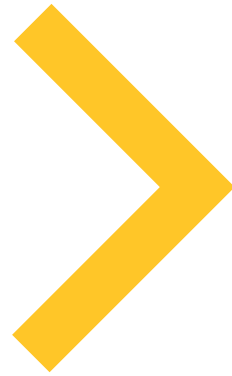
Emerging Technologies

Building upon ICF's work supporting DEP's CEP Plan, we will assess the potential application of the following emerging technologies and are open to discussing how to integrate these into the GHG reduction analysis.

- Low and No Carbon Hydrogen
- Small Modular Reactors (SMRs)
- Virtual Power Plans (VPPs)
- Advanced Large-scale Energy Storage
- Carbon Capture and Sequestration



Exploring Embodied Carbon



Embodied emissions from material extraction, manufacturing, use, and disposal have the potential to significantly impact Pennsylvania's emissions.

In the 2024 CAP, the ICF team proposes to initially study their impact through two courses of study:

The ICF team will complete a **literature review of embodied emissions** in buildings articulating their specific relation to Pennsylvania's built environment.

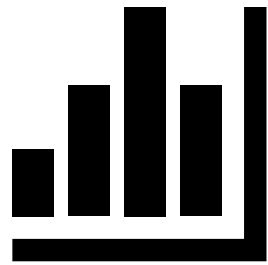
Our team will **model an example building** (a single-family home) to explore the tradeoff between embodied carbon and energy use and savings associated with net-zero buildings or major retrofits.

Cost Analysis Framing

Results could be by Strategy, by Economic Sector or across all Economic Sectors

	Customer Framing: Costs and benefits experienced by individuals whether they be a homeowner, renter, or a business	Implementer Framing: Costs expended and benefits gained by an entity implementing a specific policy or program.	Society-wide Framing: Cost and benefits economy wide and potentially across sectors.
Total Value: Total implementation, operational costs, plus associated savings and co-benefits	<ul style="list-style-type: none"> • Inform potential projects by providing costs and savings • Helps to understand energy burden on customers, to support equity impacts and LMI participation • Supports story telling from data 	<ul style="list-style-type: none"> • Helps to understand program viability • Equity impacts and LMI participation 	<ul style="list-style-type: none"> • Helps set policy priority areas • Shows and compare multisectoral costs, benefits and impact
Incremental Value: Incremental implementation & operational cost and benefits change as compared to a baseline	<ul style="list-style-type: none"> • Inform potential projects by providing costs and savings • Can inform targeted incentive levels (meeting cost tests) • Helps determine equity impacts and LMI participation 	<ul style="list-style-type: none"> • Supports meeting cost tests and cost recovery • Equity impacts and LMI participation • Understanding capital investments needed to meet carbon goals 	<ul style="list-style-type: none"> • Demonstrates the incremental societal costs and benefits of specific strategies

Impacts of Mitigation Strategies on Consumer Energy Rates



The ICF team will evaluate the impact on consumer costs for electricity and natural gas. The analysis will consider the [average statewide impact](#) and will not provide rates specific to any customer class or provider.

For electricity, the impact analysis will consider the expected change in wholesale power pricing (including energy and capacity) and transmission and distribution. ICF will use a high-level top-down approach to estimate the required investment in the transmission and distribution systems needed to [maintain reliable operation](#) given the expected load growth and changes to bulk and distributed resources over time as a result of implemented strategies.

For natural gas, ICF will use our Consumer Cost of Gas Model, which was designed to assess the implications of changes in gas utility business models and market structures incorporating forecasts of changes in customer numbers, gas throughput, changes in pipe infrastructure, and the breakdown of gas supply from the decarbonized gas volumes based on the impacts of changes in natural gas markets and decarbonization policy.

Legislative Recommendations

Technical Support Documentation and Analyses

Legislative changes that can be enacted by the General Assembly to support actions detailed in the 2021 CAP.

Emission-reduction projections stemming from actions recommended in the 2021 CAP.

Gap analysis identifying where the 2024 CAP can supplement 2021 CAP recommendations in meeting state climate goals.

Projected Impacts (in alignment with strategies)

Projected impacts from proposed Pennsylvania Legislation (e.g., updated AEPS requirements)

Projected impacts from adopting climate legislation that other states have implemented or proposed (e.g., California's ZEV requirements)

Costs and Co-Benefits

Costs and co-benefits analyses from specific climate change legislation, including economic benefits, impacts to small Pennsylvania businesses, impacts on EJ communities (e.g., impacts to air quality, health impacts), or additional environmental indicators, such as criteria pollutants and water usage.

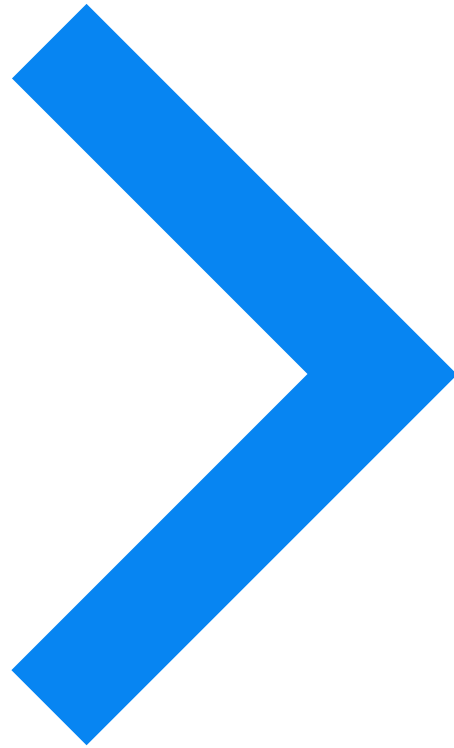
Impacts quantified at both state level and at more granular resolution to identify impacts on specific localities and communities

CCAC Role

ICF will use these analysis and present at future CCAC meetings to gather input on potential climate change legislation (including sample legislative language)

2024 CAP Outline

Review draft CAP outline (provide separately).



Climate Action Plan Q&A and Discussion.