PENNNSYLVANIA CLIMATE CHANGE IMPACTS ASSESSMENT OUTLINE

The outline describes the major sections and content of the 2021 Impact Assessment (IA) update, including a risk-based approach. The report will be organized by climate risk and detail the likelihood and consequences of each climate risk. This will allow for a prioritization of risks and impacts that can directly inform the development of the CAP.

- Executive Summary
- Introduction
  - Purpose and objectives:
    - Purpose of the Impacts Assessment/Act 70
    - How Pennsylvania is being impacted by climate change
      - How environmental justice communities are impacted by climate change, as applicable
    - How the IA directly informs priority adaptation strategies in the CAP
      - Identification of relative timing and severity of impacts, along with the lead times needed for adaptation
      - Aligning with CAP focuses: environmental justice and equity, other co-benefits (e.g., social and environmental impacts listed in scope below)
  - Summary of updates relative to previous IAs
    - Using the best available science to inform the impacts assessment
      - Climate projections were updated to reflect latest available modeling
    - Benefits of transitioning to a risk-based impacts assessment approach
      - What will the transition look like?
        - High level overview of methodology (e.g., illustrate steps with process figure)
      - Benefits: Pennsylvania can then begin comparing relative timing and severity of expected impacts for a stronger tie-in to the Climate Action Plan (e.g., IA will identify priority adaptation needs for the CAP)
  - Scope
    - Climate hazards (final set TBD, but examples include increasing temperatures, heat waves, changes in precipitation patterns, flooding, water shortage, ecosystem shifts)
    - Focus areas: environmental justice and equity, human health, economy (including recreation and tourism and agriculture), forests, ecosystems, and wildlife
    - Geographic scale: statewide with discussion of regional variations (e.g., urban or rural, proximity to waterways), populations, industries, or other areas disproportionately affected
    - Timeframe for assessing impacts
  - Expected Climate Changes in Pennsylvania
    - Provided updated mid-century and end of century climate projections for Pennsylvania over a range of emissions scenarios, based on latest available climate modeling
- Risk assessment will emphasize mid-century impacts, but comment on end of century impacts as it relates to long range infrastructure planning
  - Description of uncertainty associated with projections
  - Provide projections in key sector-relevant variables (e.g., extreme heat days, heating degree-days and cooling degree-days, growing degree-days)
- Summary of Overall Climate Risks
  - Description of key take-away and overall risks
  - Summary of highest priority risks based on relative likelihood and consequence (e.g., overall risk by hazard, hazard/sector combinations with greatest likelihood and consequences)
  - Prioritized ranking of climate risks per consequence category
  - Overview of potential economic impacts and economic opportunities created by potential need for greenhouse gas mitigation strategies.
- Climate Risk Profiles (by hazard)
  - For each profile (e.g., Extreme Heat):
    - Overview highlighting the consequences of greatest concern
      - Consequences by sector
      - Summary table of risk ratings and justification (e.g., likelihood by 2050 and consequences across categories) (see example under Supplementary Information on last page)
    - Likelihood summary
      - Overall state of science and expected timing of changes and consequences
      - Process for arriving at 2050 likelihood rating (on a scale of 1-5, Unlikely to Almost Certain)
    - Consequence summary
      - Summary and justification for ratings (overall, and for the following sectors) (on a scale of 1-5, from Minimal to Catastrophic):
        - Human health
        - Economy
          - Agriculture
          - Recreation and tourism
          - Other economic activity (e.g., energy sector)
          - Built infrastructure
        - Forest, ecosystems, and wildlife
      - Identification of specific geographies, populations, industries, or other areas disproportionately affected
      - Cost of inaction on a rough order of magnitude (high, medium, low)
- Conclusions and Recommendations
  - Recap of overall findings
  - Recommended adaptation priorities
  - Identification of research gaps, if any, or recommendations for subsequent IA update
- References
• Appendix A – Key Terms
• Appendix B - Risk Assessment Methodology
  o Introduction
    ▪ Overview of overall risk assessment frameworks (e.g., ISO 31000)
  o Step 1: Establish the context
  o Step 2: Identify potential risks
    ▪ Initial list of risks considered for the assessment (drawing from previous IA reports)
    ▪ Prioritization process (reasonably likely to occur within mid-century timeframe, likely to result in potentially major or catastrophic consequences, have adequate information to conduct risk assessment)
  o Step 3: Analyze risks
    ▪ Likelihood rating scale (TBD – example shown below)

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Rating</th>
<th>Criteria for Discrete Climate Hazards</th>
<th>Criteria for Ongoing Climate Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost certain</td>
<td>5</td>
<td>Event is expected to happen about once every two years or more frequently (i.e., annual chance ≥ 50%).</td>
<td>Event is almost certain to cross critical threshold.</td>
</tr>
<tr>
<td>Likely</td>
<td>4</td>
<td>Event is expected to happen about once every 3-10 years (i.e., 10% ≤ annual chance &lt; 50%).</td>
<td>Event is expected to cross critical threshold. It would be surprising if this did not happen.</td>
</tr>
<tr>
<td>Possible</td>
<td>3</td>
<td>Event is expected to happen about once every 11-50 years (i.e., 2% ≤ annual chance &lt; 10%).</td>
<td>Event is just as likely to cross critical threshold as not.</td>
</tr>
<tr>
<td>Unlikely</td>
<td>2</td>
<td>Event is expected to happen about once every 51-100 years (i.e., 1% ≤ annual chance &lt; 2%).</td>
<td>Event is not anticipated to cross critical threshold.</td>
</tr>
<tr>
<td>Rare</td>
<td>1</td>
<td>Event is expected to happen less than about once every 100 years (i.e., annual chance &lt;1%).</td>
<td>Event is almost certain not to cross critical threshold.</td>
</tr>
</tbody>
</table>

▪ Consequence rating scale

<table>
<thead>
<tr>
<th>Rating</th>
<th>Human Health</th>
<th>Economy: Agriculture</th>
<th>Economy: Recreation and Tourism</th>
<th>Economy: Other economic activity</th>
<th>Forests, ecosystems, and wildlife</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catastrophic (5)</td>
<td>TBD (e.g., # of people at risk)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major (4)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Moderate (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insignificant (1)</td>
<td></td>
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</tr>
</tbody>
</table>
- Step 4: Evaluate risks
  - Risk rating matrix
Supplemental Information:

### Hazard Risk Profile Summary Template

#### Likelihood

<table>
<thead>
<tr>
<th>Current Rating</th>
<th>Rating</th>
<th>Justification</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>(1-5 rating)</td>
<td>1-2 sentence justification</td>
<td>(confidence level)</td>
</tr>
<tr>
<td>2020-2050</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beyond 2050</td>
<td>(Comments on potential trends in the climate risk post-2050)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Consequences

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
<th>Justification</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human health</td>
<td>(1-5 rating)</td>
<td>1-2 sentence justification</td>
<td>(confidence level)</td>
</tr>
<tr>
<td>Economy: Agriculture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economy: Recreation and tourism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economy: Other industries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forests, ecosystems, and wildlife</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

#### Differential Impacts

(Comments on differential impacts to certain populations or areas in the Commonwealth)

#### Potential Opportunities

(Comments on any potential economic opportunities)

#### Overall Risk

<table>
<thead>
<tr>
<th>Current</th>
<th>Rating</th>
<th>(Total risk score and rating)</th>
<th>(confidence level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-century</td>
<td>(Total risk score and rating)</td>
<td>(confidence level)</td>
<td></td>
</tr>
</tbody>
</table>