Climate Change Action Plan

- 2008 - Advisory Committee established
- October 2009 – Action plan developed
  - 42% CO2 reduction below 2000 levels by 2020
  - 52 work plans recommended to Governor
- Sectors include:
  - Electricity generation, transmission and distribution
  - Residential and commercial buildings
  - Land use and transportation
  - Industry
  - Waste
  - Agriculture
  - Forestry
- Update every three years
Transportation and Land Use

- PA Clean Vehicles Program
- Biofuel Development
- Diesel Anti-Idling Program
- Low Rolling Resistance Tires
- Eco-driving
- Public transportation
  - Increase ridership through existing and new programs
- Federal funding for freight and transit
- Land use program
  - More efficient use of existing programs and new laws and programs
State Climate Adaptation Plan

- Deliver to CCAC January 2011

- Working Groups
  - Natural Resources
  - Public Health and Safety
  - Infrastructure
  - Tourism and Outdoor Recreation

- Priorities and Practical Recommendations
Climate Change Adaptation Subcommittee on Infrastructure

- Water infrastructure
- Energy
- Land Use
- Insurance
- Land Development
- Buildings
- Transportation
Topics for Consideration

- Vulnerabilities
- Risks
- Implementation strategies and data gaps
- Prioritization
<table>
<thead>
<tr>
<th>Current and Future Climate Changes Relevant to Infrastructure</th>
<th>Sector</th>
<th>Vulnerabilities</th>
<th>Risk</th>
<th>Adaptation Strategy Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Temperatures during summer months and extreme heat events</td>
<td>Transportation</td>
<td>Buckling of roadways and/or bridges due to concrete expansion and softening of bituminous pavements</td>
<td>State maintains over 40,000 miles of roadways and 25,000 bridges. Local system includes over 70,000 miles of roadway and 6,300 bridges over 20 feet in length and an unknown number of bridges less than 20 feet.</td>
<td>Review available research for potential materials that can withstand higher temperatures</td>
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<td>Higher temperatures may impact construction schedules due to impacts on materials and personnel</td>
<td>Materials may not set or cure due to higher temperatures and works are more susceptible to heat related injuries</td>
<td>Perform work activities during cooler portions of the day, i.e. work during the night time hours</td>
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<td>Transportation</td>
<td>Buckling of paved runways</td>
<td>Pavement deformations create a hazard to aircraft tires during critical high speed takeoffs and landings.</td>
<td>More frequent inspections and installation of heat/pressure sensors in the pavement for real-time anticipation of failure.</td>
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<td>Thermal misalignment of passenger and freight railways</td>
<td>Extreme heat can cause rail lines to expand creating the phenomenon known as a sun kink or nervous rail. This adversely affects the rail gauge and if left un repaired could cause trains to derail.</td>
<td>More frequent inspections and additional tie anchors will need to be installed to all of the approximately 12,000 miles (2 rails per 6,000 liner miles of track) of track in the Commonwealth.</td>
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<td>High impact thunderstorms</td>
<td>Increased risk of lightning strikes, hail and tornados causing airport closures, delays</td>
<td>Improve forecasting techniques</td>
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<td>Invasive plant species management</td>
<td>Invasive species encroach on right of way and limit sight distances causing safety issues.</td>
<td>Research and employ herbicide management techniques to control invasive species</td>
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PA Climate Changes Relevant to Infrastructure

- Higher temps during summer months/extreme heat events
- Drier summers/Drought
- More high impact storms with more flooding
- **Wetter winters/more intense winter storms**
- Sea Level Rise – salt water intrusion
# Wetter Winters/More Impact Storms

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<th>Risk</th>
<th>Adaptation Strategy Recommendation</th>
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| Winter Flooding – increased damage from ice jams/debris blocking water flow | 25,000 state owned Bridges  
- Increased funding for emergency maintenance  
- Safety and economic issues due to flooded roadways and closed/restricted bridges | Design Standard changes  
Improved emergency procedures including communication |
| Roadway degradation due to more water in soil and increased Freeze thaw cycle | Increased funding required to fix potholes and supportive road bases | Research and employ different materials that reduce roadway penetration |
| Runway degradation | Pavement deformation creates hazards for 134 public use airports | More frequent inspections/ real time pothole repair |
| Wind Shear | Closure of airports/aircraft mishaps  
Cancellation of more flights | More terminal space needed for delayed flights/ purchase additional forecasting equipment |
| Erosion of rail beds and ballast | 6000 miles of railroads. Many parallel rivers and are susceptible to erosion, undercutting, complete washout | Increased inspection – Construction of comprehensive levee system. |
1. Identify current and future climate changes relevant to the system

2. Assess the vulnerabilities and risk to the system

3. Develop an adaption strategy using risk-based prioritization schemes

4. Identify opportunities for co-benefits and synergies across sectors

5. Implement adaptation options

6. Monitor and reevaluate implemented adaptation options