Adaptation

"Actions by individuals or systems to avoid, withstand, or take advantage of current and projected climate changes and impacts. Adaptation decreases a system's vulnerability, or increases its resilience to impacts."

--Pew Center on Climate Change

The potential effects on transportation fall into three main categories:

- Sea level effects
- Storm effects
- Temperature effects

Why be Concerned about Climate Change Impacts?

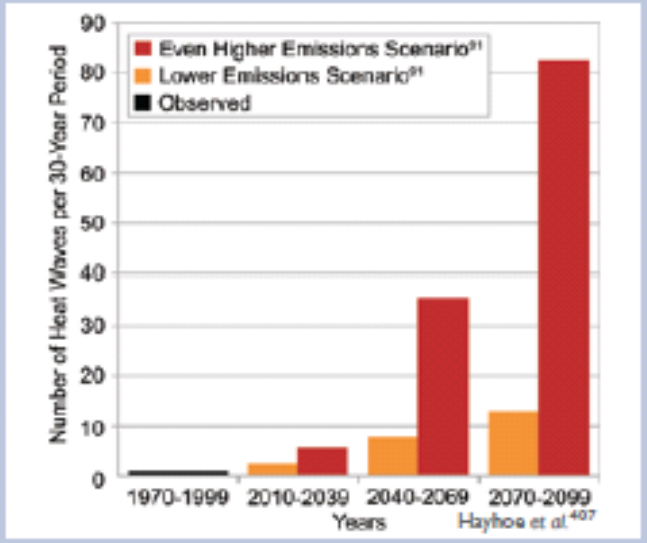
- Design life of transportation infrastructure: decades or longer
- As climate changes, our infrastructure will need to evolve to handle new conditions
- Each region has unique transportation assets, and faces different vulnerabilities and risks

Flooded roadways in Houston

Climate Change Impacts of Greatest Relevance for Transportation

- Increases in very hot days and heat waves,
- Increases in Arctic temperatures,
- Rising sea levels,
- Increases in intense precipitation events, and
- Increases in hurricane intensity

Number of 1995-like Chicago Heat Waves



Over the last three decades of this century, heat waves like the one that occurred in Chicago in 1995 are projected to occur about once every three years under the lower emissions scenario.[91] Under the even higher emissions scenario, such events are projected to occur an average of nearly three times a year. In this analysis, heat waves were

Potential Climate Changes and Transportation Impacts

Increases in very hot days and heat waves

Operations: limit construction activity due to health and safety concerns

Infrastructure: thermal expansion, pavement integrity

Increases in intense precipitation events

Operations: Traffic disruptions, evacuation route flooding

Infrastructure: Roadway flooding, road washout, landslides/mudslides, scouring

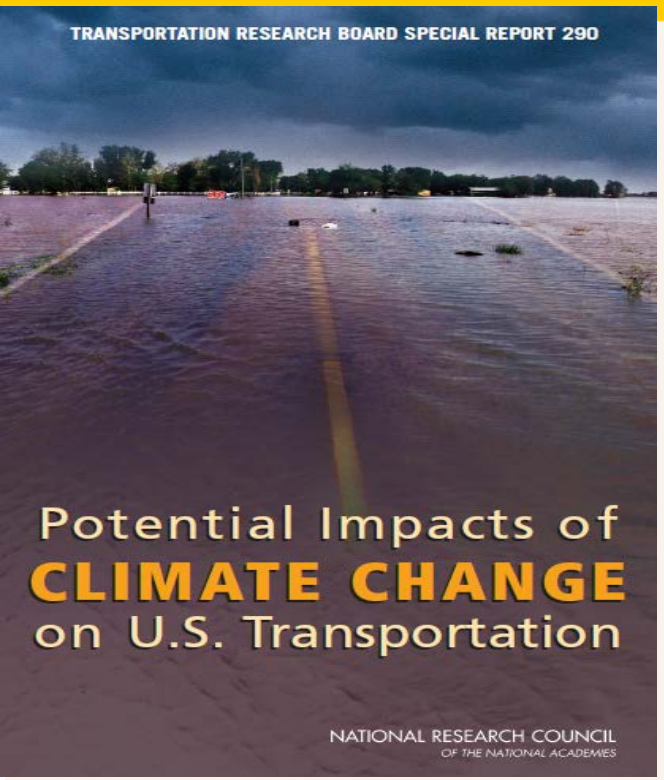
Implications for Design

- Changes in bridge height
- Changes in bridge foundation and superstructure
- Changes in materials specifications
- Changes in suspended and cable-stay bridges to withstand more severe wind and turbulence
- Changes in culvert design, capacity, and location
- Changes in slope design
- Changes in pavement drainage systems

Implications for Operations

- Pavement rutting and rail buckling
- Longer construction season
- Closures and detours due to rock slides, soil erosion, flooding
- Speed reductions
- Flooding of culverts
- Change in weight restrictions
- More grass cutting/less snow plowing
- Work crew limitations during severe heat periods

TRB SR 290



Climate change will affect transportation primarily through increases in several types of weather and climate extremes, such as very hot days; intense precipitation events; intense hurricanes; drought; and rising sea levels, coupled with storm surges and land subsidence.

The impacts will vary by mode of transportation and region of the country, but they will be widespread and costly in both human and economic terms and will require significant changes in the planning, design, construction, operation, and maintenance of transportation systems.

State and local governments and private infrastructure providers should incorporate climate change into their long-term capital improvement plans, facility designs, maintenance practices, operations, and emergency response plans

SR 290 Finding

The past several decades of historical regional climate patterns commonly used by transportation planners to guide their operations and investments may no longer be a reliable guide for future plans.

In particular, future climate will include new classes

(in terms of magnitude and frequency) of weather and climate extremes, such as record rainfall and record heat waves, not experienced in modern times . .

TRB Special Report 290

- Design standards will need to be evaluated.
- Transportation planners will need to consider climate change and its effects on infrastructure investments.
- Planning timeframes may need to extend beyond the next 20 or 30 years.
- Institutional arrangements for transportation planning and operations will need to be changed to incorporate cross jurisdictional and regional cooperation.

SR 290 Recommendation

Recommendation 1:

Federal, state, and local governments, in collaboration with owners and operators of infrastructure such as ports and airports and private railroad and pipeline companies, **should inventory critical transportation infrastructure in light of climate change projections to determine whether, when, and where projected climate changes in their regions might be consequential.**