Potential climate change and illustrative impacts on transportation

Potential Climate Change	Examples of Impacts on Operations	Examples of Impacts on Infrastructure
Increases in very hot days and heat waves	• Impact on lift-off load limits at high-altitude or hot-weather airports with insufficient runway lengths, resulting in flight cancellations and/or limits on payload (i.e., weight restrictions) • Limits on periods of construction activity due to health and safety concerns	• Thermal expansion on bridge expansion joints and paved surfaces • Concerns regarding pavement integrity (e.g., softening), traffic-related rutting, migration of liquid asphalt • Rail-track deformities
Increases in Arctic temperatures	• Longer ocean transport season and more ice-free ports in northern regions • Possible availability of a northern sea route or a northwest passage	• Thawing of permafrost, causing subsidence of roads, rail beds, bridge supports (cave-in), pipelines, and runway foundations • Shorter season for ice roads
Rising sea levels, combined with storm surges	• More frequent interruptions to coastal and low-lying roadway travel and rail service due to storm surges • More severe storm surges, requiring evacuation and/or changes in development patterns • Potential for closure or restrictions at several of the top 50 airports that lie in coastal zones, affecting service to the highest-density populations in the United States	• Inundation of roads, rail lines, and airport runways in coastal areas • More frequent or severe flooding of underground tunnels and low-lying infrastructure • Erosion of road base and bridge supports • Reduced clearance under bridges • Changes in harbor and port facilities to accommodate higher tides and storm surges
Increases in intense precipitation events	• Increases in weather-related delays and traffic disruptions • Increased flooding of evacuation routes • Increases in airline delays due to convective weather	• Increases in flooding of roadways, rail lines, subterranean tunnels, and runways • Increases in road washout, damages to rail-bed support structures, and landslides and mudslides that damage roadways and tracks • Increases in scouring of pipeline roadbeds and damage to pipelines

More frequent strong hurricanes (Category 4–5)	• More frequent interruptions in air service • More frequent and potentially more extensive emergency evacuations • More debris on roads and rail lines, interrupting travel and shipping	• Greater probability of infrastructure failures • Increased threat to stability of bridge decks • Impacts on harbor infrastructure from wave damage and storm surges