



Mainstreaming Climate Change Adaptation Strategies into New York State Department of Transportation's Operations

Mainstreaming Climate Change Adaptation Strategies into New York State Department of Transportation's Operations was developed to help the agency identify vulnerabilities of the state's transportation system to climate change and to identify opportunities to adapt the system and mainstream adaptation into the transportation decision making process. The report is divided into five chapters: an introduction, a discussion of climate change and its intersection with transportation in New York State, a vulnerability and impact assessment, a discussion of adaptation strategies and best practices, recommendation for mainstreaming those strategies into the operations of the New York State Department of Transportation (NYSDOT), and a communications and technology transfer plan.

Chapter 2 provides an overview of the latest climate science relied upon in the report, including current conditions and projected impacts in New York State. For historical trends and future projections, the report includes information on temperature variations, precipitation and snowfall rates, and sea-level rise.

Chapter 3 identifies sea-level rise and storm surge, increased temperature and heat waves, and increased intense precipitation as the principal climate vulnerabilities affecting NYSDOT. Sea-level rise is anticipated to result in permanent inundation of low-lying areas and increase the frequency and severity of coastal flooding. These impacts would increase bridge scour in coastal zones, expose infrastructure to saltwater damage, decrease clearance levels

under some bridges, increase flooding of low-lying roadways and other transportation modes, result in more frequent damages and service disruptions to transportation infrastructure in coastal areas, and increase the frequency of emergency management actions. Increased temperatures and heat waves will increase ventilation requirements for tunnels and air conditioning requirements for rolling stock. Rising temperatures will also require consideration of new heat thresholds for bridge expansion joints, new railroad design to avoid buckling, and new road surfaces to mitigate heat degradation. More frequent extreme precipitation events will cause increases in roadway flooding, potholes in pavements, washed out culverts and damaged bridges. It is anticipated that design changes will be required to prepare drainage systems and other infrastructure assets for these events.

Chapter 4 begins with a review of the existing literature on adaptation strategies and best practices. It notes that most of the literature offers general recommendations about the need for adaptation, but relatively few sources discuss the actual design and implementation of climate change adaptations. The chapter includes information on adaptation decisions frameworks and examples of adaptation measures that have been implemented in the transportation sector. The chapter also outlines adaptation options for NYSDOT in responding to sea-level rise and storm surge, intense precipitation, heat hazards, winter storms, and winds. Sea-level rise options include constructing levees, raising roadways, redesigning bridges to account for changes in scouring patterns, and redesigning culverts and ditches to withstand increased storm intensity. Adaptation options for more intense precipitation





include increasing the capacities of culverts, retention basins, and other drainage systems; relocating roadways out of future flood zones; and monitoring and remediating scour. For heat hazards adaptation options include adjusting road surface materials to withstand higher temperatures, preparing for more frequent power failures, and monitoring sagging bridges to assure adequate clearance.

Chapter 5 presents 44 key policy recommendations, framed so that adaptation measures can be mainstreamed through legislation, policies, programs, and projects. Recommendations fall into eleven categories: planning policies and guidelines, organization and management, coordination within and across agencies, regional aspects of planning, vulnerability inventories, design issues, infrastructure adaptations, monitoring and assessment, training, communications, and future research. For each set of recommendations, the report identifies which NYSDOT divisions should lead implementation. Selected policy recommendations of interest include:

- Climate change adaptation can be most cost-effective when incorporated into infrastructure during replacement and rehabilitation cycles. Integrating climate change adaptation into capital plans in this way is an important element of adaptation.
- Inconsistencies and conflicts among both internal and interagency programs that may develop as the climate changes can be identified; for example, planned expansions and rebuilding of infrastructure in current coastal and riverine flood plains can be reexamined in the light of climate forecasts.
- Developing a digital database of all NYSDOT “as built” structural and road bed

elevations in coastal areas, at least to elevations up to 20 ft above current sea level is necessary to make reasonable decisions based on projected climate risks including SLR and storm surge.

- Program and project designs should be varied according to the expected schedule of implementation and according to the expected useful lifetime of the structure or project, because the appropriate design should be for the climate variables and impacts expected at the date of implementation and beyond.

The chapter also offers extensive summaries of interviews conducted with each NYSDOT division on which these recommendations are based. One key conclusion from the discussions is that NYSDOT will need an ongoing internal structure to manage mainstreaming of climate change adaptation over the next few years. The chapter also offers guidelines for planning documents, recommendations on improving efficiency by linking adaptation measures to capital planning and rehabilitation cycles, and guidance on staying informed regarding the latest climate science.

The final chapter proposes a communications and technology transfer plan based upon a project workshop and outlines a possible agenda. It also suggests that individual discussions with managers and smaller workshops may be useful as follow-up.

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