FTA
FEDERAL TRANSIT ADMINISTRATION
U.S. Department of Transportation
Federal Transit Administration

REPORT SUMMARY

Chicago Transit Authority Pilot Project

An Integrated Approach to Climate Adaptation at the Chicago Transit Authority (CTA)

Agency Overview

The Chicago Transit Authority (CTA) operates the nation's second largest public transportation system, with an average weekday ridership of over 1.7 million. CTA is a regional transit system that serves 35 suburbs, in addition to the city of Chicago, and provides 83 percent of the public transit trips in the six-county Chicago metropolitan area. This climate change adaptation pilot project report describes ongoing efforts of CTA to increase resilience of its infrastructure, operations, and ridership to observed and projected impacts of climate change.

Goals and Objectives

The CTA climate adaptation pilot developed a comprehensive analysis to help assess future impacts of extreme weather on operations and infrastructure, which is organized under three principal tasks: Task 1 – Survey of System Vulnerabilities, Task 2 – Adaptation Implementation Strategies, and Task 3 – Integrating Adaptation Strategies into Standard Business Practices.

Key Pilot Project Findings

A baseline for observed and projected climate impacts was established based on available data and climate models, and a set of flexible tools is provided to allow testing of multiple scenarios and demonstrate the sensitivity of outputs to varying input assumptions.

Task 1 found that climatic hazards and projected future increases in extreme heat and precipitation events are likely to have significant impacts on CTA's infrastructure, transit operations, and customer experience. Localized climate models predict that prolonged heat events (e.g., three or more days exceeding 90˚F) will increase in the Chicago area under both low- and high-emissions scenarios. Extreme heat increases rates of rail buckling and signal equipment failures. CTA service disruptions due to extreme precipitation and flooding incur significant secondary costs due to replacement service, reduced reliability, and lost ridership revenue. Flooding incidents have inflicted significant capital, operating, and maintenance cost impacts as well.

Task 2 included a life-cycle cost analysis (LCCA) model to evaluate proposed adaptation solutions for three different CTA rail system vulnerabilities: right-of-way flooding, rail heat kinks, and signal house overheating. The LCCA demonstrated a positive return on investment for the majority of model runs at higher weather event frequencies than have been predicted in the baseline climate models. All model runs demonstrated a moderate degree of sensitivity to input variables, which indicates that extrapolation to other locations must be done carefully and all inputs correctly calculated for each project context. The majority of model runs generated a positive return on investment within a defined range of severe weather event frequencies, indicating that, as a general rule, the capital investments proposed can be justified in the context of other key decision variables. The LCCA analysis demonstrates that certain investments made today are projected to offset the future costs associated with climate change. However, prioritization of the improvements should not be performed exclusively from an LCCA analysis; additional factors must be considered to ultimately prioritize climate-adaptive improvements based on historical performance and available projection data.

In Task 3, two alternative approaches were proposed to incorporate climate impacts into CTA's enterprise asset management (EAM) system, in concert with the ongoing build-out of the EAM framework and ongoing engineering condition assessments: 1) develop qualitative risk assessment tables for major asset groups driven by severe weather impacts, and 2) incorporate fields in the EAM database to indicate the climate vulnerability of a given asset, which is defined as a function of three criteria: exposure, sensitivity, and adaptive capacity. A framework model was developed for forecasting operational and budgetary impacts. The model has initially been used to correlate temperature with bus HVAC defects and diesel fuel consumption. Bus HVAC defects showed a significant correlation with high temperatures, with more than 75 percent of failures occurring with temperatures above 80°F. Bus diesel fuel consumption showed a greater increase at higher temperatures (above 70°F) and a slight increase at lower temperatures (below 20°F).

Next Steps

This project establishes a baseline for observed and projected climate impacts, based on available data and climate models, and provides a set of flexible tools to allow testing of multiple scenarios and demonstrate the sensitivity of outputs to varying input assumptions. The results presented in this report can be updated with more refined data sets and climate projections and can be extended to other case studies of interest to CTA and peer agencies.

About FTA's Climate Change Adaptation Pilot Program

FTA provided just over $1 million in research funding for seven pilot projects (nine agencies) to conduct climate change adaptation assessments from 2011–2013. The main objective of the pilot projects is to advance the state of practice for adapting transit systems to the impacts of climate change. The selected projects assessed the vulnerability of transit agency assets and services to climate change hazards and developed initial adaptation strategies. The findings from the pilot projects can be applied to various size transit agencies nationwide in order to make systems more resilient and adaptable to future climatic hazards.

Project Information

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This research project was conducted by the Chicago Transit Authority and TranSystems. For more information, contact Kimberly Gayle, Director, FTA Office of Policy Review and Development, at (202) 366-1429, kimberly.gayle@dot.gov. All research reports can be found at **www.fta.dot.gov/research**.