

A VULNERBILITY & RISK ASSESSMENT OF SEPTA'S MANAYUNK/NORRISTOWN LINE

Laura Zale & Erik Johanson
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Southeastern Pennsylvania Transportation Authority Overview

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- Sixth largest public transportation system.
- 1.1 million trips per day.
- Service area includes Philadelphia, four surrounding counties, New Jersey, and Delaware.
- Five modes of transportation: bus, light rail vehicle, trackless trolley, commuter rail, and shared ride.
- Created by the State as many regional transportation providers consolidated between 1964 and 1983.

MAINTAINING A LEGACY SYSTEM WHILE STRETCHING CAPITAL DOLLARS

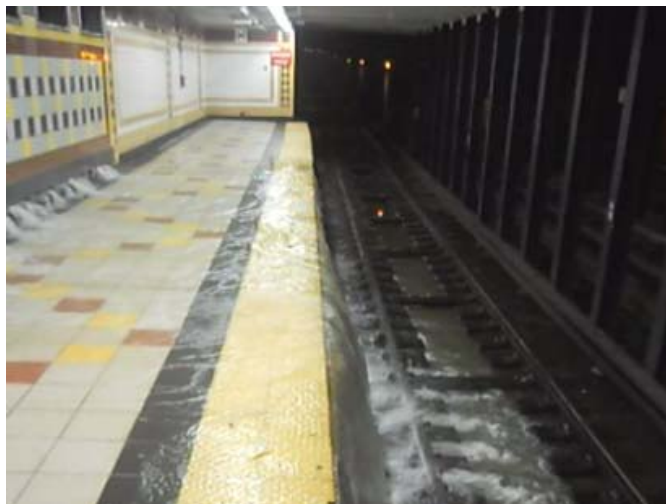
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- **Working to achieve a state of good repair is a core business goal.**
 - Fix it first to maintain a safe and reliable service.
 - Maintenance programs that extend useful life.
- **SEPTA has lost a large portion of dedicated transportation funding.**
- **Unfunded mandates put additional strain in the capital budget.**
- **The FTA estimated in 2010 that it would take \$77.7 billion to bring the country's transit infrastructure to a state of good repair. SEPTA's portion of this total has been estimated to be in excess of \$5 billion.**

SEPTA'S KEY CLIMATE CHALLENGES: VARIABILITY AND EXTREMES

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- **Climate vulnerability drains resources and manpower capacity.**
- **Increase in very heavy precipitation over the last 50 years.**
 - Subway tunnels and railroad beds particularly susceptible to flooding conditions.
- **The Philadelphia region is prone to seasonal weather fluctuations.**
 - Warmest summer and snowiest winter were both in 2010.



TRANSIT ASSET MANAGEMENT PROGRAM

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- **Transit Asset Management Program started with FTA Grant (November 2010).**
- **Three Part Strategy**
 - Vehicle Maintenance Information System Upgrade
 - Infrastructure Maintenance Management System
 - Investment Prioritization/ Decision Support Tool

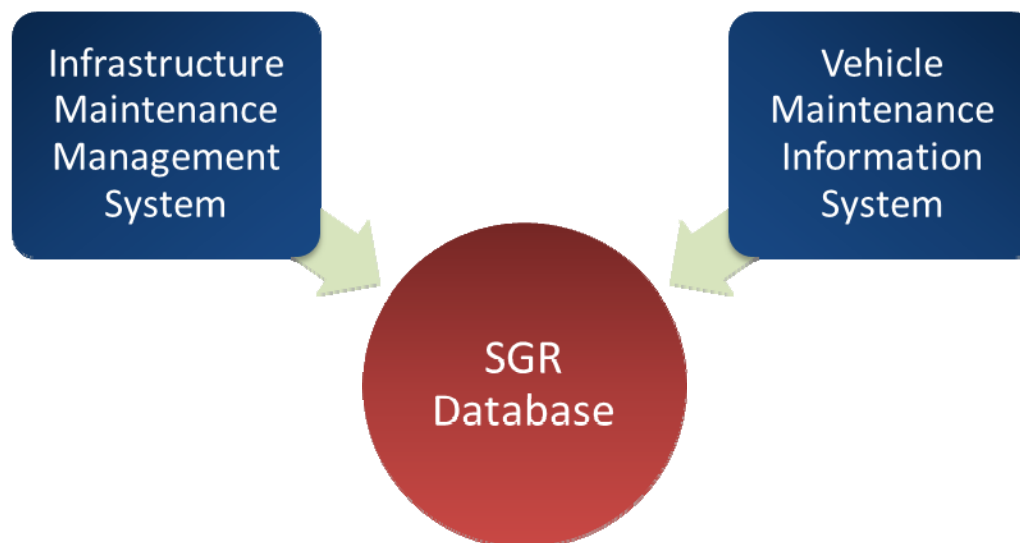


Figure 3. Percentage of extreme weather days with service disruptions on the M/N line

INFRASTRUCTURE MAINTENANCE MANAGEMENT SYSTEM

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- **Comprehensive database of assets maintained by the EM&C Division.**
 - Inspection and preventive maintenance schedules, asset history;
 - Will support trend analysis; and
 - Will include climate vulnerability “flags.”
- **Will allow managers to monitor issues with infrastructure components and evaluate the need for future capital projects.**



At left: Subway vent wells required covers for Hurricane Irene (August 2011). At right: Vent well and curb rehabilitation project (March 2012) performed to prevent water infiltration into the subway.

Figure 3. Percentage of extreme weather days with service disruptions on the M/N line

CAPITAL INVESTMENT DECISION SUPPORT TOOL

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- **SEPTA's SGR database has been developed with the goals of:**
 - Establishing SEPTA's SGR backlog;
 - Projecting future SGR needs based on asset lifecycles; and
 - Prioritizing capital expenditures.
- **Cost of replacement/ rehabilitation activities includes modifications to infrastructure to address known climate vulnerabilities.**



In response to track washouts during Tropical Storm Lee in September 2011 (left), SEPTA constructed a retaining wall (right) to prevent debris from washing onto the West Trenton Line during future storms.

CAPITAL INVESTMENT DECISION SUPPORT TOOL

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➤ Database will include future infrastructure projects that are necessary to preserve the infrastructure.

- Infiltration mitigation;
- Slope stabilization projects;
- Raising signal huts.



At left: Slope stabilization project on the Lansdale/Doylestown Line performed in 2010.

At right: In flood-prone areas, SEPTA plans to raise signal infrastructure, as shown in this photograph.

HOW CLIMATE ADAPTATION FITS INTO SUSTAINABILITY PROGRAM

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THREE PRINCIPLES

➤ BUDGET-NEUTRAL

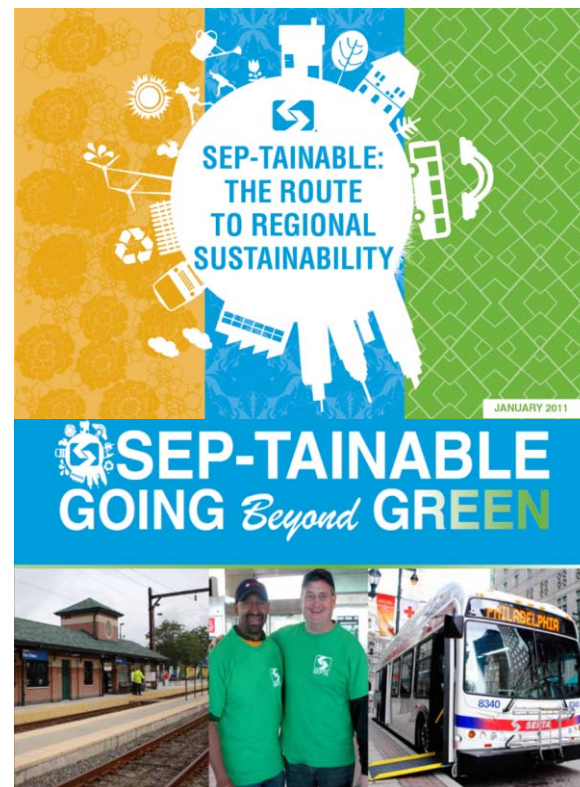
- Business Case for Sustainability
- FTA Grant Program Provides New Resources

➤ FOCUS ON EXISTING ASSETS

- Aging System is Expansive & Increasingly Vulnerable

➤ PROVIDE MULTIPLE BENEFITS

- Emergency Preparedness & Response; State of Good Repair; Asset Management; Infrastructure Resiliency



ADAPTAION PILOT PROJECT APPROACH

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➤ PARTNERSHIP

- ICF – Climate Science & Adaptation Strategy
- DVRPC (MPO) – Stakeholder Convening
- SEPTA – Engineering & Strategic Planning

➤ NARROW SCOPE & NUANCED CRITERIA

- Single Rail Line
- Inland Region

– DATA COLLECTION

- Asset Inventory
- Service Disruptions
- Operational Impacts

– STAKEHOLDER PARTICIPATION

- Integrate With Other Regional Initiatives



ANTICIPATED OUTCOMES

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➤ ASSIGNMENT OF COST

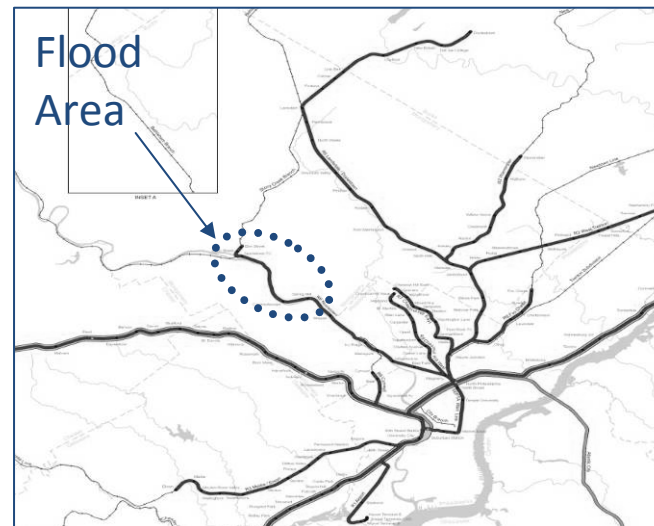
- Passenger Delays
- Workforce Impacts
- Capital Infrastructure Repair

➤ PRACTICAL GUIDANCE

- Inform Adaptation Strategy with Operational Realities
- Scalable, Transferrable Model

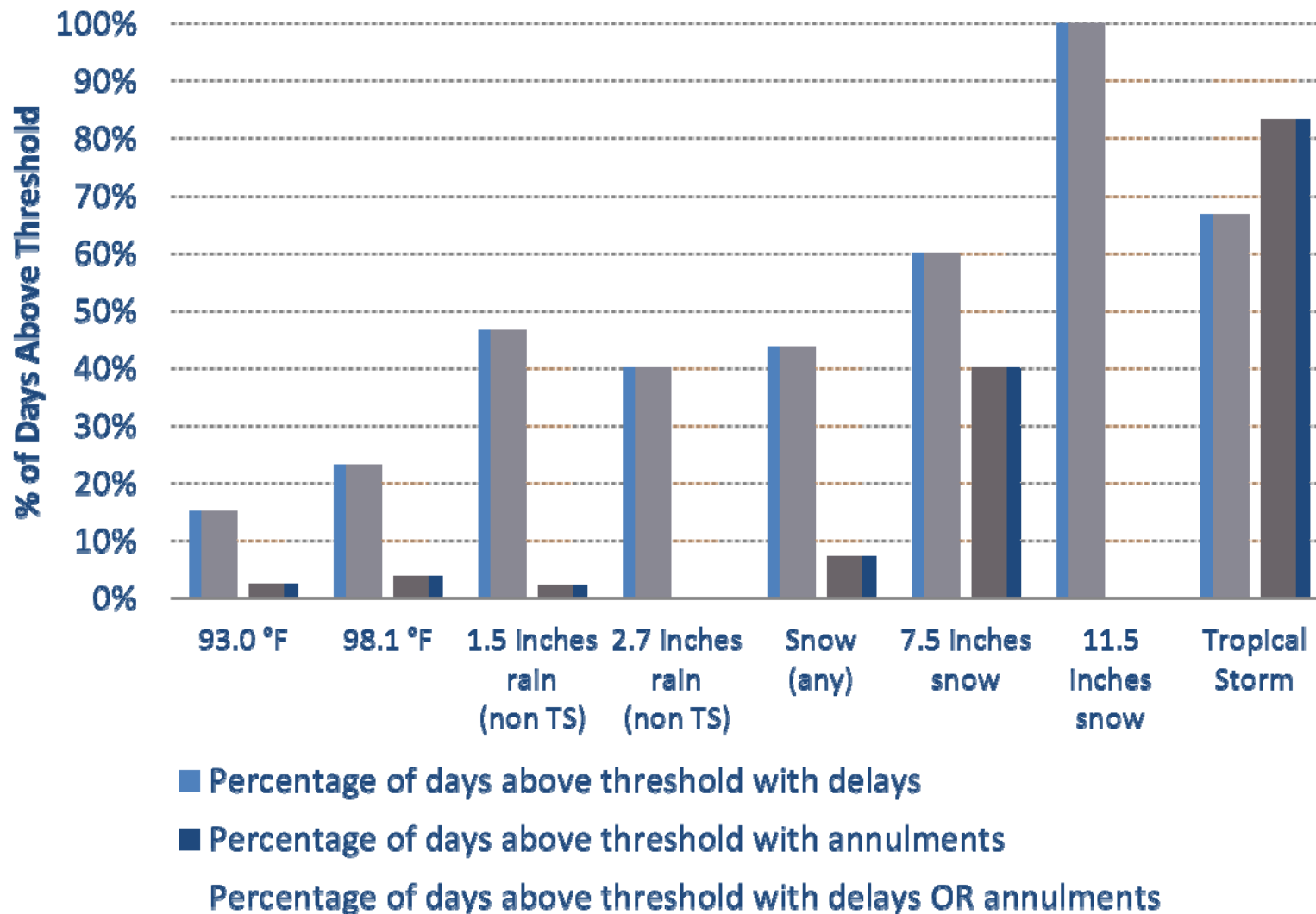
➤ LASTING PARTNERSHIPS

- Capacity-Building Exercise for Broader Regional Adaptation Initiatives



PRELIMINARY FINDINGS: SERVICE DISRUPTIONS

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PRELIMINARY FINDINGS: COSTS

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EVENT	DATE	COST TO SEPTA
Hurricane Floyd	Sept. 16-17, 1999	\$1,523,196
Tropical Storm Allison	June 16-17, 2001	\$5,755,364
Winter Snowstorm	Feb. 5-10, 2010	\$1,274,940
Hurricane Irene	Aug. 26-30, 2011	\$2,531,683
Tropical Storm Lee	Sept. 3, 2011	\$4,235,009
FIVE EVENT TOTAL		\$15,320,191

NEXT STEPS

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- **COST ANALYSIS (SUMMER 2012)**
 - FEMA Submittals; Roundtable; Work Orders, Employee/Passenger Claims; Customer Service Complaints
- **CLIMATE ANALYSIS (SUMMER 2012)**
 - Projected Trends for Philadelphia Region
- **RISK ANALYSIS (FALL 2012)**
 - Assess Vulnerabilities to Projected Trends
- **ADAPTATION MEASURES (FALL/WINTER 2012)**
 - Focus on M/N Line, Scalable to Entire System
- **STAKEHOLDER OUTREACH (ONGOING)**
 - Federal: FEMA, FTA, EPA
 - State: PEMA, Pa DEP, PennDOT
 - Local: MPO, City Water/Health/Transportation/Planning Depts

FOR FURTHER QUESTIONS REGARDING THIS PROJECT, PLEASE CONTACT:

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- **Vulnerability and Risk Assessment of SEPTA's Manayunk/Norristown Line**
 - Erik Johanson, Project Manager: ejohanson@septa.org

- **Transit Asset Management Program**
 - Laura Zale, Project Manager: lzale@septa.org