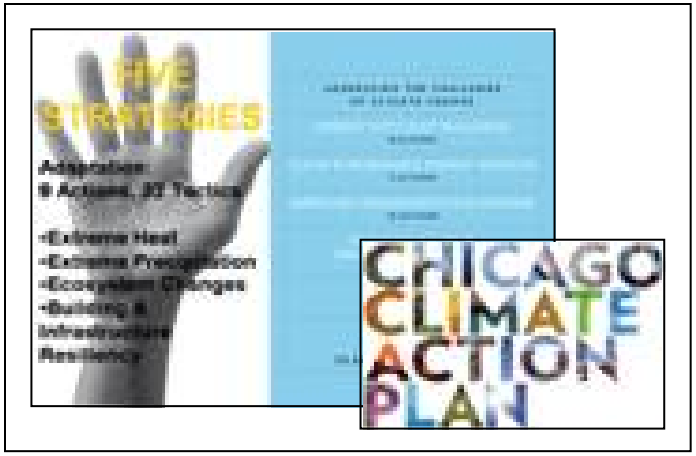
An Integrated Approach to Climate Adaptation for Transit Assets in Chicago

FTA Climate Adaptation Workshop
March 22, 2012

Karl Peet
Chicago Transit Authority
Strategic Planning & Policy

CHICAGO CLIMATE ACTION PLAN

Chicago Climate Action Plan Adaptation Evolution



FIVE STRATEGIES:

- **Energy Efficient Buildings**
- **Renewable Energy Sources**
- **Improved Transportation Options**
- **Reduce Waste and Pollution**
- **Adaptation**

2007	2008	2009	2010	2011-present
• **Assess economic risk:** Project City cost of no action at -$2.54B in high-emissions	• **Create 5 impacts working groups:** 21 departments & agencies create 39 "Tactics" for 5 groups	• **Create CCAP department work plans:** Commit to actions to adapt and mitigate	• **Define adaptation targets:** Form Adaptation Advisory Group to provide guidance	• **Strategic project implementation:** Use risk indicators to target health, natural and built environments

CTA Projected and Observed Climate Impacts

- **<u>Precipitation</u>:** Projections of ***20% more precipitation*** in the winter/spring increase flooding

- **<u>Temperature</u>:** The number of ***100-plus degree days*** could increase from two to 31 days annually

- **<u>Combined Impacts</u>:** Projected impacts include ***higher winds and more frequent power outages***

February 1, 2011 Chicago Blizzard

CTA Adaptation Pilot Workplan

- **Task I: Survey of System Vulnerabilities (30% of total effort)**
  Deliverable: Overview of key vulnerabilities (with level of risk) through survey of 20-30 general asset classes (e.g. substations, ROW, viaducts)

- **Task II: Adaptation Project Implementation Plans (50% of total effort)**
  Deliverable: In-depth analyses of three specific project areas for applying adaptation principles (e.g. traction power, right-of-way flooding),

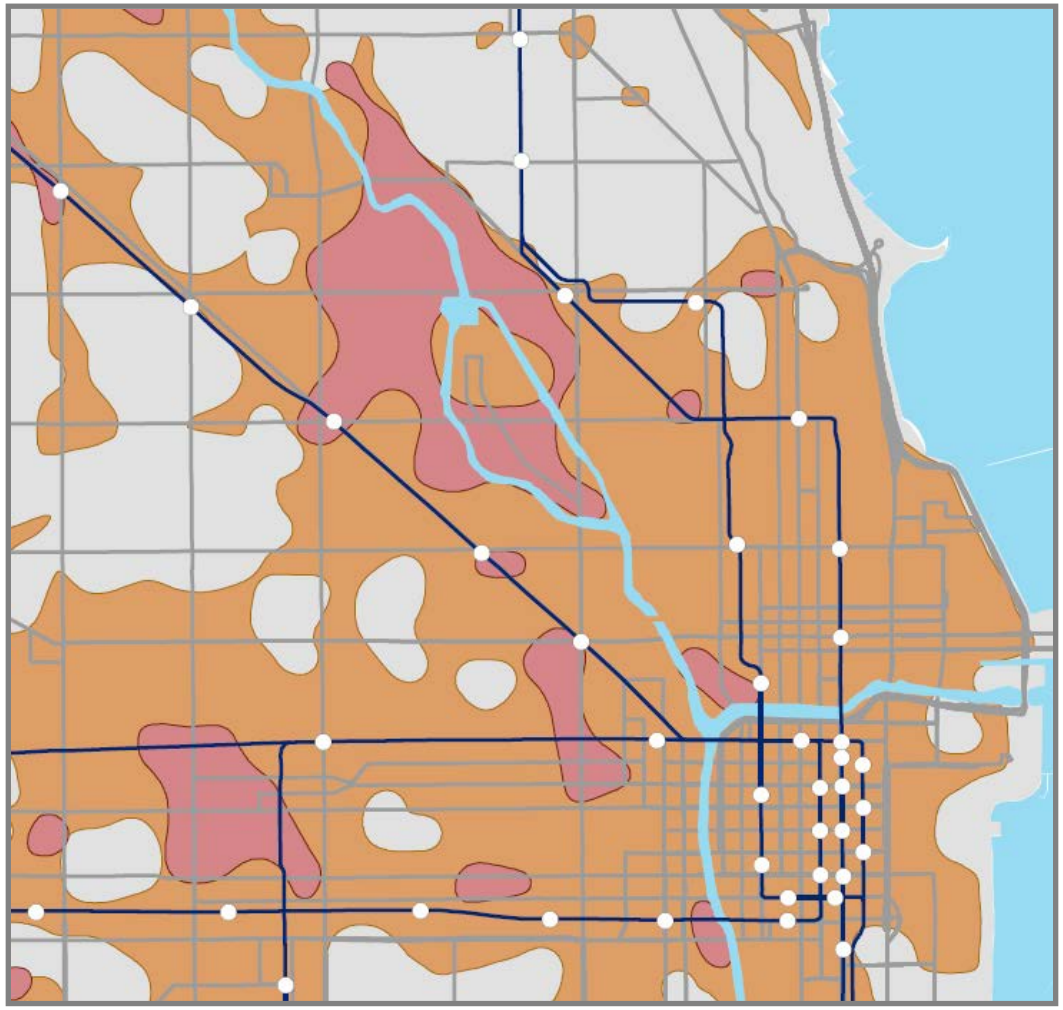
- **Task III: Integration into Standard CTA Practices (20% of total effort)**
  Deliverable: Long-term strategies to integrate adaptation into standard CTA business practices (e.g. asset management; safety and operations planning)

Task I: Survey of System Vulnerabilities

- Draw on existing **CCAP research** on projected Chicago-specific climate impacts

- Augment with **complementary data sets** that may impact transit assets

- Integrate with **CTA-internal data sets**, enhanced by strategic field visits as needed.



Chicago Urban Heat Islands

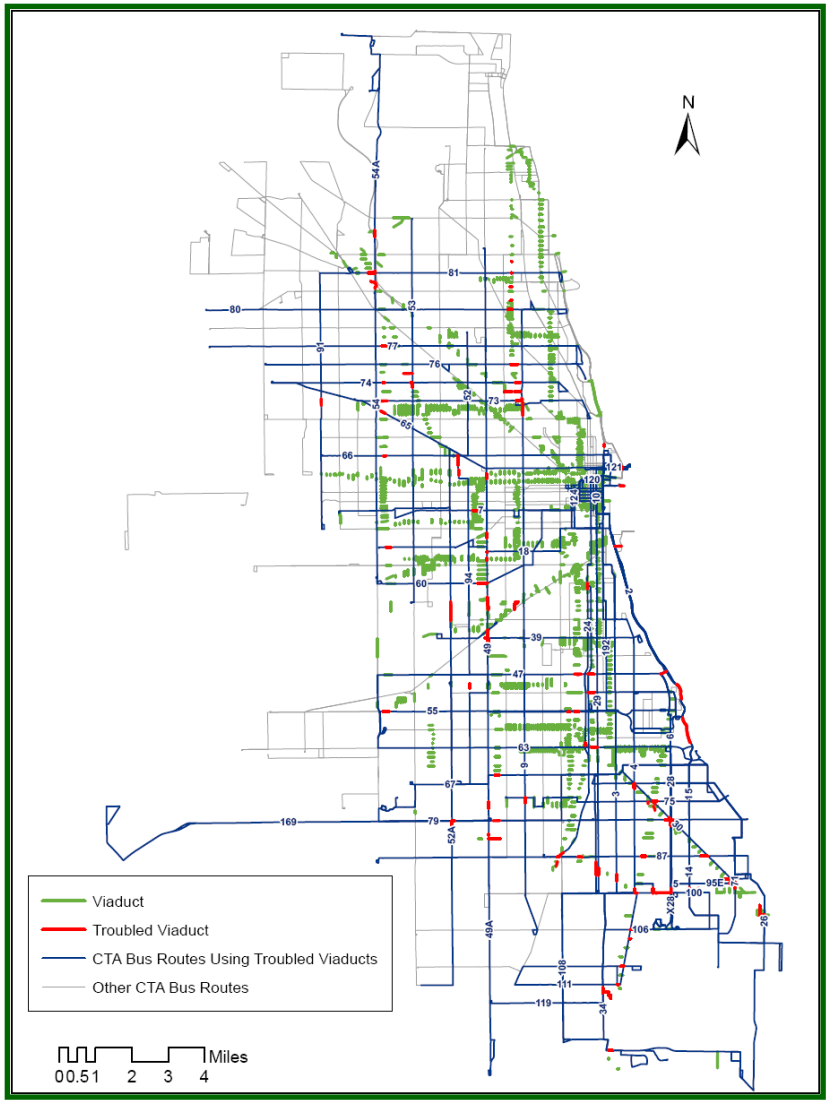
Task II: Bus/Rail Right-of-Way Flooding

CTA bus service is vulnerable to Chicago's 1500+ railway viaducts, more than 10% "troubled" by frequent flooding.

A comprehensive analysis of bus/rail ROW vulnerabilities would enable CTA to define more cost-effective approaches.

Research Questions:

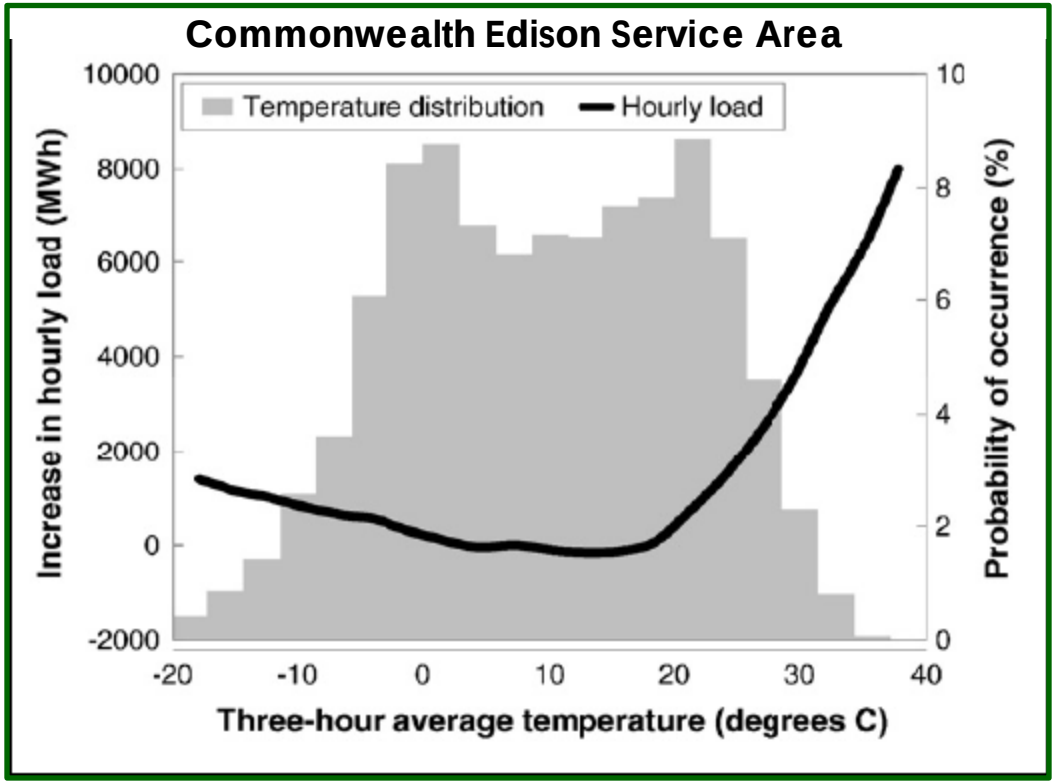
- What is the projected change in frequency/intensity of storm events in ***current*** CTA flood-vulnerable locations?
- What transit assets and locations are ***projected*** to become more vulnerable due to future climate change impacts?



Task II: Rail Traction Power Reliability

CCAP research reveals a drastic increase in electricity load at high temperatures; this distribution is projected to shift right over time.

A preliminary CTA analysis estimates that a 5° F temperature increase could increase heat-related rail failure rates by 5-10%



Research Questions:

- How will CTA's ***existing*** traction power infrastructure be affected by projected changes?
- Will projected demand on the regional grid ***increase*** disruptions/necessitate redundancies?

Task II: Customer Experience and Transit Ridership

Recent research shows vulnerability of CTA bus/rail ridership to changing weather conditions, reveals sensitivity by mode/period.

Weather Condition	Bus Ridership Impact		Rail Ridership Impact	
	Low	***High***	***Low***	***High***
Temperature (one degree increase)	+400	+700	+300	+500
Rain (one inch increase)	-16,000	-22,000	-5,000	-8,000
Wind (one mph increase)	-800	-1,300	Negligible	Negligible
Fog (moderate)	Not Insignificant	Not Insignificant	+8,000	+10,000

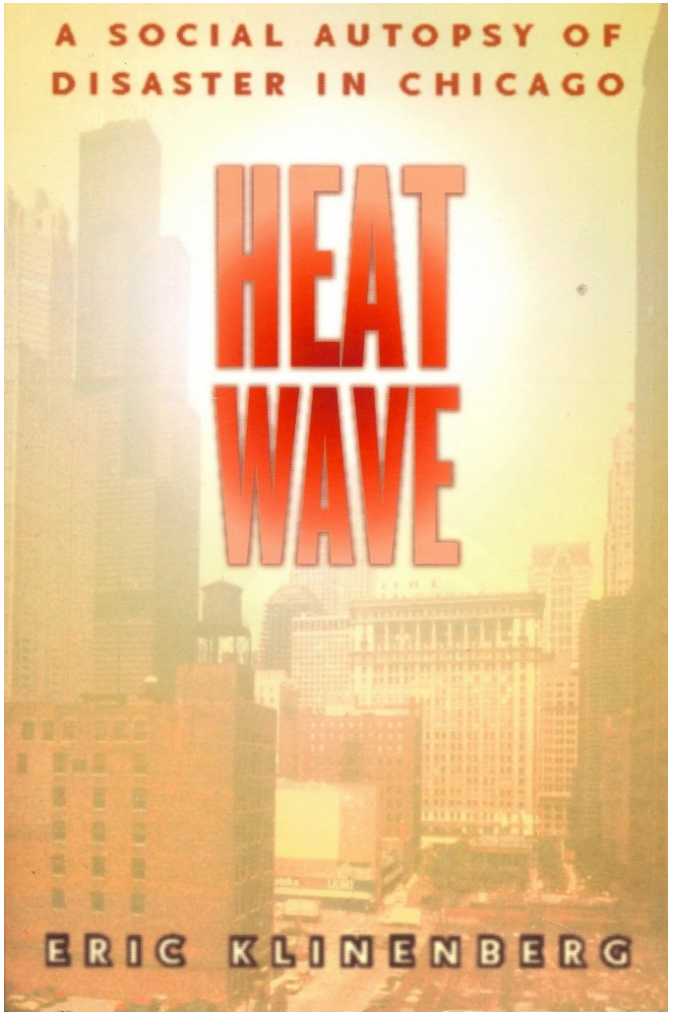
Research Questions:

- How can CTA customers be better protected at transit stations/stops under ***present*** temperature and precipitation extremes?
- What long-term measures are needed to ***sustain*** transit ridership and enhance transit's mitigation potential?

Task III: Integration into Standard CTA Business Practices

- **Transit Operations**
  Adapt bus and rail operations to both discrete and persistent climate impacts (e.g. bus reroutes for flood-prone roadways)

- **System Safety and Security**
  Develop data-driven means of expressing projected risks; define long-term strategies to bring hazards to acceptable levels

- **Asset Management**
  Produce a general framework for long-term integration of climate change impacts into existing/planned asset management systems.

- **Budget/Finance**
  Estimate additional operational costs due to projected climate impacts (e.g. accelerated bus maintenance cycles)