

## **FTA Climate Change Adaptation Webinar August 8<sup>th</sup>, 2011 Meeting Notes**

### **1. Welcome: Robert J. Tuccillo, Federal Transit Administration Associate Administrator for Budget and Policy and Chief Financial Officer.**

Mr. Tuccillo thanked the webinar participants for dialing in and joining the FTA. Mr. Tuccillo stated that achieving a state of good repair and maintaining high safety standards in the transit industry is a top FTA goal that has been articulated in many documents that they have published in the last year. These goals are threatened by changes in climate, particularly rising temperatures that can degrade assets. In a vicious cycle, many transit facilities that are not in a state of good repair may become even more prone to failure during an extreme weather event. High heat can cause tracks to buckle with the potential of endangering passenger safety. More flooding and more intense storms likewise threaten safety as well as customer and worker health. Given the \$607 billion invested in existing transit assets, responsible risk management is a necessity. Some transit systems have already factored extreme weather events into their planning, development and operations. Transit systems can build on the experience they already have with a range of climate and weather challenges. Rather than creating a new system, transit agencies can integrate these concepts into existing management programs and transportation planning processes.

On July 8<sup>th</sup>, the FTA issued a “Dear Colleague” letter to transit agencies that articulated its commitment to integrating climate change impact and adaptation into its planning, operations, policies and programs. This letter also identified a policy statement at FTA on the impact and importance of climate change adaptation.

Mr. Tuccillo also mentioned the publication of the latest FTA research report entitled “Flooded Bus Barns and Buckled Rails,” which was prepared by staff of the FTA Office of Budget and Policy. Lastly, Mr. Tuccillo reminded participants of the recently announced \$525,000 available for pilot projects to conduct climate change adaptation assessments within transit systems. Grant applications are due by August 25<sup>th</sup>.

### **2. Tina Hodges, Federal Transit Administration, Office of Budget and Policy**

Tina Hodges of the FTA’s Office of Budget and Policy presented the highlights of the recently completed report, “Flooded Bus Barns and Buckled Rails.” This report examines the impacts of climate change on U.S. public transportation and the risk management and adaptation strategies undertaken or applicable to the transit industry. This subject is especially relevant to the FTA, whose top organizational goals include ensuring both a state of good repair and traveler safety. Both of these goals are threatened by climate change. Climate change adaptation is responsible risk management considering the FTA’s investments in public transportation and infrastructure.

Global temperatures have increased in response to elevated carbon dioxide concentrations within the atmosphere. The average global temperature has increased 1.5 degrees Fahrenheit since 1900 and is projected to increase by another 2 to 11.5 degrees by 2100. The United States

Global Change Research Program concluded that global warming is occurring now and is primarily human-induced. Anticipated effects include:

Effect	Likelihood	Impacts
Intense Precipitation	Very Likely, >90%	Flooded track, bus ways, tunnels, lots, facilities Landslides
Very Hot Days & Heat Waves	Very Likely, >90%	Track buckling leads to slow order or derail Customer comfort issues Worker safety issues
Rising Sea Levels	Virtually Certain, >99%	Flooded track, bus ways, tunnels, lots, facilities Higher groundwater level floods tunnels
Increasing Hurricane Intensity	Likely, >66%	Flooding from storm surge and rain High winds – debris, wind damage Transit provision of evacuation service

Intense precipitation is expected to be greatest in the Northeast, home to some of the largest and oldest transit systems nationwide.

To meet these challenges, effective strategies must combine both mitigation and adaptation techniques. Adaptation actions undertaken by transit agencies include:

Transit Agency	Adaptation Actions
New York MTA	1 <sup>st</sup> report on climate change hazards at a US transit agency. Partnered with state and local adaptation efforts. Raised ventilation grates.
Los Angeles MTA	Conducting climate change risk assessment of assets, to be completed July
New Jersey Transit	Conducting climate change risk assessment of assets, to be completed Oct. Participating in FHWA adaptation pilot
Waves Transit, AL	Part of multi-modal US DOT Gulf Coast Study, Phase II
TriMet	Participating in regional adaptation efforts
Cape Cod Transit	Part of interagency climate change pilot, assessment of sea level rise impacts.
Honolulu Transit	Participating in FHWA adaptation pilot
King County Metro	Stakeholder in county adaptation efforts, which are at forefront of field
Transport for London	Adaptation included in risk and asset management systems. Adding air conditioning, addressing flooding to existing system. Climate impacts incorporated into design of major project – “Crossrail.”
Istanbul	New rail link built for 3 ft sea level rise + 1 in 10,000 yr flood
Taipei	After typhoon dumped 50 inches of rain in two days, set new standards for entrances: 2-4' above ground + 6" above 100 yr flood, tunnel floodgates

A helpful way to envision the inclusion of climate change adaptation into capital plans and budgets is through the use of asset management systems. Asset management systems offer a streamlined framework for incorporating climate adaptation into inventories, asset condition assessment, risk assessment, capital plans, rehabilitation cycles, and budgets. The London Underground has perhaps gone the furthest in incorporating climate adaptation into a sophisticated asset management system. London Underground mapped assets against climate risks, identified critical points, and conducted financial analyses. FTA plans to start collecting fixed asset data in the National Transit Database, including geo-location data, which will be useful to adaptation efforts. Incorporating climate change considerations into systems planning, siting of facilities, and design of new infrastructure and assets is important to ensure that new assets remain resilient to the climate conditions they may face throughout their useful life. FTA's grant requirements, planning regulations, technical assistance, and policy leadership can all play a role in improving US public transportation resilience to climate change impacts.

Additional transit agency processes that can incorporate climate change adaptation include:

- Metropolitan and Statewide Transportation Planning
- Environmental Management Systems
- Environmental Review and Project Development
- Floodplain Assessment
- Real Estate Acquisition and Relinquishment of Assets
- Design and Construction
- Retrofit
- Maintenance
- Emergency Preparedness, Response, and Recovery
- Performance Measures
- Organizational Culture and Budget Priorities

### **3. Cris Liban, Los Angeles County Metropolitan Transportation Authority**

Dr. Cris Liban, of the Los Angeles County Metropolitan Transportation Authority (LACMTA), gave a presentation on the topic of "Los Angeles County MTA Climate Change Adaptation Efforts." He described the Authority's progress toward a transit climate adaptation plan. He walked through the LACMTA's framework for climate work and the methodologies that the agency is working with its contractors on in this area.

Major legislative requirements in California provide drivers for climate change planning. These include AB 32, SB 375, the 2009 CA Climate Adaptation Strategy, and Amendments to CEQA.

- \* AB 32: Reduce state's global warming emissions be reduced to 1990 levels by the year 2020
- \* SB 375: Coordinated land use and transportation planning as a means to address climate change
- \* 2009 California Climate Adaptation Strategy
- \* Amendments to the California Environmental Quality Act Guidelines Section 15126.2

Currently, transit service disruptions occur during periods of extreme heat and heavy precipitation. Identifying portions of the transit system/particular services that are most vulnerable can help guide planning and operations. Large infrastructure projects (such as

Measure R, a voter initiative that will raise \$40 billion for transit projects and operations in Los Angeles County over the next 30 years) are in progress and being planned. Ensuring their performance and safety is critical, in both the current and future climate. Information about impacts and adaptation can be incorporated into decisions about mode selection, setting, alternatives, and materials.

There is a greater need to understand the nature and magnitude of risk associated with climate change. LACMTA is assessing both planning and operational options for reducing risks, and evaluating the relative costs and benefits related to the options.

The LACMTA takes a screening approach for climate adaptation planning. The four steps in the screening process include:

- (1) Identification of critical assets and services
- (2) Analyze historical trends and changes in climate
- (3) Identify impacts upon the transit system
- (4) Consider alternative options for adaptation to climate change

Observed climate change in southern California includes the following: The region has experienced warming in the 20th century across all seasons (~2°F) comparing last 30 years to earlier decades. The frequency of extremely warm days has increased. Precipitation changes are not statistically significant, far less than large year to year variability.

In terms of projections for future climate change: There is a projected warming of 2-6°F by 2050 and 3-10°F by 2100. The high end of the forecast range makes future springs and falls appear to be at least as warm as current summers. Precipitation changes estimated vary by model, but the majority show slight overall drying. Large year-to-year variability (including chance of heavy rainfall events) expected to continue into the future. Despite being a “dry” place on average, LA has experienced episodes of 10-12” of rain within 5 days and winters with more precipitation than Seattle receives in an average year (~40”). The high end of the range of future temperatures makes future springs and falls at least as warm as current summers.

LACMTA identified impacts associated with climate change include:

Service/Asset	Climate Impact
Rail Operations	Equipment malfunction (electrical systems; air conditioning systems) during periods of extreme heat
	Railway buckling during periods of extreme heat
	Flooding of underground stations and tracks, at-grade railways , and Bus Rapid Transit right-of-ways during heavy rainfall events
Bus Operations	Fleet breakdowns and increased maintenance during periods of extreme heat
New Construction/ Measure R Projects	Exposing new infrastructure to episodes of extreme heat and heavy rainfall events
	Labor interruptions or delays during periods of extreme heat

Climate change adaptation options that LACMTA is considering include combining weather/climate information with infrastructure monitoring and maintenance, exploring the use of more heat-resistant track materials, and improving “flood defense” at sensitive locations (like underground stations).

Important questions remain about how to evaluate and pursue options. For example, how can the costs of adaptive actions (or lack of action) be estimated? How can adaptation be made iterative? How can we monitor the impact of weather events, learn something, and update/adjust operations and planning. How can we best integrate adaptation into management/planning? What are we already doing that could be considered adaptation? How might adaptation help us achieve existing management goals?

#### **4. Projjal Dutta, New York Metropolitan Transportation Authority (NY MTA)**

Projjal K. Dutta, the Director of Sustainability Initiatives for the New York MTA, next gave a presentation on “New York MTA’s Climate Adaptation Efforts.” He stated that he wanted transit agencies to see climate change as an opportunity, since transit is a climate change solution. He emphasized that representatives of transit agencies should express this view more, so that society will invest more in public transportation.

Mr. Dutta described a case study of August 8, 2007. On this date, there was intense rain – between 1.4 to 3.5 inches in a 2 hour period. The first tornados were seen in Brooklyn in 100 years. The storm coincided with the morning rush hour, and reports of flooding came in from throughout the transit system. Pockets of intense, sustained rain overwhelmed the regional drainage systems. The flooding of the tracks and third rail in forced the shutdown of much of the New York City Subway system, affecting over 2 million customers.

Since New York City lies along the water, there is high risk from rising sea levels, increased flooding, and increased intensity storms. The subway system in particular, since it lies at such low elevation levels with subway tracks typically 20 feet below the street level, is at risk of flooding. The lowest critical elevations include the lowest points of entry to tunnels, subways or ventilation shafts.

The NY MTA is attempting to identify options for protection vulnerable transit infrastructure, considering both the level of risk and the value of facilities/components. The agency's Blue Ribbon Commission on Sustainability issued recommendations on adaptation, which included: implement an operational Climate Change database, complete a quantitative vulnerability and risk assessment, develop a Climate Change Adaptation Master Plan, and produce a climate adaptation resilience evaluation procedure.

## **5. Mike Culp, Federal Highway Administration, Office of Natural Environment**

Mike Culp of FHWA's Office of Natural Environment shared his presentation entitled "FHWA Climate Change Adaptation Activities and Lessons Learned." Climate change has implications for the planning process and asset management programs, as well as project level design considerations. Adaptation has become recognized as an important climate issue along with mitigation, yet relatively few DOTs, MPOs and cities have actually moved past very general high-level vulnerability assessments, and virtually no one has implemented adaptation projects. FHWA is helping its partners to understand how to conduct these assessments and what to do with them in order to protect our nation's transportation network.

Currently, the FHWA is developing and sharing information on tools and methodologies that states and MPOs can use to assess risk and prioritize actions including:

- Climate projections
- Critical asset identification
- Vulnerability assessment methodologies

Emphasis is placed on formulating adaptation solutions for infrastructure that is both vulnerable to the effects of climate change and critical to the transportation system.

In 2010, FHWA published "Regional Climate Change Effects." This report synthesized the latest regional climate change predictions and effects with the goal of assisting planners as they move forward with climate change adaptation planning. By using consistent climate projections, this report allows planners to begin to consider and identify potentially vulnerable infrastructure.

The FHWA created a Vulnerability/Risk Assessment Conceptual Model that identifies infrastructure is most at risk from climate change and/or is the most critical. The model operates using the following steps:

1. Develop asset inventory and prioritize (importance)
2. Gather climate data: magnitude of projected changes, including certainty / likelihood to extend available
3. Assess vulnerability and risk of the most important assets and the system as a whole to climate changes
4. Identify, Analyze, and Prioritize Adaptation Options
5. Monitor and Revisit

Using this model, several agencies have initiated pilot programs that are ongoing:

Agency	Area of Study
MTC (San Francisco)	Low-lying section of the East Bay between the Oakland Bay Bridge and the San Mateo Bridge
Virginia DOT	Hampton Roads metropolitan area
Washington State DOT	Statewide
New Jersey DOT	Atlantic Coast, Delaware River Valley
Oahu MPO	Oahu

Another ongoing FHWA initiative is Gulf Coast Study. This effort consists of two phases:

- Phase 1: Overview of climate change impacts on transportation infrastructure in central Gulf Coast (completed 2008)
- Phase 2: Focus on one metropolitan area – Mobile, AL
- Development of adaptation tools and strategies for one metropolitan area (Mobile, AL) and ensure that tools and strategies will be transferable to other areas (timeframe: 2010-2013)

There are several tasks under Phase 2. The first task is to identify critical transportation systems and infrastructure. This was done by delineating important assets, developing a scoring summary based on available data, applying engineering judgment to fill data gaps, and considering redundancy. Special care was taken during this process to distinguish community priorities from traditionally measured priorities. Professional judgment is critical due to lack of pertinent data at times. The second task is the projection of climate data. A major challenge is to bridge the gap between climate data produced by scientists and the data needs of engineers and planners. The United States Geological Survey (USGS) is actively engaged in downscaling temperature and precipitation projections provided by a number of climate models to 5 local

locations. The projections are based on three distinct emission scenarios and averaged over three time horizons, near-term, mid-century, and end-of-century. USGS is also developing 10 secondary variables. Secondary variables are any variables that can be analyzed from the downscaled daily temperature and precipitation projections.

FHWA lessons learned include:

- **Site specific climate projections are difficult to find:** Downscaling global models is a complex activity. Universities are often important players in developing this data (Washington State and Oahu pilots, for instance)
- **Transportation asset inventory data is time consuming to assemble:** There are many different sources even within one agency. Many different data formats are available and LIDAR data does not capture all needed details.
- **Interdisciplinary cooperation is key:** Effective climate change adaptation planning must include science information, engineering specifications, planning processes, and other considerations. Multi-disciplinary stakeholder communication is not easy and an understanding of existing decision-making processes and frameworks is very advantageous.
- **Impacts and concerns will vary by region – no one-size-fits-all answers**
- **Embrace the uncertainty:** Not all climate trends are clear. Planners and stakeholders must be comfortable with range of climate projections.

## 6. Questions and Answer Session

Following the presentations, the panel fielded the following questions from the audience.

**Q1: How is FEMA incorporating flooding adaptation issues into their report updates and map revisions?**

**A:** Mike Culp stated that FEMA often looks at past trends and current vulnerabilities but programs and initiatives such as the Hazard Mitigation program indicate that FEMA might be moving in a new direction. Cris Liban provided an example in Los Angeles County where efforts to increase tunnel height, while justified for public safety concerns such as ease of escape in the case of a disaster, resulted in outcomes that compliment climate change adaptation planning.

**Q2: Is FTA working with the FEMA Hazard Mitigation Grant program in implementing an adaptation strategy?**

**A:** Tina Hodges responded that FTA and FEMA have been cooperating through the Council of Environmental Quality's Inter-Agency Task Force on Climate Change Adaptation. Mr. Tuccillo was the chairman of the Urban Adaptation subgroup, which FEMA participated in. Much of the cooperation so far has been in the form of high-level risk assessments and coordinating planning.



**Q3: For LACMTA, what is Measure R and what is the implication of these projects?**

**A:** Measure R is a \$40 billion voter initiative that would expand the Los Angeles County transportation system. Cris Liban estimates that Measure R will double the size of the LACMTA system.

**Q4: How can public transportation providers be better prepared to aid in the evacuation of people in cases of disasters caused by climate change?**

**A:** Projjal Dutta and Cris Liban agree that redundancy within and across transportation modes is a key consideration. Redundancy is critical because major events can overwhelm a single system, whereas systems with parallel capacities are better equipped to withstand challenging conditions. There are also Department of Homeland Security adjustments already being developed and implemented that can double up as climate change adaptation solutions.