

Transportation Asset Management and Climate Change: Opportunities and Challenges

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Overview

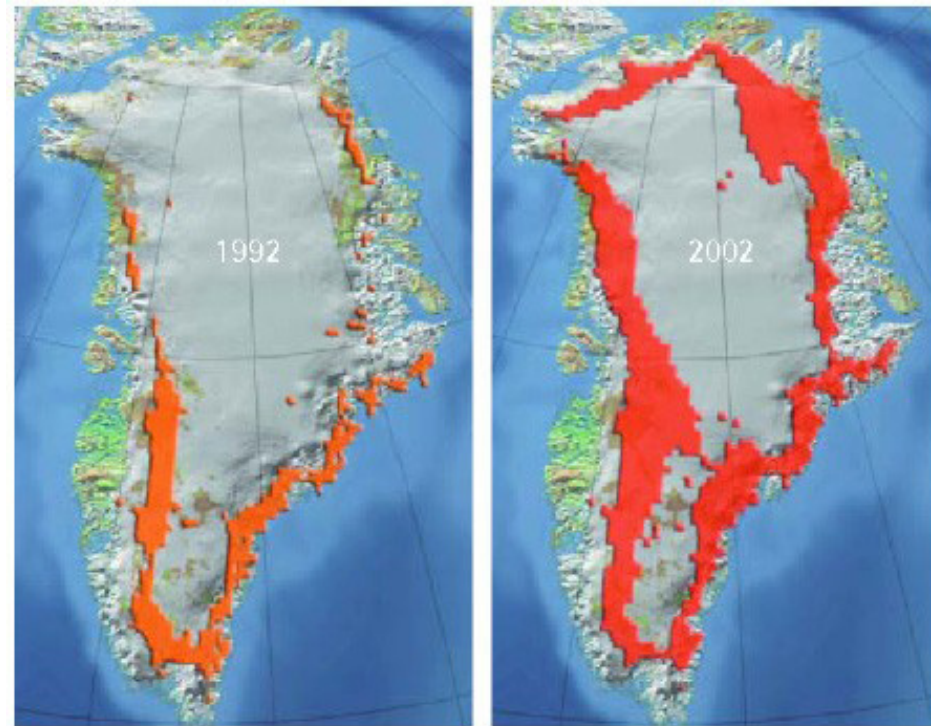
- Problem description
- Transportation and Climate Change
 - TAM Systems and CC
- Transportation Infrastructure Vulnerabilities to CC Impacts
- FHWA and FTA Climate Change Adaptation Pilot Studies
- Challenges
- Conclusions

Transportation and Climate Change

- In the U.S. - transportation sector accounts for 29% of total GHG emissions
 - Over 5% of global GHG emissions [1]
- Mitigation will be a vital component of transportation community response to CC
- But even if GHG emissions reduced today – impacts continue decades into the future [2]
- Need for adaptation strategies

Problem description

- IPCC *Fourth Assessment Report* [3]
 - Temperature and sea levels expected to increase through end of century
- Currently lack effective monitoring of Climate Change (CC) impacts on transportation
 - Will be a function of transportation agencies in the future [2]



Surface melt extent on Greenland Ice Sheet
Source: <http://cires.colorado.edu/steffen/>

TAM Systems and CC

- Various climate change impacts and potential adaptation strategies [4]
- Individual components of a TAM system can incorporate the impacts of CC [4]
- 36 states have Climate Action Plans – focus on mitigation [5]
 - Only 13 states have adaptation plans [6]
 - Cities, e.g. NYC [7], and counties also developing adaptation plans
- Plans in the U.S. do not specifically mention TAM

Potential Impacts of CC on Transportation Infrastructure

- Increased frequency and severity of storms
- Changing precipitation levels
- Temperature change
- Sea level rise
- Increased wind loads
- Storm surges and greater wave height



Flooded road in Winston, GA after 3 days of heavy rain in Sept. 2009
Source: AP Photo/Atlanta Journal Constitution, John Spink

Transportation Infrastructure Vulnerabilities to CC

- Federal Highway Administration (FHWA) – 60,000 miles of highway lie within FEMA 100-year floodplain [8]
- > 1,000 bridges may be vulnerable to failure modes associated with storms such as Hurricane Katrina [8]
- Issue of national concern



I-10 twin span post Katrina looking toward New Orleans
Source: Flickr staff photo by David Grunfeld

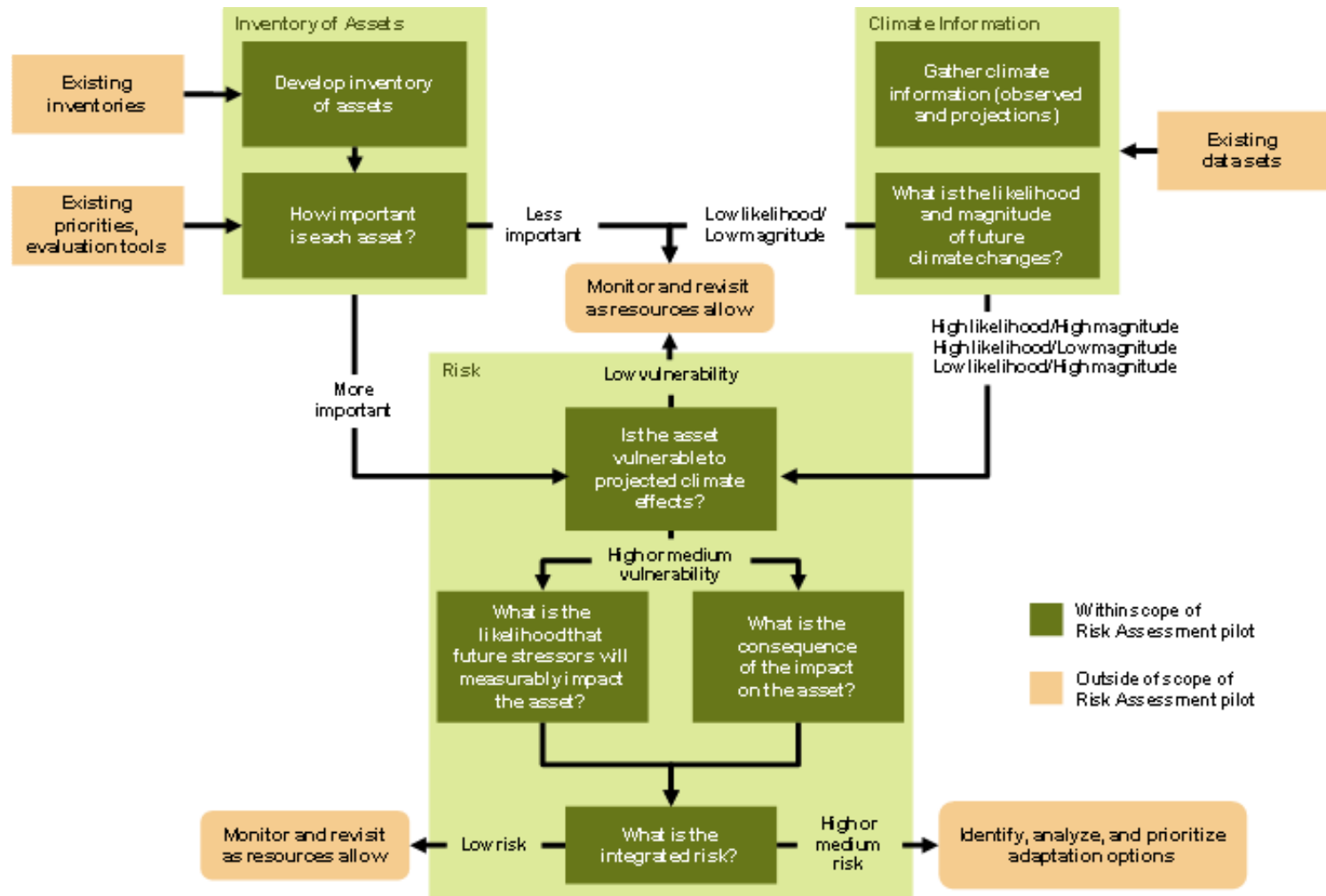
Opportunities

- Little research on incorporating climate change-related risk into transportation investment decision making and TAM systems
 - TAM systems already in place – potentially cost effective platform
 - Uncertainties associated with changing climatic conditions → risk-oriented approach
- FHWA Conceptual Model and CC Adaptation Pilot Studies

FHWA Climate Change Adaptation Pilot Studies

- FHWA requested applications in 2010 to use proposed conceptual model
 - Conduct climate change vulnerability and risk assessments
- 5 agencies selected
 - MTC – San Francisco; NJDOT/North Jersey Transportation Planning Authority – Central and Coastal New Jersey; Virginia DOT – Hampton Roads; WSDOT – State of Washington; Oahu MPO
 - Geographic diversity, diversity in size and population
 - Variety of potential CC impacts

FHWA Conceptual Model



FHWA Climate Change Adaptation Conceptual Model

Source: [9]

FHWA Pilot Results

- MTC San Francisco Bay Area
 - Alameda county sub-region examined in detail
 - Sea level rise most significant risk (in conjunction with seismic risks) – 16 ins. by 2050 and 55 ins. by 2100
- Hampton Roads Region in Virginia
 - Developed a decision model and support tool to aid in prioritization of projects in LRTP under multiple scenarios
- WSDOT – only statewide level study
 - Asset inventory and climate data mapped using GIS
 - Use of proprietary cost estimation/cost risk assessment processes and workshops to develop vulnerability assessments
- Oahu MPO
 - 2050 and 2100 time horizons for climate change stressors
 - Workshop led to selection of 5 assets for analysis

FTA Climate Change Adaptation Assessments

- Similar to FHWA pilots
- 7 agencies selected
 - MARTA, LACMTA, CTA, Central Puget Sound Regional Transit Authority; TTI with Island Transit (Galveston), Hillsborough Area Regional Transit Authority (Tampa), and Houston Metro; BART; SEPTA
- 2 pilots specifically focus on integrating CC adaptation in TAM systems



Flooded Bus Barns and Buckled Rails:

Public Transportation and Climate Change Adaptation

AUGUST 2011

FTA Report No. 0001
Federal Transit Administration

PREPARED BY
FTA Office of Budget and Policy



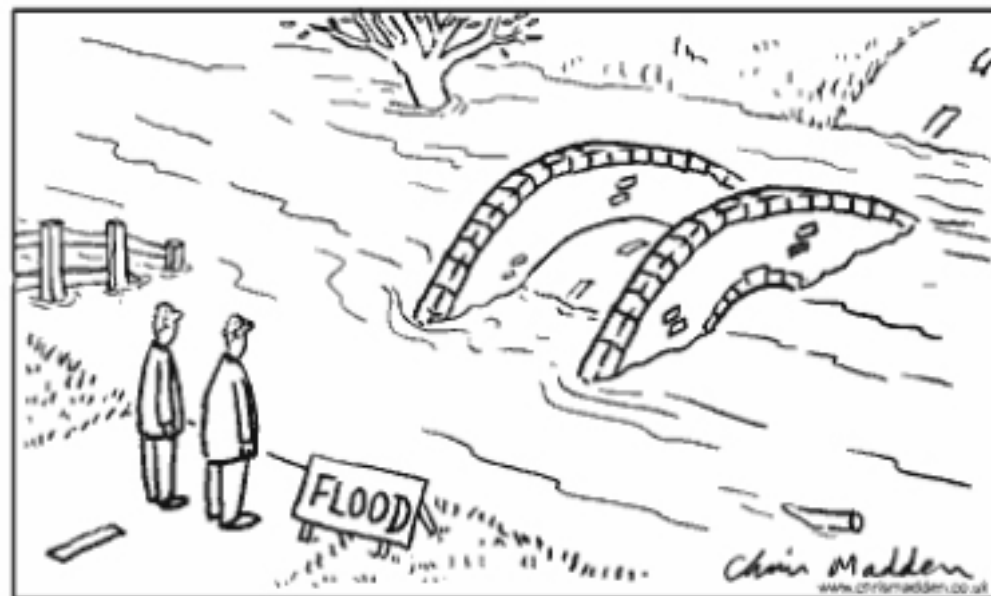
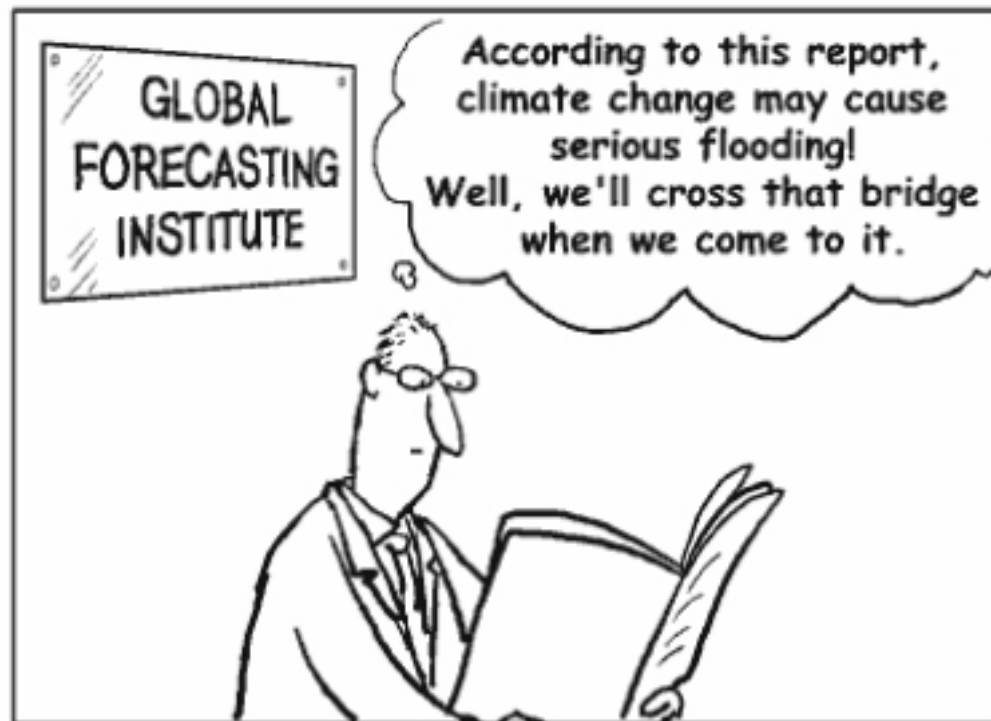
U.S. Department of Transportation
Federal Transit Administration

Challenges

- Accurate asset inventories are essential
 - Especially GIS maps to overlay CC impacts
- Failure probabilities for transportation infrastructure are essentially non-existent
 - Risk assessment as product of probability of occurrence and severity of consequence → more qualitative vulnerability assessment
 - Selecting critical assets also qualitative
- Transportation professionals are not climate scientists

Conclusions

- Society is taking steps to adapt to potential climate change impacts
- TAM systems are in use throughout the U.S. and around the globe
 - Already in place → cost-effective, logical platform to incorporate climate change considerations [4]
- FHWA and FTA pilots illustrate the importance of TAM in CC adaptation
- “The time to act is now.”



References

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