

Federal Highway Administration

Midwest Adaptation Peer Exchange Report

Minimizing the Impacts of Climate Change on
Transportation Systems in the Midwest

FHWA-HEP-11-033

In Partial Fulfillment of Task 5
DTFH61-11-F-00003

May 27, 2011

Prepared for

Federal Highway Administration

Prepared by

ICF International
1725 Eye Street NW, Suite 1000
Washington, DC 20006



**U.S. Department
of Transportation
Federal Highway
Administration**

Contents

Introduction	1
Day 1: MPO Exchange	1
Day 1 Presentation and Discussion Summaries	1
MPO Exchange Findings and Conclusions	3
Day 2: State DOT Exchange	4
Day 2 Presentation and Discussion Summaries	4
State DOT Exchange Findings and Conclusions	6
Opportunities for Future Collaboration and Additional Resources	6
Appendix A: Participant Lists	A-1
Appendix B: Agendas	B-1
Appendix C: Resources for More Information Handout	C-1
Appendix D: Presentations from MPO Peer Exchange	D-1
Appendix E: Presentations from state DOT Peer Exchange	E-1

Midwest Adaptation Peer Exchange Draft Report

Minimizing the Impacts of Climate Change on Transportation Systems in the Midwest

Introduction

On April 28 and 29, 2011, FHWA hosted two related peer exchanges in Indianapolis, Indiana. These peer exchanges consisted of two separate sessions with different audiences and adaptation planning themes. Both were titled “Minimizing the Impacts of Climate Change on Transportation Systems in the Midwest.” The peer exchanges provided an opportunity for Indiana metropolitan planning organizations (MPOs) and Midwestern state Departments of Transportation (DOTs), respectively, to collaborate and discuss opportunities for managing climate variability and change impacts on transportation systems.

During the exchange focused on MPOs, Executive Directors of MPOs in Indiana (or their delegates) gathered to discuss emergency planning and integration of climate change adaptation into Hazard Mitigation Plans. During the second day, Midwestern state DOTs discussed criticality and vulnerability of assets, state hazard mitigation planning efforts, addressing adaptation in asset management and operations decisions, and information resources that could be helpful to the group. The structure of the peer exchanges was similar, but the state DOT agenda provided more time for facilitated discussion between presentations.

This document summarizes the presentations, participant discussions, and main findings and conclusions from both peer exchanges. This document also notes opportunities for future collaboration among agencies and additional resources available to state DOTs and MPOs. Workshop materials are included in the appendices and accompanying files.

Day 1: MPO Exchange

The MPO peer exchange was a half-day meeting with representatives from MPOs across the State of Indiana. The afternoon began with a presentation on climate change and climate variability by Dr. Dev Niyogi, a professor at Purdue University and the Indiana State Climatologist. After his presentation, Laura Danielson from the Polis Center facilitated a discussion on the development of hazard mitigation plans in the Midwest and how these plans could be part of an adaptive management strategy to address climate change impacts. Following this discussion, Heather Holsinger presented on adaptation activities at FHWA, particularly Phase 2 of the Gulf Coast Study, the FHWA Conceptual Model, and the adaptation pilot projects. After the presentations, the attendees participated in a facilitated discussion that focused on incorporating climate risks into hazard mitigation plans, improving communication for emergency response, and sharing available resources. Below is a summary of these presentations and discussions.

Day 1 Presentation and Discussion Summaries

Introduction to Climate Change – Dev Niyogi

Dr. Niyogi is the Indiana State Climatologist and a professor at Purdue University at the Climate Change Research Center. Dr. Niyogi began his presentation by describing the difference between climate and weather using examples from cartoons and the news. While discussing the DC snow blizzards of 2010, Dr. Niyogi introduced the “two-step” test to determine whether an event is the result of climate change. The first step tests whether the event can be explained as due to seasonal weather patterns. The second step tests whether the event can be explained by climate variability (e.g., El Niño).

Dr. Niyogi defined several key terms during the course of his presentation, including: weather, climate, climate change, and climate variability. He explained that global warming is a particular kind of climate change characterized by an increase in the average temperature of the earth, while climate change encompasses a broader range of global changes. Dr. Niyogi introduced the greenhouse effect, the Keeling

Curve, and the IPCC emissions scenarios. He then described global climate models, particularly in terms of their projections for climate changes in the Midwest. He stated that most models project that the Midwest will become warmer and wetter. Aerosols and land use change are the two major sources of uncertainty in these projections. Dr. Niyogi closed his presentation with a list of conclusions, including:

- Most studies, assessments, observations, and projections indicate that climate is changing (how, how much, and why continues to be debated);
- Impacts have a hammer and chisel effect – large scale processes provide the hammer, the local actions/ feedbacks can provide the chisel;
- Changes in regional practices (e.g., land use decisions) will affect regional climate; and
- Planning for climate variability can help develop resilience for climate change.

FHWA Climate Change Adaptation Resources and Activities – Heather Holsinger

Heather Holsinger from FHWA’s Sustainable Transport and Climate Change Team presented the work that FHWA is doing to address climate change adaptation. Since 2002, FHWA has been engaged in a series of activities to better understand climate change and help transportation agencies incorporate climate change vulnerability and risk assessment into decision making. For example, FHWA has held workshops across the country on adaptation, developed numerous resources, published reports, and supported local initiatives. In 2009, FHWA formed the agency-wide adaptation working group in order to discuss adaptation considerations with a range of experts from throughout the agency. The working group has formulated a strategy with key action items for FHWA to pursue. One of FHWA’s key initiatives is developing and sharing information on tools and methodologies that states and MPOs can use to assess risk and prioritize action.

Ms. Holsinger highlighted the following FHWA efforts in more detail:

- FHWA is currently leading an in-depth study of climate change vulnerability and risk in the Gulf Coast region. Phase 1 of this effort (Synthesis and Assessment Product 2.7) is already complete and publicly available. Phase 2 focuses on Mobile, AL in more depth and is assessing criticality, vulnerability, and risk to specific assets in the study area.
- FHWA has developed a conceptual model to help transportation agencies identify critical assets, assess vulnerability and risk, prioritize adaptation options, and monitor/revisit (see Figure 1 for a thumbnail image of the conceptual model; to view a full-sized image, please click [here](#)). Currently, five pilot projects are testing this model in Hawaii, Washington State, New Jersey, Virginia, and California.

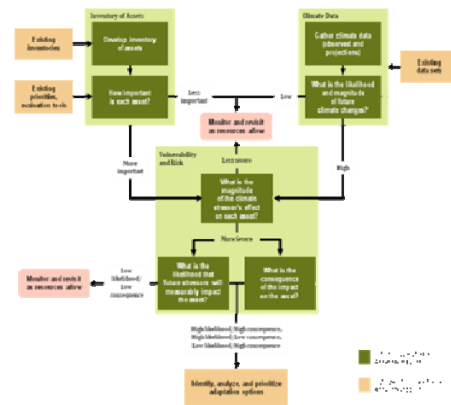


Figure 1: FHWA Conceptual Model

Ms. Holsinger concluded her presentation by noting the following lessons learned:

- Interdisciplinary cooperation is key (e.g., communication between engineers and climate scientists);
- Uncertainty is inherent and it will be important to learn how to deal with number ranges rather than point estimates;
- Community priorities are an integral part of a climate vulnerability assessment; and
- Impacts and concerns will vary by region – there are no one-size-fits-all answers.

Discussion on Multi-Hazard Mitigation Planning – led by Laura Danielson of the Polis Center

Laura Danielson of the Polis Center facilitated a discussion on multi-hazard mitigation planning in the Midwest. She began by giving background on the Disaster Mitigation Act and work the Polis Center is doing to advance hazard mitigation planning in the Midwest. In 2000, Congress passed the Disaster Mitigation Act, which requires communities to profile their natural hazards, assess the risk to the community or state, and identify strategies to mitigate future losses in order to be eligible for federal disaster funds. The Polis Center has helped counties throughout the Midwest use a tool called Hazus-MH to develop Multi-Hazard Mitigation Plans. The Polis Center has quantified flood risks for more than 2,000 non-coastal counties and is helping Wisconsin, Minnesota, and Indiana update flood mitigation plans.

Ms. Danielson then opened the topic for discussion by participants who made the following points:

- Updating flood plain maps to accurately reflect risk was important. They also asked whether it would be appropriate to look at both the 500-year as well as the 100-year flood plains. The participants agreed that the term “100-year” is misleading since it implies an event that occurs once every 100 years, when in fact during the lifetime of a mortgage the owner may see three of these events over a much shorter timeframe.
- They were interested in using the Hazus-MH tool to map assets on flood plains.
- When identifying critical assets in hazard mitigation planning, it is important to make sure that assets important to the community (e.g., covered bridges) are included.
- Communities need to cooperate in order to share data on hazard risk and mitigation planning. They noted that groups such as the Silver Jackets can provide valuable forums for this type of cooperation. They also suggested developing a common GIS data-sharing platform to facilitate information sharing.

MPO Exchange Findings and Conclusions

During the MPO exchange, the participants discussed opportunities for adaptation, barriers to adaptation, and challenges identifying critical assets for planning purposes. This discussion focused on adaptation as emergency planning and hazard mitigation.

Opportunities for Adaptation

During the exchange, the MPO participants agreed that the county hazard mitigation plans provide a natural vehicle for climate change adaptation. They also felt that using these plans for addressing climate change would help them avoid “reinventing the wheel.” In order to accomplish this, the plans will need to be revised to focus more on the transportation sector. The participants were also interested in updating the floodplain maps, using Hazus-MH to help locate vulnerable assets, and increasing interagency coordination to share information and resources.

Barriers to Adaptation

The participants agreed that one of the largest barriers to hazard mitigation is the lack of information sharing and coordination between agencies. The participants discussed efforts to improve information sharing, including the existence of Silver Jackets, an inter-agency communications and coordination initiative that works to integrate information on risk from different agencies in order to promote sustainable hazard mitigation. However, they noted that there is a lot of work to be done to simply integrate the planning and coordination occurring within their own agencies.

The participants also mentioned these additional barriers to adaptation in the context of hazard mitigation planning:

- Gathering and integrating fragmented data, particularly non-spatial data,

- Coordinating with existing efforts rather than competing for resources,
- Ensuring that the right people are “at the table”, and
- Building sustained relationships between lead federal and state agencies.

Definition of Critical Assets

The participants agreed that defining critical assets is a key, but challenging, part of emergency planning. It is important to solicit stakeholder opinions on critical assets, since assets which might not initially seem critical are often very important to the community (e.g., covered bridges, hospitals).

Day 2: State DOT Exchange

The state DOT peer exchange began with a presentation by Dr. Niyogi, who also facilitated a detailed question and answer session with participants about climate change effects expected in the Midwest. DOT representatives then discussed the impacts of existing climate variability on their transportation systems. Heather Holsinger presented on adaptation activities at FHWA and answered participants’ questions on the conceptual model and pilot activities currently underway. After a break, Brian Beucler, Dan Ghere, and Steve Gaj from FHWA gave short presentations discussing the impacts of climate change, particularly flooding, on asset management. The participants asked questions and discussed existing asset inventories and adaptive management practices. After lunch, Greg Johnson from Michigan DOT presented strategies and actions that Michigan is pursuing to improve operations under changing climatic conditions. John Buechler from the Polis Center gave a presentation on hazard mitigation planning in the afternoon. The meeting concluded with participants discussing what they had learned during the exchange.

Day 2 Presentation and Discussion Summaries

Introduction to Climate Change – Dev Niyogi

See the discussion of Dr. Niyogi’s presentation in the Day 1 Presentation Summaries section of this report.

FHWA Climate Change Adaptation Resources and Activities – Heather Holsinger

See the discussion of Ms. Holsinger’s presentation in the Day 1 Presentation Summaries section of this report.

Minimizing the Impacts of Climate Change on Transportation Systems in the Midwest - Brian Beucler and Daniel Ghere

Brian Beucler from FHWA’s Office of Bridge Technology began the presentation by defining bridge scour as the erosion of the ground base supporting bridge structures. He explained that engineers use a big event, such as the 100-year storm, to design bridges for scour. Mr. Beucler emphasized the need for clear communication around projected climate impacts, but noted that climate projections predict larger storms in the future. He defined the 100-year flood as the flood that has a 1 in 100 chance of being equaled or exceeded in any one year and which has an average recurrence interval of 100 years. Mr. Beucler noted that climate scientists and engineers speak two different languages when characterizing “heavy” precipitation since climate scientists look at all rainfalls during a particular year while engineers only look at the heaviest rainfall for a year.

Dan Ghere from the FHWA Resource Center spent the remainder of the presentation discussing the impacts that climate change, particularly increases in heavy rain events, will likely have on infrastructure. He noted that bridges, culverts, and minor drainage systems are likely to be impacted by increases in heavy rain events. For these types of issues, terrain that is wide and flat will be hit harder than other areas. He discussed examples of bridge scour that might occur and potential ways of mitigating those scour issues (e.g., increased inspection). Mr. Ghere concluded his section of the presentation by noting that while climate change may not be the direct cause of asset failure, it will affect the frequency at which these conditions occur.

Supporting Existing Infrastructure in a Changing Climate – Stephen Gaj

Stephen Gaj, the Leader of the System Management & Monitoring Team in the Office of Asset Management at FHWA, presented on supporting existing infrastructure in a changing climate. He began by outlining some of the main ways in which climate change is likely to impact transportation assets, including permanent and temporary flooding of roads, tunnels, rails, and runways; pavement and track damage from extreme heat; and slope failures. He argued that since the design life of transportation infrastructure is often decades or longer, it is important to plan ahead for climate change. In other words, as the climate changes, infrastructure will need to evolve to handle new conditions. He noted that highways are some of the most important assets nation-wide for quality of life, economic viability, global competitiveness, and emergency evacuation. Mr. Gaj defined transportation asset management as:

- “A strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well-defined objectives.”

Mr. Gaj outlined five core questions that comprise asset management:

1. What is the current state of my assets?
2. What is my required level of service/performance?
3. Which assets are critical to sustained performance?
4. What are my best “Operations and Maintenance” and “Capital Improvement” investment strategies?
5. What is my best long-term funding strategy?

He asserted that transportation planners should ask these asset management questions when planning for climate change. Asset management can help transportation agencies think beyond the short term to identify and address vulnerabilities.

Climate Change Adaptation: Issues in Highway Operations – Greg Johnson

Greg Johnson is the Chief Operations Officer at the Michigan DOT and he presented on climate change operations adaptations being implemented or planned at the Michigan DOT. He began by noting that Michigan’s major climate risks are changes in the levels and temperatures of the Great Lakes since the Great Lakes are integral to shipping, tourism, fishing, and the local weather patterns. In particular, Michigan is concerned about more frequent and intense rain events that could wash out transportation infrastructure and changes to freeze/thaw cycles and other temperature impacts that could increase maintenance costs.

Michigan has developed the following set of steps for addressing these hazards:

- Continue to develop asset management databases,
- Identify potential risks,
- Identify a set of areas/infrastructure that is at greatest risk, and
- Address these risks through regular transportation program process.

Mr. Johnson spent the remainder of his presentation outlining adaptation options that Michigan has identified for highway design, construction, systems operations, and maintenance. For example, design considerations include strategies such as increasing hydraulic openings for bridges over waterways and eliminating bridge design elements that could make a bridge scour critical. Construction strategies include instituting stronger specifications for protection of work under construction and encouraging more night/cooler weather work. Systems operations and maintenance strategies include increased deployment and use of roadway weather information stations and developing strong contingency response plans.

Multi-Hazard Mitigation Planning: Overview of the state planning process and linkages to climate change – John Buechler, The Polis Center

Mr. Buechler from The Polis Center presented similar material as Laura Danielson did for the MPOs, which focused on the Hazard Mitigation Act and development of Multi-Hazard Mitigation Plans in the Midwest. Mr. Buechler, however, gave a more formal presentation whereas Ms. Danielson used more of a facilitated discussion format. Please see the discussion of Ms. Danielson’s presentation in the MPO exchange discussion earlier in this report for more information on Polis Center activities.

State DOT Exchange Findings and Conclusions

Discussion among state DOT representatives focused on defining critical assets, identifying barriers to adaptation, and highlighting adaptation options.

Opportunities for Adaptation

During his presentation, Dr. Niyogi concluded by reminding participants that actions which reduce vulnerability to climate variability also reduce climate change risk. The participants agreed with this message and noted that asset management and strategic changes to operations also provide opportunities for adaptation.

Several participants from Midwestern DOTs mentioned that they either have strong asset management systems in place or are building these systems. Knowing where assets, such as culverts, are located throughout a floodplain can help identify assets at risk. In addition to Greg Johnson’s examples of action that Michigan is already taking to reduce climate risk, participants mentioned efforts to update FEMA’s floodplain maps, since the current maps do not accurately reflect current or future risk levels.

Barriers to Adaptation

The participants felt strongly that the Midwest is a unique region with climate change impacts and adaptation concerns that differ significantly from those on the coast. They noted that coastal work may therefore not apply to the Midwest. Dr. Niyogi highlighted the additional challenge of choosing a climate model that projects changes in the Midwest accurately, since it is a unique climate region. In addition to the scarcity of work focusing on the Midwest, participants also mentioned the following additional barriers:

- Sustaining interest and momentum over time,
- Sharing information between agencies,
- Communicating about climate change (“event management” may be a better term to use), and
- Identifying which scenarios and models should be used in planning.

Definition of Critical Assets

The participants discussed the challenge of defining criticality and that it was similar to defining critical assets for hazard mitigation. Participants from Indiana DOT noted that while their state maintains robust asset inventories, it is unclear how to prioritize those assets. Prioritization can be political. Participants agreed that issues of scale become important when determining criticality (e.g., the usefulness of Department of Homeland Security critical asset designations is limited due to the broad scale).

Opportunities for Future Collaboration and Additional Resources

Opportunities for Future Collaboration

The peer exchange served as a forum for connecting different DOTs, MPOs, and other organizations, and there are opportunities for future follow-up and collaboration among these groups. This peer exchange began forming relationships between important stakeholders in the Midwest and these relationships could

prove essential to future adaptation planning. For example, Dr. Niyogi (Purdue University Climatologist) and the Polis Center have planned a meeting to discuss opportunities for collaboration on adaptation planning in the Midwest. In addition, several of the participants were very interested in FHWA's pilot work testing the conceptual model and expressed an interest in forming a Midwestern pilot project.

Since many of the DOT and MPO participants were not aware of these resources, many appreciated learning about resources such as the State Climatologist, the Polis Center, and the Silver Jackets.

Additional Support for Midwestern DOTs and MPOs

Through the peer exchange discussions, it was clear that there are opportunities for providing additional support to DOTs and MPOs to assist them in preparing for climate change. Specific needs of interest to participants identified were:

- to have modeling tools to help them determine vulnerabilities to climate change in the Midwest. They were also interested in tools to help them identify and prioritize vulnerable assets.
- help and guidance to move from planning and process to the technical, on-the-ground application of selected strategies.
- collecting information on the costs of adaptation, which might be easiest to gather at a local scale.

Tools and Resources

Both sets of participants requested information on key resources and tools that can be used in adaptation planning. These resources and tools include both human resources (such as institutions and individuals) as well as guidance, case studies, and tools.

Prior to the peer exchange, FHWA had prepared a list of resources for participants (please see Appendix C). However, during the exchange, participants noted other possible resources including:

- Potential partners and sources of support in the Midwest:
 - State Climatologist: <http://www.stateclimate.org/>
 - Silver Jackets: <http://www.nfrmp.us/state/>
 - State Emergency Planning Committees
 - The Polis Center: <http://www.polis.iupui.edu/>
 - FEMA (designation of critical facilities)
 - Local emergency planning organizations (Local Agency Program Coordinator, local emergency management public agencies, etc.)
 - Universities
 - Water and electric utilities
- Useful tools identified:
 - FHWA's Sustainable Highways Self-Evaluation Tool, <http://www.sustainablehighways.org/>
 - FHWA's Regional Climate Change Effects report, http://www.fhwa.dot.gov/hep/climate/climate_effects/
 - FEMA's Risk MAP, https://www.fema.gov/plan/prevent/fhm/rm_main.shtm
 - Hazus-MH, <http://www.fema.gov/plan/prevent/hazus/>

Appendix A: Participant Lists

2011 FHWA/INDOT Adaptation Peer Exchanges

Minimizing the Impacts of Climate Change on Transportation Systems in the Midwest

LIST OF PARTICIPANTS – MPO Peer Exchange, April 28th

Name	Affiliation	Email
Federal Highway Administration (FHWA)		
Heather Holsinger	FHWA - HQ	heather.holsinger@dot.gov
Jim Thorne	FHWA - IL	Jim.Thorne@dot.gov
Jay DuMontelle	FHWA - IN	Jay.DuMontelle@dot.gov
Larry Heil	FHWA - IN	Larry.heil@dot.gov
Joyce Newland	FHWA - IN	Joyce.Newland@dot.gov
Bernadette Dupont	FHWA - KY	bernadette.dupont@dot.gov
Midwestern MPO Executive Directors and Representatives		
Kent Anderson	CAMPO	kanderson@campo.in.gov
Brad Mills	Evansville MPO	bmills@evansvillempo.com
Philip Roth	Indianapolis MPO	Philip.Roth@indy.gov
Doug Eytcheson	Kokomo MPO	Gcctplanner@aol.com
Sallie Fahey	Lafayette MPO	sfahey@tippecanoe.in.gov
Sandra Seanor	MACOG MPO	sseanor@macog.com
Jerry Bridges	MCCOG	jbridges@mccog.net
Dan Avery	NIRCC	dan.avery@co.allen.in.us
Kathy Luther	NIRPC MPO	Kluther@nirpc.org
Indiana DOT Participants		
Steve Smith	INDOT	ssmith@indot.in.gov
Tom Vanderpool	INDOT	tvanderpool@indot.in.gov
Laura Hilden	INDOT, Environmental Services	lhilden@indot.in.gov
Other Participants		
Anne Choate	ICF International	achoate@icfi.com
Emily Rowan	ICF International	erowan@icfi.com
Dev Niyogi	Purdue University	climate@purdue.edu
Laura Danielson	The Polis Center	ledaniel@iupui.edu

2011 FHWA/INDOT Adaptation Peer Exchanges

Minimizing the Impacts of Climate Change on Transportation Systems in the Midwest

LIST OF PARTICIPANTS – State DOT Peer Exchange, April 29th

Name	Affiliation	Email
Federal Highway Administration (FHWA)		
Steve Gaj	FHWA - HQ	Stephen.gaj@dot.gov
Heather Holsinger	FHWA - HQ	heather.holsinger@dot.gov
Brian Beucler	FHWA - HQ (Office of Bridge Technology)	brian.beucler@dot.gov
Jim Thorne	FHWA – Resource Center, IL	Jim.Thorne@dot.gov
Betsy Tracy	FHWA – IL	betsy.tracy@dot.gov
Jay DuMontelle	FHWA - IN	Jay.DuMontelle@dot.gov
Keith Hoernschemeyer	FHWA - IN	Keith.Hoernschemeyer@dot.gov
Larry Heil	FHWA – IN	Larry.Heil@dot.gov
Bernadette Dupont	FHWA - KY	bernadette.dupont@dot.gov
Jeffrey Forster	FHWA - MI	Jeff.Forster@dot.gov
Leigh Oesterling	FHWA - OH	leigh.oesterling@dot.gov
Dan Ghere	FHWA - Resource Center, IL	dan.ghere@dot.gov
State Departments of Transportation		
Merrill Dougherty	Indiana DOT	mdougherty@indot.in.gov
Anne Rearick	Indiana DOT	arearick@indot.in.gov
Brad Steckler	Indiana DOT	bsteckler@indot.in.gov
Tom Vanderpool	Indiana DOT	tvanderpool@indot.in.gov
Laura Hilden	INDOT, Environmental Services	lhilden@indot.in.gov
Justin Harrod	Kentucky DOT	Justin.Harrod@ky.gov
Jesse Mayes	Kentucky DOT	Jesse.Mayes@ky.gov
Christa Turner	Kentucky DOT	christa.turner@ky.gov
Greg Johnson	Michigan DOT	JohnsonG2@michigan.gov
Kristin Schuster	Michigan DOT	schusterk@michigan.gov
Jon Adams	Ohio DOT	Jon.Adams@dot.state.oh.us

Name	Affiliation	Email
Matt Perlik	Ohio DOT	Matthew.Perlik@dot.state.oh.us
John Stains	Ohio DOT	John.Stains@dot.state.oh.us
Other Participants		
Anne Choate	ICF International	achoate@icfi.com
Emily Rowan	ICF International	erowan@icfi.com
Dev Niyogi	Purdue University	climate@purdue.edu
John Buechler	The Polis Center	jobuechl@iupui.edu

Appendix B: Agendas

2011 FHWA/INDOT Adaptation Peer Exchanges

Minimizing the Impacts of Climate Change on Transportation Systems in the Midwest

Indiana Government Center North

Room N755

100 North Senate Avenue

Indianapolis, Indiana 46204

MPO Peer Exchange—FINAL AGENDA

Thursday, April 28, 2011, 1:00-4:15 pm	
1:00 PM	Welcome and Introductions
1:15 PM	Setting the Stage (approx. 20 minutes per presentation) <i>Presentation:</i> Climate change in the Midwest (Dev Niyogi, Purdue University) <i>Presentation:</i> Vulnerability and risk assessment: FHWA Conceptual Model; climate change risk assessment examples from transportation agencies (Heather Holsinger, FHWA) <i>Presentation:</i> Overview of hazard mitigation planning process and climate linkages (Laura Danielson, the Polis Center)
2:15 PM	Break
2:25 PM	Facilitated Discussion (approx. 30 min per topic) Recent experiences with severe weather, and planning for future events Reducing vulnerability and increasing capacity to deal with climate events
3:25 PM	Break
3:35 PM	Facilitated Discussion, cont'd (approx. 30 min) Collaborating with agencies beyond the MPO (and barriers to doing so)
4:05 PM	Wrap-up Discussion/ Lessons Learned
4:15 PM	Adjourn

2011 FHWA/INDOT Adaptation Peer Exchanges

Minimizing the Impacts of Climate Change on Transportation Systems in the Midwest

Indiana Government Center North, Room N755

100 North Senate Avenue

Indianapolis, Indiana 46204

State DOT Peer Exchange—FINAL AGENDA

Friday, April 29, 2011, 8:30 am to 4:30 pm	
8:30 AM	Welcome/ Introductions
9:00 AM	Climate Change in the Midwest and Impacts on Transportation <i>Presentation:</i> Overview of climate change in the Midwest (Dev Niyogi, Purdue University, 20 min) <i>Discussion:</i> DOT experiences with climate events (45 min)
10:05 AM	Current FHWA Adaptation Activities <i>Presentation:</i> Vulnerability and risk assessment conceptual model and pilots, peer exchanges, etc. (Heather Holsinger, 20 min)
10:25 AM	Break
10:40 AM	Climate Change and Asset Management <i>Presentation:</i> Impacts of global climate change on highway infrastructure (Brian Beucler and Dan Ghere, FHWA, 30 min) <i>Presentation:</i> Supporting existing infrastructure in a changing climate (Steve Gaj, FHWA, 15 min) <i>Discussion:</i> Strategies for planning for climate change in asset management, and barriers to action (35 min)
12:00 PM	Lunch <i>recommended location:</i> cafeteria in basement of building
1:00 PM	Climate Change and Operations <i>Presentation:</i> Climate change impacts on transportation operations (Greg Johnson, Michigan DOT, 20 min) <i>Discussion:</i> Strategies for planning for climate change in operations, and barriers to action (30 min)
1:50 PM	Hazard Mitigation Planning <i>Presentation:</i> Overview of hazard mitigation planning process and climate linkages (John Buechler, the Polis Center, 20 min) <i>Discussion:</i> State DOT involvement in state hazard mitigation planning, incorporation of climate effects into the planning process, opportunities for leveraging resources and sharing information (45 min)
2:55 PM	Break
3:10 PM	Round Table Discussion

	Strategies for incorporating climate change adaptation into DOT processes
4:15 PM	Wrap-up Discussion/Lessons Learned
4:30 PM	Adjourn

Appendix C: Resources for More Information Handout

MINIMIZING THE IMPACTS OF CLIMATE CHANGE ON TRANSPORTATION SYSTEMS IN THE MIDWEST: PEER EXCHANGE

RESOURCES FOR MORE INFORMATION¹

TRANSPORTATION ADAPTATION INFORMATION

GENERAL ADAPTATION ACTIVITIES

FHWA/AASHTO Climate Change Adaptation Peer Exchanges

- December 2009 Exchange: http://www.fhwa.dot.gov/hep/climate/peer_exchange/peer00.cfm
- December 2008 Exchange: <http://www.fhwa.dot.gov/planning/statewide/pwsacci.htm>

AASHTO Transportation and Climate Change Resources Center—State and Local Adaptation Activities

- http://climatechange.transportation.org/climate_adaptation/state_local.aspx

Integrating Climate Change into the Transportation Planning Process

- <http://www.fhwa.dot.gov/hep/climatechange/>

ASSESSING CLIMATE CHANGE EFFECTS AND IMPACTS

Regional Climate Change Effects: Useful Information for Transportation Agencies

- http://www.fhwa.dot.gov/hep/climate/climate_effects/effects00.cfm
- Also available in PDF:
 - Report and Appendix A: Detailed Methodology
http://www.fhwa.dot.gov/hep/climate/climate_effects/climate_effects.pdf
 - Appendix B: Regional Maps
http://www.fhwa.dot.gov/hep/climate/climate_effects/climate_effects_appb.pdf
 - Appendix C: Climate Change Effects Typology Matrix
http://www.fhwa.dot.gov/hep/climate/climate_effects/climate_effects_appc.pdf

The Potential Impacts of Climate Change on U.S. Transportation – Transportation Research Board (TRB) Special Report 290

- http://www.trb.org/Main/Blurbs/The_Potential_Impacts_of_Climate_Change_on_US_Tran_156825.aspx

RISK/VULNERABILITY ASSESSMENTS

FHWA Climate Change Vulnerability and Risk Assessment Conceptual Model Pilots (Ongoing)

- <http://www.fhwa.dot.gov/hep/climate/pilots.htm>

Impacts of Climate Variability and Change on Transportation Systems and Infrastructure—Gulf Coast Study

- http://www.fhwa.dot.gov/hep/climate/gcs_overview.htm

Literature Review: Climate Change Vulnerability Assessment, Risk Assessment, and Adaptation Approaches

¹ This hand out was provided to participants at the beginning of the peer exchange. Additional resources were identified during the course of the peer exchange, as noted on page 8 of this document.

- <http://www.fhwa.dot.gov/hep/climate/ccvaraaa.htm>

HAZARD MITIGATION PLANNING

The Polis Center at Indiana University Purdue University-Indianapolis

- <http://www.polis.iupui.edu/>

State Hazard Mitigation Plans

- Ohio— <http://ema.ohio.gov/mitigationplan2011.aspx>
- Indiana— <http://www.in.gov/dhs/3181.htm>
- Illinois— http://www.state.il.us/iema/planning/documents/Plan_IllMitigationPlan.pdf
- Michigan— Plan completed very recently, and not yet available online. Likely to be posted on the following website: http://www.michigan.gov/msp/0,1607,7-123-1593_3507---,00.html
- Kentucky— <http://www.kyem.ky.gov/assistance/hazardmitigation> (plan not yet available online)

FEMA Multi-Hazard Mitigation Planning

- <http://www.fema.gov/plan/mitplanning/>

GENERIC CLIMATE CHANGE RESOURCES

Midwestern Regional Climate Center

- <http://mcc.sws.uiuc.edu/>

Purdue Climate Change Research Center

- <http://www.purdue.edu/discoverypark/climate/>

US Environmental Protection Agency (EPA)—climate change website

- <http://www.epa.gov/climatechange/>

Intergovernmental Panel on Climate Change (IPCC)—Fourth Assessment Report

- http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml

GENERIC CLIMATE CHANGE AND TRANSPORTATION RESOURCES

US Department of Transportation—Transportation and Climate Change Clearinghouse

- <http://climate.dot.gov/>

FHWA—Highways and Climate Change

- <http://www.fhwa.dot.gov/hep/climate>

FHWA Transportation and Climate Change Newsletter (Ongoing)

- <http://www.fhwa.dot.gov/hep/climatechange/newsletter>

Appendix D: Presentations from MPO Peer Exchange

If you would like copies of the presentations from the MPO peer exchange, please contact either Becky Lupes (Rebecca.Lupes@dot.gov) or Heather Holsinger (Heather.Holsinger@dot.gov) at the Federal Highway Administration.

The three presentations given at the MPO peer exchange were:

- Climate change in the Midwest (*Dev Niyogi, Purdue University*)
- Vulnerability and risk assessment: FHWA Conceptual Model; climate change risk assessment examples from transportation agencies (*Heather Holsinger, FHWA*)
- Overview of hazard mitigation planning process and climate linkages (*Laura Danielson, the Polis Center*)

Appendix E: Presentations from State DOT Peer Exchange

If you would like copies of the presentations from the State DOT peer exchange, please contact either Becky Lupes (Rebecca.Lupes@dot.gov) or Heather Holsinger (Heather.Holsinger@dot.gov) at the Federal Highway Administration.

The six presentations given at the State DOT peer exchange were:

- Climate change in the Midwest (*Dev Niyogi, Purdue University*)
- Vulnerability and risk assessment: FHWA Conceptual Model; climate change risk assessment examples from transportation agencies (*Heather Holsinger, FHWA*)
- Impacts of global climate change on highway infrastructure (*Brian Beucler and Dan Ghere, FHWA*)
- Supporting existing infrastructure in a changing climate (*Steve Gaj, FHWA*)
- Climate change impacts on transportation operations (*Greg Johnson, Michigan DOT*)
- Overview of hazard mitigation planning process and climate linkages (*John Buechler, the Polis Center*)