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Workshops on Integrating  
Climate Change with  
Transportation Planning,  
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## **I. INTRODUCTION**

### **A. Purpose**

The purpose of this report is to provide a summary of five workshops on addressing climate change in the State and metropolitan transportation planning processes that the Federal Highway Administration (FHWA) sponsored in 2010. This report also provides an assessment of the workshop results and suggestions for further FHWA activity related to supporting consideration of climate change in transportation planning.

### **B. Background**

#### **1. Overall Project**

Transportation accounts for about 30 percent of total greenhouse gas emissions and is the fastest growing end-use sector of U.S. greenhouse gas (GHG) emissions. Carbon dioxide (CO<sub>2</sub>) is the most commonly emitted greenhouse gas, accounting for 95 percent of U.S. transportation emissions in 2006. As transportation both contributes to, and is affected by, climate change, research in recent years has focused both on mitigation of transportation's contributions to greenhouse gas emissions and adaptation to potential impacts on infrastructure. Additional research, however, is needed to better understand and evaluate how various strategies, such as land use changes, policy initiatives and infrastructure construction and management approaches, may affect the transportation sector's emissions of GHGs. In addition, as our fiscal resources continue to be constrained and calls for greater accountability and transparency in public spending grow, it is important to determine how new energy and greenhouse gas performance goals may affect fundamental transportation system performance and inform the development of measures for slowing VMT growth and reducing emissions.

Thus, in late 2009, FHWA initiated a research project on strategies to reduce greenhouse gas emissions from surface transportation and develop scenario planning approaches, through the use of alternatives, which take into consideration greenhouse gas reductions in transportation planning. This project is intended to support the FHWA Office of Planning, Environment and Realty (HEP) and will be used to inform actions of the FHWA, State DOTs, MPOs, and other transportation stakeholders across the Nation. The project includes development of a guidebook on strategies for GHG emissions from transportation sources and a web-based tool to help transportation planners analyze GHG reduction scenarios and alternatives for use in the transportation planning process, climate action plans, scenario planning exercises, and meeting State GHG reduction targets and goals. In addition, the project includes a series of workshops for selected DOTs and MPOs on integrating climate change considerations into transportation and comprehensive planning.

#### **2. Workshops**

The workshops allowed for five State departments of transportation (DOT) and metropolitan planning organizations (MPO) to receive expert technical assistance focused on integrating climate change considerations (both GHG mitigation and adaptation to climate change impacts) into their

planning process. FHWA originally had planned to focus the workshops on approaches to addressing climate change within transportation scenario planning. However, as development of the workshops proceeded, FHWA determined that the workshop participants in all locations, even those with a strong history of employing advanced planning methods, had not yet determined how to effectively analyze the transportation-climate change connection. Thus, FHWA decided that the workshops would be refined to focus mainly on GHG reduction tools, techniques, quantification and methodologies, with scenario planning approaches deemphasized.

**C. Project Timeline and Milestones**

FHWA initiated this project in late 2009 and conducted the five workshops during October and November 2010. The overall project, including the Guide to Mitigating Greenhouse Gas (GHG) Emissions from Transportation Sources and the web-based tool, will be completed in the spring of 2011.

**II. SCOPE AND APPROACH**

**A. Workshop Host Identification and Selection**

To identify host agencies for the workshops, FHWA worked with its consultant to create an initial list of candidates based on its knowledge of and research on climate change-related transportation planning activities and initiatives across the country. This initial candidate list included about 20 agencies, both DOTs and MPOs, across the country. FHWA then conducted additional research and interviewed officials of the candidate agencies to determine (a) the status of relevant activities/initiatives; (b) extent of issues and/or requirements to undertake climate change-related planning; (c) agency resource capacity to support such planning on a continuing basis; and (d) agency interest in hosting a workshop. FHWA also sought to achieve geographic diversity and to include candidates from both large and small agencies.

Based on this evaluation, FHWA identified and confirmed five agencies to host workshops, including two State DOTs, two MPOs, and one DOT/MPO partnership:

| <u>DOTs</u>   | <u>MPOs</u>   | <u>MPO/DOT Partnership</u>  |
|---|---|---|
| <ul style="list-style-type: none"> <li>▪ Florida DOT</li> <li>▪ Washington State DOT</li> </ul> | <ul style="list-style-type: none"> <li>▪ Atlanta Regional Commission</li> <li>▪ Chittenden County MPO (Burlington, VT)</li> </ul> | <ul style="list-style-type: none"> <li>▪ Lane Council of Governments (Eugene, OR) &amp; Oregon DOT</li> </ul> |

**B. Workshop Agenda/Content Development**

FHWA worked with the consultant to develop a general framework for the workshop content and agenda, each of which would be further refined and “customized” based on each host agency’s particular circumstances and needs vis-à-vis planning for climate change and transportation.

In general, FHWA designed the workshops to facilitate each agency's ability to more effectively integrate climate change considerations (both mitigation of GHGs and adaptation to climate change impacts) into the existing transportation planning process. Because consideration of climate change involves attempting to plan with incomplete data and for uncertain future circumstances, scenario planning<sup>1</sup> is one approach that planners may use to help them better understand options and opportunities available to the agency. Thus, part of the basic framework for developing and implementing the workshops included how an agency might apply scenario planning techniques when considering climate change.<sup>2</sup>

In general, the *pro forma* agenda for the workshops included elements of the following topics:

- |  |  |
|--|--|
| ▪ Analyzing stakeholders and target decisions              | ▪ Fundamentals of scenario development         |
| ▪ Designing the process                                    | ▪ Communication techniques                     |
| ▪ Public and stakeholder involvement planning              | ▪ Tying scenarios to principles and strategies |
| ▪ Scenario development and evaluation techniques and tools | ▪ Establishing an action plan                  |
|  | ▪ Monitor indicators                           |

With this basic framework established, FHWA and its consultant worked with each host agency to refine and adapt the agenda to its specific needs and interests. As discussed previously, it became clear during this process that scenario planning, while important, should be only one of several key climate change-related planning topics addressed in each workshop. In addition, FHWA consulted with each host agency to create a list of workshop invitees, with a focus on ensuring appropriate staff and officials from key agencies (State, regional and/or local) participated.

### C. Workshop Execution

Each of the five workshops covered approximately 1 ½ days. FHWA conducted them during a 3-week period from late October through early November 2010. FHWA's consultant managed and facilitated the workshops, each of which included presentations from the consultant, FHWA and the host agency and its partner agencies. The workshops were highly interactive and provided significant time for questions, discussions and debate on both general climate change planning issues and topics specific to the host MPO or DOT setting.

<sup>1</sup> "Scenario planning" is a methodology that provides a framework for evaluating and testing future alternatives related to the various forces that affect communities (Source: <http://www.fhwa.dot.gov/planning/scenplan/index.htm>.)

<sup>2</sup> It should be noted that FHWA designed the workshops to convey basic scenario development and evaluation steps, rather than detailed (e.g., step-by-step) guidance.

### III. SUMMARY OF WORKSHOP PROCEEDINGS AND OUTCOMES

#### A. Introduction and Overview

This section provides a summary of the proceedings of each of the five workshops. It also provides highlights of the various key issues associated with the consideration of climate change in transportation planning raised by participants. Section IV of this report provides a distillation and assessment of these issues and their implications for future FHWA activities.

#### B. State Departments of Transportation (DOT) Workshops

##### 1. Florida Department of Transportation (FDOT)

###### Summary

Florida DOT helped convene the FHWA workshop to explore how best to address climate change adaptation information sharing, coordinated planning and coordinated implementation actions. In Florida, the framework for working on climate adaptation via transportation planning at the State level is just being formed. With the lack of a transportation-climate change adaptation framework, the workshop posed many questions, identified obstacles, and highlighted areas for follow-up, but did not produce many conclusions between participants.

Overall, FDOT itself wishes to improve sharing of data and projected assumptions and impacts associated with sea level rise, storm surge, scour, and other key adaptation challenges that confront Florida. Participants that represented a variety of State, regional, and non-profit entities explored additional outcomes including avenues to improve multi-sector and multi-agency coordinated adaptation planning, including the identification of vulnerabilities. A key issue raised by workshop participants was that they believe the State needs to define an overarching process goal (e.g., data sharing only, data plus collaborative planning, etc.) as different governmental entities at various scales approach these issues together.

###### Themes of Participant Comments/Discussions

- Data may vary in different parts of the State and that is acceptable. Further, a range of assumptions should be considered, the burden of one defensible set of assumptions is an unnecessary hurdle to create.
- The State needs to better understand the multiple and synergistic effects of climate change impacts. (e.g., sea-level rise together with hurricanes.) Often they are considered in isolation from each other.
- Communication protocols on climate change need to be established between levels of government. Ultimately, adaptation planning needs to be integrated with day-to-day or ongoing planning processes.
- The impacts of climate change in Florida in some areas may be widespread and dramatic. At some point, land use patterns and associated decisions should be explored to reduce



anticipated areas of impact. However, the participants acknowledged the political and procedural difficulties in addressing the location of development patterns.

## **2. Washington State Department of Transportation (WSDOT)**

### Summary

WSDOT helped convene the FHWA workshop to help MPOs across the State explore scenario planning at the regional scale. The MPOs in Washington are working to implement Washington State Executive Order 09-05 (EO), which mandates that MPOs with urban counties “develop and adopt regional transportation plans that will, when implemented, provide people with additional transportation alternatives and choices, reduce greenhouse gases and achieve the statutory benchmarks to reduce annual per capita vehicle miles traveled...”<sup>3</sup> Washington State was in the very early stages of implementing this executive order at the time of the workshop; meetings to discuss the EO were being held in the same week as the FHWA workshop, which reduced attendance from some invited MPOs. Presentations generated conversation on modeling topics, communication techniques that address climate change and regional land use and transportation characteristics, and techniques to establish a vision once a series of scenarios have been developed.

### Themes of Participant Comments/Discussions

- **Modeling Future Behavior Appropriately for a Scenario:** The most extensive discussion focused on the fallibility of calibrating modeling tools based on past behavior for use in a wide-ranging scenario planning process. If the region’s past and current urban forms do not bear a reasonable relationship to what is being contemplated in a long-range scenario, the travel patterns that the model would predict may also not be reasonable. Therefore, for the purposes of scenario planning, it may be appropriate to relax the assumption that past behavior should solely inform predictions of future behavior. Participants discussed the delicacy of using this approach and that it must be balanced with an effort to maintain the credibility and defensibility of the tools and the overall scenario planning process. Modifying the model from calibration based on historic travel behavior should be made clear and expectations should be appropriately managed. Furthermore, a modified model should not be used for conformity analyses or NEPA. One idea that emerged from the workshop on this topic was to have FHWA sponsor a pilot project to demonstrate the appropriate use of alternative modeling techniques within a scenario planning effort.
  
- **Effectively Communicating Climate Change:** Participants had great interest in communication techniques to engage people with various attitudes toward human-caused climate change. Discussion also focused on values-based or ‘laddering’ communication techniques that relate to the underlying or more basic associations people have with various words.

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<sup>3</sup> Executive Order 09-05, “Washington’s Leadership on Climate Change,” signed 21 May 2009.

- **Understanding the Market Consistency of GHG/ VMT Reduction Strategies (“Turning Vision into Reality”)**: A discussion thread that surfaced periodically throughout the workshop centered on how to understand and work with prevailing desires and market demand as land use and transportation characteristics of a vision or of a set of policies are developed and implemented. Related to this topic was the recognition that MPOs and WSDOT have no land use authority and thus have limited ability to regulate the outcomes put forth in a regionally preferred scenario. Presentations and discussion focused on increasing political support for the vision and increase the likelihood of local governmental implementation.

## **C. Metropolitan Planning Organizations (MPO) Workshops**

### **1. Chittenden County Metropolitan Planning Organization (CCMPO)**

#### Summary

The Chittenden County Metropolitan Planning Organization (CCMPO), in partnership with the Chittenden County Regional Planning Commission (CCRPC), invited a broad range of participants, many from non-profit organizations and State and local public agencies that have addressed climate change in a variety of ways in the Burlington area in recent years. The CCMPO suggested that the workshop was organized around the central question of how the region should conduct a Climate Action Plan (CAP) process that would be led jointly by the CCMPO and CCRPC. The backdrop for this discussion was the announcement of a \$1-million grant from the U.S. Department of Housing and Urban Development (HUD) “sustainable communities” program.

During the course of the workshop, participants explored a series of fundamental questions, including the goals of the CAP, specific GHG mitigation and climate adaptation actions, components of the CAP planning process, parties to engage in the process, public involvement approaches, and the ultimate CAP products.

#### Themes of Participant Comments/Discussions

- **CAP as Multi-sector, Integrated Strategy**: Participants believed the CAP should be interdisciplinary and integrate sectors beyond transportation. At the same time, they also believed it should be integrated with the CCMPO’s Metropolitan Transportation Plan. There was interest in using the CAP process to create a comprehensive alliance of multi-sector partners for addressing climate change, including the public, private and non-profit sectors. Participants noted that it is important to identify where and how key CAP implementation decisions will be made, and to tie the CAP into the plans of the entities that will make the implementation decisions.
- **Broadening Outreach and Marketing**: Participants said that individuals changing their behavior to be more “climate-friendly” should also be a goal of the CAP. To achieve this, there is a need to educate citizens and provide an educational framework that helps achieve a big shift in public willpower and behavior. Goals that will actually be effective in helping

slow the effects of climate change are extremely hard to achieve unless there is substantial shift in public attitudes and actions. Participants also said that an ongoing, widely “marketed” plan in which all sectors can participate will be important in order to produce a CAP plan that local communities will buy into and in which they will participate.

- **Focus on Strategies with Greatest Impact:** Participants agreed that climate “solutions” identified in the CAP need to be measurable so that the Plan’s effectiveness can be monitored, assessed and publicized. It is important that CAP not be a paper plan on a shelf, but a list of specific action items, with a timetable and implementation responsibilities articulated. Participants suggested that the CAP’s primary focus be on the three sectors with the biggest potential to reduce GHG emissions in Vermont: transportation, residential and commercial buildings, and agriculture. Cumulatively, these account for 89 percent of the State’s GHG emissions. In addition, the CAP should include a methodology for implementing a long-term tracking system that allows “adaptive management” of climate action strategies as conditions change over time. Participants also concurred that CAP strategies should be assessed for cost-effectiveness vis-à-vis the presumed implementing entity as part of the process for determining what strategies are ultimately included in the CAP.

## **2. Atlanta Regional Commission (ARC)**

### Summary

ARC has conducted a variety of regional visioning and scenario planning efforts in the past decade including the recent Envision 6 effort. Therefore, this workshop focused on next steps toward more effective implementation of existing regional land use frameworks and programs. The Atlanta region is currently facing a severe water crisis. A Federal court ruling last summer threatens Lake Lanier’s future viability as the region’s primary source of water. The water crisis together with an upcoming transportation sales tax referendum put the topic of addressing climate change in a broader and more complicated political context. Discussion centered on utilizing these immediate threats and opportunities to move GHG mitigation efforts forward. This would be done by focusing on co-benefits and communication techniques that do not center on climate change by itself. Of the five workshop sites, the Atlanta region is one of the more sensitive when it comes to openly discussing human-caused climate change with local officials and regional stakeholders.

### Themes of Participant Comments/Discussions

- **Localized/ integrated communication techniques:** Discussion and presentations focused on addressing climate change in a region where climate change skepticism is common. Participants discussed co-benefits, such as household savings of time and money associated with reduced travel demand and mode shifts toward walk, bike, transit, and carpooling. Economic growth co-benefits were also seen as a key. Discussion also focused on how to use the Atlanta area water crisis to work toward GHG mitigation by emphasizing the link between increased density and reduced water demand. Communication techniques that resonate with local residents and match their values held particular interest. Generally, there was a desire among workshop

participants for better educational and training material to draw upon as local implementation steps are conducted.

- **Multi-sector approaches:** ARC has reached out to local governments extensively to communicate the link between land use strategies and efficient transportation behavior. Within the broader goal of reducing GHG, the workshop explored reductions that could come through non-transportation sectors such as building construction techniques and energy sector improvements. ARC's lack of authority beyond the transportation sector directed the discussion toward partnerships with other agencies.
- **Plan management:** Within the backdrop of Envision 6 and the Livable Centers Initiative (LCI), discussion also centered on how to improve the effectiveness of ongoing implementation efforts. This included discussion on the LCI, corridor and sub-regional visioning and planning techniques. FHWA support was discussed as well. This included the value of additional financial resources, a Peer exchange, minimizing inconsistencies between various FHWA standards, requirements and guidelines, and capacity building.

## **D. MPO/DOT Partnership Workshop**

### **1. Lane Council of Governments (LCOG) and Oregon Department of Transportation (ODOT)**

#### Summary

In 2010, the Oregon Legislature passed Senate Bill 1059 (SB1059), a statewide, comprehensive bill aimed at reducing greenhouse gas (GHG) emissions from transportation.<sup>4</sup> SB1059 names the Oregon Department of Transportation (ODOT) and the Oregon Department of Land Conservation and Development as the lead agencies in implementing its requirements. The relevant State agencies along with Lane COG and the other MPOs affected by SB1059 (all except for the Portland area MPO, METRO), were early in the process of operationalizing the language of SB1059 in the months before and after the FHWA workshop.

It was premature to address specific questions and answers regarding how to address SB1059. Some key decisions need to be made to narrow the universe of options before meaningful 'next steps' discussions can be held. Therefore, participants preferred to reflect on SB1059, ask key questions that the legislation may create, think through some of the unanticipated consequences, and outline general approaches to ensuring that the legislation most effectively accomplishes its climate mitigation goals.

The workshop focused on a few key topics: fundamental approaches to scenario planning, the range of roles, resources, and guidance that the State could provide to enable MPOs to be effective in the work of addressing SB1059, and an open discussion of the broad range of transportation-related strategies that should be explored to reduce GHG.

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<sup>4</sup>Oregon Senate Bill 1059, "An Act Relating to Greenhouse Gas Emissions; Limiting Expenditures; and Declaring an Emergency," enacted 18 March 2010 as Chapter 85, 2010 Laws of Oregon.

### Themes of Participant Comments/Discussions

- **Alternative Approaches to Scenario Planning:** Scenarios were discussed as a tool to accomplish two different general goals: (1) to face fundamental uncertainty and reaction to—or resiliency in the face of—significant shifts in external forces; e.g., demographic, economic, and environmental conditions well beyond the control of local and regional policy makers; or (2) Scenarios as mechanisms to test land use and transportation interactions while limiting the variability of external forces (i.e., more like an alternatives analysis). Participants struggled with which emphasis SB1059 should place on the two different scenario planning approaches (although it was acknowledged that the two approaches are not necessarily mutually exclusive). Participants supported and periodically affirmed the need to do both types of scenario planning. There was recognition that trying to utilize both approaches in the same planning process could create complexities that are too substantial for officials and the public.
- **Broad Questions and Issues Related to Operationalizing Requirements of SB 1059:** Participants explored general responses and key considerations raised by elements of SB1059, including (1) the toolkit, (2) the guidelines that State agencies would provide, and (3) the types of policy and investment levels that may be explored at either the metropolitan and local scale or the State level:
  - *GHG Planning Toolkit (per SB 1059):* While the legislation calls for a GHG planning “toolkit” to be made available to MPOs, there may be five distinct areas of tools, including tools to mitigate GHG emissions (e.g., TDM), modeling and technical tools, public communication strategies, GHG analysis “best practices” (e.g., inventories and projections), and process tools (methods for improving inter-jurisdictional coordination and commitment to reduce GHG emissions).
  - *State Standards or Guidelines:* Participants identified a range of guidelines or standards that would need to be provided at the State level to improve the efficiency of implementing the elements of SB1059, including clarification of the base year for analyses and adoption of accepted standards and planning assumptions.
  - *Metropolitan and State-level GHG Emission Mitigation “Levers:”* Participants identified a broad list of policy and investment strategies to reduce GHG emissions from transportation that could potentially be implemented at the metropolitan, local and State levels. The main questions from participants pertained to how best to assess each strategy’s efficacy at each level and how to prioritize them for implementation.

## IV. FINDINGS AND IMPLICATIONS

This section synthesizes and distills the proceedings of the five workshops into key themes and issues. It includes an assessment of the common issues among them and an analysis of areas for potential follow-up by FHWA.

### A. Assessment of Workshop Results

Although the five workshops were held in five different States and involved participants from DOTs, MPOs, and other stakeholder agencies, several issues or themes emerged that were shared across all or most of the events:

- **Evolving Inter-Institutional Coordination:** In all five of the workshops, participants from both DOTs and MPOs had only recently begun to design the approach for cooperative arrangements among local, regional, and State institutions by which they hoped to address climate change. Thus, each agency and its partners were working to define roles and responsibilities, establish guidelines for the climate change and transportation planning process and articulate inter-governmental communication protocols.
- **Limited Data for Planning Applications:** There is a perceived lack of directly applicable and accessible data regarding the impacts of climate change for use in transportation planning. In each of the workshops, participants repeatedly raised concerns regarding the difficulty they had experienced or believed they would experience in obtaining data adequate to answer questions about issues such as anticipated mean temperature changes, sea level rise, spread of invasive species, especially in regard to their specific geographic areas of interest. Participants said that the lack of such data could undermine the credibility of a planning process focused on prioritizing options for investing in transportation system adaptations to a changing climate's impacts.
- **Need for Appropriate Climate Change Planning Tools:** There is a need for improved tools and techniques available to DOTs and MPOs to help educate policy-makers, stakeholders and the public regarding the purpose and value of integrating climate change considerations into transportation planning. Participants in most of the workshops noted that one of the biggest challenges they face is how to engage the public, stakeholder, and policy-makers in discussions of GHG mitigation options. The analytical tools and methods available to them, however, are not necessarily adequate to conduct the types of analyses and produce the information they need to make a credible and understandable case for transportation planning that explicitly considers climate change. In addition, participants in all of the workshops noted that because climate change is a "new" and evolving issue in the transportation planning arena, they need communication tools to more effectively engage the public (e.g., visualization).
- **Limited Experience in Scenario Planning Related to Climate Change:** Across the five workshops, agencies' experience in using scenario planning generally was quite varied. It was extremely limited with specific regard to scenario planning for climate change and transportation. Most participants had a general understanding of scenario planning

concepts. The primary application of scenario-type planning to date among the workshop participants had been as a means of testing the VMT reductions associated with different land use and transportation strategies. However, there had been little use of scenario development and testing as a means of considering uncertainty and variability associated with planning assumptions or the magnitude and intensity of external factors (e.g., climate change). Many workshop participants expressed uncertainty regarding the process for creating such scenarios and how they could be applied in the established transportation planning process.

- **Status of Planning for Climate Change Tied to State Policies and Framework:** The experience to date of the DOTs and MPOs involved in the workshops demonstrated that the nature of a State's policies, regulations and laws pertaining to climate change are a primary driver of the progress and definition of a DOT's or MPO's climate change-related planning. For example, in Oregon, where the State legislature enacted a climate change planning law in 2009, the DOT and MPOs have been actively developing strategies for implementing the law's transportation and land use planning requirements. In Florida and Vermont, where no laws or requirements of this nature currently exist, the DOT and MPOs are attempting to determine the appropriate focus and extent of climate change-related planning, whether for GHG mitigation or impacts adaptation.
- **Interest in Specific Climate Change Planning Needs Varies across Different DOTs and MPOs:** The interest that the different DOTs and MPOs had in specific aspects of climate change planning was driven primarily by their individual circumstances and perceptions of the relative risks to their jurisdictions associated with these aspects. For example, the Florida DOT was primarily interested in planning for the State's transportation system to adapt to the impacts of sea level rise. In the other workshops, however, most participants were interested in addressing transportation-related GHG mitigation.

## **B. Suggested Areas for FHWA Focus**

The proceedings and outcomes of the five workshops conducted for this project suggest several areas in which FHWA could provide beneficial follow-up and support to DOTs and MPOs pertaining to planning for climate change and transportation:

- Identify effective and efficient methods and approaches for considering climate change issues and impacts in the transportation planning process.
- Provide DOTs and MPOs with additional resources to adequately address climate change planning needs and requirements.
- Identify and provide technical tools and assistance for analyzing climate change issues, impacts, and options.
- Assist with identifying effective methods for communicating the science of climate change and associated planning issues and needs to policy-makers, stakeholders, and the public.

- Provide information and education on how to appropriately and effectively use scenario planning to accommodate uncertainty and variable external forces in State and metropolitan transportation planning, both in general and with regard to climate change specifically.



## **V. POTENTIAL NEXT STEPS**

Based on the assessment of the workshop proceedings presented in Section IV, the following are potential actions FHWA could take to support and facilitate further integration of climate change considerations into transportation planning in DOTs and MPOs.

### **A. Facilitate Capacity-building for DOTs and MPOs**

FHWA should expand its efforts to help DOTs and MPOs develop and build their internal professional and technical capacities to address the complex issues associated with considering climate change as part of the transportation planning process. Such efforts could include, but not be limited to, peer exchanges, webinars, training (classroom and video or web-based), and sponsored research through FHWA's own programs and/or TRB. In addition, in order to help DOTs and MPOs have a more effective method for assessing and planning for climate change, FHWA should pursue similar capacity building in scenario planning specifically.

### **B. Provide Analytical Tools and Related Support**

FHWA should seek avenues by which it can provide DOTs and MPOs with tools and methods to efficiently and credibly analyze climate change issues, including both GHG mitigation and adaptation to climate change impacts (e.g., sea level rise, greater storm intensity, etc.). Such tools and methods could include, but not be limited to, the refinement and enhancement of the web-based tool mentioned earlier in this document, methods for linking and integrating GHG planning to the MOVES analyses and expert assistance related to interpreting analytical results.

### **C. Provide Technical Assistance and Resources**

FHWA should seek ways to expand and enhance its offerings in direct technical assistance and resources for DOTs and MPOs related to climate change and transportation planning. Such efforts could include, but not be limited to, placing relevant experts in each FHWA Resource Center, continuing to build the content of the USDOT Climate Change and Transportation Clearinghouse website (<http://climate.dot.gov/>) and on the FHWA Highways and Climate Change site (<http://www.fhwa.dot.gov/hep/climate/index.htm>), and establishing and facilitating a peer-to-peer information exchange network.