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Webinar
Integrating Sustainability and Climate Change Concerns and CSS Principles

February 22, 2:00pm – 3:30pm

U.S. Department of Transportation
 Federal Highway Administration

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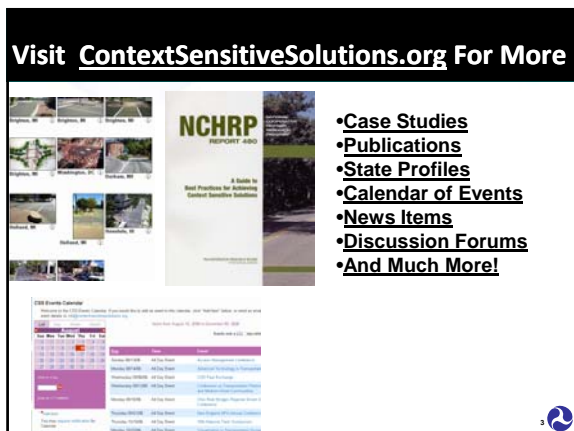


The Surface Transportation Environment and Planning Cooperative Research Program (STEP)

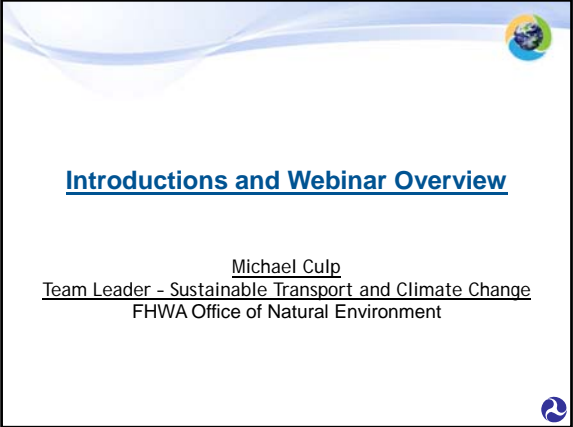
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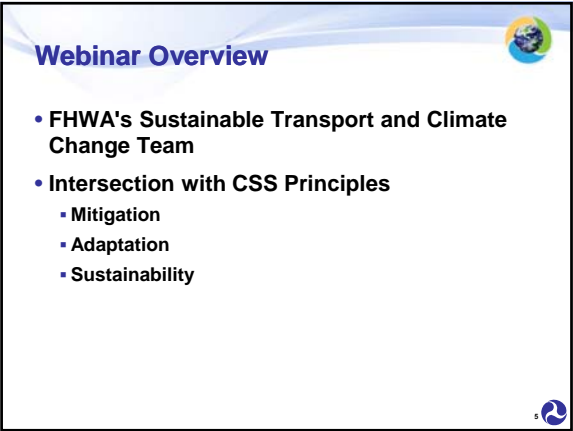
- **Case Studies**
- **Publications**
- **State Profiles**
- **Calendar of Events**
- **News Items**
- **Discussion Forums**
- **And Much More!**



Introductions and Webinar Overview

Michael Culp
Team Leader - Sustainable Transport and Climate Change
FHWA Office of Natural Environment

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Webinar Overview

- FHWA's Sustainable Transport and Climate Change Team
- Intersection with CSS Principles
 - Mitigation
 - Adaptation
 - Sustainability

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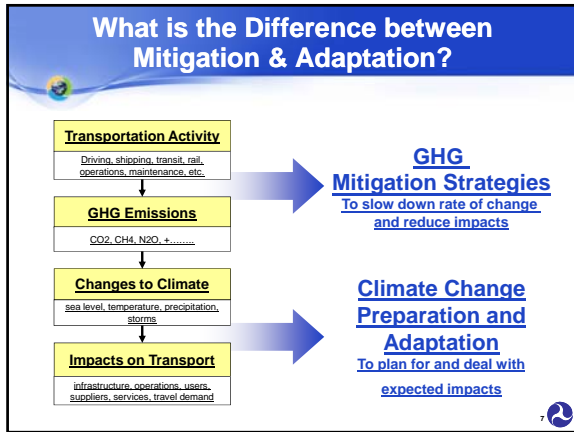


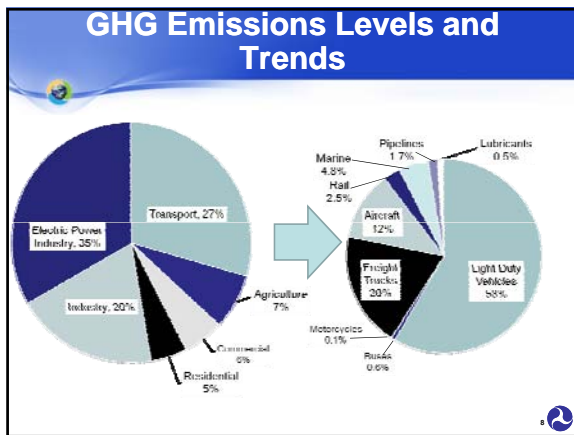
Transportation and Climate Change
Mitigation

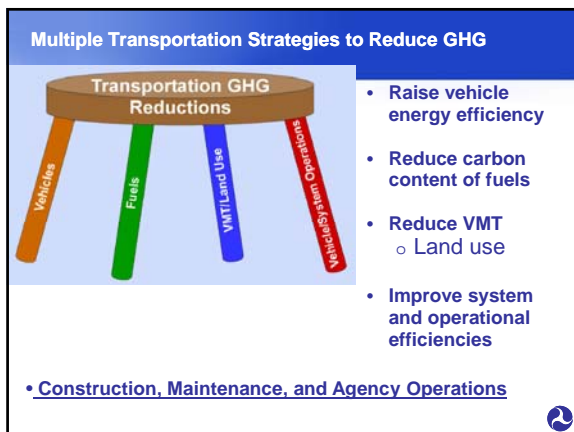
Diane Turchetta
FHWA Office of Natural Environment

CSS Webinar
February 22, 2011

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“Two Legs of the Stool”

- **Transportation System Efficiencies**
 - **Traffic flow improvements**
 - ITS/Management and Operations
 - Improved Intermodal connections
- **Travel (by SOV) Activity Reduction**
 - **Reducing VMT**
 - Land Use strategies
 - Bike/ped
 - Transit
 - Pricing





Transportation's Role in Reducing U.S. Greenhouse Gas Emissions
Volume 1: Synthesis Report

Mandated by the Energy Independence and Security Act of 2007

Report to Congress
U.S. Department of Transportation
April 2010

Produced by the U.S. DOT Climate Change Center

Analyzes:

- Transportation greenhouse gas (GHG) emissions levels and trends
- Strategies for reducing these emissions

Scope:

- Full range of strategies
- All transportation modes
- Primarily synthesis, snaps to common baseline, should be seen as rough order of magnitude
- GHG reduction, costs, co-benefits, impact on DOT goals, key interactions

http://www.climate.dot.gov/resources/presentations/html/2010_06_16.html



Reducing Greenhouse Gas Emissions from U.S. Transportation

David Greene, Howard H. Baker Center for Public Policy
Steven Plotkin, Argonne National Laboratory

Report for Pew Center on Global Climate Change

Scope:

- Assesses the potential to substantially reduce transportation's GHG emissions cost-effectively by 2035 & 2050.
- Focuses on entire U.S. transportation system
- Time frame is 2010-2050
- Three scenarios with differing assumptions about technological progress, policy initiatives, and public attitudes
- Rely on existing studies to estimate impacts

<http://www.pewclimate.org/publications/reducing-ghg-emissions-from-transportation>



Linkage Opportunities in Planning Regulation

- Energy and environmental concerns
- Integrated transportation system, system preservation, safety and security
- Transportation demand and system management strategies
- Consultation

Overview of Current Practice



- Acknowledge connection between transportation and climate change
- Mitigation of GHG emissions
 - (vision – goals – policies – strategies)
- Performance measures
 - Related to GHG emissions
- Quantifying GHG emission
 - Emerging: tools, methods, data

Federal Highway Administration
Integrating Climate Change into the Transportation Planning Process
Final Report
July 2008

www.fhwa.dot.gov/hep/climatechange/index.htm

FHWA Mitigation Activities



- Developing a GHG Mitigation Guidebook.
- Offering GHG analysis technical assistance to State DOTs and MPOs – including training on MOVES.
- Developing a web-based GHG carbon calculator for use in estimating GHG emission impacts from surface transportation strategies.
- Developing and implementing seven State DOT climate change workshops in coordination with AASHTO.
- Holding climate change mitigation peer exchanges for State DOTs and MPOs.
- Researching the GHG reduction potential of highway operation and management strategies.
- Developing FHWA guidance in response to CEQ GHG Guidance



Transportation and Climate Change Adaptation

Rob Kafalenos
FHWA Office of Natural Environment



CSS Webinar
February 22, 2011



FHWA and Climate Change Adaptation

Goal: systematic consideration of climate change vulnerability and risk in transportation decision making


- Systems level (Metropolitan, Statewide planning) & individual projects, as appropriate
- **Motivations**
 - Internal: protect integrity of transportation investments, safety
 - External: CEQ guidance on addressing climate change in NEPA
- **Cooperation**
 - FHWA, U.S. DOT, etc.



Overview of FHWA Climate Change Activities


Providing information, outreach; developing and promoting use of tools and methodologies; application

- *Potential Impacts of Global Sea Level Rise on Transportation Infrastructure: Mid-Atlantic Focus* (2008)
- **Regional Climate Change Effects: Useful Information for Transportation Agencies [Climate Effects Typology]** (2010)
- Adaptation peer exchanges (2008, 2009, future)
- Vulnerability and risk assessment conceptual model (2010)
- **Pilots of vulnerability / risk assessment conceptual model (ongoing)**
- **Gulf Coast Study: Impacts of Climate Variability and Change on Transportation Systems and Infrastructure**
 - Phase 1 – Gulf-wide (2008); Phase 2 – Mobile, AL (ongoing)
- FHWA Adaptation Working Group – draft strategy




Relationship of these activities to CSS

- Encourage greater understanding of environmental context, both current and future
- Interdisciplinary approaches (environmental staff, planners, scientists, economists)
- Foster communication and cooperation among stakeholders on identifying, protecting key parts of the transportation system
- Promote transportation options that increase safety and use resources efficiently




Regional Climate Change Effects Report

- Synthesizes information on climate change projections from multiple studies, for transportation decision makers
 - Snapshot: Summarizes recent science
- Projected *changes* by region; probabilistic where possible
 - Annual, Seasonal Temperature (change in °F)
 - Seasonal Precipitation (% change)
 - Where information exists:
 - Sea level rise, Storm activity
- Also includes information at local, state scales



Received assistance from climate experts at NOAA, USGS, DOE, etc.
http://www.fhwa.dot.gov/hep/climate/climate_effects/



Projections of Sea Level Rise, Tropical Storms & Hurricanes

Study	Global Sea Level Rise, to 2100
IPCC (2007a)	7" to 23"
Newer studies	20" to 79"

• Local sea level rise may differ from global estimates due to subsidence/uplift, sedimentation/erosion, ocean circulation, etc.

Tropical storms & hurricanes: Consensus suggests projected global conditions by 2100:

- Increase in intensity, decrease in frequency
- Increase in frequency of most intense storms



Projections of Regional Temperature, Precipitation changes

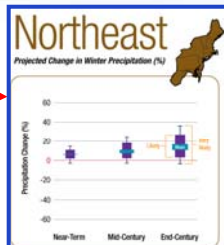
Projections of near-term, mid-term, end-of-century are provided for each region, based on the data that underlay the USGCRP (2009) report

- Two emission scenarios (B1, A2)
- IPCC AR4 climate models
- Regionally processed
- Report also includes results from other studies



Example of Regional Precipitation Change: Northeast

Season	Scenario	Near-term (%)	Mid-century (%)	End-of-century (%)
Winter	Mean	6	8-11	11-13
	Likely	2-11	2-18	4-27
	Very Likely	(2)-15	(4)-26	(4)-36
Spring	Mean	3	5-6	9-11
	Likely	(2)-7	0-12	1-21
	Very Likely	(7)-12	(5)-17	(9)-31
Summer	Mean	2	1-2	(1)-2
	Likely	(1)-6	(6)-7	(12)-11
	Very Likely	(5)-10	(12)-14	(24)-23
Fall	Mean	1-2	3	3-4
	Likely	(4)-6	(3)-9	(5)-13
	Very Likely	(10)-11	(9)-16	(15)-23



Collected Literature is discussed in the text:

—



How can this information be applied?

- Can inform planning efforts with a consistent and sector-specific information set
 - Help understand which parts of the planning area may be susceptible to sea level rise, for example
 - Serves as a starting point for discussion of potential future changes
- Can inform consideration of vulnerability of key assets
 - Projections by definition are somewhat uncertain
 - Regional projections mask differences within a region
- Some of the information is too broad / uncertain to make definitive decisions on projects
- Use of this information may vary by specialty (e.g., engineering, planning, etc.) and location

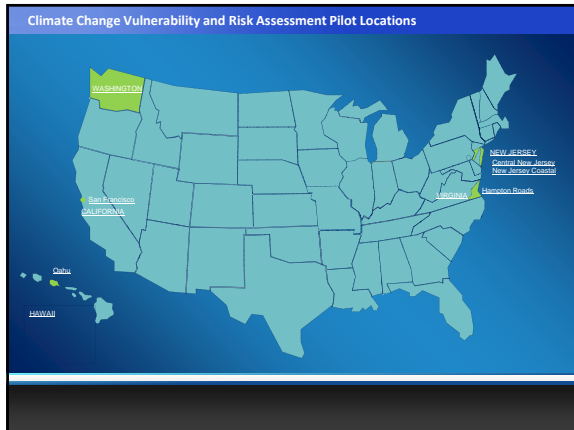
Vulnerability/Risk Assessment Conceptual Model

- **Goal:** Help transportation decision makers identify vulnerable assets and adaptation strategies
 - most exposed to the threats from climate change; and/or
 - could result in the most serious consequences as a result of those threats
- Conceptual model completed
- Pilots - Use by State DOTs and MPOs
- Update the conceptual model

Vulnerability/Risk Assessment Conceptual Model

- Develop inventory of infrastructure assets
- Gather climate data
- Assess vulnerability and risk of assets to projected climate change
- Analyze, prioritize adaptation options
- Monitor and revisit

www.fhwa.dot.gov/hep/climate/conceptual_model62410.htm



New Jersey DOT

- Study Areas:
 - New Jersey Coastal
 - Central New Jersey
- Partners:
 - New Jersey DOT
 - North Jersey Transportation Planning Authority,
 - South Jersey Transportation Planning Organization,
 - Delaware Valley Regional Planning Commission,
 - New Jersey Department of Environmental Protection

Washington State DOT

- Statewide geographic scope
- Studying WSDOT owned and managed facilities potentially at risk to a range of impacts:
 - Sea-level rise inundation areas
 - Rivers and stream channel migration, melt effects
 - Extreme temperature effects
 - Drought threats to wetland creation, mitigation sites, roadside vegetation, soil moisture/flux, invasive species, worker health, wildfire
 - Precipitation changes- threats to slope stabilization, stormwater management, erosion control, landslides, "road survivability"
 - Wildfire – safety, emergency response

Figure 8. Summary of projected first 5 snow pack meltwater for three model scenarios (AR, A1G2, and A1B) for the period 2040-2060. The maps show the projected percentage change in snow water equivalent (SWE) for the period of water the snowpack would melt (in a year).

Potential Impacts of Climate Change and Variability on Transportation Systems and Infrastructure, Gulf Coast

- **Goals:** Assessment of how climate change is expected to affect transportation in the Gulf Coast area; development of adaptation tools and strategies.
- **Phase 1**
 - Overview of climate change impacts on transportation infrastructure, and general options for addressing these challenges
 - Houston to Mobile, completed in 2008 (<http://www.climate-science.gov/Library/sap/sap4-7/default.php>)
- **Phase 2**
 - Seeks to develop more definitive information and tools
 - Test in Mobile area; plan to make process transferable to other MPOs
 - Timeframe: 2010-2013

Vulnerability Due to Range of Climate Factors

- **Temperature impacts, e.g.,**
 - Potential rise in maintenance and construction costs
 - Increased use of energy for refrigerated storage
 - Potential rise in rail buckling
 - May result in impacts to aircraft performance and runway utilization
- **Relative sea level rise impacts, e.g.,**
 - 24% of interstate miles, 28% of arterial miles, New Orleans Transit
 - 72% of freight, 73% of non-freight facilities at ports
 - 9% of the rail miles operated, 20% of the freight facilities, no passenger stations
- **Transportation in central Gulf Coast already vulnerable to large hurricanes (e.g., 2005 season)**
 - Vulnerability will be exacerbated if hurricane intensity increases, absent adaptation strategies
- **Examined effect of 18 and 23 ft storm surge**

Freight Rail Lines Vulnerable to Storm Surge of 18 feet

Storm Surge

- 18 ft or more
- 15 ft or more
- None

Rail Facilities Vulnerable to Storm Surge

- Facilities 18 ft or more
- Facilities 15 ft or more


What Are Possible Adaptation Responses?

- **Accommodate: Maintain and manage**
 - Absorb increased maintenance / repair costs
 - Improve real-time response to severe events
- **Strengthen structures / protect facilities**
 - Design changes when rebuilding / new investment
 - Promote buffers, sea walls, etc.
- **Relocate / avoid**
 - Move key facilities
 - Site new facilities in less vulnerable locations
- **Abandon and Disinvest**
- **Enhance redundancy**
 - Identify system alternatives




Gulf Coast Study: Task Objectives

- **Task 1: Identify critical assets in Mobile**
- **Task 2: Climate impacts**
 - Develop climate information
 - Assess sensitivity of assets to climate stressors
- **Task 3: Determine vulnerability of critical assets**
 - Broad assessment of vulnerability
 - In-depth vulnerability assessment of some of the most critical assets
- **Task 4: Develop risk management tool(s)**
- **Task 5: Coordination with Planning Authorities and the Public**
 - Ongoing task throughout project
- **Task 6: Information dissemination and publication**






Task 1: Identify Critical Transportation Systems

- **For each mode, which assets are "critical" to the Mobile region?**
- Determine Subset of Entire Transportation Network on Which to Perform Vulnerability Assessment and Identify Adaptive Measures
- Develop a process applicable to multiple transportation modes
- Conduct a careful review of relevant transportation models
- Develop GIS layers of critical transportation assets, for later study tasks





Task 2: Projected Climate Data

- USGS providing statistically downscaled projections for T and P
 - 4 to 7 Climate models (PCM, Hadley, ...)
 - 3 emission scenarios (A1fi, A2, B1); 3 time horizons out to 2100
 - Secondary variables calculated from daily T and P, e.g., 24-hr precip with 5%/yr prob
- Sea level rise analysis
 - Range of recent global SLR scenarios used
 - Accounts for local subsidence
- Storm Surge Modeling – ADCIRC
 - Range of storm intensities
 - Output includes surge distribution and dynamics
- Wave Modeling – STWAVE
 - Inputs from ADCIRC output and boundary conditions
 - Outputs include key aspects of wave energy
- Exposure of transportation systems will be assessed using a GIS analysis



Next Steps



- Conduct storm surge and wave modeling runs during Winter 2010-2011
- Conduct exposure analysis of transportation assets to sea-level rise and storm surge during 2011
- Review and process observed and projected climate information for temperature, precipitation and other variables
- Finalize approach for Task 3
- Begin screening critical assets for likely vulnerability to climate change



Q+A

If you have a question:

- Press * 1 on your phone
- Record your name (you will be placed into the queue)
- Ask your question after you are announced



FHWA's Sustainable Highways Program

Michael Culp
Team Leader - Sustainable Transport and Climate Change
FHWA Office of Natural Environment

CSS Webinar
February 22, 2011

Background - Sustainable Highways Self-Evaluation Tool

Sustainable Highways Tool

Working Title:
IN-VEST - Infrastructure Voluntary Evaluation Sustainability Tool

A web-based self-evaluation tool for measuring sustainability over the life cycle of a transportation project or program — from system and project planning through design and construction, to operations and maintenance

Goals

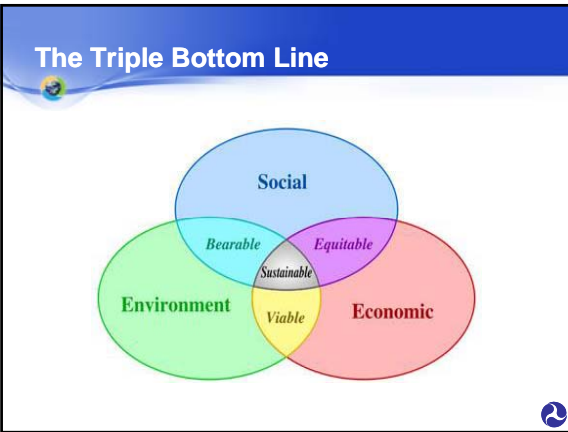
- Encourage sustainable highway practices
 - Internal improvement
 - External recognition
- Help agencies measure sustainability and quantify tradeoffs
- Provide a framework for communicating with stakeholders about sustainability
- Establish a method for evaluating sustainable highways

What the Tool is NOT...

- The tool is not final.
 - We are working on a Beta-version.
- The tool is not required.
 - Use is purely voluntary.

What is a Sustainable Highway?

- Satisfies functional requirements
 - Fulfills transportation goals and needs (e.g. congestion reduction)
 - Addresses development and economic growth
- Reduces impacts
 - Environment
 - Consumption of resources
- Addresses environmental, economic, and social equity dimensions (triple bottom line)
- Addresses sustainability from planning through operations



Description – Web Tool and Web Site

- ### What is Included in the Tool?
- Collection of best practices
 - Repository of real-world examples where best practices have been applied
 - Self-evaluation tool to measure sustainability

What are some of the Tool's characteristics?

- Web-based
- Credits based on best practices
 - (total of 68)
- Each credit assigned a point value based on expected sustainability impact
- In coordination with ASCE effort
- Other sustainable highways tools used as references
 - (GreenLITES, I-LAST, Greenroads)

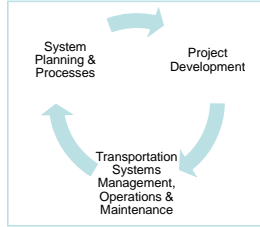
Sustainable Highway Credits

Credits are organized in 3 phases

- System Planning (SP)
 - Concerned with agency-wide management and planning of highway networks.
 - Typically involve the owner-agency having policies, procedures and systems in place to address them.
- Project Development (PD)
 - Concerned with the development of a specific project once the general need and proposal for a solution to a transportation problem have been programmed.
 - Involve environmental review, project planning, design, and construction decisions related to a specific project.
- Operations & Maintenance (OM)
 - Concerned with agency-wide practices, policies and procedures required for the overall functionality and efficiency of a highway network.

Three Phase Evaluation Options...

- Evaluate 1 of 3 Phases over the Life Cycle of a Program
- Scores are independent by Phase
 - You'll get 3 different scores
 - Scores are not additive across the 3 phases of the life cycle
 - Scores between phases are not comparable (each phase has its own range)



Three Scoring Ranges...

- Only Project Development credits are weighted
 - Safety credit up to 10 points
 - All other credits 1-5 points
- System Planning & Processes and Transportation Systems Management, Operations & Maintenance (TSMOM) credits are not weighted
 - All Credits up to 10 points with a range of points from 1 to 6
- Each Phase has its own range of scores (cannot compare total points phase to phase)

Phase	How Many Credits	Are Credits Weighted	Evaluation Scoring Range
System Planning & Processes	14	No	140 points
Project Development	39	Yes	124 points
TSMOM	15	No	150 points

Achievement Levels How will success be measured?

- Achievement levels are included in Beta version
- Look similar to LEED Rating system
 - Bronze (base level)
 - Silver (level 2)
 - Gold (level 3)
 - Platinum (top level)
- Are designed to encourage improvement

**FHWA
Sustainable Highways Self-Evaluation Tool**

System Planning and Processes Credits		Project Development Credits	
Credit	Points	Credit	Points
SP-1 Comprehensive & Integrated Planning	1	PD-1 Land Resource Analysis	1
SP-2 Environmental Management System	1	PD-2 Planning and Land Use	1
SP-3 Context Sensitive Solutions	1	PD-3 Cultural Resource Solutions (CRS)	1
SP-4 Equity Analysis	1	PD-4 Environmental Management	1
SP-5 Integrated Transportation Land Use Planning	1	PD-5 Resource Cost Analysis	1
SP-6 Multimodal Transportation	1	PD-6 Safety Performance	1
SP-7 Professional Development	1	PD-7 Safety Performance	1
		PD-8 Safety Performance	1
		PD-9 Safety Performance	1
		PD-10 Safety Performance	1
		PD-11 Safety Performance	1
		PD-12 Safety Performance	1
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		PD-14 Safety Performance	1
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		PD-98 Safety Performance	1
		PD-99 Safety Performance	1
		PD-100 Safety Performance	1

Draft Version, October 2010 Summary of Credits Page 1 of 18

System Planning & Processes Credits

SP-1 Comprehensive & Integrated Planning	SP-8 Travel Demand Management
SP-2 Environmental Management System	SP-9 Safety Management
SP-3 Context Sensitive Solutions	SP-10 Air Quality Management
SP-4 Equity Analysis	SP-11 Greenhouse Gas Emissions
SP-5 Integrated Transportation Land Use Planning	SP-12 Climate Change Effects
SP-6 Multimodal Transportation	SP-13 Noise Reduction Management Plan
SP-7 Professional Development	SP-14 Financial Sustainability

SP-3 Context Sensitive Solutions

Goal	Ensure that a system-wide context sensitive solutions (CSS) approach to project and program development is integrated into the Agency's transportation practices.
Points	1 – 10 points
Description	Agency is using tools systematically to integrate CSS principles into transportation practices.

**Project Development Credits
Project Planning/Design**

PD-1 Cost Benefit Analysis	PD-8 Habitat Restoration
PD-2 Highway and Traffic Safety	PD-9 Runoff Flow Control
PD-3 Context Sensitive Solutions	PD-10 Runoff Quality
PD-4 Lifecycle Assessment	PD-11 Ecological Connectivity
PD-5 Lifecycle Cost Analysis	PD-12 Low Impact Development
PD-6 Freight Mobility	PD-13 Recycled Materials
PD-7 Educational Outreach	PD-14 Renewable Energy

**Project Development Credits
Project Planning/Design**

PD-15 Site Vegetation	PD-22 Energy Efficiency
PD-16 Pedestrian Access	PD-23 Traffic Systems, Management and Operations (TSMO)
PD-17 Bicycle Access	PD-24 Long-Life Pavement
PD-18 Transit & HOV Access	PD-25 Pavement and Structure Reuse
PD-19 Historical, Archaeological, and Cultural Preservation	PD-26 Stormwater Cost Analysis
PD-20 Scenic, Natural, or Recreational Qualities	PD-27 Thermal Pavement
PD-21 Low-Emitting Materials	

**Project Development Credits
Project Construction**

PD-28 Contractor Warranty	PD-34 Quality Control Plan
PD-29 Stormwater Pollution Prevention Plan	PD-35 Reduced Energy Materials
PD-30 Environmental Training	PD-36 Waste Management
PD-31 Equipment Emission Reduction	PD-37 Earthwork Balance
PD-32 Fossil Fuel Reduction	PD-38 Environmental Management System
PD-33 Construction Noise Mitigation	PD-39 Tracking Environmental Commitments

PD-3 Context Sensitive Solutions

Goal	Deliver projects that synthesize transportation requirements and community values through effective decision-making and thoughtful design.
Points	5 points
Description	A technique to account for the inclusion of CSS principles in the project development process.

Transportation System Management, Operations & Maintenance Credits

OM-1	Pollution Prevention Plan	OM-7	Roadside Infrastructure Maintenance
OM-2	Pavement Management System	OM-8	Mobility
OM-3	Bridge Management System	OM-9	Safety
OM-4	Paved Surfaces Management System	OM-10	Snow & Ice Control
OM-5	Traffic Control Infrastructure Maintenance	OM-11	Renewable Energy Use
OM-6	Cleaning and Litter	OM-12	Sustainability Plan
		OM-13	Alternative Fuel Fleet
		OM-14	Recycle and Re-use
		OM-15	Ecological Connectivity

Sustainable Transport & Climate Change Team, Office Of Natural Environment, HEP, FHWA



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Q+A

If you have a question:

- Press * 1 on your phone
- Record your name (you will be placed into the queue)
- Ask your question after you are announced



For more information, visit ContextSensitiveSolutions.org

Thank you for Joining Us!

Next webinar on CSS + Corridor Planning
Date: March 21
Time: 2:00 – 3:30pm

