Innovative Eco-Logical Research: Highlights of the Upcoming Transportation Research Board (TRB) Annual Meeting

Thursday, January 12, 2012
2:00 – 3:30 PM Eastern

Moderated by: Mary Gray, FHWA Office of Project Development and Environmental Review

Presenters

• **Todd Lickfett**, U.S. Fish and Wildlife Service
• **Mehmet Egemen Ozbek, Ph.D.**, Colorado State University
• **Mike Culp**, Federal Highway Administration (FHWA), Office of Natural Environment
Transportation Research Board (TRB)

• One of six major divisions of the National Research Council

• Mission:
  “To provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal.”

• Services:
  • Information exchanges
  • Research and related programs
  • Policy analyses and recommendations
  • Publications

• 91st Annual Meeting: January 22-26, 2012, Washington, D.C.

www.trb.org
Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects

• Addresses challenges in planning for ecosystems and infrastructure:
  – Duplication of efforts
  – Uncertainty and lack of predictability
  – Results: piecemeal mitigation
Ecological Session at TRB

Enabling Planning-Level Ecological Decision Making
Monday Jan 23, 1:30 pm - 3:15 pm Hilton, Connecticut Ave. DC

- US Fish and Wildlife Service LEAP and NiSource
- US Army Corps of Engineers Watershed Investment Tools
- USEPA/USGS National Atlas of Sustainability Measures
- California Statewide Advance Mitigation Initiative
Using an Outcome-Based Ecosystem Approach

1. Integrated Ecological Framework
2. Agency specific integrated approach to conservation and transportation planning

Through Development of an Outcome-Based Ecosystem-Scale Approach and Corresponding Credit System

1. Cumulative Effects and Alternatives Analysis
2. Regulatory Assurances
3. Ecosystem Crediting
Ecosystem-Based Decisionmaking

Developed in support of/to learn more about

Eco-Logical Program
Led by FHWA
Tested through FHWA Grant Program

SHRP2 C06
Led by TRB
Tested through C21 Pilots

Integration of C06 strategically into the Eco-Logical program

Implementation/Delivery

TRB to support tools or pilots based on tools based on C06 outputs in coordination with FHWA
Questions?

Eco-Logical:  

Eco-Logical Webinar Series:  
Avoid, minimize, and mitigate impacts to Trust Resources by providing biologists and planners with information, analyses, and decision support tools to inform project siting early in the planning process.

LEAP products:
- Landscape-scale Vulnerability Assessments (LVAs)
- Trust Resource Lists & Information
- Policy Information
- Conservation Frameworks (Internal Document)
- Conservation Measure Reports
- Report Builders (Biological Assessments etc.)
- LEAP Data Portal @ USGS ScienceBase
DRAFT LEAP Landscape Vulnerability Assessment (LVA)

Conservation Value & Landscape Condition
- Condition Model
- Listed/Other Species of Concern
- Priority Conservation Areas
- Landscape Context

Predicted Landscape Change
- Build-out Models
- Planned/Proposed Development
- Exploitable Resources
- Climate Change Effects

Landscape Vulnerability Assessment

Conservation Value → (weighted by condition)

Conservation Value
- Low Value
- High Value

Predicted Change
- Change Likely
- Change Less Likely

Predicted Change
- Low Value, Change Likely
- High Value, Change Likely

Conservation Value → (weighted by condition)

Low Value
- Low Value, Change Likely

High Value
- High Value, Change Likely

Change Likely
- Low Value, Change Likely

Change Less Likely
- Low Value, Change Less Likely

High Value, Change Less Likely

High Value, Change Less Likely
LEAP Integration with IPaC

Conservation Measure Reports
- provide species/project-specific BMPs

Landscape-scale Vulnerability Assessments
- maps delivered through interactive mapper
- project area “scores” for comparison
- list of LVA elements
- links to LEAP Data Portal

Trust Resource Lists
- expanded to include non-listed Trust species (migratory birds, raptors)

LEAP products will be delivered to the public through the ECOS-IPaC system
LEAP Data Portal @ USGS ScienceBase

Searchable catalog of spatial data
Integrates with other data management platforms

**LEAP assessment data:**
- LVA data bundles
- Data processing scripts
- Documentation

**Other data themes:**
- Species Distribution & Range
- Land Use/Land Cover
- Land Ownership & Protection
- Landscape Context & Metrics
- Current Development & Disturbance
- Proposed Development
- Predictive Models
Applications to Transportation Planning

LEAP products will facilitate the Eco-Logical approach by providing information for landscape-scale decision-making

-where to site projects
-what resources will be affected
-how to avoid, minimize, and mitigate impacts

Enhanced coordination with FWS
→ Faster project delivery
→ More efficient use of $$
→ Improved conservation
LEAP Status

Wyoming pilot completion in 2012
- expand to include all R6
  (MT, WY, CO, UT, ND, SD, NE, KS)

Opportunities for cooperation with FWS
- data sharing & collection
- peer-review of spatial analyses
- partnerships

2012 TRB Annual Meeting

*Session 331: Enabling Planning-Level Ecological Decision Making: Recent Progress in the Development of National Online Information Systems and Environmental Performance Measures*

*Monday, January 23, 1:30 – 3:15PM @ Hilton*

LEAP Contacts:

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Pam Repp
pam_repp@fws.gov
A Quantitative Decision-making Framework to Evaluate Environmental Commitment Tracking Systems for the Colorado Department of Transportation

Eco-Logical Webinar Series
January 12, 2012

Presentation based on:

Mehmet E. Ozbek, Ph.D.
Assistant Professor and Graduate Program Coordinator
Department of Const Mang.
Colorado State University

Caroline M. Clevenger, Ph.D.
Assistant Professor
Department of Const. Mang.
Colorado State University
Environmental commitments are actions that are intended to avoid, minimize, or mitigate environmental impacts of a project.

Environmental commitments are required as conditions of project approval during the environmental review process.

The purpose of an Environmental Commitment Tracking System (ETS) is to provide a means of tracking the status of environmental commitments as well as maintaining necessary information tied to those commitments.

Implementation of an effective ETS can provide the means necessary to demonstrate to all stakeholders that commitments have been met.
Research Need and Purpose

• **NEED:**
  – Colorado Department of Transportation’s (CDOT) need to adopt an ETS to implement statewide

• **PURPOSE:**
  – To evaluate the ETSs used by a number of state DOTs to determine which ETS would be the most beneficial for long-term implementation at CDOT
Research Approach

A quantitative decision-making framework was developed consisting of four steps:

Step 1 - Conduct interviews with stakeholders to identify the features that CDOT prefers to have in its ETS.

Step 2 - Assign weights to those features to establish their importance relative to each other based on CDOT’s preferences using a rigorous quantitative method (i.e., Analytic Hierarchy Process).

Step 3 - Collect data from eight state DOTs through surveys to identify which features their ETSs have.

Step 4 - Perform a quantitative evaluation of those ETSs according to the features preferred by CDOT and their respective weights to assign a quantitative score to each state DOT’s ETS.
Step 1- Conducting Interviews to Identify Features

The interviewees were selected based on their knowledge of ETSs, the fact that they would be ETS end-users at CDOT, and/or because of their involvement with the CDOT NEPA process.

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<th>Interviewee*</th>
<th>Affiliation</th>
<th>Position</th>
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<td>9.</td>
<td>CDOT</td>
<td>Resident Engineer – Pueblo Region 2</td>
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*: There were two interviewees who did not want their affiliation/position reported.
Step 1- Conducting Interviews to Identify Features

1) **Allow external stakeholders to input/edit information**: ETS allows for external project stakeholders (e.g., agencies like FHWA, contractor, etc.) to input/edit information in the tracking system for those projects which they are involved with.

2) **Control which CDOT employees can view information**: ETS has the capability to assign permissions to a select group of CDOT employees allowing only them to view tracking data for a given project.

3) **Document Management**: ETS has the capability to manage documents (i.e., storing and linking related documents such as word and pdf files for easy retrieval and/or versioning control).

4) **GIS compatible**: ETS has the capability of integrating with GIS.

...  

18) **Sort and filter data**: Users can find and view only the commitments and permits that are relevant to a particular person or project.
Step 2- Assigning Weights to Features

- A well-structured quantitative multi-criteria decision analysis method, Analytic Hierarchy Process (AHP), was utilized
  - Pairwise comparisons between two elements at a time: “Which of the two is more important, and how much more important is it?”
  - Once all comparisons are made, mathematical computations (based on matrix algebra) are performed to assign weights to those elements
  - AHP also requires the calculation of the consistency ratio (C.R.). C.R. is a measure to identify how consistent the participant was

- 18 features $\rightarrow$ 153 pairwise comparisons performed by six respondents

- C.R. of the group=0.028 (<0.10 is acceptable)
## Step 2- Assigning Weights to Features

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## Step 3- Collecting Data from State DOTs about their ETSs

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## Step 4 - Quantitative Evaluation of ETSs

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Conclusions and Future Research

- Recommend further exploration of
  - FDOT’s ETS (supports 93% of CDOT’s preferences)
  - VDOT’s ETS- 90%
  - TxDOT’s ETS- 85%
  - CDOT’s existing ETS- 34%

- The analysis and recommendations are intended to minimize ETS development costs and ultimately to provide CDOT with an effective, efficient, and reliable ETS to track environmental commitment completion on projects

- The quantitative decision-making framework can be used by any state DOT. The implementation of the framework requires a minimal amount of resources, mainly in the form of time commitment

- Future research should investigate:
  - Ease of use
  - User satisfaction
  - First cost and Operational cost
Please hold all questions until the end of the webinar.

ACKNOWLEDGMENT
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FHWA’s Sustainable Highways Self-Evaluation Tool (INVEST)

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Team Leader, Sustainable Transport and Climate Change Team
Office of Planning, Environment & Realty

Eco-Logical Webinar
January 12, 2012
What is a Sustainable Highway System?

- **Satisfies functional requirements**
  - Fulfills transportation goals and needs
  - Addresses development and economic growth
- **Avoids, minimizes, reduces impacts**
  - Environment
  - Consumption of resources
- **Addresses environmental, economic, and social equity dimensions (triple bottom line)**
- **Sustainability addressed throughout the project lifecycle**
Sustainability and the Project Lifecycle

- For sustainability to be fully integrated into highway and transit programs, it must be considered throughout the project lifecycle.
- Must address sustainability from planning through operations.
Examples of Sustainable Practices

• **System Planning**
  – Integrated Planning
  – Mitigation banking
  – Fiscal planning

• **Project Development**
  – Cost Benefit Analysis
  – Construction Equipment Emission Reduction
  – Recycling and Reuse of materials

• **Operations and Maintenance**
  – Strong asset management
  – Roadside vegetation management
  – Infrastructure maintenance
Sustainability and FHWA

• Deliver Federal Aid Highway Program in a more sustainable way
• Make wise investment decisions w/ limited resources
• Take advantage of opportunities to include sustainability throughout the decision making process
• Encourage change in professional practice
• Stress more sustainable practices, get them to be applied/implemented
• Go beyond compliance
• Seek Balanced solutions
Overview of INVEST

- Voluntary Web-based Tool
- Lists “sustainable criteria” based on best practices for three project phases:
  - Systems Planning (SP)
  - Project Development (PD)
  - Systems Management, Operations and Maintenance (OM)
- Each criterion assigned a points based on expected sustainability impact
- In coordination with ASCE/ACEC/APWA effort
INVEST 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 highway systems, projects, programs
Support for Eco-Logical Principals

- Encourages integrated planning, PEL approaches
- Promotes engagement of resource and regulatory agencies
- Encourages links b/n planning and project decision making
System Planning Criteria

SP-1 Integrated Planning: Land Use and Economic Development
SP-2 Integrated Planning: Natural Environment
SP-3 Integrated Planning: Community
SP-4 Accessibility
SP-5 Safety Planning
SP-6 Multimodal Transportation
SP-7 Freight Planning
SP-8 Travel Demand Management

SP-9 Air Quality
SP-10 Energy and Fuels
SP-11 Financial Sustainability
SP-12 Analysis Methods
SP-13 Congestion Management
SP-14 Linking Asset Management and Planning
SP-15 Linking Planning and NEPA
SP-16 Infrastructure Resiliency
## SP-2 Integrated Planning: Natural Environment

<table>
<thead>
<tr>
<th>Goal</th>
<th>Integrate ecological considerations into long range transportation plans (LRTP), corridor plans, and the TIP/STIP process. Proactively support and enhance sustainable ecological function through the coordination of transportation and natural resource planning.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>1-10 Points</td>
</tr>
<tr>
<td>Requirements</td>
<td>3 points. Develop and adopt policies that encourage metropolitan or statewide transportation planning to incorporate ecological considerations into transportation plans and the planning process.</td>
</tr>
<tr>
<td></td>
<td>3 points. Develop institutional mechanisms that engage natural resource and regulatory agencies regularly in creating plans and programs (e.g. technical advisory committees).</td>
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<td></td>
<td>4 points. Assemble data on natural resources and apply system or landscape scale evaluation techniques (e.g. the Eco-Logical Ecosystem Approach/Regional Ecosystem Framework) to assess ecological conditions and avoid and/or minimize potential impacts of planned transportation projects to the natural environment.</td>
</tr>
</tbody>
</table>
# SP-15 Linking Planning and NEPA

<table>
<thead>
<tr>
<th>Goal</th>
<th>Incorporate planning documents and decisions from the transportation planning process into the environmental review process.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>2 - 10 points</td>
</tr>
</tbody>
</table>

## Requirements

**2 points.** The Agency has a program to consult with NEPA practitioners throughout the system-level planning process to ensure the material produced 1) Can be incorporated into subsequent NEPA documents in accordance with FHWA and CEQ regulations; 2) Will aid in establishing or evaluating the purpose and need of the projects, reasonable alternatives, impacts on the built and natural environment, or mitigation measures, and 3) Is in a form that is accessible during the NEPA scoping process and can be appended or referenced in the NEPA document.

**4 points.** Agency has documented procedures for linking the system-level planning process with NEPA.

**4 points.** Agency successfully incorporates analysis, decisions, and documents from the system-level planning process on specific NEPA projects. The planning studies can produce analyses and decisions for FHWA review and consideration.
Welcome!

Pilot Test Version of INVEST, the FHWA Sustainable Highways Self-Evaluation Tool

This website represents a significant revision of the FHWA Sustainable Highways Self-Evaluation Tool that was released as a Beta Version in the Fall of 2010. Called the "Infrastructure Voluntary Evaluation Sustainability Tool", INVEST is a practical, web-based, collection of best practices that allow states to integrate sustainability into their transportation projects. The use of the tool is voluntary and can be used by states or other project sponsors to measure the sustainability of their projects.

We received many valuable stakeholder comments on the Beta Version, and have made some significant changes to improve the tool and to address many of the comments. A few of the major modifications:
Next Steps for INVEST

• **Pilot Testing**
  – PD criteria - done
  – OM criteria - complete in January 2012
  – SP criteria - complete in February 2012

• **Weighting & Scoring review** - ongoing

• **Updates to Website** - ongoing

• **Version 1.0 Release** - Spring 2012
Thank You!

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