Performance Measurement Framework for Highway Capacity Decision-Making: Project C02

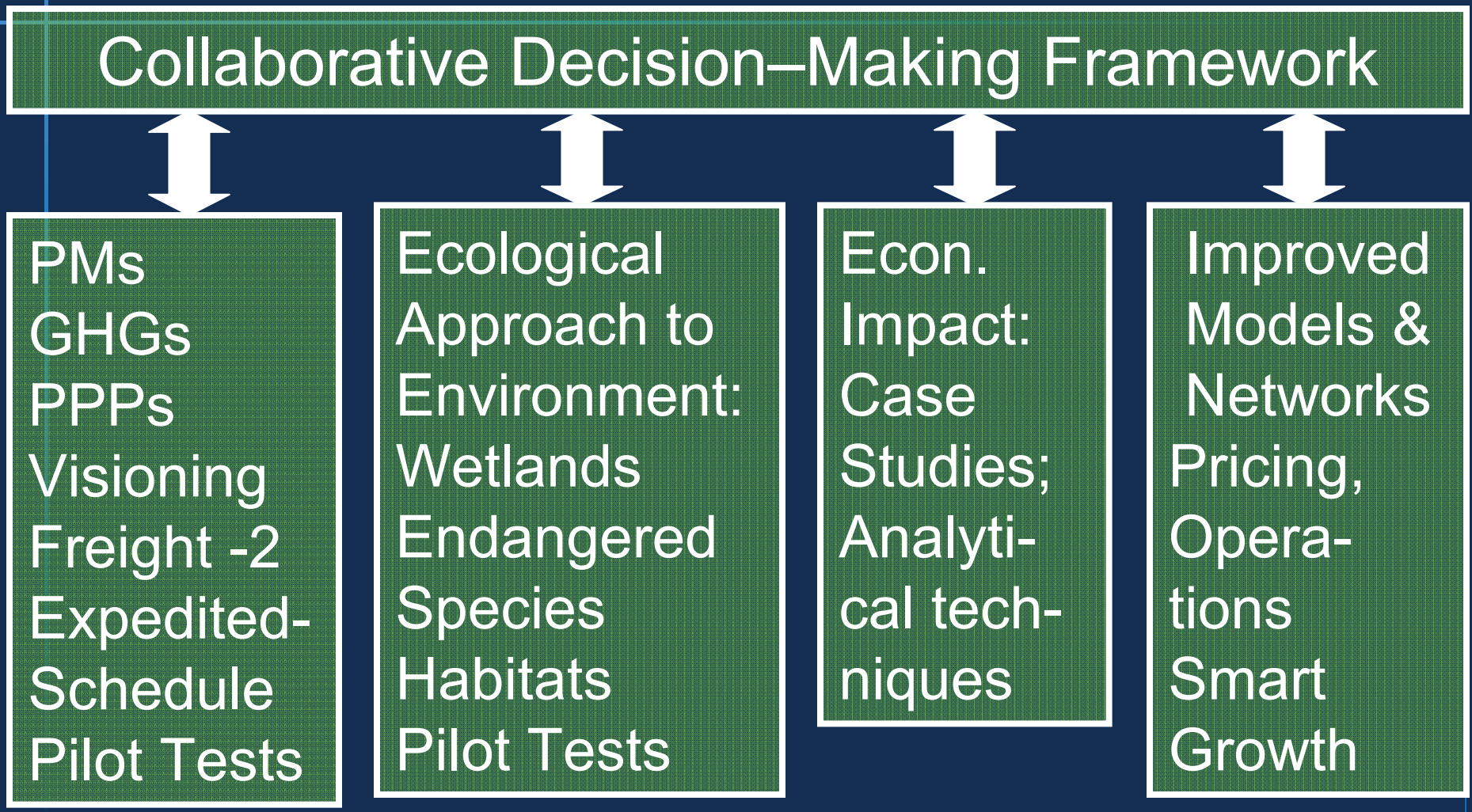
Presented at 2009 RAC Annual Meeting
Orlando, Florida

Steve Andrle
SHRP 2 Staff officer

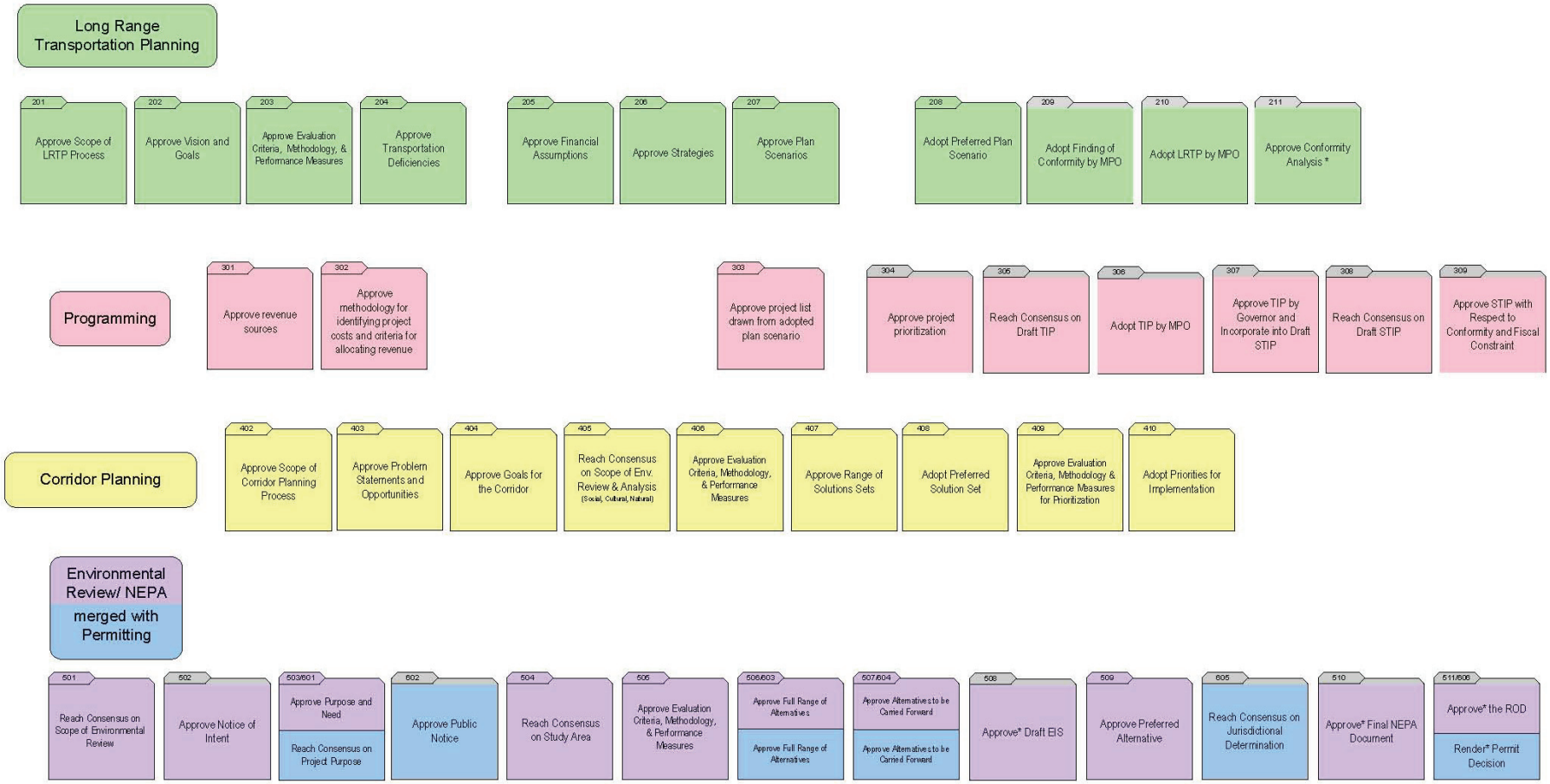
SHRP 2 Capacity Focus Area

Fundamental Goal: Integrate mobility, economic, environmental, and community needs into the planning and design of new highway capacity

Elements of Capacity Research



Collaborative Decision Making Framework (CDMF)

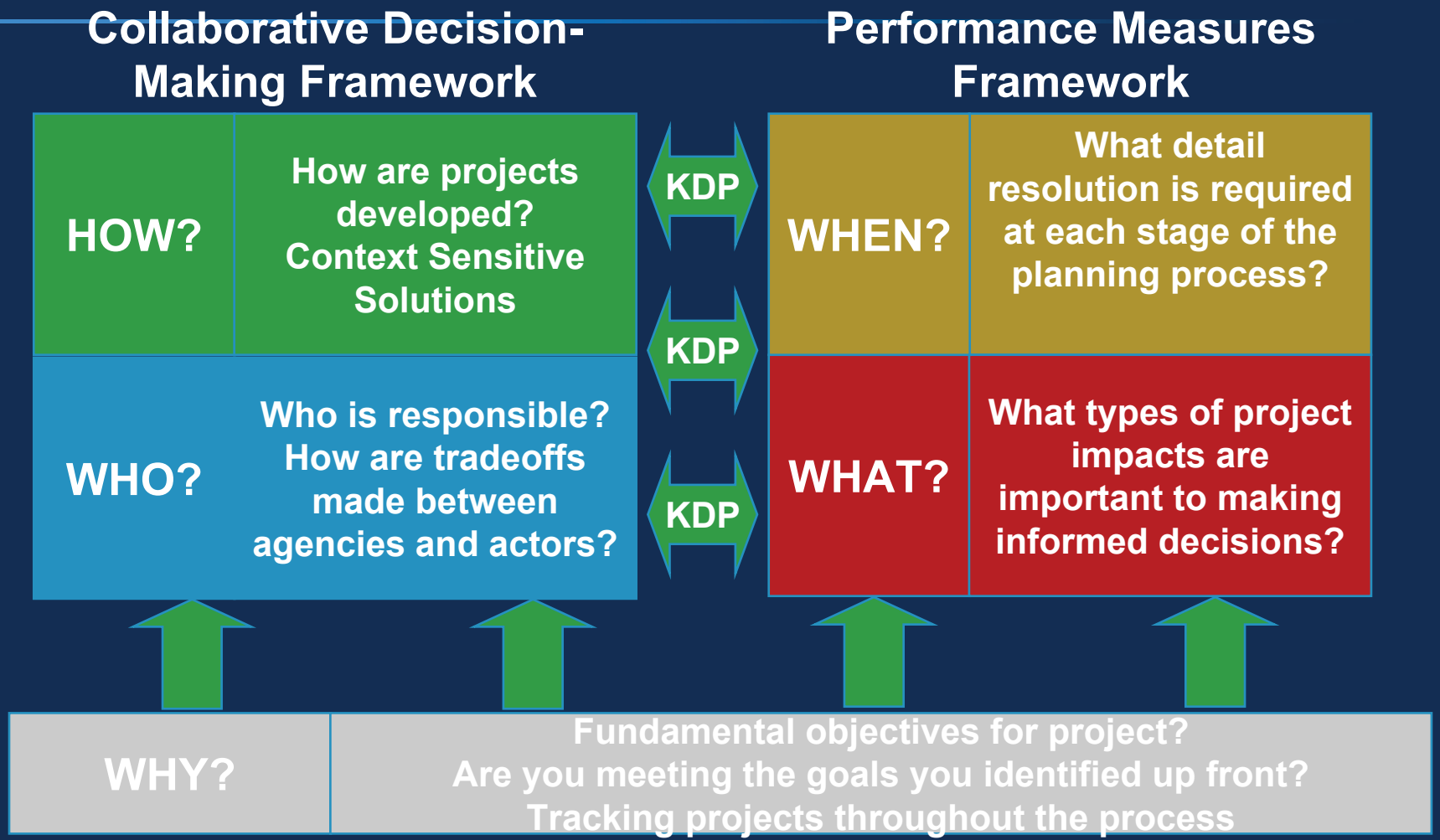


What is in the Performance Measures Framework?

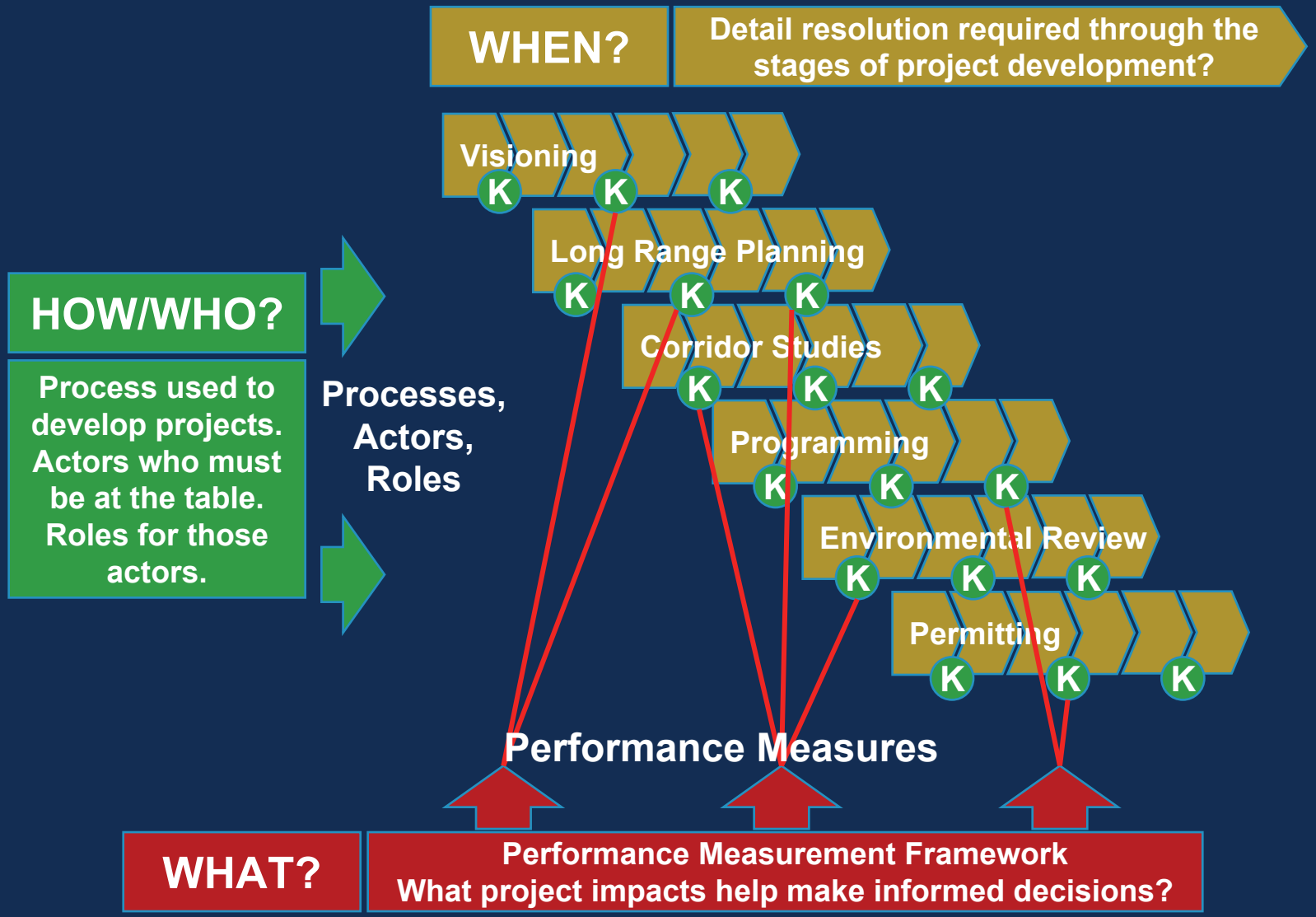
- Measures of potential impacts from highway capacity additions
  - Emphasis is on non-traditional areas of measurement, e.g., environmental and community impacts
  - Specifies uses of measures within 'master processes' (long range planning, programming, environmental review, etc.)
  - Does not include process measures
- Case studies that demonstrate specific applications of measures and tools
  - Identify new or innovative measures under development
- Linked to Key Decision Points (KDPs) in decision making

PRODUCTS

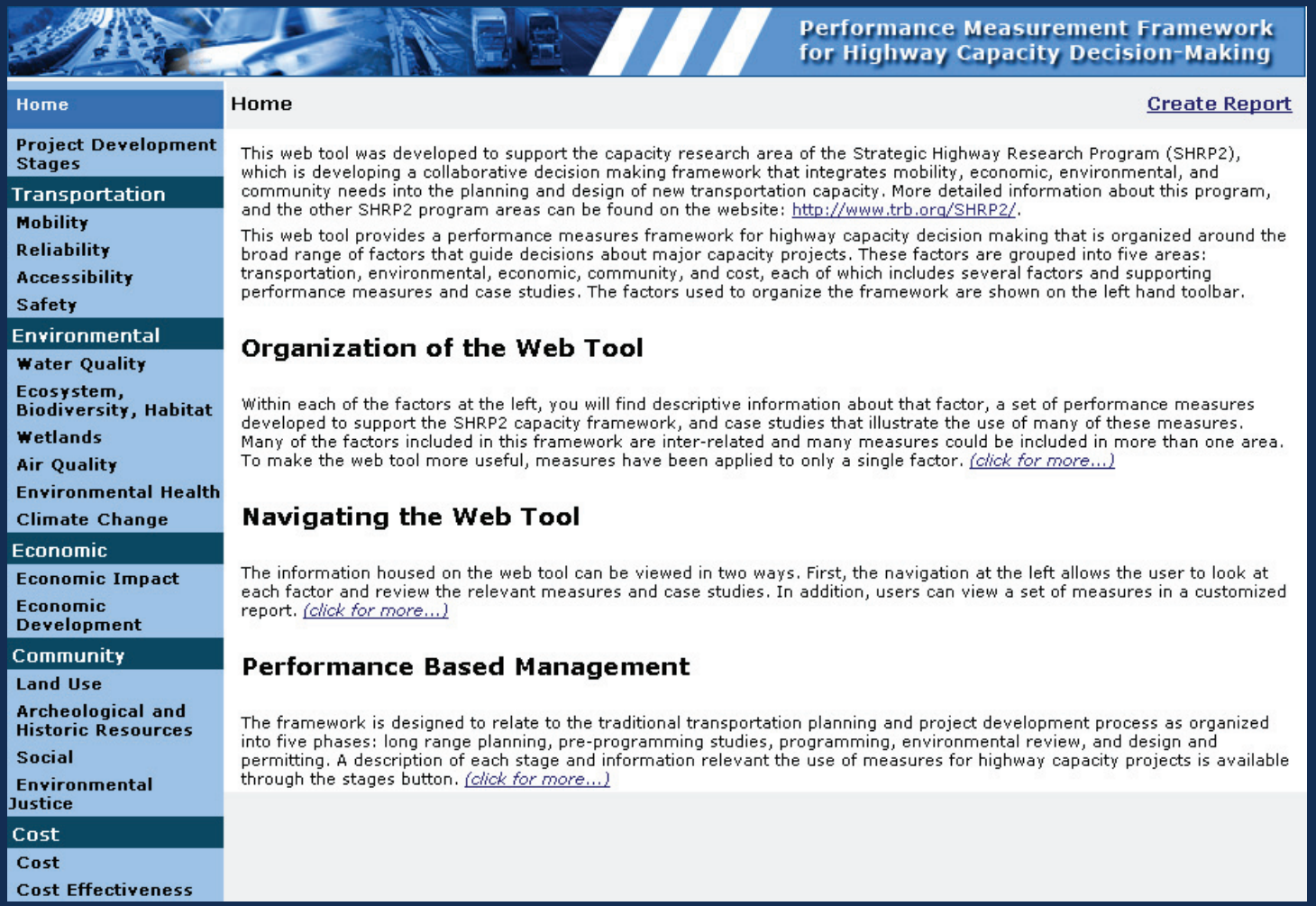
- A framework for performance measurement to support highway capacity decision making at all stages of project development
- A structured inventory of performance measures that DOTs and other agencies can use to evaluate capacity plans, programs and projects
- A set of case studies to describe the use of measures in specific contexts
- A web-based tool providing easy access to, and application of, the above products


Collaborative Decision-Making Framework
Performance Measures Framework
HOW?
How are projects developed? Context Sensitive Solutions
WHEN?
What detail resolution is required at each stage of the planning process?
KDP
KDP
WHO?
Who is responsible? How are tradeoffs made between agencies and actors?
WHAT?
What types of project impacts are important to making informed decisions?
KDP
WHY?
Fundamental objectives for project?
Are you meeting the goals you identified up front?
Tracking projects throughout the process

Performance Measurement Framework
Relationship to Collaborative Decision Making Framework



Web Tool Demonstration



Temporary Web Site

- . http://12.0.47.102/SHRPII/

How Are Measures Used
Example – Water Quality

- **Water Quality Protection Areas**
  - Impact of transportation construction on priority water quality protection areas
- How to use the measure
  - Long Range Planning - understand the locations of water quality protection areas
  - Pre-Program Studies - understand if a project will require more substantial evaluation of water quality impacts
  - Environmental Review - Used to evaluate project alternatives for their expected impacts on water quality protection areas

How Are Measures Used
Example – Water Quality (continued)

C01

Approve Visions and Goals

Approve Evaluation Criteria & Methodology

Approve Transporta-tion Deficiencies

Approve Plan Scenarios

C02

Identify water quality as area of concern

Identify relevant water quality measures

Validate water quality concern

Evaluate scenarios using measures

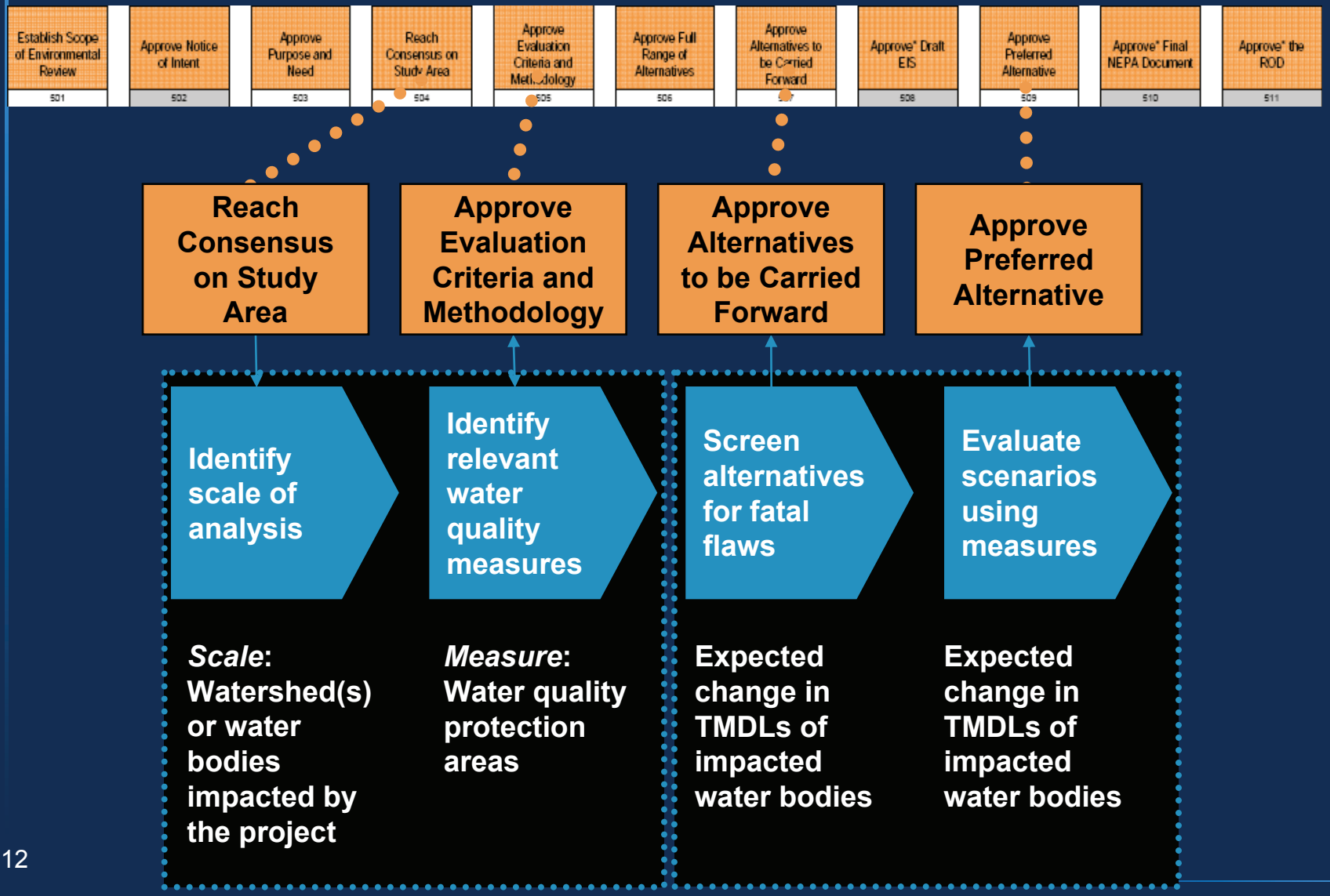
Objective: Maintain and improve water quality

Measure: Water quality protection areas

Presence of water bodies with TMDLs identified near capacity deficiencies

Presence of water bodies with TMDLs identified near priority capacity needs

How Are Measures Used
Example – Water Quality (continued)



ILLUSTRATIVE CASE STUDIES

Web Tool Report

Monday, July 20, 2009

The information in this report was developed in support of the capacity research area of the Strategic Highway Research Program (SHRP2). The overall goal of this program is to build a collaborative decision making framework that integrates mobility, economic, environmental, and community needs into the planning and design of new transportation capacity. More detailed information about this program, and the other SHRP2 program areas can be found on the website: http://www.trb.org/SHRP2/.

This report includes performance measures and case studies developed by SHRP2 Project C02: *Performance Measurement Framework for Highway Capacity Decision-Making.* The framework organizes the broad range of factors that guide decisions about major capacity projects into five areas: transportation, environmental, economic, community, and cost. The measures in the report are organized within these five areas by several specific factors.

The first set of pages in the report identify the selected measures. The heading for each measure identifies the factor area and factor that the measure supports. The measures include a description, data requirements, the typical scale of analysis, and potential uses at various stages of capacity project development (long range planning, pre-program studies, programming, environmental review, and design and permitting).

Case studies are listed together at the end of the report. The case studies offer examples of recent efforts by agencies to employ measures in the specific factor areas. The case studies include a short description, the relevant factor areas, the agency responsible for the effort, and a link to more information (if available).

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Environment:Ecosystems, Biodiversity and Habitat

Loss of Habitats

Impact of transportation construction on degradation in quality and quantity of land essential to the survival of target plant or animal species

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Degradation of the habitat that species need for food, protection from predators and breeding can be measured in terms of change in the total area of the habitat; change in composition and structure of the habitat; change in the amount of habitat edge; change in the amount of interior habitat; distance of habitat fragments from one another; and change in the average size of each patch of habitat. This measure is especially relevant for regions with federally and state listed threatened and endangered species.

How to use this measure:

- **Long Range Planning** - Used to understand locations of significant habitats that are impacted by transportation facilities and potential projects.
- **Pre-Program Studies** - Used to flag projects that are likely to significantly impact habitat due to their location.
- **Environmental Review** - Used to help DOTs determine how to minimize impacts to habitat during NEPA.

Data Requirements: Species of concern; habitat areas used by species of concern throughout their lifecycle; functional value of each identified habitat area for each species; size of habitat areas; location of habitat areas; project location data
Relevant Analysis Scales: project, corridor, region, state
Forecastable: Yes

Merced County Partnership for Integrated Planning (MCAG)

- Context: MPO Long Range Plan Update
- Issues:
  - Incorporating environmental concerns
  - Streamlining project delivery
  - Using GIS tools to integrate land use, transportation and environmental data layers
  - Collective impacts of a program of projects
  - Evaluate development scenarios
- Modeling tools
  - Upland – Scenario-based GIS modeling tool. Enabled participants and stakeholders to understand the implications of choices
  - HePlan – Habitat evaluation planning model. Predicts the incidence of habitat areas based on GIS environmental layers

MCAG Evaluation Measures for LR Plan

Factor	Measurement	Unit	High or low
Mobility	Lane miles of congestion in 2020	Lane-miles	Low is better
Accessibility	Transit ridership in 2030; bike path and sidewalk funding	Million riders per yr; millions of $	Higher is better
Safety	Accidents reduced in next 25 years	Accidents	Higher is better
Air Quality	Emissions is 2030	Tons per day	Lower is better
Land Use	Land converted to urban use; acres fo farmland impacted	Square miles	Lower is better
Cost	Env. Mitigation cost; Total regional cost	Millions of $	Lower is better

MCAG Lessons and Results

- Use of measures helped MCAG select preferred scenarios
- A cumulative impacts panel was used to develop guidelines, methods and responsibility for cumulative impacts
- Models were used to estimate the implications of alternatives
- Established new level of mutual understanding between resource agencies, transportation agencies, and the public
- Resulted in more thorough environmental analysis
- Spurred an effort to compile environmental data layers in a format useful to all partners
- Improved public participation: 30% increase in awareness of the LR plan
- LR plan approve unanimously

Atlanta Regional Commission Envision 6

- Context: Long and Short Range (TIP) Transportation Plan
- Partners
  - Governor's Congestion Mitigation Task Force
- Issues
  - Congestion, congestion, congestion
  - Comparative evaluation of alternatives

Measures

- **Recurring Delay – routine volume exceeds capacity (50 points)**
  - **Measures: Intensity, duration, extent**
  - **Post processor to demand model used for comparison against the no-build.**
  - **FTA Summit software used for transit projects**
- **Nonrecurring Delay – results from incidents (20 points)**
  - **Estimated crash rate; formula to estimate crash reduction potential from transit projects**
- **Environmental Impact – proximity to 6 sensitive areas (15 points) Transportation projects mapped to sensitive areas and points awarded**
- **Support for regional Land Use Plan – how well does the project support growth policies. (15 points)**
  - **Mapped to ARC Unified Growth Policy Map.**
  - **"Place-based" objectives (CBD, neighborhood, etc.)**
  - **Transit amenities, bike/ped, connectivity, context sensitive elements**

ARC Lessons and Results

- Sensitive environmental areas agreed to in advance and mapped. Degree of avoidance was a performance measure.
- GIS and modeling software used to generate numbers
- Complex measures were rolled into a simpler 100 point scale for comparative evaluation
- Scores used to place projects in one of three tiers
- Tier ranking used as the primary criteria for funding
- A benefit/cost approach used to place top-tier projects' in a particular TIP year

Take Aways

- The performance measures framework fits into and supports the Collaborative Decision-Making Framework
- The report is in press. Will be available shortly
- The web tool is dynamic, meaning it's never actually done.
  - Other SHRP 2 research will enhance the measures and a Capacity project integration contractor will update the web tool
  - Ideas from others can be included
- The whole web package is intended to be housed and maintained through SHRP 2 implementation funding

http://www.trb.org/shrp2/