



TRANSPORTATION ASSET MANAGEMENT

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What is Transportation Asset Management?


- “...a comprehensive and structured approach to the long-term management of assets...”
 - Strategy for Improving Asset Management Practice, AUSTRROADS, 1997
- “...goes beyond the traditional management practice of examining singular systems...and looks at the universal system of a network of roads and all of its components...”
 - Organization for European Cooperation and Development Working Group, Asset Management Systems, Project Description, 1999
- “...Through proper asset management, governments can improve program and infrastructure quality, increase information accessibility and use, enhance and sharpen decision-making, make more effective investments and decrease overall costs.”
 - Organization for European Cooperation and Development Working Group, Asset Management Systems, Project Description, 1999

What is Transportation Asset Management?

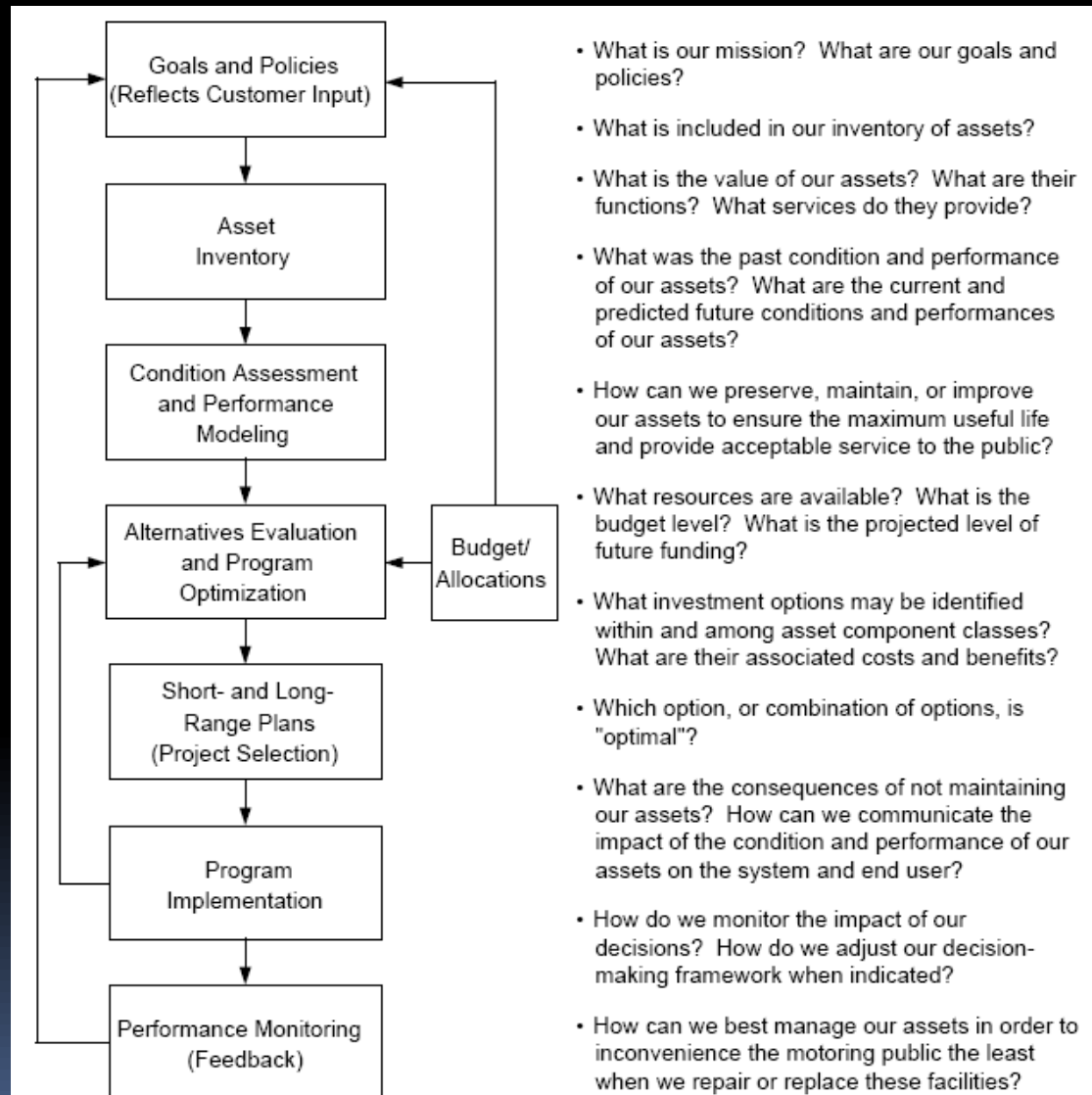
- “The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost-effective manner.”
 - International Infrastructure Management Manual Definition, 2006 Edition
- “A strategic and systematic process for operating, maintaining, upgrading, and expanding physical assets effectively through their life-cycle. 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.”
 - AASHTO Definition, Asset Management Overview, 2007



5 Core Principles

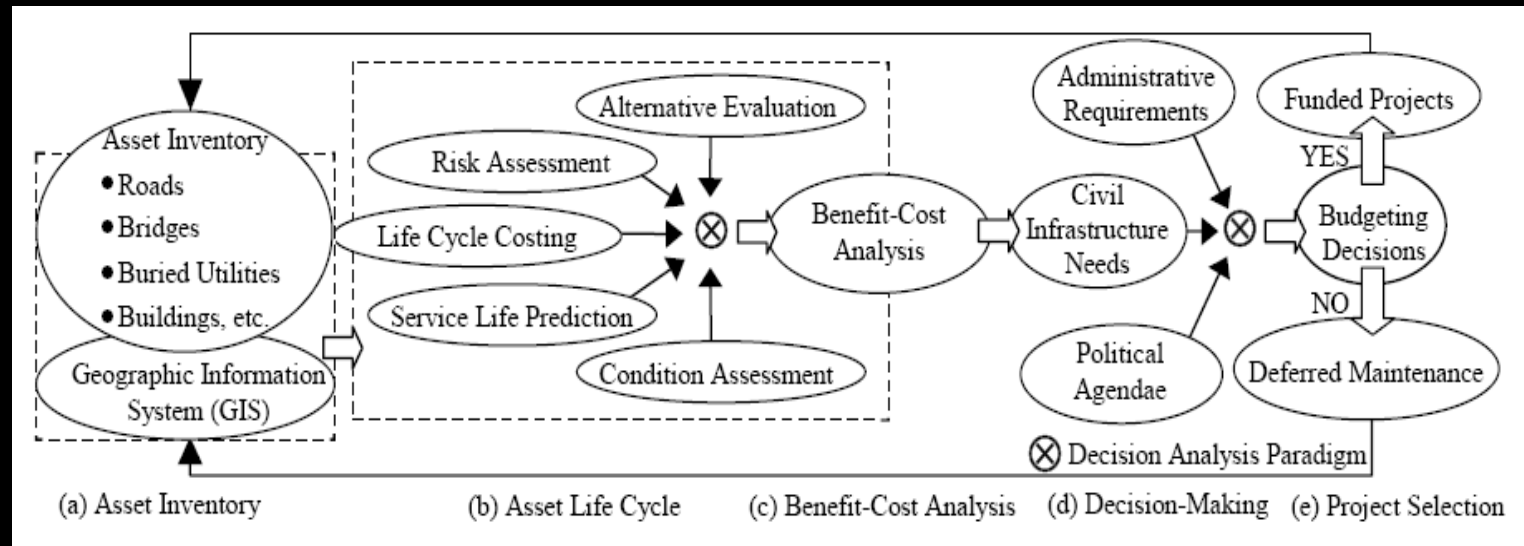
- Policy-driven
 - Performance-based
 - Analysis of Options and Tradeoffs
 - Decisions Based on Quality Information
 - Monitoring Provides Clear Accountability and Feedback
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Generic Asset Management System



Source: Asset Management Overview, FHWA-IF-08-008, 2007

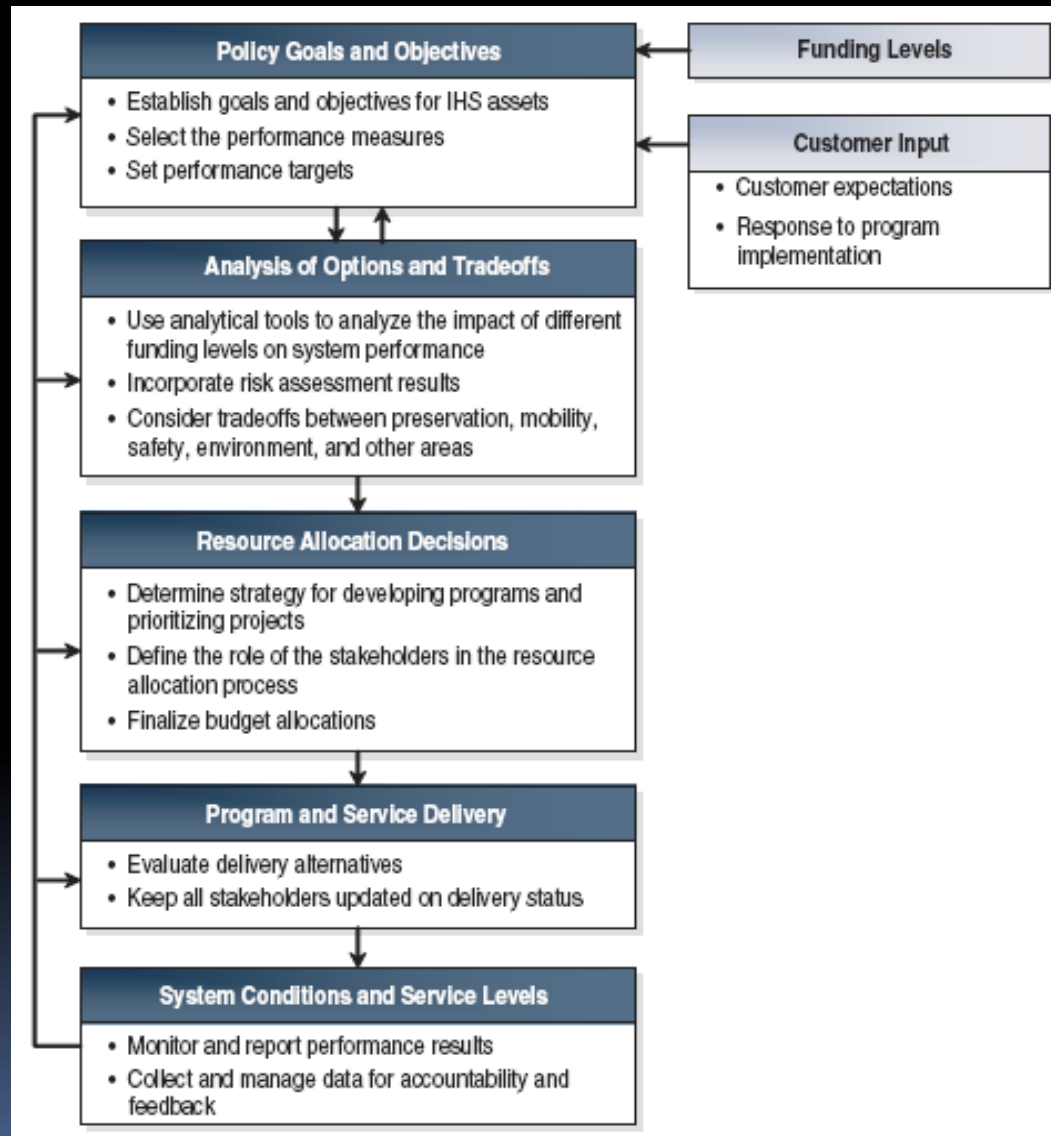
Framework for Asset Management Decision-Making



Source: Vanier and Lounis, 2006

- What do you own?
- What is it worth?
- What is the deferred maintenance?
- What is its condition?
- What is the remaining service life?
- What do you fix first?

Asset Management Process



Why use Transportation Asset Management?

- A shift from expansion to preservation
- Constrained budgets
- Higher expectations for levels of service
- Greater system complexity
- Push for increased accountability
- Staffing and expertise shortages

Challenges to Implementation

- Competing strategic goals and objectives
- Difficulty satisfying long-term investment planning needs due to focus on short-term budgets
- Developing appreciation of benefits to entire agency vs. individual units
- Organizational culture
- Lack of resources
- Identifying appropriate performance indicators
- Data collection and management (data rich, but information poor)
- Accessing and processing data from different sources
- Still developing models, methods, and tools to construct and analyze tradeoffs

Best Practices

- Scan of Best Practices in Transportation in Asset Management
- To identify best case examples of the application of asset management principles and practice in U.S. transportation agencies.
- National Cooperative Highway Research Program (NCHRP) Report 20-68 (2007)



MICHIGAN DOT

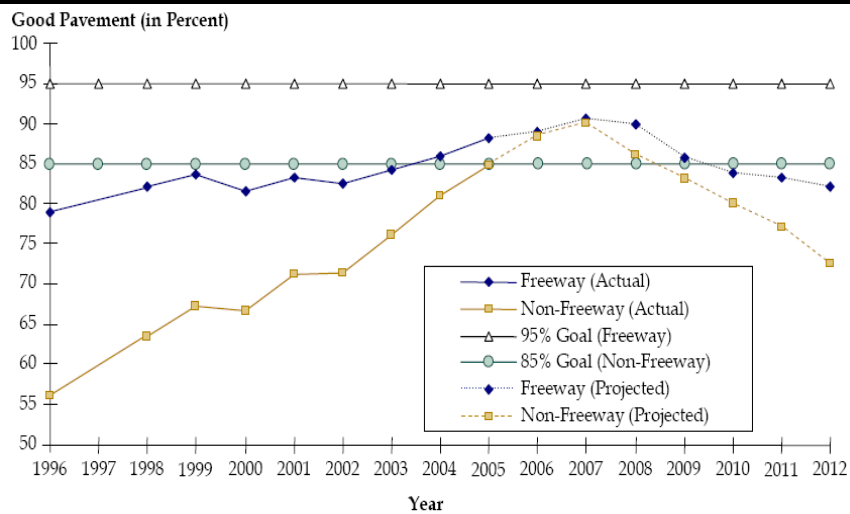


Best Practices – Michigan DOT

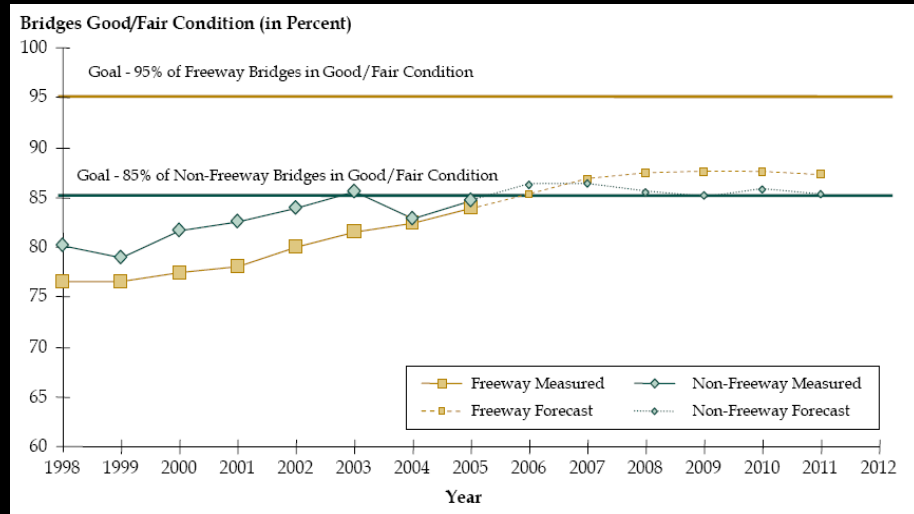
- Over 9,700 miles of road
- 27,000 lane-miles
- 5,600 bridges
- 215 park-and-ride lots
- 2,400 trucks, maintenance vehicles, vans and cars
- 450,000 signs; 4,025 traffic lights, 8 million linear feet of guardrails
- 83 rest areas and 13 travel information centers
- Over 600 miles of rail lines; 107 railroad bridges; 736 railroad crossings

Best Practices – Michigan DOT

Pavement Condition, Michigan (1996 – 2012)



Bridge Conditions, Michigan (1996 – 2010)



Source: NCHRP Report 20-68

Best Practices – Michigan DOT

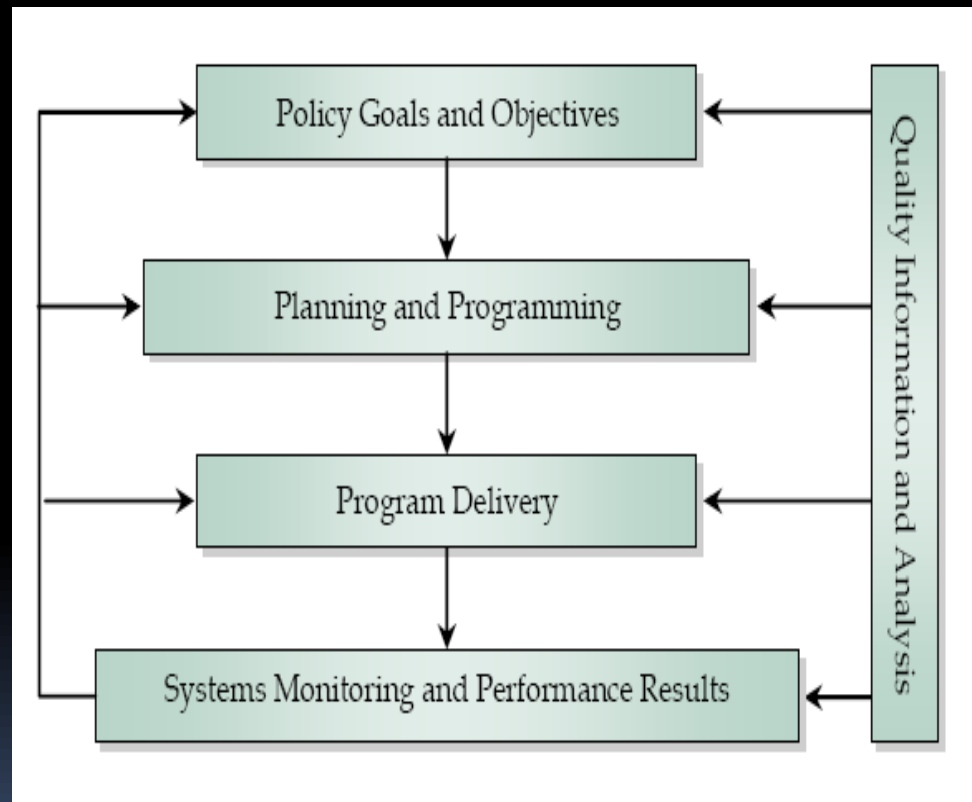
MDOT's Approach

- Set performance standards
- Monitored condition and performance
- Applied specific treatments at critical points

Organization

- Asset Management Division
- Asset Management Administrator
- Manager of the Asset Management Section

MDOT's Asset Management Process



Source: NCHRP Report 20-68

Best Practices – Michigan DOT

- **4 Analysis tools used to develop investment program:**
 - Cash Flow Model
 - Road Quality Forecasting System (RQFS)
 - Bridge Condition Forecasting System (BCFS)
 - Integrated Call for Projects

Best Practices – Michigan DOT

■ Integrated Call for Projects Letter

- The “heart” of MDOT’s asset management process
- Outlines key areas and strategic objectives
- Provides regional managers with specific technical instructions
- Review to identify candidate projects for more detailed scoping

■ Investment Template

- Links goals to program outcomes
- Communicates MDOT’s investment strategy
- 20 program categories with performance standards or goals
- Investment levels for each program category over several years



UTAH DOT



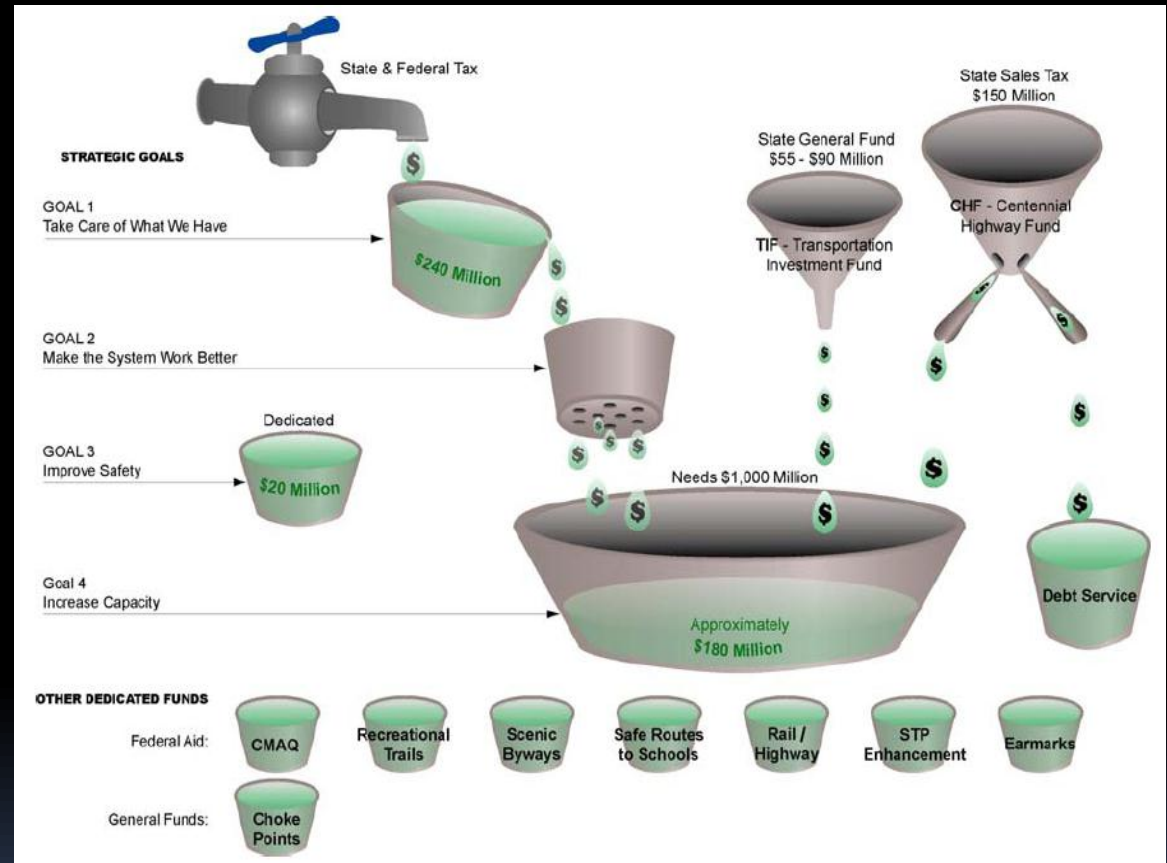
Best Practices – Utah DOT

- 5,900 miles of highways
- 14% of the State's total highway road system of 42,704 miles
- Used asset management to:
 - Provide greater credibility with elected officials and stakeholders.
 - Address questions:
 - What is the effect on asset condition of a 15% increase or decrease in funding?
 - What would be the effect on asset condition of trading off maintenance and preservation dollars with congestion mitigation dollars?

Best Practices – Utah DOT

Flow of Transportation Investment in Utah

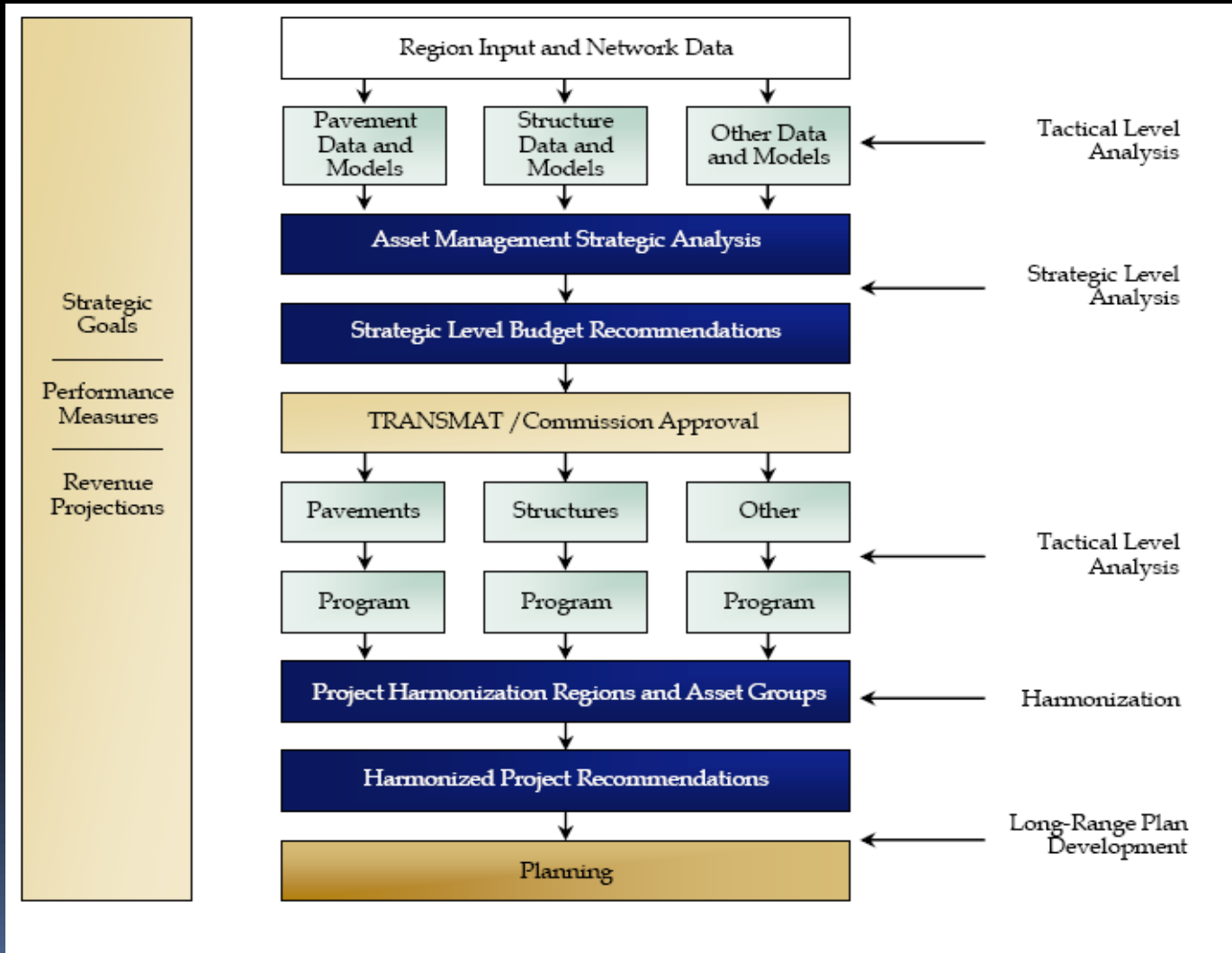
- Investment decisions relate directly to strategic goals:
 - Take care of what we have
 - Make the system work better
 - Improve Safety
 - Increase capacity
- Allocation of funds:
 - First to system preservation.
 - Then to improving system performance.
 - Lastly to enhancing the system capacity.
 - Dedicated funding is provided to the safety program.
- Adopted specific performance measures related to the four strategic goals.



Source: NCHRP Report 20-68

Best Practices – Utah DOT

Planning and Asset Management in Utah DOT



UDOT Asset Management System Decision Support Tools

- Used to make funding allocation decisions across asset groups
- Commercially available off-the-shelf software package (dTIMS CT)
- “Stovepipe” analysis of an individual asset or cross-asset optimization
- Incremental benefit/cost optimization to determine funding levels
- Separate management systems for each asset group (Pavement Management System (dTIMS CT), Bridge Management System (Pontis), Maintenance Management System (in-house), Accidents and Safety)
- Separate systems used to recommend projects for each asset
- Incremental benefit/cost optimization used to determine recommended projects and compare strategies

UDOT Lessons Learned

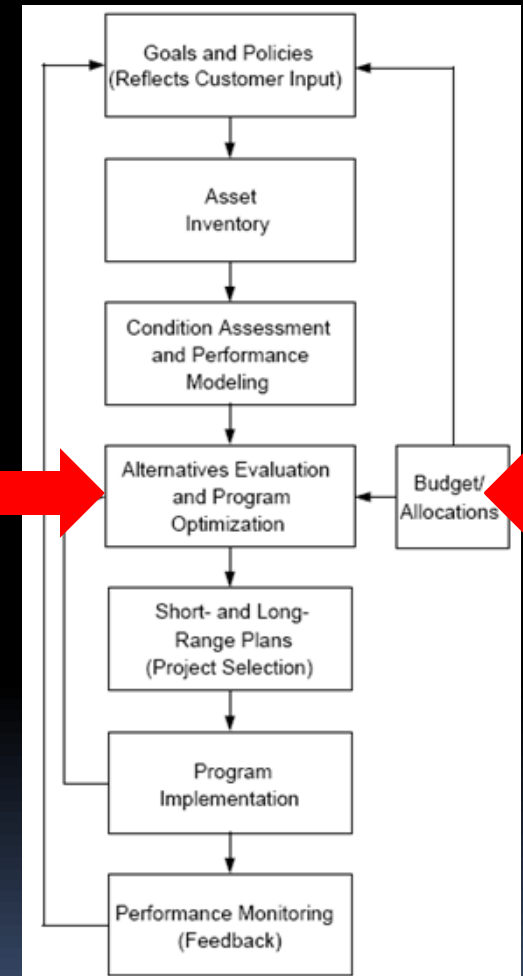
- What is best for the organization is best determined by internal and external stakeholders.
- A self-assessment survey serves as a catalyst for respondents to become champions for asset management.
- The system is only one part of asset management. Organizational structures, operating procedures, human resources, and clear authority serve as the foundation for an asset management program.
- If presented effectively to decision-makers, the logic and facts of system preservation speak for themselves.
- Developed an understanding that pavement and bridge preservation projects would not compete against each other. Threshold target values for asset condition determine whether a project will be built.
- There is no “silver bullet” solution.

Best Practices – Top 10

1. Agencies had adopted a “preservation first” strategy.
2. Success directly linked to asset management champions.
3. AM process + Investment justification info = \$
4. The most successful processes had moved away from a “worst-first” investment strategy and adopted principles based on life-cycle costing.
5. Performance measures guided investment decisions.
6. Scenario analysis was very effective at convincing decision-makers of the need for investment.
7. No one organizational model.
8. Growing pains led to enhanced communications between different organizational units.
9. Little evidence of the application of risk analysis techniques.
10. New technologies can make data collection activities more cost-effective and efficient.

My Research

- A Study of Optimal Decision-Making in Asset Management
- Decision-Making - the core of the asset management process
 - Making the “right” decisions
 - Allocation of limited resources
 - Achieving a desired objective
 - Obtaining the best return for the expenditure
- Key Considerations
 - Goals/Objectives
 - Criteria
 - Performance, cost, risk
 - Alternative Analysis Methods
 - Benefit-Cost Analysis
 - Multi-attribute (multi-criteria) utility theory



Source: Asset Management
Overview, FHWA-IF-08-008, 2007

My Research

Purpose

- To examine the project selection decision-making process.

Key Questions

- What process is used to select projects to satisfy objectives?
- What is the rationale? And, how is it documented for future use?
- What are the key inputs, outputs, and activities of the process?
- What key organizational roles are involved in the process?
- What factors most significantly influence the decision?
- How is cross-asset optimization approached?
- How are subjective criteria incorporated into the process?
- How can an organization's decision-making process be applied to another organization?



My Research


Research Approach

- Literature Review
- Case Studies (Municipal/State Organizations)
- Map the decision-making process
- Develop methodology
- Model the methodology
- Validate model with scenarios



My Research

Contributions of this Research

- Process model to facilitate understanding and application in other organizations.
 - Improvements to current practices.
 - Framework for developing decision support tools.
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Recommended Resources

- AASHTO's Transportation Asset Management Website (<http://assetmanagement.transportation.org>)
- AASHTO Transportation Asset Management Guide: A Focus on Implementation
- International Infrastructure Management Manual, 2006 Edition (ISBN No: 0-473-10685-X)
- New Zealand Asset Management Support (NAMS) Website (<http://www.nams.org.nz/>)

FYI - Analytical Tools

Tool	System Type	Available From	Notes
AssetManager NT	Investment analysis	AASHTO	Integrates investment analysis results from multiple sources
AssetManager PT	Needs and Project Evaluation	AASHTO	Prioritizes projects based on user-specified measures
BCA.Net	Needs and Project Evaluation	FHWA	Performs benefit/cost analysis for highway improvements
BLCCA	Needs and Project Evaluation	NCHRP	Bridge preservation life cycle cost analysis
DIETT	Risk Assessment	NCHRP	Prioritizes risks to transportation choke points
HDM-4	Investment Analysis	McTrans, Presses de l'ENPC (Paris)	Simulates highway investment needs, condition and performance
HERS-ST	Investment Analysis	FHWA	Simulates highway investment needs, condition and performance
IDAS	Needs and Project Evaluation	McTrans and PCTrans	Evaluates network impact of ITS improvements
MOOS Bridge Level Model	Needs and Project Evaluation	NCHRP	Assist in developing bridge-level strategies using data from Pontis. Also can be used to prioritize investments to mitigate bridge risks
MOOS Network Level Model	Investment Analysis	NCHRP	Uses data from the bridge-level model to perform multi-objective analysis
NBIAS	Investment Analysis	FHWA	Simulates bridge investment needs, condition and performance
PONTIS	Management System	AASHTO	BMS licensed by most U.S. state DOTs
REALCOST	Needs and Project Evaluation	FHWA	Performs benefit/cost analysis for pavement projects
STEAM	Needs and Project Evaluation	FHWA	Evaluates network impact of multimodal improvements
TRNS*PORT	Results Monitoring	AASHTO	Supports preconstruction, contracting, and construction management

Source: NCHRP Report 632

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